CEREALS.

Fig. 121.—Barley, X 110.
Transverse section, showing in order, pericarp, seed coats, aleurone layer, and starch cells.

Fig. 122.—Barley, X 55.
Surface view of epidermis with hairs.

Fig. 123.—Barley, X 125.
Surface view of upper chaff layer.

Fig. 124.—Barley Starch, X 220.
CEREALS.

Fig. 125.—Buckwheat, $\times 110$.
Transverse section through part of pericarp, seed coat, and part of endosperm.

Fig. 126.—Buckwheat, $\times 110$.
Surface view of scutellum.

Fig. 127.—Buckwheat, $\times 110$.
Surface section. Aleurone or proteid layer.

Fig. 128.—Buckwheat Starch, $\times 230$.
Starch granules separated.
CEREALS.

FIG. 120.—Buckwheat Starch, ×110.
Starch grains in masses.

FIG. 130.—Corn, ×110.
Transverse section through pericarp, seed coat, proted layer, and part of endosperm, showing starch cells.

FIG. 131.—Corn, ×110.
Surface view showing two layers of the mesocarp.

FIG. 132.—Corn, ×110.
Surface section. Proteid layer.
PLATE IV.

CEREALS.

Fig. 133.—Corn Starch, X 220.

Fig. 134.—Corn Starch, X 220.
With polarized light.

Fig. 135.—Oat, X 110.
Transverse section through chaff.

Fig. 136.—Oat, X 110.
Surface section. Protein layer with fragments of epidermis and hairs.
PLATE V.

CEREALS.

Fig. 137.—Oat, ×110.
Surface view of upper chaff layer.

Fig. 138.—Oat, ×15.
Surface view of epidermis and hairs.

Fig. 139.—Oat Starch, ×220.

Fig. 140.—Rice, ×110
Transverse section through seed coat and part of endosperm.
CEREALS

**Fig. 141.—Rice, \( \times 110 \).** Surface section through starch cells.

**Fig. 142.—Rice, \( \times 110 \).** Surface view of upper chaff layer.

**Fig. 143.—Rice Starch, \( \times 220 \).** Transverse section through the entire grain.

**Fig. 144.—Rye, \( \times 18 \).**
CEREALS.

**Fig. 145.**—Rye, X 110.
Transverse section through pericarp, seed coat, aleurone layer, and starch cells of endosperm.

**Fig. 146.**—Rye, X 110.
Surface view of epidermis and underlying layers.

**Fig. 147.**—Rye, X 110.
Surface view of epidermis and of seed coat.

**Fig. 148.**—Rye Starch, X 220.
PLATE VIII.

CEREALS.

FIG. 140.—Wheat, X110.
Transverse section through pericarp, seed coat, protein layer, and starch cells of endosperm.

FIG. 150.—Wheat, X110.
Surface view of outer and inner epidermis showing protein layer.

FIG. 151.—Wheat, X110.
Surface view of epidermis, with hairs.

FIG. 152.—Wheat Starch, X220.
PLATE IX.

LEGUMES.

Fig. 153.—Bean, X 110.
Transverse section through starch cells.

Fig. 154.—Bean Starch, X 220.

Fig. 155.—Bean, X 110.
Transverse section through hull, showing palisade cells of epidermis, and underlying hypoderma.

Fig. 156.—Lentil, X 110.
Transverse section through hull and part of endosperm, showing some of the starch cells.
LEGUMES.

PLATE X.

Fig. 157.—Lentil, ×110.
Surface view of epidermis.

Fig. 158.—Pea, ×110.
Transverse section through hull and seed coat showing outer palisade cells and underlying hypoderma.

Fig. 159.—Pea, ×110.
Surface section through base of palisade layer.

Fig. 160.—Pea, ×110.
Powdered pea hulls.
LEGUMES.

Fig. 161.—Pea, X110.
Surface view of palisade cells.

Fig. 162.—Pea, X110.
Transverse section through starch cells.

Fig. 164.—Pea, X30.
Transverse section through starch cells.

Fig. 164.—Pea Starch, X220.
PLATE XII.

MISCELLANEOUS STARCHES.

Fig. 165.—Potato Starch, × 220.

Fig. 166.—Potato Starch, × 220.
With polarized light.

Fig. 167.—Arrowroot Starch, × 220.

Fig. 168.—Tapioca Starch, × 220.
(Cassava.)
TURMERIC. SAGO.

Fig. 169.—Turmeric, × 70.
Transverse section through rhizome.

Fig. 170. Turmeric, × 110.
Longitudinal section. Note spiral ducts through the center.

Fig. 171.—Powdered Turmeric, × 110.
Showing starch grains, fragments of cell tissue, coloring matter, etc.

Fig. 172.—Sago Starch, × 220.
PLATE XIV.

COFFEE.

Fig. 173.—Raw Coffee, \( \times 110 \).
Transverse section of outer portion of endosperm.

Fig. 174.—Roasted Coffee, \( \times 130 \).
Transverse section through parenchyma of endosperm.

Fig. 175.—Coffee, \( \times 110 \).
Surface view of seed coat.

Fig. 176.—Coffee, \( \times 110 \).
Roasted, ground coffee, showing fragments of endosperm parenchyma and of seed coat.
Plate XV.


Fig. 177.—Adulterated Coffee. 130.
Dark masses of roasted pea starch are shown, with transparent fragments of the palisade cells of the pea-chaff.

Fig. 178.—Adulterated Coffee. 130.
The vascular ducts of chicory show most conspicuously in this field.

Fig. 179.—Chicory. X 25.
Transverse section through the root.

Fig. 180.—Chicory. X 110.
Transverse section.
FIG. 181.—Chicory, ×110.  
Tangential section, showing reticulated ducts and wood parenchyma.

FIG. 182.—Chicory, ×110  
Radial section, showing bark parenchyma and milk ducts.

FIG. 183.—Chicory, ×110.  
Roughed and ground, showing fragments of ducts and other tissues.

FIG. 184.—Cocoa, ×110.  
Transverse section through periphery of seed, seed coats, and cotyledon.
PLATE XVII.

COCOA.

Fig. 185.—Powdered Cocoa, X 110.

Fig. 186.—Adulterated Cocoa, X 110.
Showing admixture of arrowroot with the cocoa powder.

Fig. 187.—Cocoa Shell, X 110.
Transverse section through epidermis, pulp, and mucilaginous layers of the pericarp and seed coat.

Fig. 188.—Cocoa Shell, X 110.
Longitudinal section through shell.
PLATE XVIII.

TEA. SPICES.

Fig. 189.—Tea, × 55.
Transverse section through midrib of leaf. Note the palisade layer below the upper epidermis, the inner wood vessels above the center, and the parenchyma of the pulp.

Fig. 190.—Tea, × 110.
Surface view of lower epidermis, with stomata at one of the hairs.

Fig. 191.—Allspice, × 9.
Transverse section through the entire berry, showing the two cells, with kidney shaped seed in each.

Fig. 192.—Allspice, × 70.
Transverse section through pericarp, showing 0 spaces and stone cells.
PLATE XVIII.

TEA. SPICES.

Fig. 189. — Tea, × 55.
Transverse section through midrib of leaf. Note the palisade layer below the upper epidermis, the inner wood vessels above the center, and the parenchyma of the pulp.

Fig. 190. — Tea, × 110.
Surface view of lower epidermis, with stomata and one of the hairs.

Fig. 191. — Allspice, × 9.
Transverse section through the entire berry, showing the two cells, with kidney shaped seed in each.

Fig. 192. — Allspice, × 70.
Transverse section through pericarp, showing oil spaces and stone cells.
PLATE XIX.

SPICES.

FIG. 193.—Allspice Seed, X 110.
Transverse section through seed shell and part of embryo, showing starch cells.

FIG. 194.—Allspice Seed, X 110.
Transverse section through the resinous portion of the seed coat, showing port wine colored lump of gum or resin.

FIG. 195.—Powdered Allspice, X 110.
Showing stone cells, resinous lumps, and starch.

FIG. 196.—Adulterated Allspice, X 110.
Showing a large fragment of the seed skin of cayenne at the left.
Fig. 107.—Cassia Bark, \texttimes 45. 
Transverse section through the bark.

Fig. 108.—Cassia Bark, \texttimes 45. 
Longitudinal section.

Fig. 199.—Cassia Bark, \texttimes 110. 
Transverse section, showing cork cells, parenchyma, and stone cells.

Fig. 200.—Cassia Bark, \texttimes 110. 
Longitudinal section, showing bunches of bast fibers at the left, starch cells in the center, and stone cells at the right.
FIG. 201. — Ceylon Cinnamon Bark, $X_{110}$.
Transverse section, showing many bast fibers and starch cells.

FIG. 202. — Ceylon Cinnamon Bark, $X_{110}$.
Longitudinal section, showing bast fibers, stone cells, and parenchyma.

FIG. 203. — Powdered Cassia, $X_{110}$.
Showing stone cells, starch, and corky tissue.

FIG. 204. — Powdered Cassia, $X_{110}$.
Showing bast fibers and starch.

PLATE XXI.

SPICES.
Fig. 205. Powdered Cassia, X 110. 
Showing large bast fiber and starch grains.

Fig. 206. Adulterated Cassia, X 110. 
A mass of foreign bark.

Fig. 207. Cayenne, X 110. 
Transverse section through pericarp.

Fig. 208. Cayenne, X 110. 
Transverse section through seed coat and part of endosperm. Collapsed parenchyma cells separate endosperm from long epidermal cells.
PLATE XXIII.

SPICES.

Fig. 209.—Cayenne, X110.
Surface view of fruit epidermis.

Fig. 210.—Cayenne, X110.
Surface view of two layers of seed coat.

Fig. 211.—Powdered Cayenne, X110.
A large mass of fruit epidermis.

Fig. 212.—Powdered Cayenne, X110.
Showing chiefly two of the seed coat layers.
SPICES.

**Fig. 213.**—Adulterated Cayenne, *X* 130.
Corn and wheat starch and coconut shells appear chiefly. A bit of cayenne is shown at the right.

**Fig. 214.**—Adulterated Cayenne, *X* 214.
The central mass is ground red wood, surrounded by corn starch grains.

**Fig. 215.**—Clove, *X* 65.
Transverse section from the center outward to epidermis, showing parenchyma.

**Fig. 216.**—Clove, *X* 110.
Transverse section near epidermis, showing large oil cavities.
FIG. 217.—Clove, X78.
Longitudinal section through entire clove.

FIG. 218.—Clove, X70.
Central longitudinal section, showing duct bundles.

FIG. 219.—Clove, X110.
Surface view of epidermis.

FIG. 220.—Powdered Cloves, X130.
Dense, spongy tissue, with small oil drops.
Fig. 221.—Clove Stem, ×70. Transverse section through outer part of stem, showing bast fibers at the left, parenchyma in the center, and stone cells near the epidermis.

Fig. 222.—Clove Stem, ×25. Central longitudinal section through entire stem, showing bast fibers in the center, and stone cells at the right.

Fig. 223.—Clove Stem, ×70. Longitudinal section, showing the stone cells.

Fig. 224.—Powdered Clove Stems, ×110. Showing fragments of tissues, stone cells, and bast fibers.
PLATE XXVII.

SPICES.

Fig. 225.—Powdered Clove Stems, X 110.
Showing bundle of bast fibers.

Fig. 226.—Adulterated Cloves, X 110.
Showing chiefly stone cells of cocoanut shells.

Fig. 227.—Adulterated Cloves, X 130.
With large admixture of cocoanut shells.

Fig. 228.—Ginger, X 110.
Transverse section, showing starch cells with contents.
Fig. 229.—Ginger, × 110.
Transverse section, showing parenchyma, starch grains, and duct vessels.

Fig. 230.—Ginger, × 110.
Longitudinal section, showing spiral ducts and pigment cells.

Fig. 231.—Ginger Starch, × 220.

Fig. 232.—Adulterated Ginger, × 110.
A mass of wheat bran tissue is most conspicuous.
FIG. 233.—Adulterated Ginger, X 130.
The central dark mass is a yellow fragment of turmeric.

FIG. 234.—Adulterated Ginger, X 130.
Containing a large admixture of corn and wheat starches.

FIG. 235.—Penang Mace, X 110.
* Transverse section through epidermis and oil cells, showing also parenchyma with contents of amyloextrin.

FIG. 236.—Bombay or Wild Mace, X 110.
Transverse section through outer layers, showing yellow and red resinous lumps.
SPICES.

Fig. 237.—Nutmeg, \( \times 110 \).
Transverse section through the exterior and interior teguments of the seed and part of the endosperm, showing starch cells.

Fig. 238.—Nutmeg, \( \times 25 \).
Transverse section near exterior of seed.

Fig. 239.—Nutmeg, \( \times 110 \).
Surface view of seed coat, showing also portions of underlying tissues.

Fig. 240.—Powdered Nutmeg, \( \times 110 \).
FIG. 241.—White Mustard, X110
Transverse section through mucilaginous epidermis, sub-epidermal parenchyma layer (square cells), palisade cells, and broken parenchyma layer of the hull.

FIG. 242.—White Mustard, X110.
Transverse section through the tissue of the radicle.

FIG. 243.—White Mustard, X110
Surface view of two layers of the hull or seed coat.

FIG. 244.—White Mustard, X110.
Surface section through palisade cells and underlying layer of the seed coat.
SPICES.

**Fig. 245.**—Black Mustard, $\times 110$.
Transverse section, showing fragments of the epidermis and dark colored palisade cells of the seed coat.

**Fig. 246.**—Black Mustard, $\times 110$.
Surface view of two of the seed coat layers.

**Fig. 247.**—Ground Mustard, $\times 130$.
Ground without removal of the oil.

**Fig. 248.**—Ground Mustard Hulls, $\times 110$. 
**PLATE XXXIII.**

**SPICES.**

**Fig. 250.—Dakota Mustard Flour, × 110.**
Dark spots show starch grains of foreign weed seed, stained with iodine.

**Fig. 250.—Whiterated Mustard Flour, × 110.**
Showing masses of wheat starch.

**Fig. 251.—Pepper, × 110.**
Transverse section through inner part of pericarp (including parenchyma and seed coat layers) and portion of perisperm, showing starch and oil cells.

**Fig. 252.—Pepper, × 110.**
Surface view of hypodermal layer.
Fig. 253.—Pepper, X 110.
Transverse section through outer part of pericarp, showing epidermis, underlying stone cell layers, parenchyma, and seed coat.

Fig. 254.—Pepper, X 110.
Surface section through stone cell layer.

Fig. 255.—Pepper Starch, X 220.
Starch granules separated.

Fig. 256.—Pepper Starch, X 110.
Starch grains in masses.
SPICES.

Fig. 257. Ground Pepper Shells, × 110. Mainly showing stone cells.

Fig. 258. Adulterated Pepper, × 130. Showing wheat and buckwheat starches.

Fig. 259. Adulterated Pepper, × 130. Showing wheat, corn, and rice starches.

Fig. 260. Adulterated Pepper, × 130. The large, lower mass shows buckwheat starch, while the finer-grained mass near the top is of pepper.
SPICES. SPICE ADULTERANTS.

Fig. 261.—Adulterated Pepper, X·110.
The central mass shows the sclerenchyma cells of olive stones.

Fig. 262.—Adulterated Pepper, X·130.
Cayenne and wheat starch are the adulterants.

Fig. 263.—Powdered Olive Stones, X·110.

Fig. 264.—Powdered Coconut Shells, X·110.
PLATE XXXVII.

SPICE ADULTERANTS.

Fig. 265.—Powdered Elm Bark, \( \times 110 \).

Fig. 266.—Pine Sawdust, \( \times 110 \).
Finely ground.

Fig. 267.—Pine Wood, \( \times 110 \).
Transverse section.

Fig. 268.—Pine Wood, \( \times 110 \).
Radial and tangential sections.
PLATE XXXVIII.

EDIBLE FATS.

Fig. 260.—Pure Butter, X25.
With polarized light and selenite plate.

Fig. 270.—Process or Renovated Butter, X25.
With polarized light and selenite plate.

Fig. 271.—Oleomargarine, X25.
With polarized light and selenite plate.
FIG. 272.—Lard Stearin, × 110.
Leaf lard, crystallized from ether.

FIG. 273.—Lard Stearin, × 220.
Leaf lard, crystallized from ether.

FIG. 274.—Lard Stearin, × 220.
"Back" lard, crystallized from ether.

FIG. 275.—Lard Stearin, × 480.
"Back" lard, crystallized from ether.
PLATE XL.

EDIBLE FATS.

Fig. 276.—Beef Stearin, X 15.
Crystallized from ether.

Fig. 277.—Beef Stearin, X 110.
Crystallized from ether.

Fig. 278.—Beef Stearin, X 270.
Crystallized from ether.