

PINUS: SALIENT FEATURES OF THE SPOROPHYTE

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PAPER-III
Group-A

Systematic Position:

Division - Coniferophyta
Class - Coniferopsida
Order - Coniferales
Family - Pinaceae
Genus - Pinus

Distribution of species:

Pinus is represented by about 90 species widely distributed throughout the Northern Hemisphere, specially in extra-tropical regions. Species of Pinus reported from India are mainly restricted to the Western Himalayas, while P. insularis is found to grow in the North-eastern provinces.

Common species - P. wallichii (= P. excelsa),
P. roxburghii (= P. longifolia), P. insularis (= P. khasya)
and P. Gerardiana (= P. merkusi).

Morphology of the sporophyte:

(i) Tall trees with excurrent branching pattern, bearing fascicles of slender needle-like, evergreen foliage leaves.

(ii) Main stem - stout and cylindrical, bearing a series of wide-spreading branches and covered with a scaly bark.

(iii) A large terminal bud at the apex of shoots are of two kinds - long shoots of unlimited growth and dwarf shoots of limited growth.

(iv) Long shoots usually bear scale leaves, in the axils of which numerous dwarf shoots appear.

(v) At the apex of each dwarf shoot, there is a fascicle of two or more needle-like leaves, closely held together at the base by a circle of scales.

(vi) Primary ^{usually} root system is persistent and perennial.

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Stem Anatomy:

- (i) T.S. of a young stem shows three distinct regions: epidermis, cortex and stele.
- (ii) Parenchymatous pith at the centre of the stele surrounded by a ring of vascular bundles, separated from one another by primary medullary rays.
- (iii) V. Bs. conjoint, collateral and open
- (iv) Xylem contains tracheide; no true vessels found.
- (v) Phloem comprises of seive tubes and parenchyma.
- (vi) A strip of cambium found in between xylem and phloem.
- (vii) Cortex is made up of parenchyma, frequently with chloroplasts and traversed by longitudinal resin canals (ducts).
- (viii) Epidermis with heavily cutinized outer walls found external to the cortex.
- (ix) Cambial activity during secondary growth produces secondary xylem and phloem, as in dicots. Conspicuous annual rings are gradually developed.
- (x) Secondary medullary rays formed in the usual manner. Resin canals also appear in the secondary xylem.
- (xi) A complete ring of cork cambium appears in the hypodermal region of the cortex, which eventually gives rise to the periderm. Successive layers of cork cambium appear deeper and deeper in the cortex, and finally in the outer part of the phloem. Thus a thick protective bark develops on the outside of the stem.

Leaf Anatomy:

- (i) A cross section through the middle of a leaf (needle) of the current year shows

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the outermost single-layered epidermis made up of thick-walled cells with a heavy cuticle, the lumen of each cell being nearly obliterated.

(ii) Hypodermis sclerenchymatous, with fine pits on the lignified walls. — It is several-layered, specially at the ridges.

(iii) A few stomata found on the epidermis; each stoma interrupting the epidermis and hypodermis, and opening into a respiratory cavity in the mesophyll, which consists of several layers of large, polygonal, thin-walled parenchyma cells, containing prominent chloroplasts. Their walls are infolded to form peculiar projections into the cell cavities.

(iv) A few resin ducts lined by a thin epithelial layer and surrounded by a sheath of sclerenchyma are also present in the mesophyll.

(v) There are two V. Bs., each one having its xylem towards the upper side of the leaf, and its phloem facing the lower side, which is usually nearly convex.

Bundles are embedded in a many-layered ground tissue, the pericycle, which is surrounded by an endodermis, clearly separating the central region from the mesophyll.

(vi) Pericycle consists of two kinds of parenchyma cells, termed collectively the transfusion tissue, and an irregular band of sclerenchyma lying across and below the phloem of each bundle, and connecting them.

(vii) Transfusion tissue consists of albuminous cells, serving for translocation of food from the mesophyll to the phloem, and tracheidal cells, which are empty

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dead cells with lignified walls having bordered pits, and functioning as channels for water and dissolved salts from xylem to mesophyll.

Root Anatomy:

- (i) T.S. of the primary root consists of epidermis, cortex and stele.
- (ii) Two, three or four groups of primary xylem are found alternating with the corresponding number of phloem groups.
- (iii) A small parenchymatous pith may or may not be present.
- (iv) Several-layered pericycle forms the outer boundary of the stele.
- (v) Cortex limited internally by the endodermis with thickened walls.
- (vi) A resin canal usually formed within the forking of each protoxylem.
- (vii) Secondary growth occurs as in dicot roots.

Reproductive Features:

- (i) Plants are monoecious, bearing both microsporophylls in staminate strobili and megasporophylls in carpellate strobili.
- (ii) Bisporangiate strobili may also occur exceptionally, as in P. maritima and P. laticio.

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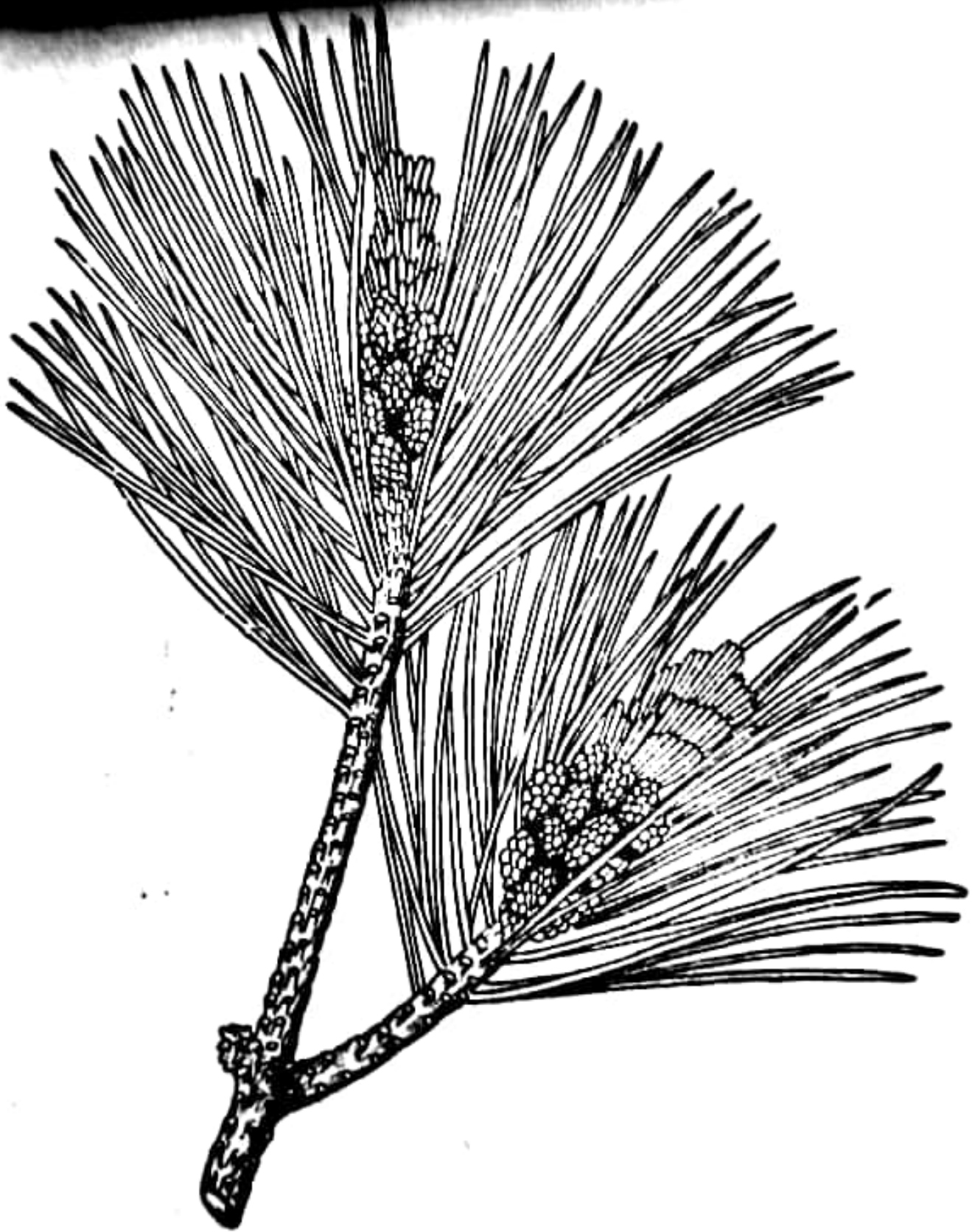


Fig. 455. *Pinus*.
Branches bearing staminate strobili.

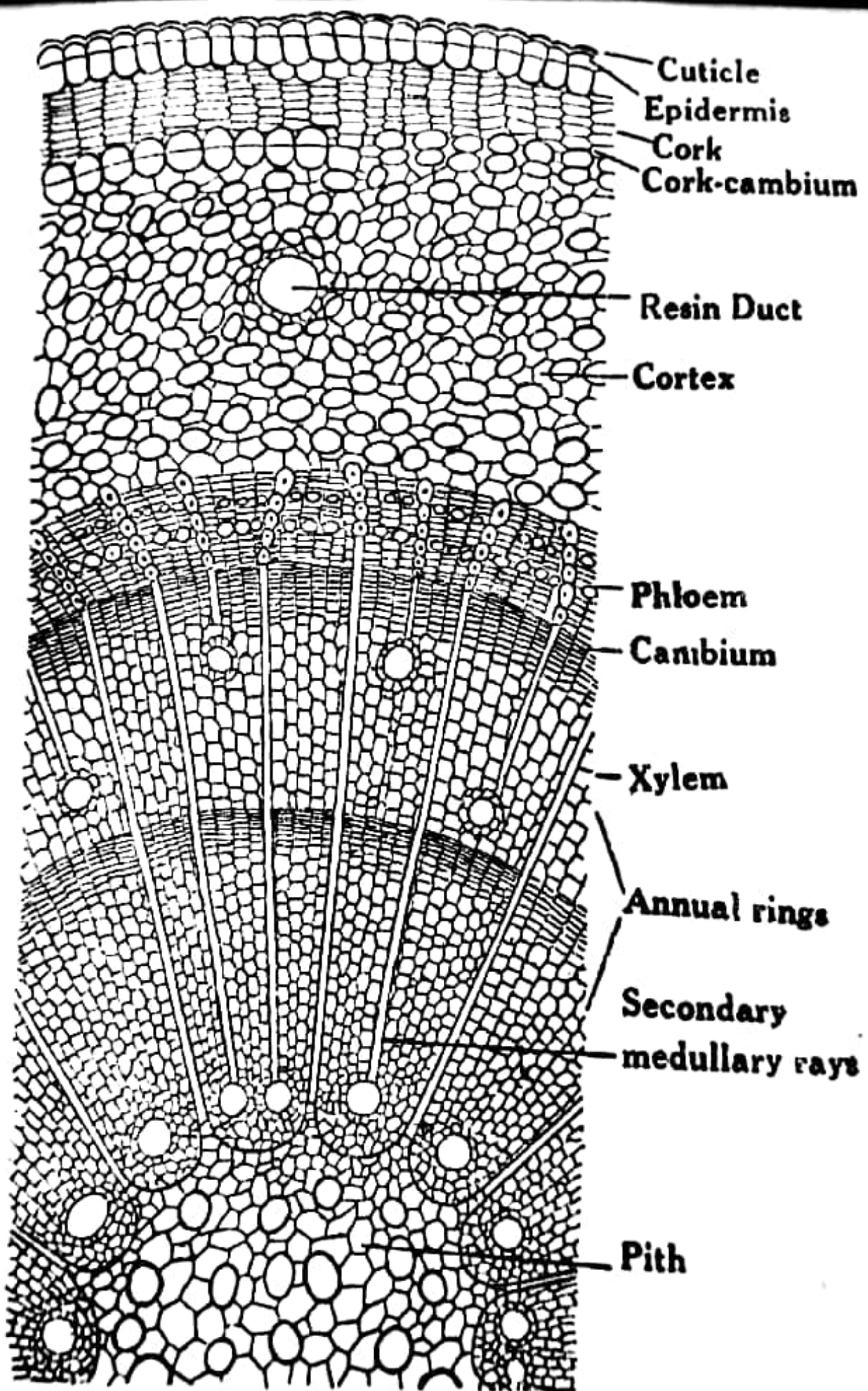


Fig. 456. *Pinus*.
Part of a cross-section of a two-year-old stem.

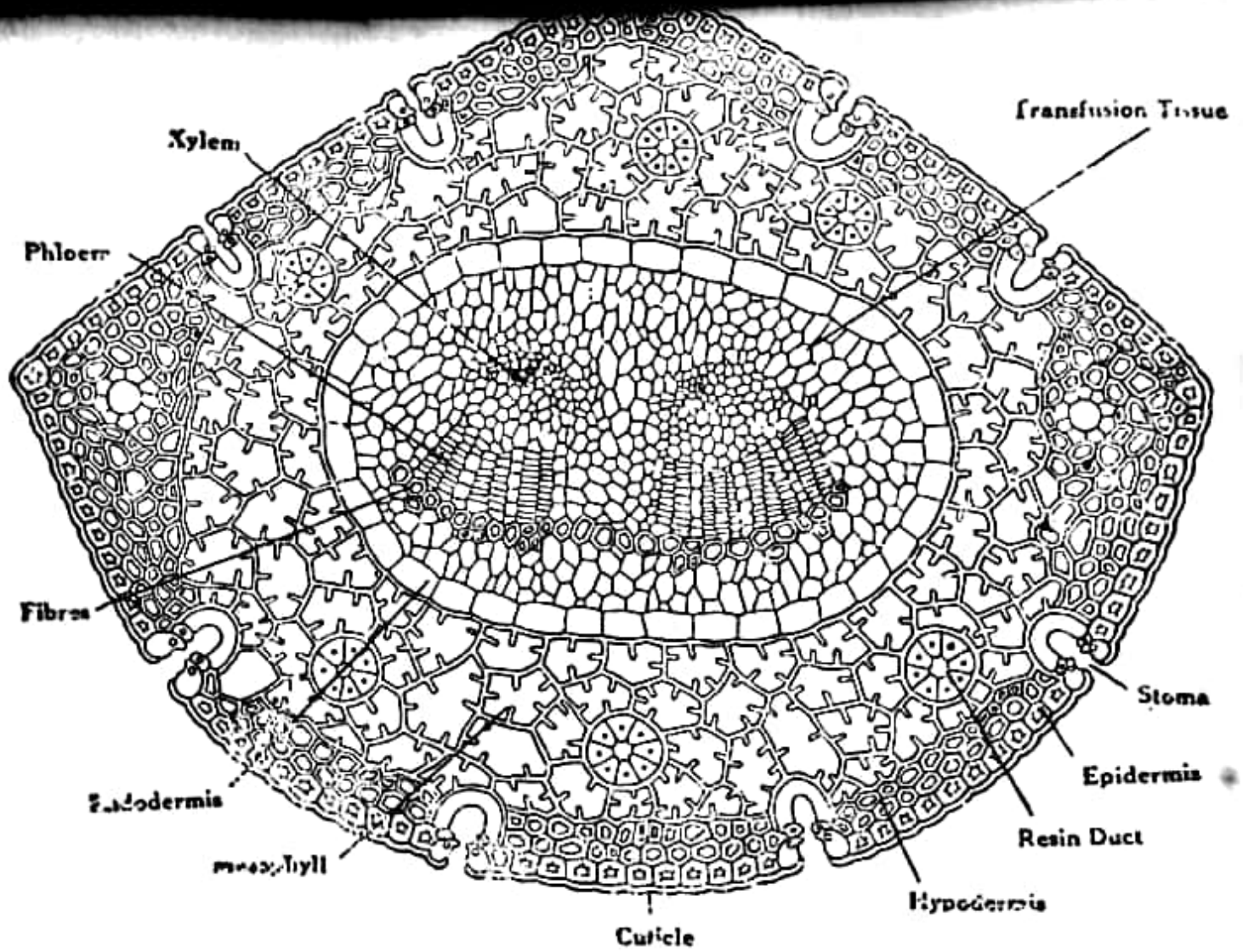


Fig. 457. *Pinus*.
Cross-section of a needle.

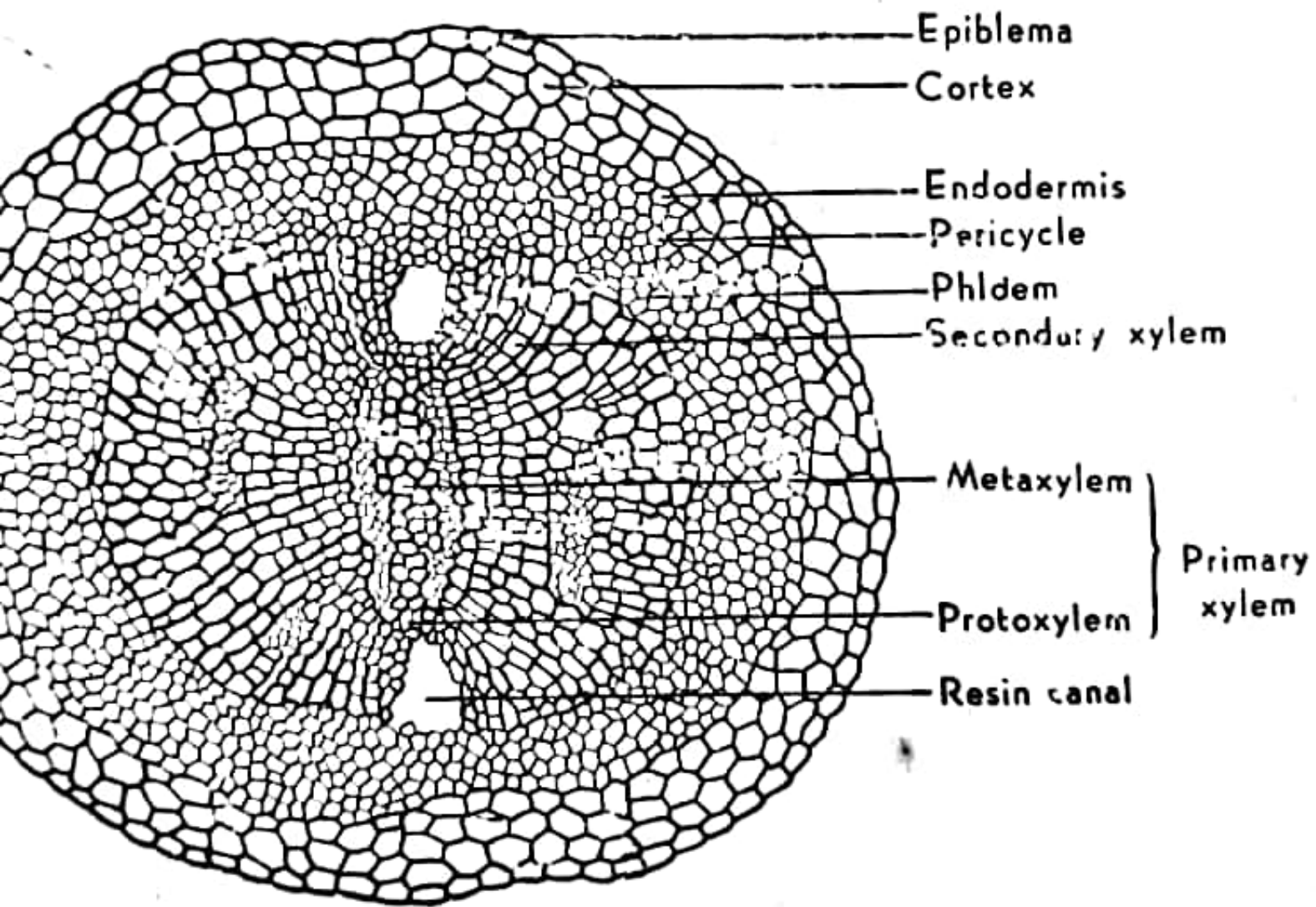


Fig. 458. *Pinus*.
T.S. of a root.