or more precarious than that of spores. If the latter be the case, then extent of distribution becomes an index of age.

When one compares the distribution of such forms as ferns and certain other groups of plants with that of mammals, reptiles and certain other groups of animals, one cannot but be impressed with the totally different laws that govern these two supertypes of life forms.

Species concerning the identification of which there was any doubt were kindly reported on by C. Christensen.

STUDIES ON CHINESE BAMBOOS. I A NEW SPECIES OF ARUNDINARIA FROM SOUTHERN CHINA

Part 1. Diagnosis

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The bamboo which is the subject of the present paper is the principal, and practically the only, bamboo exported from southern China. Known as the Tonkin Cane of commerce, its botanical identity has long remained a mystery, and to people in the West even its source was until recently unknown. In 1925 the writer, then in the employ of the United States Department of Agriculture, learned of its occurrence in Kwong Ning and Wai Tsaap Districts on the border between Kwangtung and Kwangsai provinces, and visited this area in an effort to obtain living specimens. With some difficulty a few plants were secured, and a diligent search for flowering specimens yielded only a few dried husks remaining from the previous season. In 1928 the area was revisited and a few more plants were secured, together with flowers in good condition. At length, in 1929, about 200 plants were secured for transfer to the Lingnan University Campus where they have since been growing under observation.

This bamboo is known in the West as Tonkin Cane, among the dealers in China as Ts'ing Lei Bamboo (青籬竹), and to the growers and the people generally as Cha Kon Chuk (茶桿竹). This multiplicity of names doubtless explains in a measure the confusion that has existed in the West in regard to the origin and identity of this bamboo.

Now that its botanical characters are fully known, it appears that this bamboo falls in the genus *Arundinaria* of which it represents a species not hitherto described. The writer has failed to find any description applicable to this species in the literature examined and no specimens of it were found upon careful search of material in the herbaria of the following institutions: Arnold Arboretum; Royal Botanic Gardens, Kew; British Museum (Natural History); Museum Nationale d'Histoire Naturelle, Paris; Botanischer Gartens und Museums, Berlin-Dahlem; University of Zurich; Conservatoire et Jardins Botaniques, Geneva. Specimens collected by the writer in 1925 are depositedin the United States National Herbarium, Washington, D.C.

[1] Received for publication March 21, 1931.

Arundinaria amabilis sp. nov.

A bamboo of the monopodial type,[1] RHIZOMES slender, horizontal, subterranean; completely enveloped in sheaths when young; rapid-growing, indeterminate, branching at intervals; the *internodes* 5 to 15 mm in diameter and 5 to 50 mm (usually about 30 mm) in length; cylindrical or, rarely, flattened; sometimes with a furrow above a bud and extending to the next node; usually with a slender cylindrial cavity in the center; *nodes* not prominent; with or without roots when mature; *buds* oval, closely flattened to the rhizome, often lacking altogether on from one to several adjacent nodes. CULMS distant; arising from lateral buds at the nodes of the rhizomes, very stiff and upright to the tip; cylindrical; sometimes elliptical in cross-section below the surface of the ground; smooth, unarmed, pale green in color, with a thin, gray. waxy covering; visibly striated; always variously marked, when mature, by the growth of black fungi and gray lichens; up to 5. 7 cm in diameter and rarely exceeding 13 m in height (usually about one-half this size,) with from 28 to 44 nodes above the ground, the lower ones usually without buds in culms from mature, normal rhizome systems; subterranean nodes up to 16 in number, each with a row of roots emerging just above the sheath scar. NODES glabrous; those without branches not prominent, those bearing branches with a somewhat prominent ridge just above the point of attachment of sheaths, and increasing in relative prominence in the upper nodes. INTERNODES straight; longer toward the middle of the culm and shorter toward the two extremities, 1. 5 cm (lowest subterranean) to 48 cm (15th above the surface of the ground) in a large specimen; cylindrical, somewhat D-shaped in cross section immediately above the nodes which bear branches, and more pronouncedly so toward the tip; *walls* medium in thickness, usually relatively thicker in small culms, and thicker at the base of the culm than above. PITH white to straw-colored; flocculose in texture, forming a scant, woolly deposit on the inner walls of the lower nodes; increasingly abundant in the upper chambers, some of them being almost completely filled. BRANCHES glabrous; unarmed; usually in threes sometimes solitary; distinctly flattened and thick-walled at the base; growing upward closely against the culm the lowest usually occurring several nodes below the middle of normal, mature culms. LEAVES rather thick and stiff, flat, pale green below, glabrous except a small puberulent area at the base on the under side of young leaves; entirely covered with a thin, transparent, waxy deposit of cutin whose surface is rough with microscopic raised dots; up to 35 cm long and 3.5 cm wide (usually about one-half this size); linear-lanceolate; *apex* acuminate; *base* gently tapering to the short petiole; one *margin* distinctly scabrous-serrulate and the other slightly so; margins of mature leaves somewhat cartiliginous and downwardly involute; *midrib* slender; *main veins* 7 to 9 on either side of the midrib; secondary veins minutely tessellated; PETIOLE short (5 mm), pubescent below when young, glabrous when mature. LEAF SHEATHS slender, cylindrical, sometimes somewhat striate below, densely pubescent along and near the upper margins when young, nearly glabrous, except the margins when mature; terminating above in two tardily deciduous tufts of 5 to 8 twisted bristles of various lengths (5 to 15 mm); covered with a thin, transparent coating of cutin whose surface is rough to the touch. LIGULE 1 to 2 mm long; upper margin gently curved; densely short-pubescent on the outside and bordered by a dense fringe of short, soft hairs. CULM SHEATHS, exclusive of pseudophylls, up to 42 cm in length and 11 cm in width; tawny brown in color; uniformly medium (about 2.5 mm) in thickness, somewhat thicker at the base; brittle; not persistent; inner surface smooth, shiny, with parallel veins at intervals of about 0.5 mm, conspicuous but not raised above the surface; outer surface hard, densely covered, particularly above, with sharp, castaneous-brown, appressed, deciduous

[1] McClure, F.A. Some observations on the bamboos of Kwangtung. Lingnaam Agr. Rev. **3** (1): 40-47, *7 pl.* 1925.

hairs, 1 to 4 mm in length; margins bordered above with a dense fringe of deciduous hairs up to 5 mm in length; surface not, or scarcely, striate; sheath abruptly truncate at point of attachment of pseudophyll; culminating, on either side of the base of the pseudophyll, in a tuft of stiff, more or less curved bristles, up to 15 mm in length. PSEUDOPHYLLS long, slender (5 mm long and 2 mm wide in the lowest to 18 cm long and 2 cm wide in the upper sheaths); fugaceous; stiffly upright; those on the lowest sheaths rarely reflexed; upper portion involute; *apex* acute to subulate; *veins* conspicuous, visibly tessellated; *margins* scabrous-serrulate above to setose below. LIGULE brown, striated, rounded, about 5 mm in length at center, including the border of fine, soft hairs 1 to 2 mm long with which the irregularly toothed margin is fringed. INFLORESCENCES terminal on the ultimate branches, each consisting of persistent, stiffly upright, medium-dense panicles of 3 to 15 pedicelled spikes; flowering branches often interspersed with leafy ones; PEDICELS (ultimate branches bearing individual spikes) 2.5 mm to 9 mm in length; pubescent; each subtended by a tiny pubescent bractlet 1.5 to 3 mm in length; SPIKES distinctly flattened, lanceolate, composed of 5 to 14 1-flowered spikelets and usually 2 empty glumes. EMPTY GLUMES unequal; glabrous, shiny on inner surface; outer surface densely pubescent above, glabrous below; upper margins fringed with hairs 0.5 mm in length; the lower glume shorter and narrower, lanceolate; 6 to 7 mm in length and 2 to 2.5 mm in width; the upper one oblong-lanceolate; 9 to 11 mm long and 4 to 5 mm wide. RACHILLA articulate above the empty glumes and just below each succeeding spikelet; individual sections of the rachilla 3 to 4 mm in length, 1 mm in width; flattened and thin at the base, D-shaped in cross-section at the middle, and elliptical in cross-section at the summit; glabrous and shiny on the flattened side which lies next the palea; minutely pubescent on the curved side, with a corona of tiny hairs around its summit. LEMMA ovate-lanceolate, acuminate, 10 to 15 mm in length, 4 to 8 mm in width; densely, minutely pubescent; upper two-thirds of margins densely fringed with fine hairs pointing toward the apex and increasing in length, upward, to 5 mm. PALEA 2-keeled; 5 mm to 9.5 mm in length, 1 to 2.5 mm in width (from keel to keel), average size about 9 mm long and 2 mm wide; broadly lanceolate; glabrous below, pubescent toward the blunt apex, particularly between the keels; keels fringed with short (.25 mm) hairs; margins of palea not meeting except near the apex. LODICULES three, 2.5 mm long, 1 mm wide, unequal; spatulate to lanceolate; scarious above, somewhat thicker below; upper margin minutely laciniate as though fringed with slender, hair-like processes. STAMENS three, *filaments* about 9 mm long, *anthers* 6 to 7 mm long and 1.5 mm wide; 2-celled; with a notch at the two extremeties; opening by lateral, longitudinal slits; often not completely exserted. OVARY 1.5 mm long and 0.6 mm in diameter; slender, fusiform, glabrous. STIGMAS three, 5 mm long, upright, included, scantily plumose. Mature CARYOPSIS unknown.

Since this bamboo is thus far known only in cultivation the question arises as to the wisdom of treating it as a species. Nevertheless, it is so different from any bamboo hitherto described that it should be given a distinctive name. In view of the likelihood that the wild form may be discovered in the course of time, the writer proposes to reserve the specific name *Arundinaria amabilis* for it and to treat the present form tentatively as a variety under the name *A. amabilis* var. *sativa*.

KWANGSI: Oo Shek (烏石), above Au Tsai (坳仔), on the Sui River (綏江) in Wai Tsaap District (懷集縣), F. A. McClure, Field No. 1587, April 7, 1925, and from same locality, F. A. McClure, Field No. 3555 Nov. 5, 1928. KWANGTUNG: Mung Haang (蒙坑) above Koo Shui (固水) on the Sui River, in Kwong Ning District (廣寧縣), Lingnan (Tang and Fung) No. 17531-2 March 3, 1929. *Type*. All deposited in the Lingnan University Herbarium.

Among the known species of *Arundinaria* the nearest relative of this bamboo seems to be *A. japonica* S. & Z.[1] from which it differs in the following respects: inflorescence stiffly erect, not lax; spikes 5-14-flowered, never above 7 cm in length; distinctly flattened; borders of all glumes, paleas and lemmas bearing a fringe of hairs of varying length; palea distinctly shorter than the lemma, with a blunt, not forked, apex; lodicules unequal. In habit, this is a far more magnificent plant, with taller, more massive, straighter stems.

The qualities of the stems of this plant fit it admirably for many uses, among which is the manufacture of split bamboo fishing rods, which appears to be its chief use abroad. The culture of this bamboo and the methods used in the preparation of its culms for the market will be dealt with in a subsequent paper.

[1] E. G. Camus, *in* Les bambusees (Paris, Paul Lechevalier, 1913), treats this under *Sasa japonica* Makino.

EXPLANATION OF PLATES[1]

PLATE 1

Fig. 1 Sketch of leafy vegetative branch and flowering branch with leaf. x 2/5.

PLATE 2

Fig. 2 Spike. x 4.
Fig. 3 Lower empty glume. x 4.
Fig. 4 Upper empty glume. x 4.
Fig. 5 First spikelet, at base of spike, still attached to the pedicel, the empty glumes having been removed. Note rachilla. x 8.
Fig. 6 Dorsal view of a palea from one of the largest spikelets. x 8.
Fig. 7 Dorsal view of a palea from spikelet near tip of spike. x 8.
Fig. 8 The terminal, sterile, spikelet. x 8.

PLATE 3

Fig. 9 Spikelet, lateral view. x 4.
Fig. 10 Lemma from same. x 4.
Fig. 11 Palea, lateral view. x 4.
Fig. 12 Palea, ventral view, with essential organs removed. x 4.
Fig. 13 Pistil (gynecium). x 4.
Fig. 14 Anthers with portion of filaments attached. x 4. Left, lateral view; right, dorsal view.
Fig. 15 A set of 3 lodicules. x 4.
Fig. 16 Another set of lodicules, showing variation. x 4.
Fig. 17 Rachilla; dorsal, lateral and ventral views (left to right). x 4.
Fig. 18 Same, showing variation.

PLATE 4

Fig. 19 Tip of rhizome, enclosed in sheaths, showing roots and a bud. x 3/5.
Fig. 20 Longitudinal section of small stem showing nature of pith and relative thickness of walls. x 3/5.
Fig. 21 Tip of young shoot, at a height of about one foot. x 2/5.

PLATE 5

Fig. 22 Undergrown portion of culm with roots removed, lateral view. x 2/5.
Fig. 23 Same, rotated on long axis one quarter turn, to show by comparison, the flattened and curved condition of this portion of the stem.
Fig. 24 First two nodes of the stem above the surface of the ground. x 2/5.
Fig. 25 Same, rotated one quarter turn on its axis, still somewhat flattened. x 2/5.

[1] Magnifications approximate; see text for exact measurements.

PLATE 6

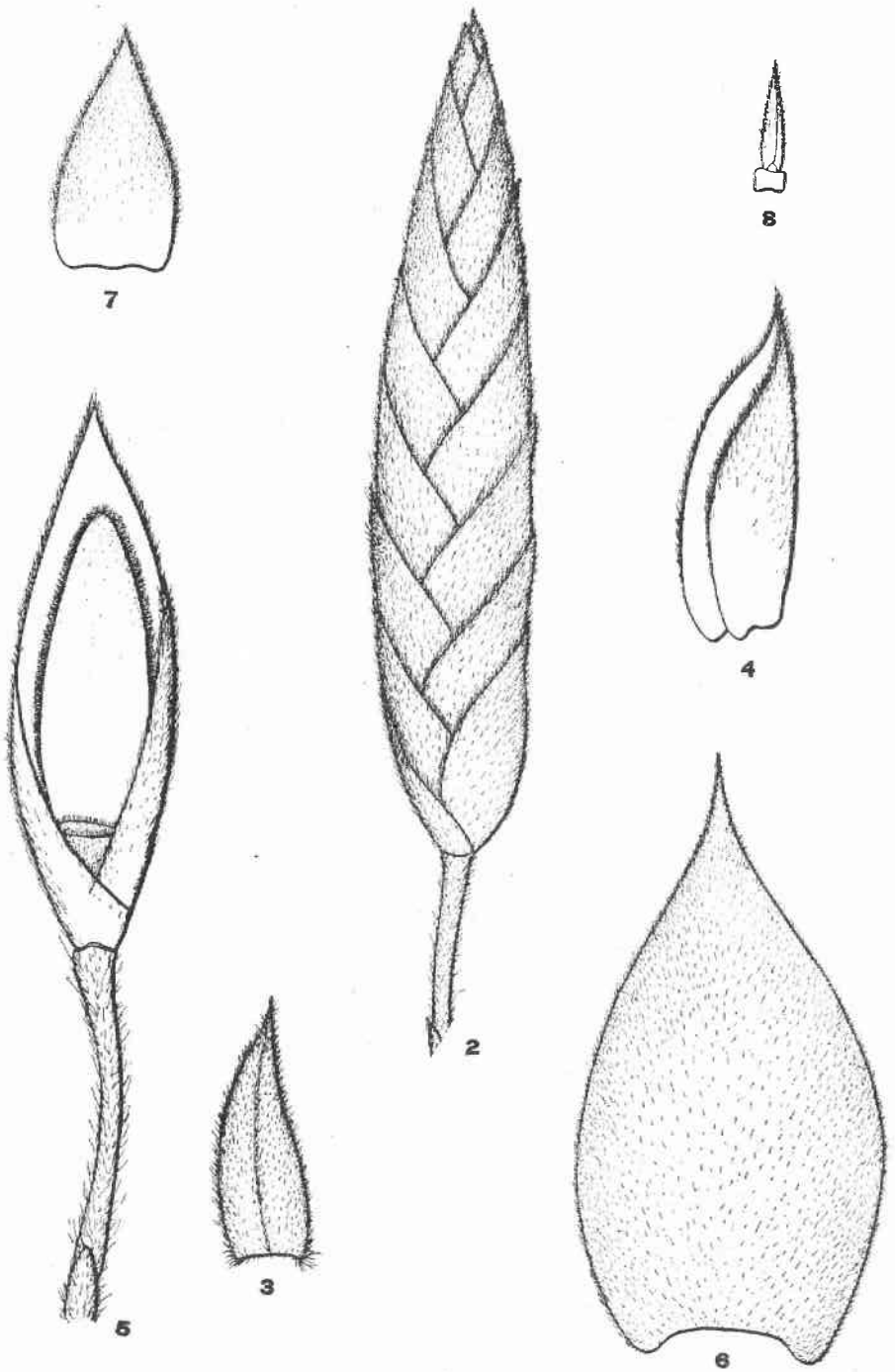
Fig. 26 Third and fourth nodes of the stem. x 2/5.
Fig. 27 Cross section of stem just above the fourth node. x 2/5.
Fig. 28 Thirteenth node, the first at which a branch-bud appears on this particular specimen. x 2/5.
Fig. 29 Same, rotated one quarter turn on its axis.
Fig. 30 Twenty-fourth node showing typical group of branches.
Fig. 31 Same, rotated one quarter turn on its axis to show extreme upright habit of branches.
Fig. 32 Thirty-first node of stem, showing typical group of three branches. x 2/5.
Fig. 33 Same, rotated one quarter turn on its axis, to show marked flattening of stem above point of attachment of branches. x 2/5.

PLATE 7

Fig. 34 Photograph of leafy flowering branch. x 1/4.
Fig. 35 Photograph of leafless flowering branch. x 1/4.
Fig. 36 Photograph of shoot. x 1/4.
Fig. 37 Photograph of mid-portion of a small culm showing upright habit of branches. x 1/4.
Fig. 38 Photograph of upper portion of a small culm. x 1/4.
Fig. 39 Photograph of longitudinal section of small stem showing pith. x 1/4.
Fig. 40 Photograph of tip of rhizome. x 1/4.

PLATE 8

Fig. 41 Sketch map of Kwangtung province and adjacent portions of Kwangsi showing (cross-hatched area) present known distribution of *Arundinaria amabilis*.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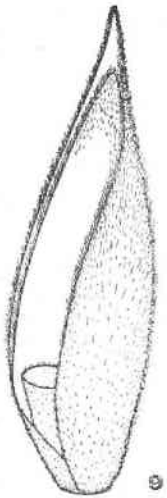

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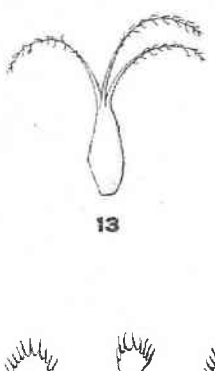

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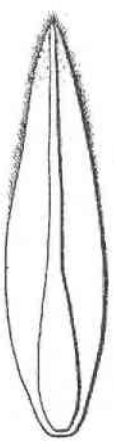

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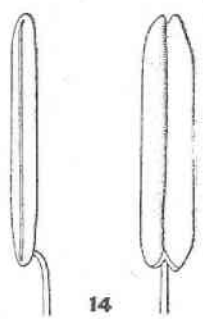

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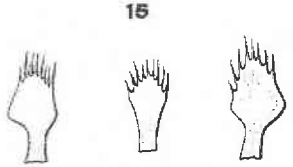

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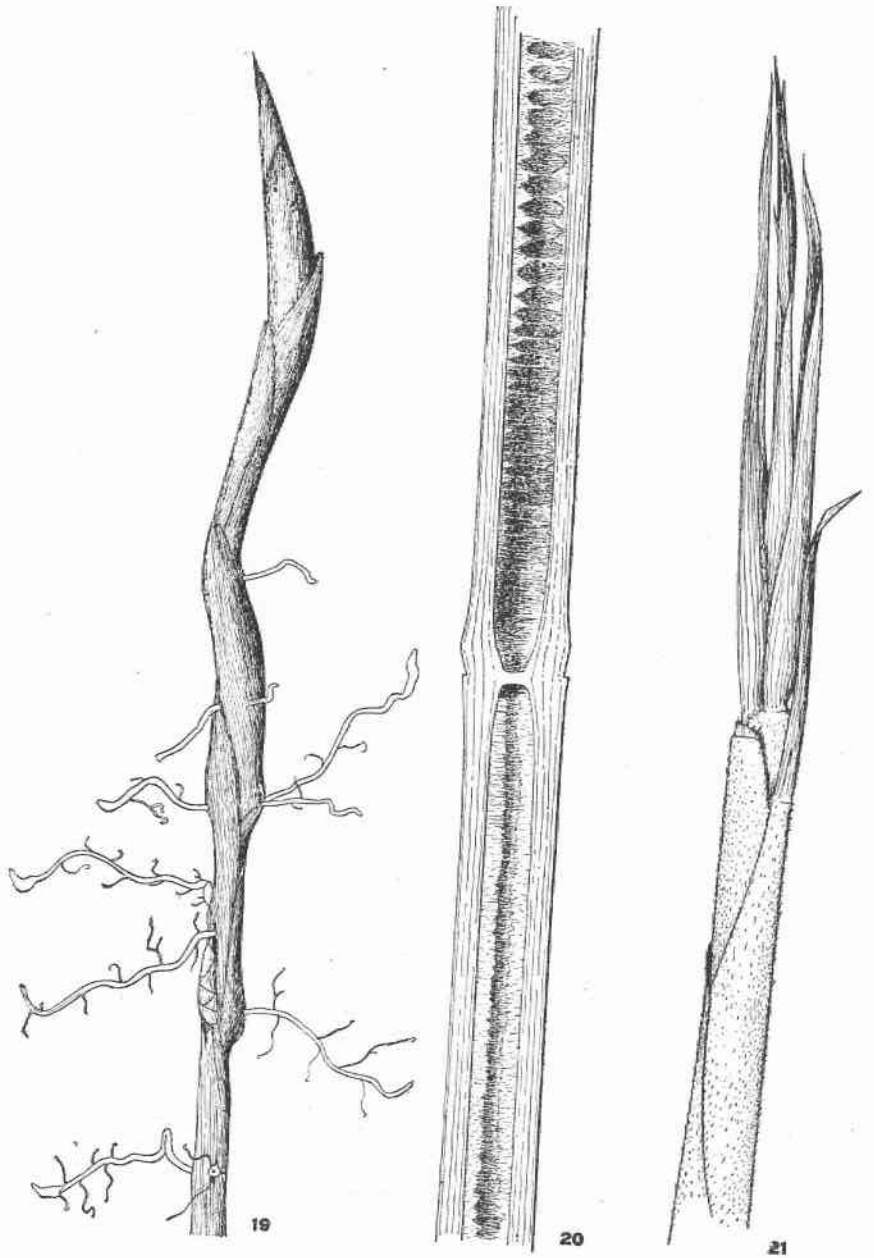
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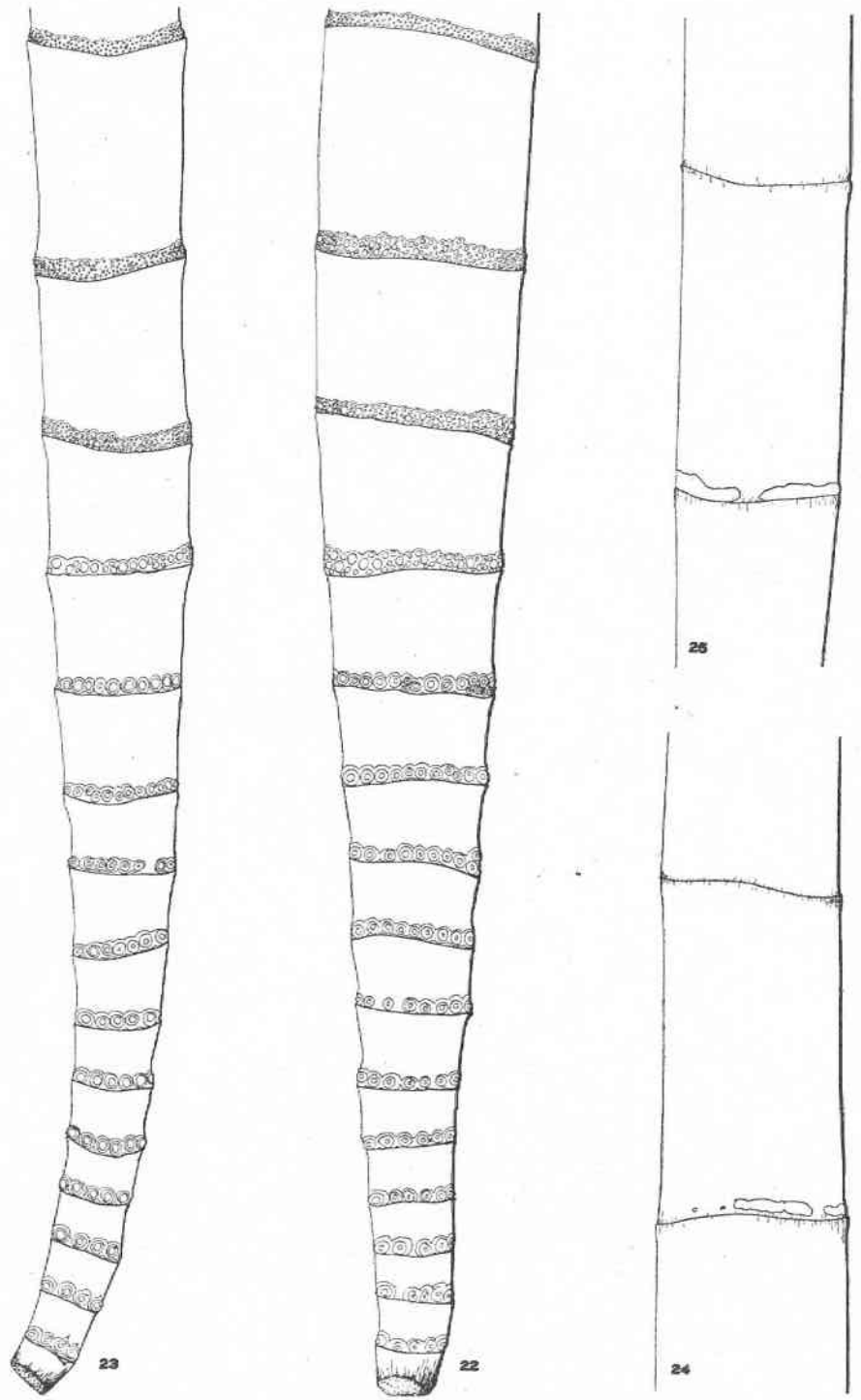
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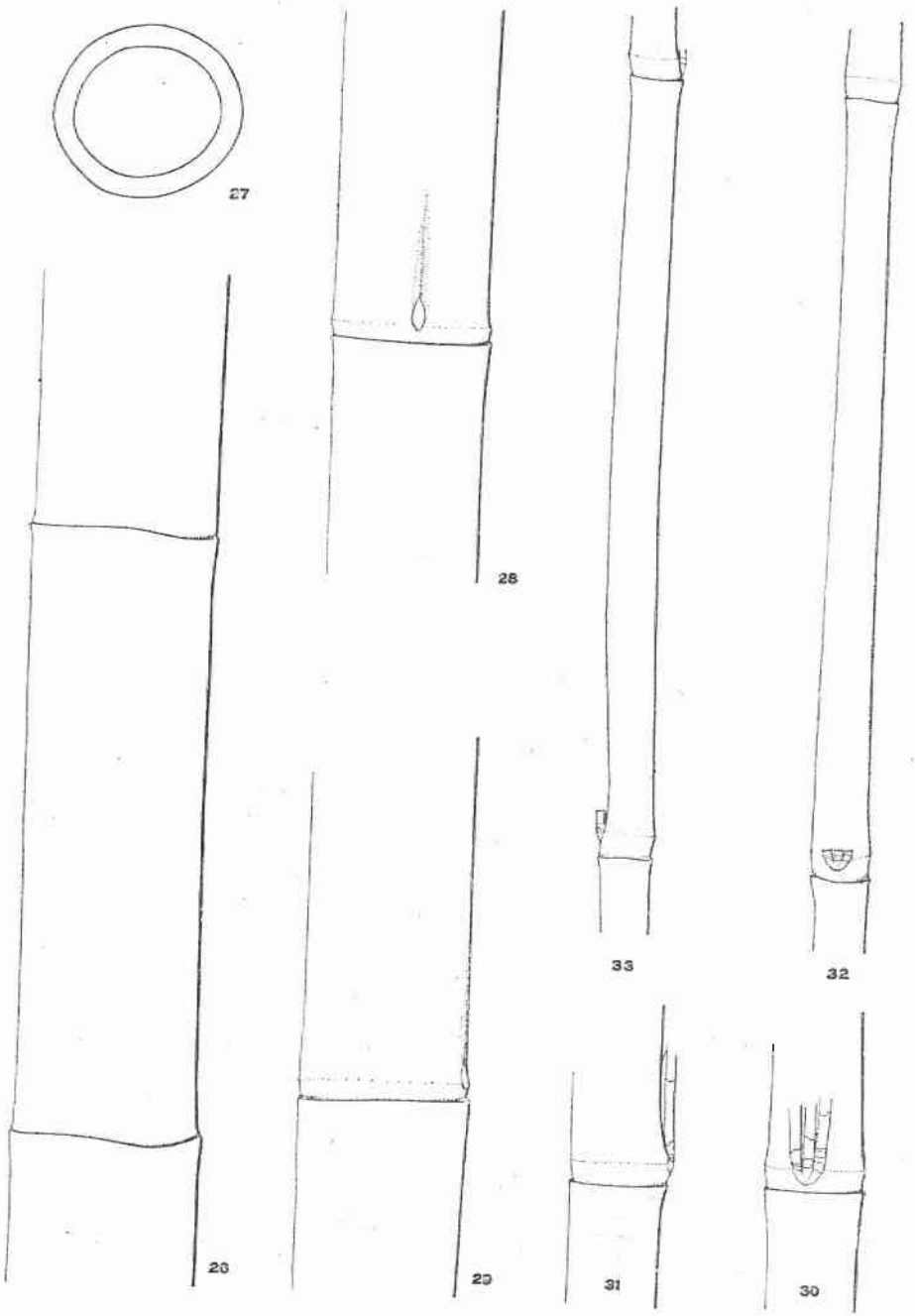
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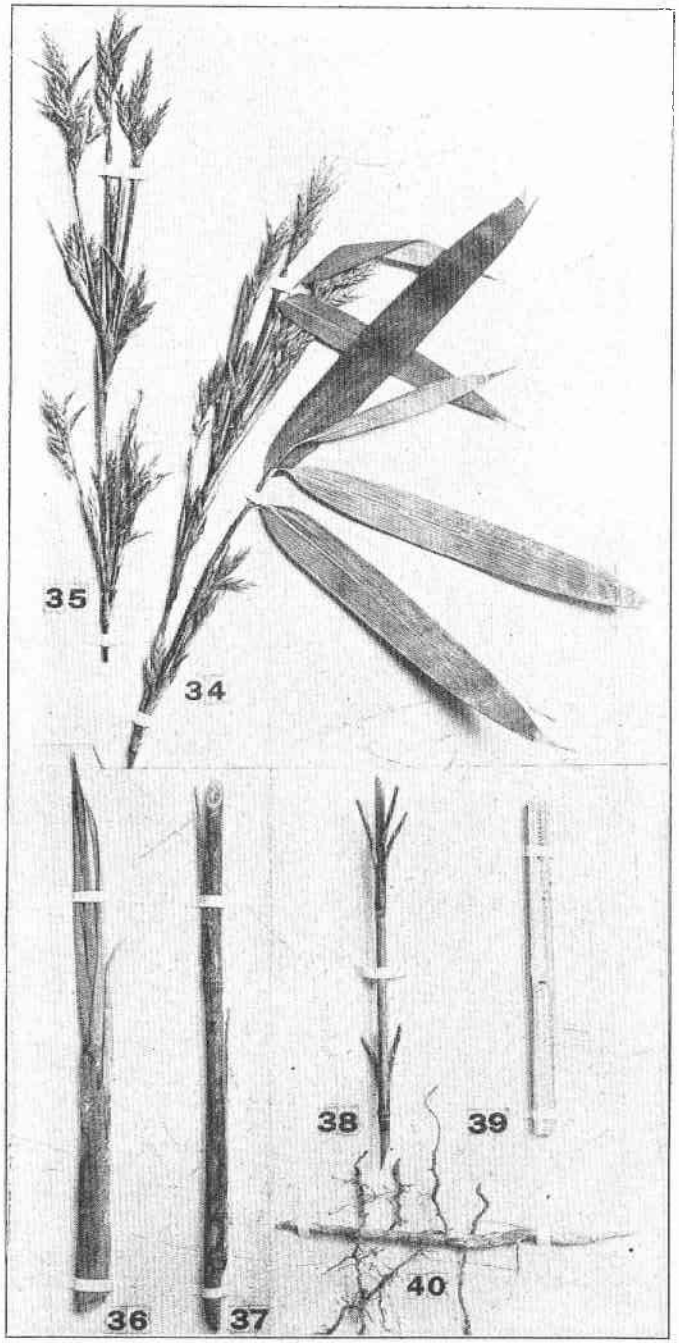
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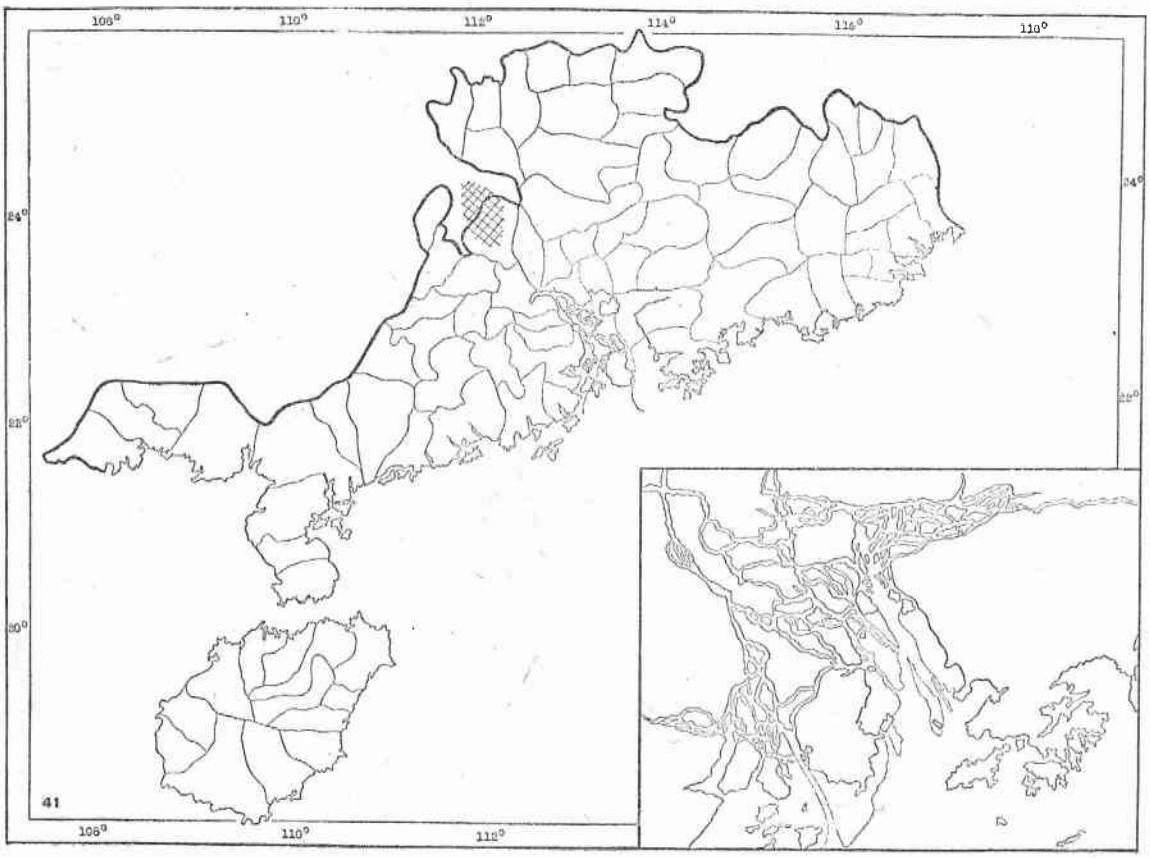
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