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Frontispiece. *Fritillaria imperialis*, Linn.

BEAUTIFUL FLOWERS OF KASHMIR

BY

ETHELBERT BLATTER S.J., Ph.D., F.L.S.

Illustrated by

Mrs. G. A. WATHEN

and

HALDAR JOO WALL

Volume II

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DEDICATED

TO

F. J. MITCHELL, Esq.

WITHOUT WHOSE ENCOURAGEMENT THIS WORK

COULD NOT HAVE BEEN

WRITTEN

PREFACE.

A slight change has been introduced in this volume. At the request of many who have used the first part of this work the derivation and meaning of the botanical names have been added. I should also have liked to oblige those who are anxious to learn something about the economic uses and the folk-lore of the various plants, but the limited space did not allow this addition.

The reader's attention is drawn to the fact that in many cases I have not given all the colours which may be observed in certain flowers. I have not even always mentioned that particular colour which is shown in the illustration. Many flowers vary a good deal, even under the same or similar conditions. In one and the same species white and coloured forms may be observed. Other species change their colour under different conditions of altitude, soil or illumination. We possess comparatively few accurate colour-records regarding the flowers growing in the temperate and alpine regions of Kashmir. There is a vast field for further observations.

E. B.

LIST OF ILLUSTRATIONS.

Plate	Fig.		Name of artist
Frontispiece :		*Fritillaria imperialis*, Linn.	M. W.
34	1	*Lactuca longifolia*, DC.	H. J. W.
	2	*Lactuca decipiens*, C. B. Clarke ...	M. W.
	3	*Lactuca rapunculoides*, C. B. Clarke	M. W.
	4	*Lactuca Lessertiana*, C. B. Clarke ...	M. W.
	5	*Lactuca scariola*, Linn.	H. J. W.
	6	*Lactuca sp.*	H. J. W.
35	1	*Rhagadiolus Hedypnois*, Fisch. & Mey.	H. J. W.
	2	*Koelpinia linearis*, Pall.	H. J. W.
	3	*Scorzonera divaricata*, Turcz. ...	H. J. W.
	4	*Tragopogon pratense*, Linn.	H. J. W.
36	1	*Codonopsis rotundifolia*, Benth. ...	H. J. W.
	2	*Codonopsis ovata*, Benth.	M. W.
	3	*Phyteuma Thomsoni*, C. B. Clarke ...	M. W.
	4	*Campanula latifolia*, Linn.	M. W.
	5	*Campanula aristata*, Wall.	M. W.
	6	*Campanula argyrotricha*, Wall. ...	H. J. W.
	7	*Campanula alsinoides*, Hook. f. & T....	M. W.
	8	*Campanula cashmiriana*, Royle ...	H. J. W.
37	1	*Pyrola rotundifolia*, Linn.	H. J. W.
	2	*Moneses uniflora*, Linn.	M. W.
	3	*Gaultheria trichophylla*, Royle ...	M. W.
	4	*Gaultheria trichophylla*, Royle ...	H. J. W.
	5	*Cassiope fastigiata*, D. Don	M. W.
38	1	*Hypopithys lanuginosa*, Nutt. ...	M. W.
	2	*Primula nivalis*, Pall.	M. W.
	3	*Primula rosea*, Royle	M. W.
	4	*Primula reptans*, Hook. f.	M. W.
	5	*Primula denticulata*, Sm.	M. W.
	6	*Primula elliptica*, Royle	M. W.
	7	*Primula sp.*	H. J. W.

Plate	Fig.		Name of artist
39	1	*Androsace septentrionalis*, Linn. ...	H. J. W.
	2	*Androsace sarmentosa*, Wall. ...	M. W.
	3	*Androsace sempervivoides*, Jacquem. ...	H. J. W.
	4	*Androsace aizoon*, Duby	H. J. W.
	5	*Androsace rotundifolia*, Hardw. ...	M. W.
	6	*Cortusa Matthioli*, Linn.	M. W.
40	1	*Gentiana Moorcroftiana*, Wall. ...	H. J. W.
	2	*Gentiana aurea*, Linn. (rose-coloured form)	H. J. W.
	3	*Gentiana tenella*, Fries. (alpine form)	M. W.
	4	*Gentiana tenella*, Fries.	H. J. W.
	5	*Gentiana sp.*	H. J. W.
	6	*Gentiana carinata*, Griseb.	H. J. W.
41	1	*Gentiana cachemirica*, Dcne.... ...	H. J. W.
	2	*Gentiana Kurroo*, Royle	H. J. W.
	3	*Gentiana serrata*, Gunner, var. *Stracheyi*, C. B. Clarke	H. J. W.
	4	*Gentiana sp.*	H. J. W.
	5	*Gentiana venusta*, Wall.	H. J. W.
	6	*Gentiana venusta*, Wall.	M. W.
42	1	*Pleurogyne spathulata*, A. Kerner ...	H. J. W.
	2	*Pleurogyne spathulata*, A. Kerner ...	M. W.
	3	*Pleurogyne carinthiaca*, Griseb. ...	H. J. W.
	4	*Pleurogyne carinthiaca*, Griseb. ...	M. W.
	5	*Jaeschkea gentianoides*, Kurz. ...	H. J. W.
	6	*Jaeschkea latisepala*, C. B. Clarke ...	H. J. W.
43	1	*Swertia petiolata*, Royle	H. J. W.
	2	*Swertia petiolata*, Royle	M. W.
	3	*Swertia purpurascens*, Wall.	H. J. W.
	4	*Swertia cordata*, Wall.	H. J. W.
	5	*Limnanthemum nymphaeoides*, Link...	H. J. W.
44	1	*Cynoglossum glochidiatum*, Wall. ...	M. W.
	2	*Cynoglossum zeylanicum*, Thunb. ...	M. W.
	3	*Lindelofia longiflora*, Baillon... ...	M. W.
	4	*Lindelofia longiflora*, Baillon, var. *Levingii*, C. B. Clarke	M. W.
	5	*Lindelofia angustifolia*, Brand ...	H. J. W.
	6	*Mertensia echioides*, Benth.	M. W.

Plate	Fig.		Name of artist
	7	*Mertensia tibetica*, C. B. Clarke ...	M. W.
	8	*Lappula glochidiata*, Brand	H. J. W.
	9	*Adelocaryum anchusoides*, Brand ...	M. W.
45	1	*Lycopsis arvensis*, Linn.	H. J. W.
	2	*Macrotomia Benthami*, DC.	M. W.
	3	*Onosma echioides*, Linn.	H. J. W.
	4	*Myosotis sylvatica*, Hoffm.	M. W.
	5	*Moltkia parviflora*, C. B. Clarke ...	M. W.
	6	*Eritrichium strictum*, Dcne.	M. W.
46	1	*Cynanchum auriculatum*, Wight ...	M. W.
	2	*Orobanche epithymum*, DC.	H. J. W.
	3	*Orobanche cernua*, Loeffl.	H. J. W.
	4	*Cuscuta capitata*, Roxb.	H. J. W.
	5	*Polemonium coeruleum*, Linn. ...	M. W.
	6	*Utricularia flexuosa*, Vahl	H. J. W.
	7	*Atropa belladonna*, Linn.	M. W.
	8	*Atropa belladonna*, Linn.	M. W.
47	1	*Veronica Beccabunga*, Linn.	M. W.
	2	*Veronica laxa*, Benth.	M. W.
	3	*Veronica deltigera*, Wall.	M. W.
	4	*Leptorhabdos Benthamiana*, Walp. ...	H. J. W.
	5	*Euphrasia officinalis*, Linn.	M. W.
	6	*Scrophularia Scopolii*, Hoppe ...	M. W.
	7	*Picrorhiza Kurrooa*, Benth.	H. J. W.
	8	*Wulfenia Amherstiana*, Benth. ...	M. W.
48	1	*Pedicularis pyramidata*, Royle ...	M. W.
	2	*Pedicularis pyramidata*, Royle ...	H. J. W.
	3	*Pedicularis pectinata*, Wall. ...	H. J. W.
	4	*Pedicularis tenuirostris*, Benth. ...	M. W.
	5	*Pedicularis Garckeana*, Prain ...	M. W.
	6	*Pedicularis Wallichii*, Bunge ...	H. J. W.
	7	*Pedicularis Roylei*, Maxim.	M. W.
49	1	*Pedicularis rhinanthoides*, Schrenk....	M. W.
	2	*Pedicularis rhinanthoides*, Schrenk....	H. J. W.
	3	*Pedicularis bicornuta*, Klotzsch. ...	M. W.
	4	*Pedicularis elephantoides*, Benth. ...	M. W.
	5	*Pedicularis siphonantha*, D. Don ...	H. J. W.
	6	*Pedicularis siphonantha*, D. Don ...	H. J. W.
	7	*Pedicularis Oederi*, Vahl	H. J. W.
	8	*Pedicularis Oederi*, Vahl	M. W.

Plate	Fig.		Name of artist
50	1	*Lathraea squamaria*, Linn.	M. W.
	2	A species of *Acanthaceae*	H. J. W.
	3	*Strobilanthes alatus*, Nees	M. W.
	4	*Lagotis glauca*, Gaertn. (rose) ...	M. W.
	5	*Lagotis glauca*, Gaertn. (blue) ...	M. W.
	6	*Euphorbia Wallichii*, Hook. f. ...	M. W.
	7	*Euphorbia prolifera*, Ham.	M. W.
51	1	*Salvia Moorcroftiana*, Wall.	H. J. W.
	2	*Salvia hians*, Royle	M. W.
	3	*Salvia hians*, Royle	H. J. W.
	4	*Salvia glutinosa*, Linn.	H. J. W.
	5	*Salvia glutinosa*, Linn.	M. W.
52	1	*Nepeta connata*, Royle	H. J. W.
	2	*Nepeta Govaniana*, Benth.	H. J. W.
	3	*Nepeta erecta*, Benth....	M. W.
	4	Hybrid between *Nepeta Govaniana* and *N. erecta*	H. J. W.
	5	*Nepeta Cataria*, Linn.	H. J. W.
	6	*Nepeta salviaefolia*, Royle	H. J. W.
53	1	*Elsholtzia strobilifera*, Benth. ...	H. J. W.
	2	*Elsholtzia cristata*, Willd.	H. J. W.
	3	*Scutellaria prostrata*, Jacquem. ...	H. J. W.
	4	*Scutellaria galericulata*, Linn. ...	H. J. W.
	5	*Ajuga bracteosa*, Wall.	H. J. W.
54	1	*Leonurus cardiaca*, Linn.	H. J. W.
	2	*Stachys melissaefolia*, Benth... ...	H. J. W.
	3	*Stachys sp.*	H. J. W.
	4	*Phlomis spectabilis*, Falc.	H. J. W.
	5	*Wikstroemia canescens*, Meissn. ...	H. J. W.
	6	*Daphne papyracea*, Dcne.	H. J. W.
55	1	*Chenopodium Blitum*, Hook. f. ...	H. J. W.
	2	*Polygonum recumbens*, Royle ...	H. J. W.
	3	*Polygonum amphibium*, Linn. ...	H. J. W.
	4	*Polygonum amplexicaule*, Don ...	H. J. W.
	5	*Polygonum amplexicaule*, Don ...	M. W.
	6	*Polygonum affine*, Don	M. W.
	7	*Polygonum perpusillum*, Hook. f. ...	M. W.
	8	*Oxyria digyna*, Hill	H. J. W.

Plate	Fig.		Name of artist
56	1	*Ephedra Gerardiana*, Wall.	H. J. W.
	2	*Hydrocharis Morsus-ranae*, Linn. ...	H. J. W.
	3	*Listera kashmiriana*, Duthie... ...	H. J. W.
	4	*Listera Lindleyana*, King & Pantl. ...	M. W.
	5	*Spiranthes australis*, Lindl.	H. J. W.
	6	*Epipactis latifolia*, All.	H. J. W.
	7	*Epipactis gigantea*, Dougl.	M. W.
57	1	*Orchis incarnata*, Linn.	M. W.
	2	*Orchis incarnata*, Linn.	H. J. W.
	3	*Epipogum aphyllum*, Swartz ...	M. W.
	4	*Epipogum tuberosum*, Duthie ...	H. J. W.
	5	*Cypripedium cordigerum*, D. Don ...	H. J. W.
	6	*Herminium sp.*	H. J. W.
	7	*Aletris nepalensis*, Hook. f.	H. J. W.
58	1	*Iris kumaonensis*, Wall.	M. W.
	2	*Iris ensata*, Thunb.	H. J. W.
	3	*Colchicum luteum*, Baker	M. W.
	4	*Hemerocallis fulva*, Linn.	M. W.
59	1	*Ixiolirion montanum*, Herb.	M. W.
	2	*Gagea lutea*, Schult. f.	M. W.
	3	*Gagea persica*, Boiss.	M. W.
	4	*Allium humile*, Kunth	H. J. W.
	5	*Lloydia serotina*, Reichb.	M. W.
60	1	*Tulipa praecox*, Tenore	M. W.
	2	*Lilium polyphyllum*, D. Don. ...	M. W.
	3	*Fritillaria Roylei*, Hook.	M. W.
	4	*Eremurus himalaicus*, Baker... ...	M. W.
	5	*Tulipa stellata*, Hook.	M. W.
61	1	*Trillium Govanianum*, Wall.... ...	M. W.
	2	*Trillium Govanianum*, Wall.... ...	M. W.
	3	*Arisaema Wallichianum*, Hook. f. ...	M. W.
	4	*Arisaema tortuosum*, Schott	M. W.
62	1	*Potamogeton lucens*, Linn.	H. J. W.
	2	*Potamogeton pectinatus*, Linn. ...	H. J. W.
	3	*Naias major*, All.	H. J. W.
	4	*Myriophyllum spicatum*, Linn. ...	H. J. W.

GLOSSARY.

Achene—A dry one-seeded fruit as in the Dandelion, or one carpel in a cluster, as in the fruit of the Buttercup.
Acuminate—When the tip of a leaf is tapering and prolonged to a long point.
Acute—Having a sharp-pointed tip or when the tip forms a narrow angle.
Alternate—When the leaves are arranged one above the other at different levels.
Annual—Plants that flower in the same year in which they are raised from seeds.
Anther—That part of a stamen in which the pollen is produced.
Awn—A stiff or flexible bristle.
Axil—The angle formed by the stem or branch with the attached leaf.
Axillary—When an organ grows from the axil of a leaf.

Berry—A fleshy or pulpy fruit with seeds embedded, e.g., Grape, Gooseberry.
Bi—Used in compounds, means twice or two, e.g., bilobed, i.e., having two lobes.
Blade—The flat part of a leaf.
Bracts—Leaf-like or scale-like organs immediately beneath the flowers. Several bracts arranged in a whorl below an umbel or head of flowers are called involucre.
Bracteoles—Small bracts immediately below or next to the flower.

Calyx—Made up of sepals which are free or united.
Capsule—A dry fruit splitting open when ripe.
Carpel—One of the component parts of a fruit; carpels are separate (Buttercup) or united (Flax); the pod of a Pea consists of one carpel.
Catkin—e.g., the flower-spike of a Willow.
Ciliate—Having hairs on the margin.
Claw—Stalk of a petal.
Compound—When a leaf is divided to the stalk or midrib into several distinct leaflets.
Corolla—Made up of petals which are free or united.
Corymb—When the flower-stalks arise from different points on the axis; the stalks get shorter higher up so that the flowers are at the same level.
Crenate—When a leaf has rounded teeth on the margin.
Cyme—An irregular clustered inflorescence; the cyme of a Forget-me-not is called scorpioid cyme.

Digitate—When the leaflets of a compound leaf arise all from the top of the stalk, spreading like the fingers of a hand.
Drupe—A fleshy fruit enclosing a stone which contains the seed, e.g., the Cherry.

Elliptical—Similar to egg-shaped, but both ends are equal.
Entire—When a leaf has an unbroken margin.
Epiphyte—A plant growing on another but not drawing food from it, e.g., many orchids.

Fascicled—Arranged in a bunch or cluster.
Filament—Stalk of a stamen bearing the anther.
Filiform—Very slender, thread-like.
Follicle—A fruit consisting of one carpel which opens only along the inner suture when ripe (e.g., Larkspur).

Glabrous—Smooth, having no hairs.
Glandula—Furnished with glands, usually at the tip of hairs.

Hermaphrodite—When both sexes are present in the same flower.

Inflorescence—The mode in which the flowers are arranged on the axis.
Involucre—A collection of a sort of leaves round a cluster of flowers (Dandelion), or at some distance below them.

Keeled—When an organ has a ridge like a keel of a boat.

Linear—When a leaf is narrow and has the edges almost parallel, e.g., in Grasses.
Lobe—A division of a simple leaf, or of a leaflet or petal.

Mucronate—When a leaf or petal terminates in a short hard point.

Odd-pinnate—When a leaf is pinnate and has an odd terminal leaflet.
Ovary—That part of the female organs of a flower which contains the ovules or young seeds.

Panicle—When the axis of the inflorescence divides into branches each bearing two or more flowers.
Pappus—The calyx-limb composed of hairs or bristles, e.g., in the seed of the Dandelion.
Perennial—Flowering more than once from the same root.
Persistent—Used usually of the calyx or style when they are still visible in the ripe fruit.
Pinnate—A compound leaf having several leaflets attached to each side of a central rib.
Pinnatifid—When the leaves are cut into lateral segments to about the middle, e.g., the Common Groundsel.
Pubescent—Clothed with short soft hairs.

Raceme—An inflorescence having a common axis bearing stalked flowers, e.g., the Hyacinth.
Radical—When the leaves grow direct from the root or root-stock e.g., in the Primrose.
Regular—When all the petals or all the sepals are alike.

Salver-shaped—e.g., the corolla of Syringa.
Spike—An inflorescence having the stalkless flowers on a common undivided axis.
Stigma—The viscous topmost part of the style receiving the pollen.
Stipules—Leaflets at the base of the leaf-stalk, having a lateral position.
Style—The mostly slender termination of the ovary bearing the stigma.

Tuber—An underground fleshy stem, e.g., the potato.

Umbel—An inflorescence in which the flower-stalks radiate from one point.
Unisexual—Flowers or plants bearing only male or female organs.

Valvate—Used of sepals and petals when their edges meet without overlapping.

Whorl—When several leaves or organs arise on the same plane from the central axis.
Winged—Stems or branches or seeds provided with a membranous or leafy expansion.

Plate 34

COMPOSITAE (*continued*).

LACTUCA, Linn. Lettuce.

From the Latin name of the Lettuce, *Lactuca sativa*, derived from *lac*, milk, alluding to its milky juice.)

A. Herbs with radical leaves and erect leafy flowering stems; flower-heads panicled, erect. Flower-stalk with bracts; outer involucral bracts slowly passing into the inner. Flowers yellow, blue or purple; achenes beaked; pappus silvery.
- I. Flowers yellow ... ... *L. scariola.*
- II. Flowers pale blue ... ... *L. dissecta.*
- III. Flowers blue-purple ... ... *L. longifolia.*

B. Perennial usually tall leafy herbs; roots large, tuberous or spindle-shaped; leaves more or less pinnatifid or pinnate and sharply toothed; flower-heads very many, drooping; involucral bracts usually very short, inner few, long, narrow; flowers blue-violet or purple; achenes smooth; pappus deciduous.
- I. Not more than 3 ft. high.
  - 1. Lower leaves not halbert-shaped ... ... *L. decipiens.*
  - 2. Lower leaves halbert-shaped *L. rapunculoides.*
- II. 4-7 ft. high (but dwarfed plants also found) ... ... *L. hastata.*

C. Perennial herbs; roots tuberous; stems and branches soft, ascending; leaves very membranous, pinnate or pinnatifid, scarcely toothed; flower-heads drooping, narrow; flower-stalks without bracts, involucral bracts few, outer slowly longer; flowers blue or purple; achenes smooth; pappus deciduous.
- I. Pappus as long as the achene ... *L. macrorhiza.*
- II. Pappus shorter than the achene *L. Lessertiana.*

D. Leaves radical, long-stalked; stems one or more, erect; flower-heads many, small ($\frac{1}{6}$-$\frac{1}{4}$ in.), erect; flower-stalks slender, without bracts; outer involucral bracts minute, inner all equal, linear, green; flowers yellow; achenes smooth; pappus silvery or yellowish ... ... *L. polycephala.*

Fig. 1. Lactuca longifolia, DC. Long-leafed Lettuce.

Glabrous. Stems tall, erect, 3-6 ft. high, branched above. Leaves 4-7 by $\frac{1}{4}$-$\frac{1}{2}$ in., long-pointed, entire or sparingly pinnatifid, stem-clasping, basal lobes narrow, sharp-pointed, appressed to the stem. Heads $\frac{1}{2}$ in. long; stalks slender, erect, 12-20-flowered, forming broad or narrow panicles. Flowers blue-purple. Achenes $\frac{1}{4}$ in. long including the beak, dark brown, much compressed, faces nearly smooth, 3-5-nerved, beak not longer than the body.

Flowers.—June.

Locality.—Lower Sind Valley.

Distribution.—W. and Central Himalaya, from Kashmir to Nepal, 4,000-9,000 ft.

Fig. 2. Lactuca decipiens, C. B. Clarke.

(*Decipiens* means misleading, because this species can easily be mistaken for another one.)

Glabrous. Stem tall, 2-3 ft. high, branched above. Lower leaves rarely entire, mostly pinnatifid with the lobes bent downwards, with a broad halbert-shaped terminal lobe; stem-leaves with long, winged stalk, broadened and ear-shaped at the base; uppermost lance-shaped. Heads $\frac{2}{3}$ in. long, 6-8-flowered, cylindric, glabrous, drooping. Flowers blue. Outer involucral bracts oblong-egg-shaped, blunt, half as long as the 5-6 linear-oblong inner which are glabrous or stiff-hairy on the back. Achenes $\frac{1}{4}$-$\frac{1}{3}$ in. long, compressed, ribbed, rather suddenly contracted into a short dark beak which is $\frac{1}{4}$ the length of the body. Pappus $\frac{1}{4}$ in. long, dirty white.

Flowers.—August.

Locality.—Khelanmarg, catchment area among scrub near nala, about 10,000 ft., common; Dras.

Distribution.—W. Himalaya, 8,000-10,000 ft.

Fig. 3. Lactuca rapunculoides, C. B. Clarke.

(*Rapunculoides* means resembling the Rapunculus.)

Glabrous or sparsely bristly above. Stem erect, 2-3 ft. high, simple or branched above. Lower leaves long-stalked, halbert- and heart-shaped with margins curved inwards or variously toothed, upper middle leaves with broadly winged stalks, with ear-shaped lobes at the base, uppermost almost stalkless, often lance-shaped. Heads very narrow, $\frac{1}{2}$-$\frac{3}{4}$ in. long, 6-8-flowered, drooping. Flowers blue. Outer involucral bracts very small, inner few, very narrow with broadened tips. Achenes $\frac{1}{3}$ in. long, very narrow, slightly compressed, smooth, streaked, narrowed into a brown beak. Pappus falling off soon, dirty white, rather shorter than the achenes.

The plant varies in height from 8 in. to 3 ft. according to the height of the surrounding vegetation.

Very similar to *L. decipiens*, but the heads are smaller, and the outer involucral bracts much shorter, and the achenes are quite different.

Flowers.—August.

Locality.—Gulmarg, woods, above 8,500 ft. common.

Distribution.—W. Himalaya, 9,000-12,000 ft., from Kashmir to Nepal.

Fig. 4. Lactuca Lessertiana, C. B. Clarke.

Glabrous or laxly hairy. Stem short, stout or absent, up to 1 ft. high, simple or branched from the base. Leaves always membranous, very variable, elongate-inversely lance-shaped and entire, or shorter and toothed or pinnatifid, margins and lobes almost entire, stalk absent or simple at the base. Heads $\frac{3}{4}$ in. long, almost cylindric or bell-shaped, 12-24-flowered, erect or drooping, ending the branches or in panicles, blackish, sometimes densely long-hairy. Flowers blue. Outer involucral bracts few, linear or absent, inner linear-oblong, blunt. Achenes $\frac{1}{4}$ in. long including the stout pale beak, flattened, black, strongly ribbed. Pappus white or yellowish, very soon falling off, shorter than the achene.

Resembles *L. macrorhiza*, but can always be distinguished by the achenes. The size varies a good deal according to the length of the grass amongst which the plant grows.

Flowers.—August, September.

Locality.—Gulmarg, open grassy margs, about 8,500 ft.

Distribution. — Temperate and alpine Himalaya, from Kashmir, 8,000-13,000 ft. to Sikkim, 9,000-16,000 ft.

Fig. 5. Lactuca scariola, Linn. Prickly Lettuce.

(*Scariola* may have been derived from *seriola*, diminutive of the Greek *seris*, lettuce, or from *serriola*, a small saw, alluding to the prickly leaves.)

A tall, erect, glabrous, very leafy plant, 2-5 ft. high, branched, usually prickly towards the base; juice very acrid. Leaves stalkless, 5-7 in. long, pinnatifid, segments toothed, pointing downwards; lower surface usually prickly on the mid-rib and nerves. Upper leaves erect, arrow-shaped below, stem-clasping. Heads yellow, $\frac{1}{2}$ in. long, erect, scattered in a panicle with long spreading branches, branches and flower-stalks white with many green heart-shaped bracts. Involucral bracts egg-shaped, the inner ones linear. Achenes $\frac{1}{4}$ in. long including the very slender beak, ribbed, grey, pale, beak about as long as the body. Pappus $\frac{1}{5}$ in. long.

Flowers.—June.

Locality.—Ganderbal.

Distribution.—W. Himalaya, from Murree to Kunawer, 6,000-11,000 ft., Siberia, Europe, Canaries.

Fig. 6. Lactuca sp.

Locality.—Gagangir (Hallberg).

Lactuca dissecta, D. Don.

(*Dissecta* means dissected, alluding to the leaves.)

Glabrous or nearly so. Stems often tufted, erect, 6-18 in. high, leafy and much branched or naked and nearly simple. Leaves 1-4 in. long, pinnatifid, lobes varying much in size and cutting; radical leaves usually many, stalkless; lower stem-leaves stalked; upper ones stalkless, lobed at the base; uppermost linear. Heads many, $\frac{1}{4}$-$\frac{1}{2}$ in. long, erect, narrowly cylindric, few-flowered, forming corymbs, stalks slender; flowers pale blue. Achenes inversely lance-shaped, transversely wrinkled, 3-ribbed on each face, margins thickened, beak very slender, twice as long as the body.

Flowers.—June.

Locality.—Ganderbal.

Distribution.—Temperate Himalaya, from Kashmir to Bhutan, 4,000-8,000 ft., W. Tibet, Afghanistan, Baluchistan, Salt Range.

Lactuca hastata, DC.

(*Hastata* means halbert-shaped.)

Stems very tall and robust, erect, 4-7 ft. high, sometimes dwarfed and slender, glabrous towards the base, more or less glandular upwards especially on the branches of the inflorescence. Leaves large, variable, smooth or rough; stalks with or without wings, base broadened or 2-lobed; blade 6-12 by 1½-4 in., pinnately lobed, end-lobe broad, coarsely toothed, lower lobes many to none. Heads ¾ in. long, nodding, in branched racemes forming a panicle. Flowers 10-30 in a head, dark blue. (Hooker says blue-purple or dark red.) Outer involucral bracts oblong-egg-shaped, half as long as the 8-10 linear-oblong glabrous or bristly inner ones. Achenes ¼ in. long including the beak, black when ripe, suddenly contracted into a cleft tip in which the white beak is seated; beak about half as long as the body. Pappus ¼ in., falling off soon, dirty-white, outer ring of bristles distinct.

Flowers.—August.

Locality.—Temperate regions.

Distribution.—From Kashmir to Sikkim, 4,000-12,000 ft., Khasia Mts., 5,000-6,000 ft., Nilgiris.

Lactuca macrorhiza, Hook. f. Large-rooted Lettuce. Collett, fig. 85.

Glabrous or nearly so. Root thick, woody. Stems tufted, prostrate or pendulous, much branched, 3 in. to 3 ft. high, sometimes the whole plant reduced to a few leaves and one or more flowering stems. Leaves thin, very variable in size and shape, usually pinnately lobed, sometimes heart-shaped, rounded or egg-shaped; stalks winged or not, broadened or lobed at the base. Heads ½-¾ in. long, ending the branches, drooping or inclined, 6-16-flowered. Flowers grey-blue (according to Hooker, blue or purple). Outer involucral bracts lance-shaped, very much shorter than the 6-10 linear-oblong inner ones. Achenes flat, ⅙-¼ in. including the slender beak, about 5-ribbed on both faces, black when ripe; beak about half as long as the body. Pappus silky white, as long as the achene.

Flowers.—August, September.

Locality.—Temperate regions.

Distribution.—From Kashmir to Sikkim, 6,000-16,000 ft.

Lactuca polycephala, Benth. Many-headed Lettuce.

A flaccid, slender, glabrous annual, 6-18 in. high. Leaves membranous, 3-10 by ¼-¾ in.; radical leaves stalked, very long, narrow, linear or lance-shaped, entire, toothed or pinnatifid; stem-leaves stalkless, oblong or lance-shaped, base arrow-shaped, auricles sharp-pointed. Flowering stems simple or branched. Heads ⅛-¼ in. diameter, 10-20-flowered, erect, forming corymbs or panicles. Outer involucral bracts very small, inner 6-10, linear-oblong, green. Flowers yellow. Achenes ⅛ in. long, red-brown, hardly compressed, smooth, narrowed into a short slender brown beak, with about 10 very strong ribs. Pappus silvery, as long as the achene.

Locality.—Tropical and subtropical regions.

Distribution.—Afghanistan, Punjab Plain, Bengal, up to 6,000 ft. on the Himalaya, from Kashmir to Sikkim, Khasia Hills, Upper Burma.

Plate 35

RHAGADIOLUS, Juss.

Fig. 1. Rhagadiolus Hedypnois, Fisch. & Mey.

Glabrous or sparsely hairy. Branches 2-8 in. long, all spreading from the root. Leaves 1-3 in. long, inversely egg-shaped-oblong, toothed or pinnatifid at the base, narrowed into the stalk. Flower-heads ¼-⅓ in., few-flowered, in the axils of or at the end of the branches, yellow. Flower-stalks thickened in fruit. Involucral bracts small, slightly spiny or smooth in fruit, in one series, at length keeled and embracing the outer achenes. Achenes ¼-½ in. long, much exceeding the bracts, bent inwards, narrow, smooth, beaked, outer ones with a short pappus, inner with a pale-like pappus.

Flowers.—April, May.

Fruits.—May.

Locality.—Gagribal on the Dal, on a hill; Srinagar.

Distribution.—Kashmir, Baluchistan, Persia, Caucasus, Mesopotamia, Syria, Asia Minor.

KOELPINIA, Pall.

Fig. 2. Koelpinia linearis, Pall.

A glabrous or slightly hairy, weak annual. Root slender. Stem 6-12 in. high, erect or decumbent, simple or branched, leafy. Leaves chiefly radical, linear, quite entire, 2-6 by $\frac{1}{10}$-$\frac{1}{4}$ in., gradually narrowed at both ends. Heads small, $\frac{1}{4}$-$\frac{1}{3}$ in., stalked, yellow. Involucre cylindric; bracts 5-7, narrow, almost equal, thin, base at length keeled, outer very few, small. Achenes $\frac{1}{3}$-$\frac{2}{3}$ in. long, curved inwards like birds' claws, much longer than the bracts, ribbed, slightly hairy, dorsal ribs usually with rows of spines.

Flowers.—May.

Locality.—Gagribal; Pandrathan.

Distribution.—N. Africa, S. Russia, W. Asia, Soongaria, Siberia, Afghanistan, Baluchistan, W. Himalaya and W. Tibet, 2,000-14,000 ft.

SCORZONERA, Linn.

(From the Spanish name of these plants *escorzonera*, meaning lizard-root, derived from the Spanish name *scorzone* or *escuerzo* given to a lizard which was wrongly considered to be poisonous and whose bite these plants were reputed to cure.)

1. Achenes longer than the pappus. Flowers yellow ... ... *S. divaricata.*
2. Achenes shorter than the pappus. Flowers purple ... ... *S. purpurea.*

Fig. 3. Scorzonera divaricata, Turcz.

(*Divaricata* means spreading irregularly and widely.)

A glabrous plant. Root woody. Stem slender, branched from the base or above only, grooved, branches spreading. Leaves 2-6 by $\frac{1}{10}$-$\frac{1}{8}$ in., slender, curved, margins bent inwards. Heads cylindric, 1-1½ in., 5-8-flowered. Involucral bracts 4-8, in 3-4 series, glabrous or hairy, outer ones short, broad, inner long, linear. Flowers yellow. Achenes $\frac{2}{3}$ in., very slender, pale, smooth, streaked. Pappus shorter than the achenes, hairs feathery below.

Locality.—Above Baltal.

Distribution.—W. Himalaya, from Kashmir to Kunawer, 9,000-15,000 ft., Mongolia,

Scorzonera purpurea, Linn. Purple Scorzonera.

Glabrous or sparsely woolly. Root cylindric, neck densely fibrous. Stem slender, erect, leafy, often woolly below the heads. Leaves narrowly linear, shorter than the stem, radical leaves in the lower part slightly hairy, otherwise glabrous, stem-leaves stalkless, half-stem-clasping. Heads 1-4, cylindric. Involucral bracts hairy, outermost egg-shaped, inner lance-shaped, shorter than the purple flowers. Achenes angled, on the angles often slightly tubercular-wrinkled. Pappus dirty-white, longer than the achene.

Locality.—Banehal, 8,000 ft.

Distribution.—Europe, Central and S. Russia, Asia Minor, Siberia, Kashmir.

TRAGOPOGON, Linn. The Goat's Beard.

(From the Greek *tragos*, a goat, and *pogon*, a beard, referring to the long pappus.)

1. Achenes $\frac{3}{4}$ to nearly 1 in.; beak as long as or shorter than the body, very slender ... *T. pratense.*
2. Achenes $\frac{1}{2}$ in.; beak short, not slender ... *T. gracile.*

Fig. 4. Tragopogon pratense, Linn. Goat's Beard, Buck's Beard, Shepherd's Clock, Go-to-bed-at-noon, Jack-by-the-hedge, Joseph's Flower, Nap-at-noon.

Erect, more or less grass-like. Stem 1-2 ft. high, usually branched and leafy, bluish green, smooth, tall, with a milky juice. Leaves linear, tapering to a long point, wavy, stem-clasping, $\frac{1}{8}$-$\frac{1}{3}$ in. diameter about the middle, with swollen sheaths. Flower-heads yellow; stalk hardly thickened under the head. Involucral bracts about 8, as long as or longer than the flowers. Achenes $\frac{3}{4}$ to nearly 1 in. long with a long beak, rough, beak as long as or shorter than the body. Pappus hair has stalked feathery down.

Flowers and Fruits.—May.

Locality.—Srinagar; Gadsar; Dachigam Rakh on right bank of stream along road; near Shirazia Bagh.

Distribution.—W. Himalaya and W. Tibet, up to 14,000 ft., westward to the Atlantic.

Tragopogon gracile, D. Don. Graceful Goat's Beard.

Glabrous, sometimes slightly cottony. Stems often tufted, 6-18 in. high, erect, simple or branched from near the base; juice milky. Leaves alternate, narrow, entire, 3-8 in. long, sharp-pointed, base sheathing the stem; radical leaves sometimes as long as the stem. Heads yellow, 1-2 in. diameter, solitary, terminal. Involucral bracts 5-8, $\frac{1}{2}$-$1\frac{1}{2}$ in. long, in one series, green, sharp-pointed. Achenes slender, ribbed, prickly on the upper half, tapering into a short beak. Pappus in one series, feathery, united at the base, a few naked-tipped hairs usually projecting beyond the others.

Locality.—Temperate regions.

Distribution.—Temperate Himalaya, from Kashmir to Nepal, 6,000-13,000 ft.

Plate 36

CAMPANULACEAE. The Bell-blower Family.

(*Campanula* means a small bell, alluding to the shape of the flowers.)

CODONOPSIS, Wall.

1. Flowers purple or lurid grey-blue ... *C. rotundifolia.*
2. Flowers sky-blue ... ... *C. ovata.*

Fig. 1. Codonopsis rotundifolia, Benth.

Stem twining. Leaves very variable in size, often 2 by $\frac{1}{4}$ in., alternate, egg-shaped, rounded at the base, crenate, smooth or sparsely hairy; stalk $\frac{3}{4}$ in. long. Flower-stalks 1-6 in., in the axils or at the end of the branches. Calyx-lobes $\frac{3}{4}$ by $\frac{1}{4}$-$\frac{1}{3}$ in., elliptic, often crenate or toothed. Corolla $\frac{3}{4}$-$1\frac{1}{4}$ by $\frac{3}{4}$ in., widely bell-shaped, purple or lurid grey-blue. Capsule hemispheric, $\frac{1}{2}$-$\frac{3}{4}$ in. broad, beak $\frac{1}{4}$ in. long. Seeds $\frac{1}{16}$ in., oblong-ellipsoid, netted, not glistening.

Locality.—Sind Valley.

Distribution.—W. Himalaya, from Kashmir to Kumaon, 7,000-11,000 ft.

Fig. 2. Codonopsis ovata, Benth.

Root woody, large, spindle-shaped. Stem 6-12 in., decumbent, then upright. Leaves $\frac{1}{4}$-$\frac{3}{4}$ by $\frac{1}{6}$-$\frac{1}{2}$ in., alternate and opposite, egg-shaped, blunt or sharp-pointed, hairy on both surfaces; stalk $\frac{1}{8}$-$\frac{1}{4}$ in. long. Flower-stalks 3-6 in. long, at the end of the branches. Calyx-lobes $\frac{1}{3}$-$\frac{1}{6}$ in., elliptic-oblong, slightly hairy. Corolla 1-1$\frac{1}{4}$ by $\frac{1}{3}$-$\frac{2}{3}$ in., broadly bell-shaped, widened upwards, sky-blue. Capsule inversely conic, depressed, $\frac{1}{3}$-$\frac{1}{2}$ in. broad, beak $\frac{1}{3}$ in. long. Seeds $\frac{1}{16}$ in. long, narrowly ellipsoid, not glistening.

Flowers.—June, July.

Locality.—Aporwat above Gulmarg, open rocky hill-side, above 11,000 ft.; Tosh Maidan, 11,000-12,000 ft.; Charpat, in Juniper tract.

Distribution.—W. Himalaya, from Kashmir to Garhwal, 8,000-12,000 ft.

PHYTEUMA, Linn. The Rampion.

(From the Greek *phyteuma*, a plant, a seed, a name employed by the ancients for a vegetable.)

Fig. 3. Phyteuma Thomsoni, C. B. Clarke. Thomson's Rampion.

A nearly glabrous perennial herb. Root long, woody. Stems $\frac{1}{2}$-4 ft. high, erect. Radical leaves stalked; stem-leaves 3 by 1$\frac{1}{2}$ in., stalked, alternate, egg-lance-shaped, indistinctly crenate. Flowers many, forming a lax panicle, sometimes only a simple terminal cluster; stalks $\frac{1}{8}$-$\frac{1}{4}$ in. long. Calyx-tube inversely conical, teeth $\frac{1}{4}$ in. long, awl-shaped. Corolla blue, lobes linear-oblong, $\frac{1}{4}$-$\frac{1}{3}$ by $\frac{1}{10}$-$\frac{1}{8}$ in. Filaments of stamens short, hairy, converging above; anthers large, oblong, at first forming a cylinder round the style, but quite free. Ovary 2-celled; stigma 2-lobed. Fruits white when young.

Flowers and Fruits.—May, June.

Locality.—Near Shirazia Bagh, on hill; Gadsar; Dachigam Rakh; below Gulmarg, damp woods, about 8,000 ft., common.

Distribution.—N. W. Himalaya, Kashmir, 6,000-8,000 ft.

CAMPANULA, Linn. The Bell-flower.

I. Flowers dark purple. Corolla 1-1½ by 1 in. ... ... *C. latifolia.*

II. Flowers blue.

1. Corolla ⅓ in. long and broad, deep blue. Leaves hairless ... ... *C. aristata.*
2. Corolla ½-¾ in. long. Leaves softly silvery-hairy ... ... *C. argyrotricha.*
3. Corolla ¾-1 in. long, bright blue. Leaves hairy on both sides ... *C. cashmiriana.*

III. Flowers pale lilac, purple, or grey-purple. Corolla ¼-½ in. long ... *C. colorata.*

IV. Flowers white.

1. Leaves oblong-egg-shaped. Fruit rounded at the base ... ... *C. alsinoides.*
2. Leaves linear-lance-shaped ... *C. tenuissima.*

Fig. 4. Campanula latifolia, Linn. Great Bell-flower.

(*Latifolia* means broad-leafed.)

Rootstock stout and woody. Stems 2-6 ft. high, glabrous or downy, stout, furrowed, branched. Radical leaves long-stalked, stiffly hairy, downy below, egg-shaped or broadly lanceolate, heart-shaped below, stem-leaves stalkless, bluntly toothed, oblong, egg-shaped. Flowers almost erect, large, dark purple, lower ones long-stalked, forming racemes, stalks ¼-½ in. long, bent back in fruit. Calyx-teeth lance-shaped, almost entire, ½-¾ in. long, minutely hairy. Corolla 1-1½ by 1 in., lobes sharp-pointed. Fruit a capsule, ½ by ⅓ in., glabrous or nearly so. Seeds $\frac{1}{12}$ in. long.

Flowers.—July.

Locality.—Gulmarg, woods and rough hill-sides, above 8,000 ft., common; Baltal.

Distribution.—Europe, N. and W. Asia, W. Himalaya from Kashmir to Kumaon, 8,000-11,000 ft.

Fig. 5. Campanula aristata, Wall.

(*Aristata* means having a long, pointed process, very likely alluding to the fruit.)

A hairless plant. Stems 8-24 in. high, erect, simple. Radical leaves long-stalked, elliptic, almost entire; stem-leaves linear, 1½ by $\frac{1}{10}$-⅛ in., toothed. Flowers solitary; stalk ½-10 in. long. Calyx-teeth ⅓ in. long, linear. Corolla ⅓ in. long

and broad, conic, lobed half-way down, deep blue. Fruit a capsule, $\frac{3}{4}$ by $\frac{1}{6}$ in., narrowly oblong or almost linear, contracted near the summit. Seeds very small, ellipsoid.

Flowers.—July, August.

Locality.—Above Gulmarg, open hill-sides, above 11,000 ft., common; Tosh Maidan to Damam Sar, 13,000 ft.; Charpat, among short grass of the Juniper tract.

Distribution.—Alpine Himalaya, from Kashmir to Sikkim, 11,000-16,000 ft.

Fig. 6. Campanula argyrotricha, Wall. Silver-haired Bell-flower. Collett, fig. 89.

(From the Greek *argyros*, silver, and *triches*, hairs.)

Stems many, 4-8 in. long, weak, procumbent, thread-like, hairy. Leaves nearly stalkless, thin, egg-shaped, $\frac{3}{4}$ by $\frac{1}{2}$ in., often smaller, toothed or nearly entire, softly silvery-hairy with a few long hairs interspersed. Flowers blue, long-stalked, solitary or in racemes. Calyx-teeth $\frac{1}{5}$ in. long, elliptic-oblong, entire, rarely with a few teeth. Corolla $\frac{1}{2}$-$\frac{3}{4}$ in. long, sparingly hairy outside. Fruit a capsule, $\frac{1}{5}$ in. diameter, rounded at the base.

Locality.—Sind Valley.

Distribution.—W. Himalaya, from Kashmir to Kumaon, 8,000-11,500 ft.

Fig. 7. Campanula alsinoides, Hook. f. & T.

(*Alsinoides* means resembling *Alsine.*)

Stems slender, very many from a woody root, 4-8 in. long, hairy. Leaves $\frac{1}{2}$-$\frac{3}{4}$ by $\frac{1}{4}$-$\frac{1}{3}$ in., oblong-egg-shaped, almost stalkless, indistinctly toothed, hairy on both surfaces, thin, herbaceous. Flower-stalks $\frac{1}{4}$-1 in., slender. Flowers white with fine red lines, centre green. Fruit a capsule, $\frac{1}{8}$ in. diameter, rounded at the base.

Flowers.—August.

Locality.—Above Lian Marg, crevices of rocks, about 11,000 ft.; Kishtwar.

Distribution.—N.W. Himalaya, from Kashmir to Garhwal, 8,000-11,000 ft.

Fig. 8. Campanula cashmiriana, Royle.
Kashmir Bell-flower.

A very variable plant. Stem rounded, sometimes zigzag, at other times flexuose, densely hairy. Leaves 1 by $\frac{1}{3}$-$\frac{1}{2}$ in., thick, oblong, entire or sparingly crenate, closely hairy on both surfaces, often nerved beneath. Calyx-teeth $\frac{1}{4}$-$\frac{1}{3}$ in., egg-lance-shaped, almost entire, very hairy, sometimes overlapping at base. Corolla $\frac{3}{4}$-1 by $\frac{1}{2}$-$\frac{2}{3}$ in., broadly bell-shaped, bright-blue. Fruit a capsule, $\frac{1}{5}$ in. long, broader than long.

Locality.—Sind Valley.

Distribution.—Kashmir and W. Tibet, 6,000-11,000 ft.

Campanula colorata, Wall. Collett, fig. 87.

(*Colorata* means coloured.)

Roughly hairy. Stems $\frac{1}{2}$-2 ft., erect, slender, simple or branched. Leaves broadly or narrowly lance-shaped, often spoon-shaped, 1-1$\frac{1}{2}$ in. long, stalkless or almost so, crenate or toothed, softly hairy on both surfaces. Flowers many, pale lilac, purple or grey-purple, in clusters or panicles; stalks sometimes 1-2 in., slender, sometimes short and rigid. Calyx lance-shaped or triangular-lance-shaped, $\frac{1}{6}$-$\frac{1}{4}$ in., entire or toothed. Corolla $\frac{1}{4}$-$\frac{1}{2}$ in. long, laxly hairy outside, lobed from $\frac{1}{3}$-$\frac{1}{2}$ its length. Fruit a capsule, $\frac{1}{6}$-$\frac{1}{4}$ in. long and broad, inversely conic. Seeds very small, ellipsoid.

Flowers.—June.

Locality.—Ganderbal; Magam, along ditches; near Nil Nag, 7,300 ft.

Distribution.—Kashmir and W. Tibet, 6,000-11,000 ft.

Campanula tenuissima, Dunn. Slender Bell-flower.

Up to 8 in. high, sparingly covered with short hairs. Stems many from the root, flexuose, very slender. Leaves few, on the stem, stalkless, linear-lance-shaped, narrowed towards base and tip, toothed, sparingly hairy, $\frac{2}{5}$-$\frac{3}{5}$ in. long. Flowers many, forming a thin terminal panicle, $\frac{1}{3}$-$\frac{2}{5}$ in. long. Calyx-tube $\frac{1}{5}$ in. long, limb as long as the tube, teeth linear. Corolla white, bell-shaped, $\frac{1}{5}$ in. long, lobes 5, half as long as the corolla. Fruit a capsule, trigonous, narrowed at the base, crowned with the calyx-lobes.

Can be distinguished from *Campanula argyrotricha* by the lance-shaped leaves and by the fruit narrowed at the base.

Flowers.—August.

Locality.—Jhelum Valley Road at about 2,600 ft. (Stewart).

Distribution.—So far not found elsewhere.

Plate 37

ERICACEAE. The Heath Family.

(From the Greek *ereike*, heath, broom.)

PYROLA, Linn. The Wintergreen.

(*Pyrola* is the diminutive of *pyrus*, pear-tree.)

Fig. 1. Pyrola rotundifolia, Linn. Round-leafed Wintergreen.

A glabrous, perennial herb. Leaves round or broadly egg-shaped or inversely egg-shaped or elliptic, narrowed into the stalk, 1-2 in. diameter; quite or nearly entire, leathery, blunt or slightly pointed; stalk about as long as the blade. Flower-stem 6-8 in. high. Flowers many, forming a raceme, drooping, about $\frac{1}{3}$ in. diameter. Bracts $\frac{1}{3}$ in. long, lance-shaped, stem-clasping. Calyx deeply 5-lobed, persistent, segments broadly egg-shaped or egg-lance-shaped or oblong-lance-shaped. Petals $\frac{1}{4}$ in. long, round or inversely egg-shaped, white and pink. Stamens 10, shorter than the style. Anthers blunt or mucronate at the base. Ovary 5-celled. Style as long as or longer than the petals; lobes of stigma erect or spreading. Fruit a capsule, $\frac{1}{4}$-$\frac{1}{3}$ in. diameter, crowned by the persistent style.

Locality.—Thajwas.

Distribution.—Europe, N. Asia, N.W. and E. Himalaya, Khasia Hills, N. America.

MONESES, Salisb.

Fig. 2. Moneses uniflora, Linn. Snowdrop Wintergreen.

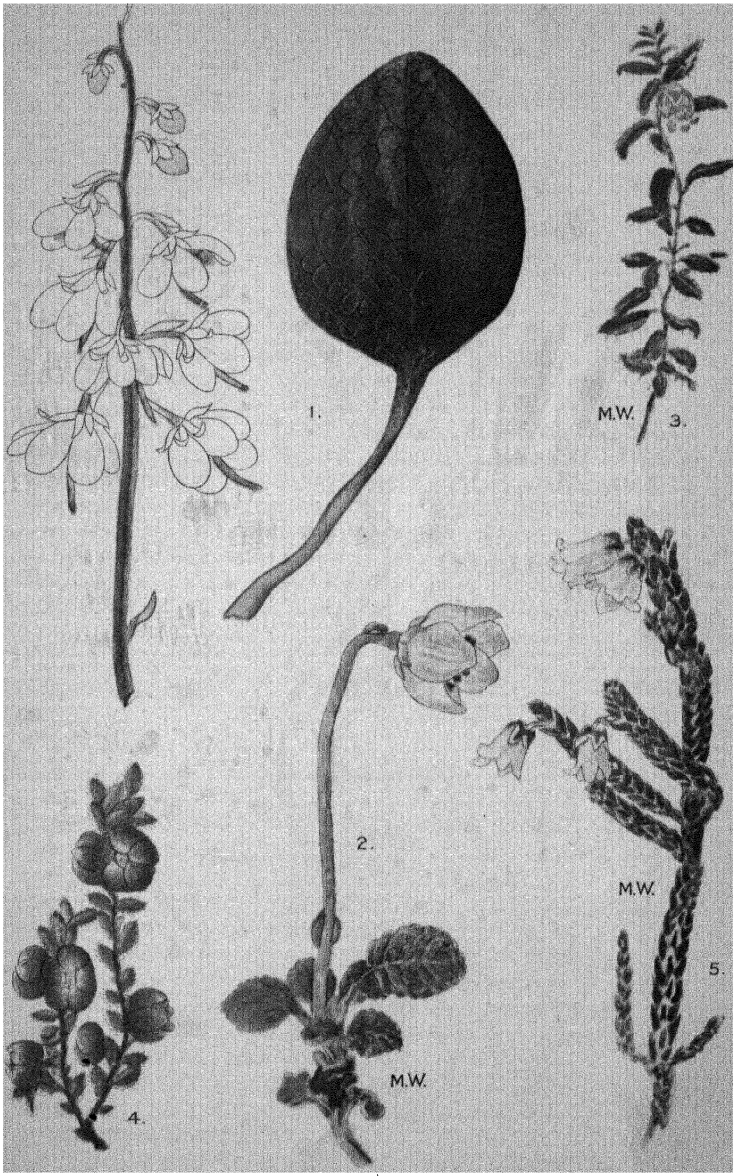
(*Uniflora* means one-flowered.)

Stem leafy, 1-4 in. high. Leaves few, rounded or spoon-shaped, toothed, wavy, alternate, membranous, shortly stalked. Flowering stem bearing one bract at the top. Flower large, solitary, at the end of the stem, drooping, then erect, white. Sepals blunt and broad, fringed with hairs. Petals nearly flat, spreading. Stamens shorter than the corolla, closely pressed to the petals. Stalks of anthers curved. Stigmas long, persistent. Fruit a capsule, erect.

Flowers.—August.

Locality.—Gulmarg, on banks under Spruce beside running water, about 8,500 ft., very rare.

Distribution.—N. and arctic Europe and Asia.



FIGS.—1, *Pyrola rotundifolia*, Linn.; 2, *Moneses uniflora*, Linn.; 3, *Gaultheria trichophylla*, Royle; 4, *Gaultheria trichophylla*, Royle; 5, *Cassiope fastigiata*, D. Don.

GAULTHERIA, Linn.

(After Gaulthier, a botanist of Quebec.)

1. Anther-cells not 2-horned at the tip *G. trichophylla.*
2. Anther-cells 2-horned at the tip ... *G. nummularioides.*

Figs. 3 and 4. Gaultheria trichophylla, Royle.

(*Trichophylla* is derived from *triches*, hairs, and *phyllon*, leaf, alluding to the long hairs on the margin of the leaves.

A small shrub. Stems 6-12 in., wiry, prostrate, much-branched, more or less hairy upwards. Leaves persistent, alternate, oblong, $\frac{1}{4}$ by $\frac{1}{8}$ in., almost stalkless, entire or indistinctly crenulate, hairless on both surfaces, margins usually long-hairy. Flowers small. Flower-stalk $\frac{1}{10}$ in. long, with bracts. Calyx egg-shaped, 5-fid, in fruit enlarged, teeth $\frac{1}{10}$ in. long, egg-shaped-oblong. Corolla $\frac{1}{8}$ in. long and broad, wide bell-shaped, red or nearly white. Stamens 10; anther-cells not two-horned at the tip. Ovary 5-celled; style cylindric; stigma simple. Fruit a capsule, $\frac{1}{6}$ in. diameter; fleshy calyx blue-black.

Flowers.—September.

Locality.—Aporwat, above Gulmarg, rocky hill-side amongst Birch trees, above 11,000 ft., common; Thajwas.

Distribution.—Alpine Himalaya, from Kashmir to Sikkim, 10,000-13,000 ft.

Gaultheria nummularioides, D. Don.

(*Nummularioides* means resembling *Nummularia.*)

A small shrub. Stems prostrate, hairy, much-branched, leafy. Leaves thin, nearly stalkless, spreading, egg-shaped, rounded at the base, $\frac{1}{2}$ by $\frac{1}{3}$ in., almost entire, glabrous above, hairy beneath, margins toothed, fringed. Flowers solitary, in the axils, $\frac{1}{4}$ in. long, pink or white; stalks $\frac{1}{10}$ in. long, clothed with hairless, leathery, egg-shaped-oblong bracts. Calyx-teeth 5, lance-shaped, $\frac{1}{8}$ in. long. Corolla $\frac{1}{5}$ by $\frac{1}{6}$ in., wide, tubular; teeth very small, bent back. Stamens 10, anther-cells 2-horned at the tip. Fruit $\frac{1}{6}$ in. diameter, enclosed in the fleshy, dark-blue, persistent calyx.

Locality.—At altitudes of 5,000-9,000 ft.

Distribution.—Throughout the Himalaya up to 9,000 ft., Khasia Hills, 4,000-6,000 ft., Java.

CASSIOPE, D. Don.

(After Cassiope, the wife of Cepheus and mother of Andromeda, afterwards placed among the constellations.)

Fig. 5. Cassiope fastigiata, D. Don. Heather.

(*Fastigiata* means having a pyramidal form.)

A small shrub. Stems densely tufted, 6-12 in. high, much branched. Leaves thick, stalkless, erect, closely appressed, overlapping, egg-shaped-oblong, less than $\frac{1}{4}$ in. long, sharp-pointed, margins membranous. Flowers in the axils, drooping, solitary, or in clusters of 2 or 3, white; stalks hairy, curved. Calyx hairless, sepals $\frac{1}{8}$-$\frac{1}{6}$ in., elliptic, sharp-pointed. Corolla $\frac{1}{4}$-$\frac{1}{3}$ in., widely campanulate. Stamens 10, each anther-cell 1-horned. Capsule erect, globose, 5-celled.

Flowers.—July.

Locality.—Damam Sar, 13,600 ft.; Aporwat above Gulmarg, flat tops of big rocks and stony hill-side, above 11,000 ft., common.

Distribution.—Alpine Himalaya from Kashmir to Bhutan 10,000-14,000 ft.

Plate 38

MONOTROPACEAE.

(*Monotropos* means dwelling alone, solitary, perhaps alluding to the parasitic habit of the plants.)

HYPOPITHYS, Scop.

(From *hypo*, under, and *pitys*, pine-tree, because often found in forests.)

Fig. 1. Hypopithys lanuginosa, Nutt. Himalayan Bird's Nest.

(*Lanuginosa* means woolly.)

A leafless herb, parasitic on the roots of trees, never green. Stem scaly, hairy, pale yellow-brown, 6-18 in. high, scales alternate, $\frac{3}{4}$ in. long, egg-shaped-oblong. Flowers pale yellow-brown, several in a terminal raceme; stalks $\frac{1}{4}$-$1\frac{1}{2}$ in. long. Terminal flower with 5 petals and 10 stamens, the others with 4 petals and 8 stamens. Sepals inversely egg-shaped-lance-shaped, falling off soon. Petals $\frac{1}{2}$ in. long, inversely

egg-shaped-oblong, falling off soon, inner surface densely hairy. Stamens and stigma nearly level with their tips. Ovary 5-celled. Fruit a capsule, 4-5-celled, erect.

Closely related to the British Bird's Nest (*Monotropa Hypopithys*, Linn.), but can be distinguished by its hairiness.

Flowers.—July.

Locality.—Dudhganga forest, 7,500 ft.; Gulmarg, woods and shady nalas, 8,500 ft., common.

Distribution.—Temperate Himalaya, 7,500-8,500 ft., Khasia Hills, 4,000-5,000 ft., N. Asia, N. America.

PRIMULACEAE. The Primrose Family.

(*Primula* is the diminutive of *primus*, the first, alluding to the fact that the Primrose is one of the first spring flowers.)

PRIMULA, Linn. The Primrose.

In the following key the species are arranged according to the colour of the flowers, though the colour of *P. Clarkei* is not known. It is well known how difficult it is to classify the Primulas owing to the fact that all parts vary considerably. But it was not considered advisable to neglect such a prominent character as the colour simply because of one species it is unknown. Several species will be found twice in the key because their colour varies.

I. Flowers yellow ... ... *P. floribunda.*

II. Flowers white.
1. Leaves $\frac{3}{5}$-$1\frac{1}{5}$ in. long, $\frac{2}{5}$-$\frac{4}{5}$ in. broad ... ... *P. involucrata.*
2. Leaves 3-5 in. long, $\frac{3}{5}$-$1\frac{1}{5}$ in. broad (fig. 2) ... ... *P. nivalis.*

III. Flowers lilac.
1. Leaves elliptic-round or egg-shaped, $\frac{3}{5}$-$\frac{4}{5}$ in. long ... *P. sibirica.*
2. Leaves egg-lance-shaped, 2 in. long (fig. 5) ... *P. denticulata.*
3. Leaves oblong-spoon-shaped, $\frac{3}{5}$-$\frac{4}{5}$ in. long ... ... *P. Schlagintweitiana.*

IV. Flowers rose.
  1. Leaves $\frac{2}{5}$-$\frac{4}{5}$ in. long.
    a. Flower-stalks $\frac{2}{5}$-1 in. long — *P. sibirica.*
    b. Flower-stalks $\frac{1}{5}$-$\frac{2}{5}$ in. long (fig. 6) ... ... — *P. elliptica.*
  2. Leaves 2-5 in. long (fig. 3) — *P. rosea.*

V. Flowers violet ... ... — *P. erosa.*

VI. Flowers purple.
  1. Leaves not more than $\frac{2}{5}$ in. long.
    a. Leaves $\frac{1}{3}$-$\frac{2}{5}$ in. long, mealy below ... ... — *P. minutissima.*
    b. Leaves $\frac{1}{6}$ in. long, not mealy below (fig. 4) ... — *P. reptans.*
  2. Leaves more than $1\frac{1}{2}$ in. long.
    a. Leaves inversely egg-spoon-shaped.
      aa. Leaves not mealy ... — *P. erosa.*
      bb. Leaves densely white, mealy below ... — *P. hazarica.*
    b. Leaves egg-shaped-oblong or lance-shaped (fig. 2) ... ... — *P. nivalis.*
    c. Leaves egg-lance-shaped, 2 in. long (fig. 5) ... — *P. denticulata.*
    d. Leaves almost round ... — *P. rotundifolia.*
  3. Leaves $\frac{1}{2}$-1 in., bluish-green beneath ... ... — *P. elliptica.*

VII. Flowers blue ... ... — *P. denticulata.*

VIII. Colour not known ... ... — *P. Clarkei.*

The species figured on Plate 38 are described first. The rest follow in alphabetical order.

Fig. 2. Primula nivalis, Pall. Snow Primrose.

(*Nivalis* means pertaining to snow, snowy, alluding to the high altitudes at which the plant is found.)

Glabrous, mealy or not. Leaves 3-5 in. long, $\frac{3}{5}$-$1\frac{1}{5}$ in. broad, egg-shaped-oblong or lance-shaped, blunt or almost sharp-pointed, crenate-toothed or almost entire, slowly narrowed into the winged stalk, margin often bent back. Flowering stem robust, 3-10 in. high, longer than the leaves, bearing a many-flowered umbel, rarely 2 superposed umbels; bracts

broad at the base, then awl-shaped and long-pointed; flower-stalks rather short, during flowering time $\frac{1}{5}$-$1\frac{1}{5}$ in. long, later on longer. Flowers erect, purple or white, or light violet-purple with white centre and purple eye. Calyx often mealy, about $\frac{1}{2}$ in. long, cupular, cleft beyond the middle, lobes lance-shaped. Corolla-tube longer than the calyx, limb $\frac{3}{5}$-$\frac{4}{5}$ in. diameter, lobes egg-shaped. Seeds papillose.

Flowers and Fruits.—June to August.

Locality.—Aporwat above Gulmarg, open stony hill-side, above 10,000 ft., common; below Basam Gali in damp ground, above 10,000 ft., common; Tosh Maidan, in open localities, 11,000-12,000 ft., abundant; Damam Sar, 13,500 ft.

Distribution.—From the Pontic Mountains through the Caucasus, Turkestan, Afghanistan and Himalaya, to Yunnan, Altai Mts., Baikal region, Dahuria.

Note.—This species as understood here includes the varieties *purpurea*, *Moorcroftiana*, *macrocarpa* and *linearifoba* of *Primula Stuartii*, Hook. f., in the Flora of British India. *Primula Stuartii*, Wall., does not seem to occur W. of Garhwal.

Fig. 3. Primula rosea, Royle. Rose-coloured Primrose. Coventry, pl. XXX.

Quite glabrous, not mealy. Leaves appearing shortly after the flowers, all radical, simple, 2-5 in. long, egg-shaped-oblong or inversely lance-shaped, or spoon-shaped, blunt or sharp-pointed, stalkless or almost so, green and glabrous on both surfaces, margin with closely set teeth, midrib broad. Flowering stem as long as or longer than the leaves, robust, in dwarfed specimens often not higher than 1 in. Bracts lance-shaped, long-pointed. Flowers bright or pale rose-red, 5 to many, forming lax umbels, stalks usually short, about $\frac{2}{5}$ in. long, but very variable. Calyx 5-lobed to the middle, $\frac{1}{4}$-$\frac{1}{3}$ in. long, lobes triangular, sharp-pointed. Corolla-tube longer than the calyx, lobes 5, 2-fid, sometimes toothed, limb flat. Capsule globose, enclosed in the calyx; seeds pale, sharply angled.

Flowers.—May to September, according to altitude.

Locality.—Khelanmarg, 10,000 ft.; below Basam Gali, in damp ground; Basam Gali, higher level in open ground; Dudhganga forest in damp localities, 8,800 ft.; Gulmarg, open grassy margs near streams and clearings in forest, above 8,500 ft.; Tosh Maidan.

Distribution. — Alpine W. Himalaya, 8,000-12,000 ft., Afghanistan.

Fig. 4. Primula reptans, Hook. f. Creeping Primrose. Coventry, pl. XXXII.

Roots stout, fleshy. Stems slender, creeping, intricately branching, forming dense patches, not mealy. Leaves very small, almost $\frac{1}{6}$ in. long, round, deeply cut into little linear lobes with bent back margins, stalk about $\frac{1}{8}$-$\frac{1}{3}$ in. long. Flowers $\frac{1}{2}$-$\frac{3}{4}$ in. diameter, pale purple or bright blue-purple, short-stalked, solitary, stalk shorter than the calyx. Calyx cleft to the middle; lobes triangular, sharp-pointed, margin hairy. Corolla salver-shaped, 5-lobed, lobes spreading, deeply bifid, tube much longer than the calyx, about $\frac{1}{3}$ in. long. Fruit a capsule; seeds many.

Distinguished from all other species, except *P. minutissima*, by the very small leaves. From this it can be distinguished by the solitary, stalked flowers and the recurved margins of the leaves.

Appears to retain seed till the summer following seeding.

Flowers.—July.

Locality.—Damam Sar, 13,500 ft.; Aporwat, above Gulmarg, mossy turf on open hill-side amongst boulders, about 12,500 ft.; Burjila, 14,500 ft.

Distribution.—W. Himalaya, from Kashmir to N. of Kumaon, up to 14,500 ft.

Fig. 5. Primula denticulata, Sm. Coventry, pl. XXIX; Collett, fig. 91.

(*Denticulata* means finely toothed.)

Rootstock stout, short, thick. Glabrous, sparingly mealy. Leaves all radical, simple, appearing after the flowers, egg-lance-shaped, up to 2 in. long, stalkless or at the base narrowed into a short winged stalk, the lower surface often sparingly covered with a yellowish powder. Flowering stem rigid, longer than the leaves, 4-12 in. long, bearing a compact round cluster of flowers; bracts lance-shaped, broad at the base, the outer ones about $\frac{1}{3}$ in. long; flower-stalks very short. Flowers lilac or blue, or mauve, $\frac{1}{2}$-$\frac{3}{4}$ in. diameter. Calyx 5-lobed, about $\frac{1}{3}$ in. long, tubular-bell-shaped, slightly hairy, split beyond the middle, lobes narrowly lance-shaped, blackish. Corolla salver-shaped, tube usually twice as long as the calyx, 5-lobed, lobes notched. Capsule oblong or globose, enclosed in the calyx.

Flowers.—May to September.

Locality.—Khelanmarg, 10,000 ft.; Basam Gali at higher

level in open localities; Damam Sar, 13,500 ft.; Gulmarg, open margs, above 8,000 ft., very common; Haran in Willow plantation (Coventry); Baltistan.

Distribution.—Temperate Himalaya, from Afghanistan and Kashmir to Yunnan, 7,000-13,500 ft., Khasia Hills, 5,000 ft.

Fig. 6. Primula elliptica, Royle.

Not mealy. Leaves almost erect, thinly leathery, ½-1 in. long, glabrous, bluish-green beneath, round or oblong-round or elliptic, sharply toothed, narrowed into a broad stalk which is as long as or longer than the blade. Flowering stem much longer than the leaves, 2-8 in. high, loosely 3-10-flowered; bracts linear, blunt, base shortly produced; flower-stalks ⅕-⅖ in. long, shorter than the bracts. Calyx bell-shaped, ¼-⅓ in. long, split to the middle, lobes triangular. Corolla rose-coloured or mauvy-purple with orange eye, tube longer than the calyx, lobes deeply notched. Capsule enclosed in the calyx.

Flowers.—June, July.

Locality.—Tosh Maidan to Damam Sar, 13,000 ft.; Khur Mt., 13,500-13,800 ft.; Aporwat above Gulmarg, mossy, rocky and damp ground, about 12,000 ft., not abundant; Ladakh.

Distribution.—W. Himalaya, 8,000-14,000 ft.

Fig. 7. Primula sp.

Flowers very dark purple, paler centre.

Locality.—Thajwas.

Primula Clarkei, Watt. Clarke's Primrose.

This plant has the habit of a Violet. Rootstock slender, woody. Quite glabrous. Leaves 1-1½ in. long, round or round-heart-shaped, sharply toothed or crenate, tip rounded, nerves very slender; stalk 2-4 in. long, very slender, base narrowly sheathing. Flowering stalk 0; flower-stalks 2-5, slender, as long as or shorter than the leaf-stalks. Calyx broadly bell-shaped, ⅓ in. long, during flowering time about ⅕ in. long, lobes broadly triangular, sharp-pointed. Corolla-tube ⅖ in. long, slender, longer than the calyx, limb flat, lobes rather narrow, notched. Capsule globose, enclosed in the calyx.

Locality.—Poosiana, 7,000 ft.

Distribution.—Apparently endemic in Kashmir.

Primula erosa, Wall.

(*Erosa* means irregularly toothed as if gnawed.)

Glabrous or slightly hairy. Leaves appearing together with the flowers, not mealy, membranous, 2-8 (sometimes 18) in. long, 1-1½ in. broad, net-veined, inversely egg-spoon-shaped or inversely lance-shaped, blunt, toothed, slowly narrowed into the stalk. Flowering stem 8-10 in. long, much longer than the leaves, bearing a many-flowered umbel; bracts small, triangular, mealy. Flower-stalks filiform, very short, longer than the bracts, up to $\frac{2}{5}$ in. long. Calyx-lobes long or short, lance-shaped, sharp-pointed. Corolla purple or violet, tube twice as long as the calyx, limb flat, $\frac{1}{2}$-$\frac{3}{5}$ in. diameter, lobes notched. Capsule enclosed in the calyx.

Locality.—Ladakh.

Distribution.—Temperate Himalaya, from Kashmir to Bhutan, 4,500-9,500 ft., Khasia Hills.

Primula floribunda, Wall.

Glandular-hairy. Leaves thin, 2-4 by $\frac{1}{2}$-1½ in., narrowed into a broad winged stalk, elliptic or egg-shaped, sharp-pointed or blunt, coarsely and irregularly toothed. Flowering stalk 4-8 in. long, slender, erect, solitary or tufted. Flowers yellow, unequally stalked, in one or several superposed whorls. Bracts stalkless, leaf-like, egg- or lance-shaped, sharp-pointed, finely toothed, the lower ones $\frac{4}{5}$-1$\frac{1}{5}$ in. long, $\frac{2}{5}$-$\frac{3}{5}$ in. broad, upper ones smaller. Calyx glandular, hemispheric in fruit, cleft to the middle, broadly bell-shaped; lobes sharp-pointed, after flowering bent back. Corolla scented, salver-shaped, tube slender, $\frac{1}{4}$-$\frac{1}{3}$ in. long, hairy, throat more or less widened, lobes notched. Capsule egg-shaped. Seeds $\frac{1}{50}$ in., black, angled, papillose.

Locality.—At elevations of 2,500-6,500 ft.

Distribution.—W. Himalaya, from Afghanistan to Kumaon.

Primula hazarica, Duthie.

(After Hazara, a district of the N.W. Frontier Province.)

Leaves, including the stalk, 1$\frac{1}{5}$-3 in. long, $\frac{2}{5}$-$\frac{4}{5}$ in. broad, inversely egg-shaped or spoon-shaped, finely toothed, membranous, densely white-mealy below, sharp-pointed or blunt, slowly narrowed into the short, winged stalk. Flowering stem only slightly longer than the leaves, 2$\frac{3}{5}$-3½ in. high, bearing a one- to many-flowered umbel; bracts linear, about $\frac{1}{3}$ in.

long, slightly bent back; flower-stalks slender, $\frac{2}{5}$-1 in. long, longer in fruit. Calyx $\frac{1}{5}$-$\frac{1}{3}$ in. long, narrowly bell-shaped, split to the middle; lobes lance-shaped, sharp-pointed, hairy on the margins. Corolla purple; tube cylindric, 2-3 times as long as the calyx, pale yellow, limb $\frac{3}{4}$ in. broad, lobes notched. Capsule inversely egg-shaped, enclosed in the calyx.

Locality.—Mazaffarabad District.

Distribution.—W. Himalaya, 10,000-14,000 ft.

Primula involucrata, Wall.

(*Involucrata* means being provided with an involucre.)

Not mealy. Leaves 1-3 in. long, leathery, egg-shaped or oblong or oblong-heart-shaped, or round, blunt, entire or obscurely and minutely toothed, narrowed into a long or short stalk $\frac{3}{5}$-$1\frac{1}{5}$ in. long. Flowering stem much longer than the stem, slender, 4-12 in. high, loosely 3-6-flowered; bracts linear, about $\frac{1}{3}$ in. long, base much produced, often bifid. Flower-stalks $\frac{4}{5}$ in. long, slender. Calyx tubular, 5-ribbed, glabrous, about $\frac{1}{4}$ in. long, lobes narrowly triangular. Corolla white, tube twice as long as the calyx, limb flat, $\frac{4}{5}$ in. diameter lobes broad, notched.

Very nearly related to *Primula sibirica*, but has larger leaves, longer leaf-stalks, larger flowers which are white, and a shorter fruit.

Locality.—Ladakh; Liddar Valley.

Distribution.—Alpine Himalaya, from Kashmir to Sikkim, 12,000-15,000 ft. (not in Europe, Siberia and N. America).

Primula minutissima, Jacquem.

(*Minutissima* means very small.)

A very small plant, densely tufted, stoloniferous, forming large patches of rosettes, each $\frac{1}{2}$-$\frac{3}{4}$ in. diameter. Leaves densely crowded, dark green, $\frac{1}{4}$-$\frac{1}{2}$ in. long, spoon-lance-shaped or inversely lance-shaped, long-pointed, blunt or sharp-pointed, toothed, glabrous or slightly hairy above, more or less mealy beneath. Flowering stem very short, hidden amongst the leaves, 1-3-flowered; bracts 1-2, small. Flowers stalkless, very large considering the size of the plant. Calyx glabrous, about $\frac{1}{6}$ in. long, cleft to the middle, tubular-bell-shaped, lobes oblong or lance-shaped, much shorter than the long corolla-

tube. Corolla purple, $\frac{1}{3}$-$\frac{2}{5}$ in. long, tube glabrous, limb $\frac{2}{5}$-$\frac{3}{5}$ in. diameter, lobes deeply bifid. Ovary glabrous.

Locality.—In the alpine regions.

Distribution.—From Kashmir, 12,000-15,000 ft., to Sikkim, 13,000 ft.

Primula rotundifolia, Wall. Round-leafed Primrose.

More or less mealy. Leaves long-stalked, almost round, 1-4$\frac{1}{2}$ in. diameter, membranous, sulphurous-mealy beneath, deeply heart-shaped at the base, irregularly toothed; stalk longer than the blade, 6-12 in. long. Flowering stem 4-12 in. high, bearing one simple umbel or several superposed ones; umbels many-flowered; bracts awl-shaped, many; flower-stalks $\frac{2}{5}$-$\frac{3}{5}$ in. long, slender, minutely hairy. Buds densely clothed with sulphurous meal. Calyx mealy, minutely hairy, $\frac{1}{4}$-$\frac{1}{3}$ in. long, bell-shaped, cleft below the middle, lobes lance-shaped, sharp-pointed. Corolla purple, tube twice as long as the calyx; limb flat, $\frac{1}{3}$-$\frac{3}{4}$ in. diameter, lobes inversely egg-shaped, scarcely notched. Ovary with a slightly lobed crown, stigma wedge-shaped. Capsule $\frac{1}{4}$-$\frac{1}{2}$ in. long. Seeds pale, $\frac{1}{25}$ in. long, coarsely papillose.

Locality.—In temperate regions.

Distribution.—Himalaya from Kashmir, 11,000 ft., to Sikkim, 12,000-13,000 ft.

Primula Schlagintweitiana, Pax. Schlagintweit's Primrose.

Slender, not mealy. Leaves $\frac{3}{5}$-$\frac{4}{5}$ in. long, $\frac{2}{5}$ in. broad, oblong-spoon-shaped, blunt, narrowed into the stalk which is as long as or shorter than the blade, irregularly and sharply toothed, minutely hairy. Flowering stem slender, much longer than the leaves, 3-5 in. long, bearing a dense, many-flowered cluster; bracts lance-shaped, broadened at the base, the outer ones about $\frac{1}{5}$ in. long. Flower-stalks almost absent. Calyx about $\frac{1}{5}$ in. long, tubular-bell-shaped, not mealy, cleft beyond the middle, lobes lance-shaped, sharp-pointed. Corolla lilac (?), tube twice as long as the calyx, $\frac{3}{8}$-$\frac{2}{5}$ in. long, limb $\frac{2}{5}$ in. broad, lobes notched.

Locality.—Not known.

Distribution.—From Kashmir to Kumaon, 12,000 ft.

Primula sibirica, Jacq. Siberian Primrose.

Not mealy. Leaves $\frac{1}{2}$-1 in. long, $\frac{2}{5}$-$\frac{3}{5}$ in. broad, or smaller, pale green, membranous or leathery, glabrous, elliptic-round, or egg-shaped, blunt, entire or scarcely obscurely toothed,

suddenly contracted into the stalk which is more or less as long as the blade. Flowering stem longer than the leaves, 3-7 in. high, slender, bearing a lax, few-flowered umbel; bracts oblong, blunt, about $\frac{1}{3}$ in. long, saccate at the base. Flower-stalks $\frac{2}{5}$-1 in. long, slender. Calyx about $\frac{1}{3}$ in. long, glabrous, tubular, 5-ribbed, lobes short. Corolla lilac or rose, tube slightly longer than or twice as long as the calyx, limb flat, $\frac{1}{2}$-$\frac{3}{4}$ in. diameter, often smaller, lobes deeply notched. Ovary globose, top rounded, thickened. Capsule cylindric, exserted. Seeds very small, angular, smooth, pale.

Locality.—In alpine regions.

Distribution.—Mountains of Central Asia to the N.W. Himalaya, W. Tibet, Altai, Baikal region, arctic region of Europe, America and Asia.

Plate 39

ANDROSACE, Linn.

(From the Greek *aner*, *andros*, a man, and *sakos*, a shield, because the leaves of some species resemble the shield of the ancients.)

A. Flowering stems usually several. Leaves all radical. Stolons absent.

I. Leaves lance-shaped, elliptic, or spoon-shaped, forming dense rosettes.

1. Flowers white or rose-coloured (fig. 1) ... ... *A. septentrionalis.*
2. Flowers flesh-coloured or red (fig. 4) ... ... *A. aizoon.*

II. Leaves rounded - kidney - shaped, usually 7-lobed and lobes again 3-lobed, long - stalked. Flowers deep pink, varying to nearly white (fig. 5) ... ... *A. rotundifolia.*

B. Flowering stem solitary. Flowers in umbels, except sometimes in *A. villosa.*

I. Leaves very small, cartilaginous, hairless except the ciliate margins.

1. Stolons 1-2 in. long. Flowers flesh-coloured (fig. 3) ... ... *A. sempervivoides.*
2. Stolons scarcely any ... ... *A. mucronifolia.*

II. Leaves large or small, hairy.
1. Plants robust. Flowers some shade of purple or flesh-coloured.
a. Leaves radical and on the stem, all of the same size. Flowers pale- or dark-purple, tinged with blue, centre yellow ... ... *A. lanuginosa.*
b. All leaves radical forming rosettes, some larger than the others.
aa. Bracts linear. Flowers pale pink-purple or rose-coloured (fig. 2)... ... *A. sarmentosa.*
bb. Outer bracts lance-shaped, partly leaf-like. Flowers flesh-coloured ... ... *A. primuloides.*
c. All leaves radical, scarcely forming rosettes. Flowers flesh-coloured, then turning white ... ... *A. foliosa.*
2. Plants slender. Flowers white or rose-coloured.
a. Densely long-hairy all over. Flowers white or rose-coloured ... ... *A. villosa.*
b. Not densely hairy all over. Flowers white ... ... *A. Chamaeiasme.*

C. Flowering stem solitary, forked-branched *A. muscoidea.*

The species figured are described first; the rest follow in alphabetical order.

Fig. 1. Androsace septentrionalis, Linn. Northern Androsace.

A very variable plant. Root thin, slightly branched. Leaves forming rosettes, lance-shaped, or oblong- or egg-lance-shaped, stalkless or narrowed into a broadly winged stalk, finely toothed. Flowering stems few or one, erect, many-flowered, $1\frac{3}{8}$-7 in. long, slightly covered with star-shaped hairs, finally hairless. Bracts linear-lance-shaped, entire or with scattered ciliate teeth. Flower-stalks 3 to many times as long as the bracts. Calyx bell-shaped, hairless, cleft almost to the middle, tube whitish, lobes lance-shaped or

triangular awl-shaped, sharp-pointed, green. Corolla white or rose-coloured, tube shorter than the calyx-lobes, lobes inversely egg-shaped, blunt, slightly longer than the calyx-lobes, limb $\frac{1}{6}$-$\frac{1}{5}$ in. diameter. Seeds 5-10, small, angular, granulate.

Locality. — Zoji La ; Shatung La, 12,800-14,800 ft. ; Karakoram and Deosar, 12,000-14,000 ft.

Distribution.—W. Himalaya, Europe, W. and N. Asia, N. America.

Fig. 2. Androsace sarmentosa, Wall.

(*Sarmentosa* means being provided with stolons or runners.)

Stolons 2-5 in. long. Leaves forming rosettes, none on the stem, $\frac{3}{5}$-$1\frac{3}{5}$ in. long, $\frac{1}{6}$-$\frac{2}{5}$ in. broad, more or less woolly, the young ones silvery hairy, finally hairless, always stalkless, lance-shaped, sharp-pointed, entire. Flowering stems hairy, about 5 times as long as the leaves, measuring usually about 4 in. Bracts 2 in. long, linear-lance-shaped, hairy. Flower-stalks many, 3-4 times as long as the bracts, woolly. Calyx cleft to the middle, lobes triangular, blunt. Corolla pale pink-purple or rose-coloured, tube as long as the calyx-lobes, lobes round-inversely egg-shaped, blunt, entire, limb $\frac{1}{5}$-$\frac{1}{4}$ in. diameter.

Flowers.—June, July.

Locality.—Basam Gali, abundant on slopes below Pass ; Tosh Maidan along top of ridge; Aporwat above Gulmarg, open rocky and scrubby hill-side, above 10,500 ft.

Distribution.—Himalaya, from Kashmir to Nepal, Yunnan.

Note.—Hooker's varieties *grandifolia, primuloides* and *foliosa* mentioned in the " Flora of British India " are not included in this species.

Fig. 3. Androsace sempervivoides, Jacquem.

(*Sempervivoides* means resembling the *Sempervivum* or Common House-Leek.)

Stolons 1-2 in. long, $\frac{1}{25}$ in. thick, naked, producing rosettes of leaves $\frac{3}{5}$ in. diameter. Leaves $\frac{1}{5}$-$\frac{1}{3}$ in. long, $\frac{1}{12}$-$\frac{1}{6}$ in. broad, cartilaginous, densely packed, egg-spoon-shaped, glabrous, with ciliate margins. Flowering stems 3-5 times as long as the leaves, solitary, slightly glandular ; bracts $\frac{1}{6}$-$\frac{1}{5}$ in. long, lance-shaped. Flower-stalks short, stout ; umbels glandular-hairy. Calyx bell-shaped, glandular-hairy, cleft almost to the middle, lobes egg-lance-shaped, sharp-pointed. Corolla flesh-

coloured, tube shorter than the calyx-lobes, lobes wedge-inversely egg-shaped, scarely notched, limb $\frac{1}{5}$-$\frac{1}{4}$ in. diameter. Capsule 1-2-seeded. Seeds large, oblong, plano-convex.

Flowers.—May, June.

Fruits.—June, July.

Locality.—Khelanmarg, 10,000 ft.; Tosh Maidan, 10,000 ft., abundant, along top of ridge; below Basam Gali in open situations above 10,000 ft., common on slopes below Pass.; Gulmarg, 11,000-12,000 ft.; Budgukod; Sind Valley; Barzil and Tilail, 12,000-13,000 ft.

Distribution.—From Kashmir to Simla.

Fig. 4. Androsace aizoon, Duby.

(*Aizoon* is derived from the Greek *aei*, always, and *zoon*, a living creature, so called because the plant lives under almost any treatment.)

Root up to $\frac{1}{5}$ in. thick, vertical. Leaves $\frac{1}{3}$-1 in. long, $\frac{1}{5}$-$\frac{1}{3}$ in. broad, forming rosettes, leathery, bluish-green, spoon-shaped, mucronate, hairless, covered with tiny white globules especially towards the tip, shortly ciliate. Flowering stem 7-20 in. long, many times longer than the leaves, erect. Bracts $\frac{1}{8}$-$\frac{1}{5}$ in. long, much shorter than the numerous flower-stalks, lance-shaped, hairy. Calyx bell-shaped, cleft to the middle, lobes egg-shaped-triangular, blunt. Corolla flesh-coloured or red, somewhat fleshy, tube almost as long as the calyx-lobes, lobes bifid with 2 bifid appendages or inversely egg-shaped, limb $\frac{1}{6}$ in. diameter. Capsule with bifid valves. Seeds large, angular, rough.

Locality.—Sonamarg.

Distribution.—W. Himalaya, 8,000-11,000 ft., China.

Fig. 5. Androsace rotundifolia, Hardw. Round-leafed Androsace.

A very variable plant. No stolons. Perennial. Glandular-hairy or densely long-hairy. Leaves all radical, $\frac{1}{2}$-$1\frac{1}{2}$ in. diameter, stalked, round-kidney-shaped, mostly 7-lobed, lobes again 3-lobed, stalks $1\frac{1}{5}$-3 in. long, 2-5 times as long as the blade. Flowering stems few to many, 1-7 in. long, many-flowered; bracts short or long, broad or narrow, wedge-shaped or inversely egg-shaped or linear, sometimes $\frac{2}{3}$ in. long and often crenate or 3-5-cleft at the broad end. Calyx cleft to the middle or beyond, lobes egg-shaped, recurved in fruit, fruiting

calyx $\frac{1}{4}$-$\frac{1}{2}$ in. diameter, sometimes much enlarged and nearly 1 in. diameter and sharply toothed or 3-fid at the tip. Corolla deep pink, varying to nearly white, usually much larger than the calyx, but when the latter is enlarged it becomes very small, lobes egg-shaped, entire or notched. Capsule much smaller than the calyx. Seeds very small, rounded.

Flowers.—May, June.

Locality.—Steep hill-sides south of Sarban Lake; Tangmarg, dry banks and roadsides, 7,200-8,700 ft.; Gadsar; near Shirazia Bagh; Dachigam Rakh; Gulmarg, banks above paths and in loose rocky soil, above 7,000 ft., common.

Distribution. — Afghanistan, temperate Himalaya, 5,000-11,000 ft., from Hazara and Kashmir to Kumaon, W. Tibet.

Androsace Chamaeiasme, Host.

(*Chamaciasme* is derived from the Greek *chamai*, on the ground or low, and *iasme*, the name of a sweet-smelling oil or the plant itself which was known to the ancients as coming from Persia.)

A very variable plant, stoloniferous. Leaves $\frac{2}{5}$ in. long, $\frac{1}{12}$-$\frac{1}{8}$ in. broad, forming rosettes, lance-shaped, quite entire, narrowed into the stalk, on both sides almost hairless, long-ciliate on the margins. Flowering stems 1-5 in. long, 2-8-flowered, densely hairy. Bracts as long as the flower-stalks or shorter, lance-shaped or lance-egg-shaped, densely hairy, sharp-pointed. Calyx bell-shaped, cleft beyond the middle, lobes hairy, lance-shaped, blunt. Corolla white, tube as long as the calyx-lobes, lobes notched, limb $\frac{1}{3}$-$\frac{1}{2}$ in. diameter, throat yellow, finally red. Seeds few, $\frac{1}{12}$-$\frac{1}{8}$ in. long.

Locality.—Burjila; Karakoram, 12,000-15,000 ft.

Distribution.—W. Himalaya, from Kashmir to Kumaon, W. Tibet, Europe, Arctic Russia, Central and N. Asia, N. America.

Androsace foliosa, Duby. Leafy Androsace.

This is **Androsace sarmentosa** var. **foliosa**, Hook. f. in the "Flora of British India."

Stolons stout, naked. Leaves all radical, scarcely forming rosettes, the lower ones shorter, inversely egg-shaped, glabrous, stalkless, narrowed towards the base, ciliate, the upper ones alternate, egg-shaped or lance- to inversely egg-shaped, quite entire, ciliate, narrowed into the winged stalk which is

half-stem-clasping and half-sheathing, $1\frac{1}{5}$-$1\frac{3}{5}$ in. long, $\frac{1}{2}$-$\frac{3}{5}$ in. broad. Flowering stems hairy, 3 times as long as the leaves, erect. Flower-stalks hairy. Bracts hairy, much shorter than the flower-stalks, the outer ones lance-shaped, blunt, the inner linear. Calyx bell-shaped, as long as the corolla-tube, cleft almost to the base, lobes egg-lance-shaped, blunt. Corolla flesh-coloured, finally getting white, lobes inversely egg-shaped-round, or round and notched, throat yellow, limb $\frac{2}{5}$ in. diameter.

Locality.—Banehal.

Distribution.—N. W. Himalaya, from Chitral and Hazara to Kashmir.

Androsace lanuginosa, Wall. Woolly Androsace.

Very variable. The whole plant densely covered with silvery hairs. Stems leafy; stolon-like branches 2-12 in. long, leafy throughout and with scattered rosettes. Leaves $\frac{1}{2}$-$\frac{3}{4}$ in. long, $\frac{1}{6}$-$\frac{1}{4}$ in. broad, lance- to egg-shaped, sharp-pointed, stalkless. Flowering stems axillary, $1\frac{3}{5}$ in. long. Bracts usually $\frac{1}{5}$ in. long, silvery, oblong-lance-shaped or linear. Flower-stalks 1-$1\frac{1}{2}$ times longer than the bracts; umbels during flowering-time more or less contracted. Calyx cleft to the middle, lobes egg-shaped. Corolla pale- or dark-purple, usually tinged with blue, centre yellow, tube as long as the corolla-tube, lobes round-inversely egg-shaped, scarcely notched, limb $\frac{1}{3}$-$\frac{2}{5}$ in. diameter. Capsule 4-6-seeded. Seeds angular.

Locality.—Pir Panjal.

Distribution.—W. Himalaya, from Kashmir to Kumaon, 7,000-10,000 ft., Tibet.

Androsace mucronifolia, Watt. (=**A. microphylla,** Hook. f.)

(*Mucronifolia* means that the leaves have a mucro or sharp point.)

Densely or laxly tufted. Stolons scarcely any. Branches 1-6 in. long, sometimes rigid, densely covered with rosettes of leaves. Leaves bent inwards, slightly fleshy, inversely egg-shaped, stalkless, $\frac{1}{12}$-$\frac{1}{6}$ in. long, $\frac{1}{18}$ in. broad, blunt or mucronate, ciliate on the margins. Flowering stems 2-5 in. long, transparent or slightly glandular-hairy. Bracts oblong-lance-shaped, blunt, $\frac{1}{8}$ in. long, ciliate. Flower-stalks very short or none. Flowers 3-6 forming a head, rarely only 1 flower. Calyx cleft almost to the middle, lobes triangular, blunt. Tube of corolla as long as the calyx-lobes, lobes round-inversely egg-shaped, limb about $\frac{1}{4}$ in. diameter.

Locality.—Bari La in Baltistan; Astor Valley; Barzil; Tilail; Gilgit; Zoji La.

Distribution.—Hazara, inner ranges of Kashmir, 12,000-13,000 ft., W. Tibet.

Androsace muscoidea, Duby.

(*Muscoidea* means moss-like.)

More or less tufted. Stems forked-branched, forming broad, dense patches 6-10 in. diameter of crowded branches and stolons 2-6 in. long, naked below or covered almost throughout their length with little balls of leaves. Leaves small, forming close-set little balls about $\frac{1}{4}$ in. diameter, stalkless, linear or oblong, blunt, curved inwards, greenish-white, entire, white-hairy, finally almost hairless. Flower-stalks slightly longer than the leaves. Calyx 5-parted, very hairy, lobes lance-shaped, blunt. Corolla-lobes inversely egg-shaped, blunt.

Locality.—Gombur; Ladakh near Leh; Timti Pass.

Distribution.—Apparently endemic in Kashmir.

Androsace primuloides, Duby. (= **A. sarmentosa**, var. **primuloides**, Hook. f.) Primrose-like Androsace.

(*Primuloides* means resembling a Primrose.)

Stolons 2-4 in. long, lax, spreading, hairy when young, finally hairless. Leaves radical, forming rosettes, very long-white-hairy, stalkless, lance-shaped or linear-lance-shaped, or linear, entire, blunt, some $\frac{2}{5}$-$\frac{3}{5}$ in. long, appressed to the ground, others much larger, $1\frac{1}{5}$-$3\frac{2}{5}$ in. long, erect, often stalked. Flowering stems 1-4 in. long, axillary, densely hairy. Flower-stalks varying much in length. Bracts $\frac{1}{4}$-$\frac{1}{2}$ in. long, mostly narrowly oblong-lance-shaped, blunt, hairy, as long as the flower-stalks or shorter. Calyx bell-shaped, densely hairy, cleft to the middle or beyond, lobes lance-shaped, blunt. Corolla flesh-coloured, tube as long as the calyx-lobes, lobes round-inversely egg-shaped, limb $\frac{1}{3}$-$\frac{2}{5}$ in. diameter.

Nearly related to *A. sarmentosa*, but can be distinguished by its unequal bracts of which some are small, others much larger.

Distribution.—Hazara, Kashmir, Kumaon.

Androsace villosa, Linn.

(*Villosa* means being covered with long weak hairs.)

An extremely variable plant covered all over with long white hairs, forming tufted masses of short naked stems and stolons bearing at close intervals hairy rosettes ½-1 in. diameter. Leaves linear-lance-shaped or lance-shaped-inversely egg-shaped, almost blunt, quite entire, stalkless, covered on both sides with long, woolly, white hairs. Flowering stems 1-2 in. long or absent. Bracts linear-lance-shaped, mostly longer than the short and sometimes unequal flower-stalks. Calyx bell-shaped, cleft to the middle or beyond, lobes linear-lance-shaped or lance-shaped, or lance-egg-shaped. Corolla white or rose-coloured, tube almost as long as the calyx-lobes, throat yellow-red-ringed, lobes inversely egg-shaped, entire or somewhat notched, limb ⅓-⅖ in. diameter. Seeds few.

Locality.—Ladakh.

Distribution.—W. Himalaya, from Kashmir to Kumaon, Afghanistan, Caucasus, Asia Minor, Europe, Central and N. Asia.

CORTUSA, Linn.

Fig. 6. Cortusa Matthioli, Linn.

(After P. A. Matthiolus, born at Sienna in 1500, one of the better commentators of Dioscorides.)

A perennial, hairy herb. Leaves all radical, long-stalked, glabrous or hairy, membranous, rounded - heart - shaped, 7-9-lobed, crenate-toothed, 1-4 in. diameter, stalk 4-6 in. Flowering stems much longer than the leaf-stalks, slender, 5-12-flowered in an umbel. Flower-stalks slender, very unequal. Bracts often unequal, more or less broadly lance-shaped, entire or toothed, ⅛-¼ in. long. Calyx bell-shaped, cleft to the middle, 5-lobed, lobes narrowly triangular, sharp-pointed. Corolla purple, sometimes white between funnel- and bell-shaped, ½-¾ in. diameter, cleft to the middle, tube short, throat naked, lobes 5, oblong, blunt. Stamens 5, anthers almost stalkless at the base of the corolla, arrow-shaped. Style filiform, exserted. Capsule egg-shaped, 5-valved, many-seeded.

Flowers.—June to August.

Locality.—Tosh Maidan, along top of ridge; below Tosh Maidan, 9,600 ft., common; Basam Gali, in Juniper tract,

above 10,000 ft. ; Aporwat above Gulmarg, rocky hill-side and sometimes in woods, about 9,000 ft., common.

Distribution.—Himalaya, from Kashmir to Sikkim, 7,000-10,000 ft., Afghanistan, Alps of Europe, N. Asia, China.

Plate 40

GENTIANACEAE. The Gentian Family.

(Said to be derived from Gentius, King of Illyria, about 500 B.C., who is reported to have recommended *Gentiana lutea*, Linn., as a remedy for plague.)

GENTIANA, Linn. The Gentians.

The following key includes all the species figured on Plates 41 and 42. The descriptions of the plants illustrated on Pl. 40 will be given under Pl. 40, those of Pl. 41 under Pl. 41, and the other species will follow in alphabetical order.

A. Corolla not longer than 1 in., 4-5-lobed. No folds between the lobes. Capsule included, stalkless or short-stalked. Seeds small, many, yellow-brown, almost globose.

I. Corolla not fringed in the throat.
1. Corolla blue. Capsule $\frac{2}{3}$ in. long, lance-shaped (Pl. 40, fig. 1) ... *G. Moorcroftiana.*
2. Corolla bluish or yellowish or pale-rose. Capsule $\frac{1}{4}$ in. long, oblong (Pl. 40, fig. 2) ... ... *G. aurea.*

II. Corolla fringed in the throat.
1. Corolla pink-purple. Capsule $\frac{1}{3}$ in. long, stalk $\frac{1}{12}$ in. long ... *G. borealis.*
2. Corolla dirty violet, rarely white. Capsule $\frac{2}{3}$ in. long, stalkless (Pl. 40, figs. 3 and 4) ... ... *G. tenella.*

B. Corolla not longer than 1 in., 5-lobed. Folds between the lobes. Capsule often protruding. Seeds small, globose, oblong or sickle-shaped, not glistening.

I. Capsule inversely egg-shaped.

1. Leaves with a cartilaginous margin.
   a. Not fringed in the corolla-tube.
      aa. Leaves $\frac{1}{4}$-$\frac{1}{5}$ in. long, egg-shaped ... ... *G. aquatica.*
      bb. Leaves $\frac{1}{8}$-$\frac{1}{6}$ in. long.
         i. Stem $\frac{1}{4}$-1 in. high ... *G. pygmaea.*
         ii. Stem up to $3\frac{1}{2}$ in. high *G. pseudo-humilis.*
   b. Fringed in the corolla-tube ... *G. Hugelii.*
2. Leaves without a cartilaginous margin.
   a. Calyx-lobes bent back. Corolla blue.
      aa. Calyx-lobes egg-shaped ... *G. squarrosa.*
      bb. Calyx-lobes spoon-shaped *G. Loderi.*
   b. Calyx-lobes not bent back. Corolla white or blue ... *G. humilis.*

II. Capsule ellipsoid or egg-shaped.

1. Leaves silvery-shining... ... *G. argentea.*
2. Leaves green.
   a. Capsule $\frac{1}{5}$ in. long. Corolla dark blue (Pl. 40, fig. 6) ... *G. carinata.*
   b. Capsule $\frac{1}{8}$ in. long. Corolla blue or yellowish-green ... *G. pedicellata.*

C. Corolla 1 in. long or more, 5-lobed. Folds between the lobes. Not fringed in the corolla-tube. Seeds globose, not winged, glistening-white.

I. Calyx-tube $\frac{1}{4}$ in. long, lobes linear or oblong (Pl. 41, figs. 5 and 6) *G. venusta.*

II. Calyx-tube $\frac{1}{3}$ in. long, lobes spoon-shaped-oblong (Pl. 41, fig. 1) ... *G. cachemirica.*

III. Calyx-tube $\frac{1}{2}$ in. long, lobes oblong *G. nubigena.*

D. Like C, but seeds not glistening-white.

I. Corolla 2 in. long. Capsule $\frac{3}{4}$ in. long. Seeds tail-shaped at one end (Pl. 41, fig. 2) ... ... *G. Kurroo.*

II. Corolla $\frac{3}{4}$-1 in. long. Capsule $\frac{1}{2}$ in. long. Seeds almost blunt at both ends ... ... *G. decumbens.*

E. Corolla $\frac{3}{4}$-2 in. long and more, 4-lobed. No folds between the lobes. Not fringed in the tube. Seeds almost globose or ellipsoid, not glistening-white.

I. Calyx-tube not 4-keeled. Corolla $\frac{3}{4}$-$1\frac{1}{4}$ in. long ... ... *G. serrata.*

II. Calyx-tube strongly 4-keeled. Corolla $\frac{3}{4}$-$2\frac{1}{2}$ in. long (Pl. 41, fig. 3) ... ... *G. serrata*, var. *Stracheyi.*

Fig. 1. Gentiana Moorcroftiana, Wall. Moorcroft's Gentian.

(After William Moorcroft, who travelled and collected in Nepal and the N.W. Himalaya. Died in Afghanistan in 1825.)

Stem 8-16 in. high, erect, branches ascending. Leaves oblong or elliptic or lance-shaped, 1 by $\frac{1}{3}$ in., narrowed below. Flowers arranged in cymes on a common axis, stalks $\frac{1}{2}$-$1\frac{1}{2}$ in. long. Calyx-tube $\frac{1}{10}$ in. long, often longer, lobes $\frac{1}{3}$ in. long, linear. Corolla blue, when open $\frac{1}{2}$-1 in. long, before expansion often short, enlarged in fruit, often $1\frac{1}{2}$ in. long, funnel-shaped, mouth $\frac{1}{3}$ in. diameter, no folds between the lobes, lobes 4-5. Stamens included in the tube. Capsule $\frac{2}{3}$ in. long, lance-shaped, stalk $\frac{1}{3}$ in. long.

Locality.—Thajwas; Baltistan.

Distribution.—W. Himalaya; Kashmir and Lahul, 8,000-12,000 ft.

Fig. 2. Gentiana aurea, Linn. Golden Gentian.

Stem 4-18 in. high, erect, branches ascending. Leaves 1 by $\frac{1}{3}$ in., oblong or elliptic, narrowed below. Flowering stalk $\frac{1}{4}$-2 in. long, 1-flowered, in axillary and terminal fascicles. Calyx-tube $\frac{1}{24}$ in. long, lobes $\frac{1}{5}$ in., linear-spoon-shaped, finely toothed. Corolla bluish or yellowish or pale-rose-coloured,

$\frac{1}{4}$-$\frac{1}{3}$ in. long, lobes 5, egg-shaped, shorter than the tube, glands at the base of the corolla-tube absent or insignificant. Capsule $\frac{1}{4}$ in. long; stalk $\frac{1}{8}$ in. long.

Locality.—Zoji La; Baltistan, 10,000-14,000 ft.; Skardo, 9,200 ft.

Distribution.—Kashmir, Central Asia, subarctic zone.

Figs. 3 & 4. Gentiana tenella, Fries. Tender Gentian.

A delicate, annual plant, 2-10 in. high, erect or straggling, branched from the base, with long, ascending, mostly 1-flowered branches. Leaves $\frac{1}{2}$ by $\frac{1}{4}$ in., oblong or egg-shaped, the lowest spoon-shaped. Calyx bell-shaped, tube hardly any, lobes $\frac{1}{8}$ by $\frac{1}{10}$ in., elliptic, often unequal. Corolla dirty violet, rarely white, tubular-bell-shaped, 5-lobed, $\frac{1}{2}$ by $\frac{1}{8}$-$\frac{1}{5}$ in., lobes $\frac{1}{4}$ in., elliptic, throat bearded with small scales. Capsule $\frac{2}{3}$ in. long, oblong-linear, stalkless.

Fig. 3 shows the alpine form with flowers much smaller than in the fully developed plant.

Flowers.—August, September.

Locality. — Thajwas; Khelanmarg, rocky ground, over 10,000 ft., common.

Distribution.—W. Himalaya, 10,000-14,000 ft., Sikkim, 12,000 ft., arctic and alpine Europe, N. and Central Asia.

Fig. 5. Gentiana sp.

This is very likely a new species, resembling *Gentiana micans*, C. B. Clarke. The capsule is much longer.

Locality.—Gangabal (Hallberg).

Fig. 6. Gentiana carinata, Griseb. Keeled Gentian. Coventry, pl. XXXIII.

Stems 1-6 in. high, erect, branched. Radical leaves $1\frac{3}{4}$ by $\frac{1}{3}$ in., stalkless, very sharp-pointed, oblong-lance-shaped, stem-leaves similar, but smaller. Flowers dark blue, in clusters, almost stalkless. Calyx-tube $\frac{1}{4}$ in. long, lobes $\frac{1}{8}$ in., lance-shaped, sharp-pointed, erect, sometimes inversely egg-shaped. Corolla $\frac{1}{2}$ by $\frac{1}{8}$ in., tube-shaped, upwards narrowly funnel-shaped, throat with or without scales, folds between the lobes bifid or almost entire. Capsule $\frac{1}{8}$ by $\frac{1}{8}$ in., ellipsoid, compressed, stalk 0-$\frac{1}{8}$ in.

Flowers.—May to July.

Locality.—Gulmarg, 8,600-8,700 ft.; Khelanmarg 10,000 ft.; Tosh Maidan, scattered, 10,000 ft.; below Basam Gali, in open situations above 10,000 ft. up to 12,000 ft.; Khur Mt., 13,000-13,400 ft., abundant.

Distribution.—N.W. Himalaya.

Plate 41

Fig. 1. Gentiana cachemirica, Decne. Kashmir Gentian.

Branches often many from the root, 0-6 in. long. Leaves elliptic or oblong, radical ones 1 by $\frac{1}{3}$ in., inversely egg-shaped-oblong, sharp-pointed, stem-leaves $\frac{1}{3}$-$\frac{2}{3}$ in. long. Flowers solitary, stalkless, blue. Calyx-tube $\frac{1}{3}$ in. long, bell-shaped, lobes $\frac{1}{4}$ in. long, spoon-shaped-oblong, sharp-pointed, a wide sinus between the lobes. Corolla 1-1$\frac{1}{4}$ by $\frac{1}{2}$ in., tube-bell-shaped, lobes $\frac{1}{5}$ in., egg-shaped, sharp-pointed, erect. Capsule $\frac{1}{3}$ by $\frac{1}{6}$ in., stalk $\frac{1}{5}$-1 in.

Locality.—Thajwas, on rocks.

Distribution.—W. Himalaya, from Kashmir to Kumaon, 9,000-13,000 ft.

Fig. 2. Gentiana Kurroo, Royle.

Rootstock stout, perennial. Flowering stems 2-12 in. high, simple. Leaves oblong or linear, radical ones 3 by $\frac{1}{3}$ in., tufted, stem-leaves 1 in. long, linear, united at the base into a tube. Flowers 1-4 on each stem. Calyx-tube $\frac{1}{3}$-$\frac{1}{2}$ in. long, not keeled, lobes $\frac{1}{3}$-$\frac{1}{2}$ in. long, not all equal, linear, rarely somewhat oblong. Corolla 2 by $\frac{3}{4}$ in., lobes $\frac{1}{2}$ in. long, egg-shaped, sharp-pointed, sky-blue. Capsule $\frac{3}{4}$ by $\frac{1}{5}$ in., stalk $\frac{1}{4}$-$\frac{1}{2}$ in. long. Seeds twice as long as broad, sharp-pointed at one end, almost tail-shaped at the other.

Locality.—Dachigam; Wangat Nala.

Distribution.—N.W. and W. Himalaya, 5,000-11,000 ft.

Gentiana serrata, Gunner.

(*Serrata* means toothed, alluding to the toothed corolla-lobes.)

Stems $\frac{1}{2}$-2 ft. high, much-branched. Leaves 1$\frac{1}{2}$ by $\frac{1}{4}$ in., oblong-linear, distant, scarcely united at the base. Peduncles 1-8 in. long. Calyx-tube cylindric or funnel-shaped, $\frac{1}{2}$ in. long, 4-lobed, lobes $\frac{1}{3}$ in. long, unequal, 2 opposite egg-lance-shaped, 2 lance-shaped. Corolla $\frac{3}{4}$-1$\frac{1}{4}$ in. long, blue, tube 1 by $\frac{1}{4}$ in., lobes $\frac{2}{3}$ in. long, fringed or toothed at least at the tip, glands

near the base of the tube very indistinct. Capsule ¾ by ¼ in., stalk ⅓ in. Seeds almost globose, hardly longer than broad, netted and finely scaly.

Locality.—Karakoram.

Distribution.—W. Himalaya, 9,000-15,000 ft., N. Asia, Europe, N. America.

Fig. 3. Gentiana serrata, Gunner, var. **Stracheyi,** C. B. Clarke. Strachey's Gentian.

Like the foregoing plant, but the leaves are broader, the calyx-tube has 4 strong keels, the corolla measures ¾-2¼ in., and the seeds are ellipsoid and much larger.

Locality.—Dachigam; Wangat Nala.

Distribution.—W. Himalaya.

Fig. 4. Gentiana sp.

This is a species nearly related to *Gentiana decumbens,* Linn. f.

Locality.—Zoji La (Hallberg).

Figs. 5 and 6. Gentiana venusta, Wall.

Stems 0 or up to 3 in. high, prostrate. Leaves ¼-⅓ in. long, elliptic or inversely egg-shaped, blunt. Flowers 1-3, almost stalkless on the short, densely leafy, annual shoots. Calyx-tube ¼ in. long, lobes ⅙-¼ in. long, linear or oblong, sinus between neighbouring lobes wide. Corolla 1 by ¼-⅓ in., tube-shaped. Capsule ½-⅔ by ¼-½ in.

Flowers.—August.

Locality.—Aporwat, short turf amongst boulders on mountain top, above 12,500 ft.

Distribution.—Alpine W. Himalaya, from Kashmir to Kumaon, 11,000-14,000 ft.

Gentiana aquatica, Linn. Water-Gentian.

Branching from the base. Branches 1-3 in. long, many, weak, little divided. Radical leaves ¼-⅓ in. long, egg-shaped; stem-leaves small, ⅛ in. long, egg-shaped or inversely egg-shaped, distant, usually blunt, with a sharp point, margin transparent, narrow, bent back. Flower-stalks ⅛-½ in. long, solitary at the end of the branches. Calyx ¼-⅓ in. long,

lobes $\frac{1}{8}$ in. long, lance-shaped, sharp-pointed, entire, hairless, erect. Corolla-tube hardly longer than the calyx, less than $\frac{1}{2}$ in., sometimes $\frac{2}{3}$ in., lobes short, blue, folds between the lobes bifid, throat without scales. Capsule $\frac{1}{5}$ by $\frac{1}{8}$-$\frac{1}{6}$ in., stalk long, often $\frac{2}{3}$ in. Seeds ellipsoid, trigonous, almost as broad as long.

Locality.—Karakoram, 13,000-14,000 ft.

Distribution.—Kashmir, N. Asia.

Gentiana argentea, Royle. Silvery Gentian. Collett, fig. 101.

Stems 1-4 in. high, leafy, erect, simple or branched. Leaves silvery-shining, radical ones lance-shaped, finely pointed, 1 by $\frac{1}{4}$ in., forming rosettes, stem-leaves rather shorter, uppermost egg-shaped or oblong, hairless, often closely surrounding the flower-heads. Flowers blue, stalkless, $\frac{1}{3}$ in. long, crowded into heads at the end of stem and branches. Calyx nearly as long as the corolla, lobes finely pointed. Corolla $\frac{1}{3}$ in. Capsule egg-shaped, more than $\frac{1}{4}$ by $\frac{1}{5}$ in., stalk $\frac{1}{8}$ in. long.

Flowers.—May.

Locality.—At altitudes of 7,000-12,000 ft.

Distribution.—W. Himalaya, Afghanistan.

Gentiana borealis, Bunge. Northern Gentian.

Stem 3-12 in. high, erect, branches ascending. Leaves oblong, 1 by $\frac{1}{3}$ in., hardly narrowed at the base. Flower-stalks short, 0-1 in., mostly forming cymes on axillary peduncles. Calyx-tube $\frac{1}{10}$ in., lobes $\frac{1}{4}$ by $\frac{1}{16}$ in. Corolla pink-purple, tube-shaped, 4-lobed, terminal flower often 5-lobed, tube $\frac{1}{3}$ in., lobes $\frac{1}{6}$ in., egg-shaped, ending in a sharp point. Capsule $\frac{1}{3}$ in. long, narrowly oblong, stalk $\frac{1}{12}$ in. long.

Locality.—N. Kashmir; Karakoram.

Distribution.—W. Tibet, 12,000-14,000 ft., N.W. America.

Gentiana decumbens, Linn. f.

(*Decumbens* means lying down, alluding to the stem.)

Rootstock stout. Flowering stems 2-10 in. long, simple. Leaves oblong, radical ones 2 by $\frac{1}{4}$-$\frac{1}{3}$ in., stem-leaves 1-$1\frac{1}{2}$ in., oblong or elliptic, united at the base into a tube. Flowers 1-2, almost stalkless in each upper axil, the upper 3-7 forming a

cluster. Calyx-tube $\frac{1}{3}$ in. long, lobes $\frac{1}{5}$ in. long, the tube often cleft down one side nearly to the base, the lobes very unequal. Corolla $\frac{3}{4}$-1 in., funnel-shaped, lobes rounded. Capsule $\frac{1}{2}$ by $\frac{1}{6}$ in., stalk $\frac{1}{4}$-$\frac{1}{3}$ in. Seeds oblong, trigonous, sickle-shaped, twice as long as broad, almost blunt at both ends.

Locality.—Baltistan ; Karakoram.

Distribution.—W. Himalaya, 11,000-15,000 ft., Dahuria, Siberia.

Gentiana Hugelii, Griseb. Hugel's Gentian.

An annual herb, about 4 in. high, quite hairless. Lowest leaves 2-4 pairs, forming a rosette, stalkless, elliptic or elliptic-oblong, blunt, up to 1 in. long and $\frac{3}{5}$ in. broad, with a cartilaginous margin. Flowers in a head, rarely solitary, blue ; outer bracts of the flower-head almost round, leaf-like, the rest narrower and thinner, always shorter than the calyx. Calyx egg-shaped-oblong, tube $\frac{2}{5}$ in. long, lobes egg-shaped or elliptic-egg-shaped, up to $\frac{1}{6}$ in. long. Corolla about $\frac{3}{4}$ in. long, tube oblong, $\frac{7}{12}$ in. long, fringed inside below the lobes, lobes egg-shaped, $\frac{1}{8}$-$\frac{1}{5}$ in. long, with folds between the lobes, $\frac{1}{10}$ in. long. Anthers linear, $\frac{1}{10}$ in. long, filaments about $\frac{1}{5}$ in. long. No style ; stigmas linear, $\frac{1}{12}$-$\frac{1}{5}$ in. long, bent back. Capsule inversely egg-shaped, $\frac{1}{3}$ in. long, $\frac{1}{6}$ in. broad above. Seeds oblong, smooth, not winged.

Locality.—Pir Panjal, 11,400 ft. ; Zaskar, 8,000-10,000 ft.

Distribution.—Kashmir.

Gentiana humilis, Steven. Low Gentian.

Branches from the base, many, weak, little divided, laxly leafy, one-flowered. Leaves small, slightly fleshy, oblong, upper ones united at the base. Calyx thinly cylindric, narrowed towards the base, lobes shortly lance-shaped, sharp-pointed, tube 3-4 times as long as the lobes. Corolla white or blue, lobes egg-shaped-triangular, $\frac{1}{3}$ by $\frac{1}{20}$ in., sometimes $\frac{1}{2}$ by $\frac{1}{4}$ in., folds between the lobes slightly shorter than the lobes, entire or lobed. Capsule $\frac{1}{8}$-$\frac{1}{6}$ or even $\frac{1}{4}$ in. long, inversely egg-shaped-globose.

Locality.—Karakoram, 13,000-16,000 ft.

Distribution.—Kashmir, Caucasus, N. Asia, N. America.

Gentiana Loderi, Hook. f. Loder's Gentian.

(After E. G. Loder, who sent this plant to J. D. Hooker.)

A hairless, perennial herb. Branches prostrate, leafy. Leaves ½ in. long and broad, spreading, almost stalkless, broadly elliptic, blunt, 3-nerved, leathery, green or purplish-brown. Flowers at the end of the branches, solitary, stalkless. Calyx ½ in. long, bell-shaped, tube purplish, lobes as long as the tube, spoon-shaped, spreading and bent back, green, leathery. Corolla blue, tube-bell-shaped, lobes 5, rounded, egg-shaped, throat with erect scales. Style slender.

Locality.—Kashmir Valley.

Distribution.—Apparently endemic in Kashmir.

Gentiana nubigena, Edgew. Cloud-born Gentian.

(Alluding very likely to the great height at which the plant is found.)

Stems absent or up to 6 in. high, usually 1-2 flowering and 1-2 barren ones from the same root. Leaves oblong-linear, lower ones 2½ by ¼ in., stem-leaves shorter, united at the base into a short tube. Flowers often 1-3 on each branch, shortly stalked or almost stalkless. Calyx-tube ½ in. long, lobes ⅛ in. long, oblong, with a wide sinus between neighbouring lobes, sinus often folded. Corolla 1-1½ by ¼-⅜ in., funnel-shaped or almost tube-shaped, lobes ⅙ in. long, sharp-pointed. Capsule ½-¾ in., stalk ¼-½ in. long.

Locality.—At elevations of 16,000-18,000 ft.

Distribution.—Alpine Himalaya, from Kashmir to Sikkim.

Gentiana pedicellata, Wall. (= **G. quadrifaria**, C. B. Clarke).

(*Pedicellata* means having a stalk to the flower.)

Stems usually many, erect or decumbent, 4-10 in. high, branching from the base. Leaves green, radical ones ½-1½ in. long, egg- or lance-shaped, often forming rosettes, stem-leaves smaller, leathery, ¼-½ in., egg- and lance-shaped. Cymes usually 3-5-flowered. Flowers ⅓ in. long; stalks 0-⅛ in. long. Calyx shorter than the corolla-tube, hairless, lobes lance-shaped, sharp-pointed. Corolla 5-lobed, ¼-½ in. long, intensely blue or yellowish-green, lobes green outside, folds between the lobes small, bifid or notched, throat without scales. Capsule ⅛ by ⅛-⅙ in., ellipsoid or egg-shaped, stalk ¼-⅓ in. Seeds ellipsoid, smooth.

Locality.—At elevations from 3,000-10,000 ft.

Distribution.—From Kashmir to Bhutan, Khasia Hills, 3,000-5,000 ft., Burma, China, Deccan Mts., Ceylon, Java.

Gentiana pseudo-humilis, Burkill.

(*Pseudo-humilis* means resembling the species *G. humilis*.)

A dwarf plant, tufted, stems almost decumbent, up to 3½ in. long, quite hairless. Radical leaves egg-shaped-round, up to ⅛ in. long, margin cartilaginous, stem-leaves inversely egg-shaped, bent back, ⅛-⅕ in. long, ⅛ in. broad, united and sheathing at the base. Flowers solitary, stalked or almost stalkless, blue. Calyx-tube 10-ribbed, ⅕ in. long, 1/12 in. diameter, teeth lance-shaped, 1/12 in. long, with a white margin. Corolla-tube ⅓ in. long, folds between the lobes large, lobes egg-shaped, 1/12-⅕ in. long. Stamens reaching the throat, filaments fixed above the middle of the tube. Ovary stalked, ⅛ in. long, stalk scarcely 1/12 in. long. Capsule long-stalked, much protruding, ⅕ in. long.

Locality.—Rupshu, 15,000-18,000 ft.; Kargil; Leh; between Leh and Lipshi, 12,000-14,000 ft.; near Karsar.

Distribution.—Alpine W. Himalaya, from Kashmir to Garhwal; Afghanistan, Siberia.

Gentiana pygmaea, C. B. Clarke. Pygmy Gentian.

Stem ¼-1 in. high, simple, 1-flowered. Leaves ⅛-⅙ in. long, egg- or inversely egg-shaped, sometimes long-pointed, distant. Calyx shorter than the corolla-tube, lobes lance-shaped, sharp-pointed, erect. Corolla blue, ⅛-½ in. long, tube-shaped, folds between the lobes bifid, throat without scales.

I have seen no specimens. It may be a form of *Gentiana aquatica*.

Locality.—Palgam, 13,500 ft.

Distribution.—So far not been found anywhere else.

Gentiana squarrosa, Ledeb.

(*Squarrosa* means spreading widely.)

Branches arising from the base, many, weak, little divided. Stem-leaves small, inversely egg-shaped, bent back. Calyx-teeth egg-shaped, with a short hard point at the tip, bent back. Corolla less than ½ in. long, blue. Capsule short-inversely egg-shaped, compressed.

This species is perhaps not distinct from *G. aquatica*. The following are the only characters by which it can be distinguished: Calyx-teeth egg-shaped and bent back, instead of being erect.

Locality.—Karakoram, 10,000-15,000 ft.

Distribution.—Kashmir, Sikkim, Dahuria, Siberia.

Plate 42

PLEUROGYNE, Eschsch.

1. Stem-leaves linear-oblong ... ... *P. spathulata.*
2. Stem-leaves egg-shaped or elliptic ... *P. carinthiaca.*

Figs. 1 and 2. Pleurogyne spathulata, A. Kerner.

(*Spathulata* means spoon-shaped, alluding to the shape of the radical leaves.)

An annual herb, 6-12 in. high, branching from the base. Leaves opposite, radical ones 1½ in. long, linear-spoon-shaped, stem-leaves linear-oblong, ¾ by ⅛ in. Flower-stalks long. Sepals narrowly oblong, about half the length of the corolla. Corolla purple, tube very short, lobes spreading, often ⅜ in. Stamens attached to the corolla-tube, filaments linear, anthers large, oblong. Ovary 1-celled, stigma stalkless. Capsule oblong, sharp-pointed, stalkless. Seeds many, ellipsoid, larger than in the next species.

Flowers.—September.

Locality.—Aporwat above Gulmarg, grassy stony hill-side, above 11,000 ft., not very abundant; Zoji La.

Distribution.—Kashmir, Lahul.

Figs. 3 and 4. Pleurogyne carinthiaca, Griseb.

Carinthian Pleurogyne.

(*Carinthiaca* is derived from Carinthia, a country of Jugo-Slavia in southern Europe, and means that it was found in that country.)

An annual herb, 1-6 in. high, stems very many, branching from the base. Radical leaves 1 by ⅓ in., inversely egg-shaped, lasting or sometimes disappearing, stem-leaves egg-shaped or elliptic, ½ by ¼ in., narrowed at the base. Flower-stalks mostly long, ¼-2 in. long. Sepals ¼-⅓ by ⅛ in., elliptic, more or less blunt. Corolla of 5 petals, tube very short, lobes ½ by ¼ in., blue with green nerves, fringed near the base. Anthers oblong, often as long as the filaments. Capsule ½ in. long, oblong, sharp-pointed, stalkless. Seeds many, small, ellipsoid.

Flowers.—August.

Locality.—Aporwat above Gulmarg, open hill-sides and margs, above 10,000 ft., common; Thajwas; Karakoram.

Distribution.—W. Himalaya, from Kashmir to Kumaon, 10,000-13,000 ft., Europe, Caucasus, Afghanistan, Central Asia, Siberia.

JAESCHKEA, Kurz.

(After Jaeschke, who collected plants in the W. Himalaya.)

1. Sepals $\frac{1}{4}$ by $\frac{1}{20}$ in. Capsule very shortly stalked ... ... *J. gentianoides.*
2. Sepals $\frac{1}{3}$ by $\frac{1}{6}$-$\frac{1}{3}$ in. Capsule stalkless *J. latisepala.*

Fig. 5. Jaeschkea gentianoides, Kurz.

(*Gentianoides* means gentian-like.)

Stems $\frac{1}{2}$-$2\frac{1}{2}$ ft. high, rigid, slender. Leaves $1\frac{1}{2}$ by $\frac{1}{4}$ in., narrowly lance-shaped, stalkless. Flowers blue in panicles, many, stalks 0-$\frac{1}{2}$ in. Sepals $\frac{1}{4}$ by $\frac{1}{20}$ in., lance-shaped, sharp-pointed. Corolla tube-shaped, opening when only $\frac{1}{6}$ in. long, but enlarging till in fruit it measures more than $\frac{1}{2}$ in., lobes 5, short, $\frac{1}{5}$ by $\frac{1}{6}$ in. in fruit, triangular-lance-shaped. Stamens 5, shorter than the corolla-lobes, anthers oblong-arrow-shaped. Ovary 1-celled, stigma 2-lobed. Capsule $\frac{1}{3}$ in. long, ellipsoid, compressed, very shortly stalked. Seeds 10-30.

Locality.—Zoji La.

Distribution.—Alpine W. Himalaya, 8,000-13,000 ft.

Fig. 6. Jaeschkea latisepala, C. B. Clarke.

(*Latisepala* means having broad sepals.)

An erect herb, closely resembling the preceding species, but stouter and with broader leaves. Leaves oblong-long-pointed. Sepals unequal, egg-shaped or inversely egg-shaped, or round, $\frac{1}{3}$ by $\frac{1}{6}$-$\frac{1}{3}$ in. Capsule stalkless. Seeds $\frac{1}{20}$ in. long.

Locality.—Thajwas.

Distribution.—Alpine W. Himalaya, 9,000-13,000 ft.

Plate 43

SWERTIA, Linn.

(After Emmanuel Swert, a Dutch gardener and writer of the seventeenth century.)

A. Calyx and corolla 5-lobed.

I. Two glands on each corolla-lobe.

1. Stems hollow.

a. Seeds not winged. Flowers lurid grey or nearly white with blue-green veins ... *S. petiolata.*

b. Seeds winged.

aa. Glands on corolla-lobes fringed. Flowers lurid grey ... ... *S. speciosa.*

bb. Glands on corolla-lobes naked or almost so ...	*S. Thomsoni.*
2. Stems not hollow	*S. tetragona.*
II. One gland on each corolla-lobe.	
1. Corolla purple or dark red ...	*S. purpurascens.*
2. Corolla yellow-white ...	*S. cordata.*
3. Corolla white in the upper half, with 2 purple blotches at the base	*S. paniculata.*
B. Calyx and corolla 4-lobed.	
1. Corolla white or pale blue, darker dotted	*S. angustifolia*, var. *Hamiltoniana.*
2. Corolla green-yellow, variously tinged.	
a. One gland on each corolla-lobe	*S. alata.*
b. Two glands on each corolla-lobe	*S. Chirata.*

Figs. 1 and 2. Swertia petiolata, Royle. Coventry, pl. XXXIV.

(*Petiolata* means stalked, alluding to the long leaf-stalks.)

Stem 1-4 ft. high, hollow, $\frac{1}{8}$-$\frac{1}{6}$ in. thick. Lower stem-leaves with a stalk 2-3 in. long, in tufts, oblong, $3\frac{1}{2}$ by 1 in., 5-nerved, united into a tube, leaves at the base of the inflorescence $1\frac{1}{2}$ by $\frac{1}{2}$ in., stalkless, hardly united, upper stem-leaves stalked or stalkless. Flowers 1-$1\frac{1}{4}$ in. diameter, lurid grey or nearly white with blue-green veins, in clusters of 3-5 flowers which are borne on long stalks erect from the axils of the leaves, forming a long, narrow panicle. Sepals 5, $\frac{1}{3}$ by $\frac{1}{8}$ in., lance-shaped, sometimes larger. Corolla-lobes 5, $\frac{1}{2}$-$\frac{2}{3}$ by $\frac{1}{6}$-$\frac{1}{5}$ in., with 2 round, fringed yellow glands at the base of each lobe. Stamens 5, fastened to the base of the corolla. Capsule $\frac{1}{2}$ by $\frac{1}{4}$ in., egg-shaped. Seeds not winged.

Flowers.—June to September.

Locality.—Basam Gali at higher levels, abundant towards the Pass and above it, associated with *Primula Stuartii*, *Primula rosea*, *Adonis chrysocyathus*; Khur Mt., 13,200 ft.; Gulmarg, woods and open hills, usually near watercourses, above 8,000 ft., very common; Thajwas; Tragbol.

Distribution.—W. Himalaya, 8,000-14,000 ft., Afghanistan.

Swertia speciosa, Wall. Showy Swertia.

Stems robust, 2-4 ft. high, hollow, $\frac{1}{8}$ in. thick. Radical leaves long-stalked, stem-leaves opposite, stalkless, egg-shaped, 5 by 2 in., long-pointed, narrowed downwards, bases united, stem-clasping. Clusters of flowers forming a narrow panicle. Flower-stalks $\frac{1}{4}$-3 in. long. Flowers lurid grey, $1\frac{1}{2}$ in. diameter. Sepals 5, $\frac{1}{3}$ by $\frac{1}{6}$ in., egg-shaped, toothed, much overlapping at the base. Corolla 5-lobed, lobes $\frac{3}{4}$ by $\frac{1}{5}$ in., spoon-shaped-oblong, 2 long-fringed glands on each lobe. Seeds compressed, narrowly winged.

Locality.—Sonamarg, 9,000 ft.

Distribution.—W. Himalaya, from Kashmir to Kumaon, up to 10,500 ft.

Swertia Thomsoni, C. B. Clarke. Thomson's Swertia.

Stem hollow. Lower stem-leaves long-stalked, oblong or elliptic, scarcely united at the base, upper often stalkless. Clusters of flowers forming a narrow panicle. Stalks of flower-clusters often 6 in. long. Sepals 5, sharp-pointed, $\frac{1}{4}$ by $\frac{1}{10}$ in. Corolla-lobes 5, almost blunt, $\frac{1}{3}$ by $\frac{1}{5}$ in., glands 2 yellow spots near the base of each lobe, obscure. Capsule $\frac{1}{4}$-$\frac{1}{3}$ in. long. Seeds small, globose, somewhat angular, narrowly or irregularly winged, finely netted, glistening.

Locality.—Sonamarg.

Distribution.—Kashmir, apparently endemic.

Swertia tetragona, C. B. Clarke.

Stems $\frac{1}{2}$-2 ft. high, usually branching. Leaves lance-shaped, $\frac{3}{4}$-1 in. long, 3-1-nerved. Sepals 5, narrowly lance-shaped, $\frac{1}{6}$ in. long. Corolla nearly white, lobes 5, more than $\frac{1}{4}$ in. long, two oblong, hairy glands on each lobe. Filaments of stamens linear, not united; anthers oblong, halbert-shaped to the middle. No style. Stigmas of 2 hemispheric plates. Capsule $\frac{1}{4}$-$\frac{1}{3}$ in. long, oblong, blunt. Seeds small.

Resembles *Swertia paniculata*, but can be distinguished by the absence of the style and the halbert-shaped anthers.

Flowers.—September.

Locality.—Temperate regions.

Distribution.—From Kashmir to Simla, 5,000-8,000 ft.

Fig. 3. Swertia purpurascens, Wall. Purple Swertia. Collett, fig. 102.

Stems ½-3 ft. high. Leaves oblong or lance-shaped, 1½ by ½ in., base narrowed, lowest almost blunt, upper sharp-pointed, hairless. Panicles many-flowered, leafy, flower-stalks often clustered. Sepals ⅛ in. long, oblong, 1-nerved. Corolla-lobes 5, ¼ in. long, egg-shaped, sharp-pointed, purple or dark red; bent back in flower, one horse-shoe-shaped pit at the base of each lobe. Filaments of stamens broadened downwards and united into a short erect tube, anthers elliptic-lance-shaped, long-pointed. Capsule stalkless; seeds $\frac{1}{50}$ in. diameter, globose, smooth, light yellow when ripe.

Flowers.—September.

Locality.—Gagangir.

Distribution.—Temperate N.W. Himalaya, from Kashmir to Kumaon, 5,000-12,000 ft.

Fig. 4. Swertia cordata, Wall.

(*Cordata* means heart-shaped, alluding to the leaves which are often heart-shaped.)

Stem ½-3 ft. high. Leaves 1¼ by ¾ in., stalkless, egg-shaped, sharp-pointed, 5-3-nerved, often heart-shaped. Panicles large, many-flowered, branches obliquely ascending or spreading. Flower-stalks 0-1½ in., often clustered. Sepals 5, ⅓ by ⅛ in., egg-lance-shaped. Corolla yellow-white, margins marked with short, pale purple streaks, one round, yellowish gland above the base of each lobe, lobes ¼-⅓ in., elliptic or oblong. Filaments of anther linear, free. Style cylindric, stigmas almost hemispheric. In N. Kashmir double flowers occur.

Flowers.—August, September.

Locality.—Gagangir; Karakoram.

Distribution.—Temperate Himalaya, 4,000-12,000 ft., from Kashmir to Bhutan, Khasia Hills, 3,000-5,000 ft.

Swertia paniculata, Wall.

(*Paniculata* means panicled, referring to the arrangement of the flowers.)

Stems 1-3 ft. Branches spreading. Leaves oblong or lance-shaped, 3-1-nerved, 1½ by ⅔ in. Sepals 5, ⅕ in. long, oblong, sharp-pointed. Corolla white in the upper half with

two purple blotches at the base forming a broken ring, lobes 5, ¼ in. long, egg-shaped, sharp-pointed, spreading, not bent back, one egg-shaped gland on each lobe. Filaments of stamens linear, not united. Anthers oblong. Style long. Stigmas linear. Capsule ⅓ in., elliptic-lance-shaped, long-pointed. Seeds globose, smooth, light yellow when ripe.

Flowers.—September.

Locality.—Temperate regions.

Distribution.—W. Himalaya, from Kashmir to Nepal, 5,000-8,000 ft.

Swertia angustifolia, var. **Hamiltoniana**, Burkill (=**Swertia angustifolia**, Ham.).

(*Angustifolia* means narrow-leafed; *Hamiltoniana* to commemorate Francis Hamilton, *né* Buchanan, 1762-1829, Superintendent of the Sibpur Botanic Garden from 1814-1815.)

Stem 1-3 ft. high, branching, angles narrowly winged. Leaves linear-lance-shaped, 2½ by ¼ in., sharp-pointed. Inflorescence rather strict. Sepals 4, oblong-linear, as long as or just longer than the petals. Corolla white or pale blue, darker dotted, lobes 4, oblong, sharp-pointed, ¼-⅓ in., 1 green, round gland on each lobe. Capsule egg-shaped.

Flowers.—September.

Locality.—Banks of the Chenab; Gulmarg; Dulai.

Distribution.—Subtropical Himalaya, from Kashmir to Sikkim, Khasia Hills, Assam, Cooch Behar, S.W. and S. China.

Swertia alata, Royle. Winged Swertia.

Stem 1-2 ft., branching, 4-angular, angles often winged. Stem-leaves almost stalkless, egg-shaped, sharp-pointed, 1¾ by ¾ in., 5-nerved. Calyx 4-lobed, lobes ¼ in. and more. Corolla lurid green-yellow, dotted and veined with purple, lobes 4, often shorter than the calyx, one fringed gland on each lobe. Resembles *Swertia Chirata*, but can be distinguished by having only one gland on the corolla-lobes.

Flowers.—September.

Locality.—Temperate regions.

Distribution.—W. Himalaya, from Kashmir to Kumaon, 4,000-6,000 ft.

Swertia Chirata, Ham. Chiretta.

(*Chirata* or *chiretta* is the vernacular name for the medicinal roots and stems obtained from this plant.)

Stems robust, 2-5 ft. high, branching, rounded except near the top. Leaves broadly lance-shaped, 4 by 1½ in., lower sometimes stalked. Panicle large, leafy, many-flowered. Calyx lobes 4, $\frac{1}{6}$ in. long, lance-shaped. Corolla green-yellow, tinged with purple, lobes ¼ in. long, egg-shaped, the two glands on each lobe green, fringed with long white or pink hairs. Filaments of stamens linear, free; anthers oblong. Style cylindric. Stigmas oblong. Capsule ¼ in. and more, egg-shaped, sharp-pointed. Seeds $\frac{1}{50}$ in., smooth, finely netted or not.

Flowers.—September, October.

Locality.—Temperate regions.

Distribution.—From Kashmir to Bhutan, 4,000-10,000 ft., Khasia Hills, 4,000-5,000 ft.

LIMNANTHEMUM, S. P. Gmel. The Water-Snowflake, also called Water-Lily.

(*Limnanthemum* is derived from the Greek *limne*, a marsh, and *anthamon*, flowering, and means therefore a marsh-flower.)

Fig. 5. Limnanthemum nymphaeoides, Link.

(*Nymphaeoides* means resembling *Nymphaea*, the Water-Lily.)

A water-plant. Stems long, floating, rooting at the nodes. Leaves almost opposite, 1-2 in. diameter, round, deeply heart-shaped, stalk 1-2 in. long. Flowers in axillary umbels, flower-stalks 1-4 in. long. Flowers yellow. Calyx-lobes 5, ½ by ⅛ in. Corolla-lobes ¾-1 in., crenulate-ciliate. Stamens on the corolla-tube; filaments linear, short. Anthers halbert-shaped-oblong. Ovary 1-celled; capsule 1 in. long, ellipsoid, sharp-pointed. Seeds many, $\frac{1}{6}$ in. diameter, ellipsoid, winged.

Flowers.—May.

Locality.—Dal district; between Srinagar and Gulmarg, in ditches along roads.

Distribution.—From W. and Central Europe to China.

Plate 44

BORAGINACEAE. The Borage Family.

(Named from *Borago*, a genus which is not represented in India. The derivation of *Borago* is very uncertain.)

CYNOGLOSSUM, Linn. The Hound's Tongue.

(From *kyon*, a dog, and *glossa*, a tongue, in allusion to the rough leaves of some species.)

A. Nutlets attached by their tips to the style and separating from it when ripe.
  I. Scales at the throat almost square or trapeziform.
    1. Nutlets with a distinct margin.
      a. Corolla scarcely $\frac{1}{8}$ in. long... *C. glochidiatum.*
      b. Corolla $\frac{1}{5}$ in. long ... ... *C. microglochin.*
    2. Nutlets without a distinct margin *C. zeylanicum.*
  II. Scales transversely linear, much broader than long ... ... *C. lanceolatum.*

B. Nutlets free from the style even before they are ripe.
  1. Corolla about $\frac{1}{8}$ in. diameter ... *C. petiolatum.*
  2. Corolla about $\frac{2}{5}$ in. diameter ... *C. nervosum.*

Fig. 1. Cynoglossum glochidiatum, Wall. (Including **C. Wallichii,** G. Don. and **C. denticulatum,** A. DC. of Hooker's "Flora of British India.")

(*Glochidiatum* means having hooked bristles, alluding to the nutlets of this species.)

Stem erect, 1-2 ft. high, simple or branched, hairy. Basal leaves long-stalked, lance-shaped or oblong, 2-4½ in. long, 1-2 in. broad, ciliate or finely toothed on the margin ,narrowed into a stalk 2½-3½ in. long, hairy on both surfaces with hairs arising from calcareous tubercles, often very hairy on the main-nerve below; stem-leaves short-stalked or stalkless, gradually getting smaller upwards, sharp-pointed. Flowers in many, dense-flowered, one-sided racemes arising from the axils or the end of the branches; flower-stalks shorter than the calyx in fruit. Sepals oblong or oblong-elliptic, 1-nerved, more or less densely ciliate, up to $\frac{1}{12}$ in. long. Corolla blue, bell-shaped, $\frac{1}{10}$-$\frac{1}{8}$ in. long, limb cleft almost to the base, almost

as long as the tube, furnished at the mouth with 5 almost square scales which are larger than the anthers. Stamens included in the corolla-tube, very short. Ovary flattened, 4-lobed, 4-celled. Style simple, fixed between the lobes of the ovary. Nutlets 4, round, $\frac{1}{12}$ in. diameter, densely covered with hooked bristles on the margin, outer surfaces concave with few hooked bristles.

Flowers.—May to August.

Locality.—Gulmarg, open margs, above 8,000 ft., not abundant; Saida Kadal, in wheat-fields.

Distribution.—Central Asia, Afghanistan, Kashmir, Tibet, Assam, Central and S. India (not in Ceylon).

Cynoglossum microglochin, Benth.

An erect, hairy plant, 1-3 ft. high. Basal leaves stalked, oblong-elliptic, about 2 in. long, $\frac{3}{5}$ in. broad, stem-leaves many, almost stalkless, egg-shaped or elliptic, sharp-pointed, densely hairy beneath, 3-4 in. long, $1\frac{3}{5}$-2 in. broad. Racemes dense-flowered, lower fruiting flower-stalks as long as the calyx. Sepals lance-shaped, sharp-pointed, $\frac{1}{8}$ in. long, hairy. Corolla blue, funnel-shaped, $\frac{1}{5}$ in. long, limb about $\frac{1}{3}$ in. broad, cleft to the base, scarcely shorter than the tube, furnished at the throat with trapeziform scales. Style slightly longer than the calyx. Nutlets egg-shaped, scarcely $\frac{1}{8}$ in. long, concave on the outer face, smooth, with hooked bristles on the margin, scar triangular.

Flowers.—July to September.

Locality.—Srinagar.

Distribution.—Temperate W. Himalaya, 7,000-11,000 ft., from Kashmir to Kumaon.

Fig. 2. Cynoglossum zeylanicum, Thunb. (= **C. furcatum**, Wall.). Ceylon Hound's Tongue. Collett, fig. 104.

Stem erect, stout, 1-3 ft. high, simple or branched, hairy. Basal leaves long-stalked, oblong or elliptic, 6-8 in. long, $1\frac{1}{2}$-$3\frac{1}{2}$ in. broad, densely hairy on both sides, wedge-shaped at the base, secondary nerves very prominent on lower surface, stalk up to 5 in. long, lower stem-leaves short-stalked, upper stalkless, gradually getting smaller upwards, oblong or lance-shaped. Flowers very many in one-sided racemes which form a large panicle, flower-stalks shorter than the calyx in fruit. Calyx cleft for about $\frac{3}{4}$ its length, lobes egg-shaped, blunt, $\frac{1}{8}$-$\frac{1}{6}$ in. long, nerveless, hairy. Corolla blue or white, funnel-shaped, $\frac{1}{5}$ in. long, limb about $\frac{1}{3}$ in. diameter, cleft to the base,

furnished at the mouth with 5 blue, almost square scales which are much smaller than the anthers. Style stout, half as long as the calyx. Nutlets egg-shaped, $\frac{1}{8}$-$\frac{1}{6}$ in. long, uniformly covered with hooked bristles, outer face slightly convex, with a triangular scar.

Flowers.—June to August.

Locality.—Gulmarg, hills and margs, above 7,000 ft., common.

Distribution.—Afghanistan, Kashmir to Kumaon and Sikkim, Assam, E. Bengal, Central and S. India, Ceylon, Philippines, Formosa, Japan, Yunnan.

Cynoglossum lanceolatum, Forsk. (Including **C. micranthum**, Desf. of Hooker's "Flora of British India"). Lance-leafed Hound's Tongue.

Stem erect, 2-5 ft. high, simple or sometimes branched, more or less hairy. Basal leaves short-stalked, lance-shaped or oblong-lance-shaped, 3-6 in. long including the long stalk, $\frac{2}{5}$-$\frac{4}{5}$ in. broad, gradually narrowed into the stalk, 1-nerved, rough on both sides with long, bulbous-based hairs; lower stem-leaves short-stalked, upper stalkless, very variable, sometimes linear, then lance-shaped or oblong, 2-7 in. by $\frac{1}{5}$-2 in., sharp-pointed. One-sided racemes of many flowers forming lax racemes. Sepals oblong-elliptic, up to $\frac{1}{12}$ in. long, blunt, ciliate. Corolla pale blue or white, funnel-shaped, $\frac{1}{12}$-$\frac{1}{6}$ in. long, limb cleft almost to the base, almost as long as the tube, furnished at the mouth with 5 transversely linear scales which are much broader than long. Stamens very short, anthers egg-shaped, much smaller than the scales. Style stout, very short. Nutlets almost globose, up to $\frac{1}{6}$ in. diameter, more or less uniformly covered with hooked bristles.

Flowers.—June to August.

Locality.—Up to 8,000 ft.

Distribution.—Africa, Arabia, Afghanistan, N.W. Himalaya to Sikkim, southwards to Ceylon, Assam, Burma, Siam, China, Philippines.

Cynoglossum petiolatum, A. DC.

(*Petiolatum* means stalked, alluding to the long stalks of the radical leaves.)

Erect, hairy, 2-3 ft. high. Lower leaves oblong, long-stalked, stalk about 5 in. long, stem-leaves few, egg-shaped, sharp-pointed, finely hairy beneath. Racemes straggling, branched, 4-8 in. in fruit. Flower-stalks very short, lower

scarcely ¼ in. long. Calyx-lobes ⅛ in. long, egg-shaped, blunt, hairy. Corolla ⅛ in. diameter, tube hardly longer than the calyx, lobes rounded, furnished at the throat with white scales. Faces of nutlets slightly provided with hooked hairs, except on the margins.

Locality.—Zaskar, near Umasi Pass.

Distribution.—Alpine W. Himalaya.

Note.—Brand considers this plant to be a cultural form of *Cynoglossum nervosum*, or even identical with it.

Cynoglossum nervosum, Benth.

(*Nervosum* means provided with nerves, in allusion to the very distinct nerves of the leaves in this species.)

Stem erect, branched, up to 3 ft. high. Basal leaves narrowly lance-shaped, up to 8 in. long including the stalk, 1⅕ in. broad, stem-leaves short-stalked, elliptic or oblong, 3 to 5 in. long, ⅘-2 in. broad, wedge-shaped at the base, 5-6-nerved, nerves very distinct. Racemes 1-6 in., lax; lower flower-stalks ¼-⅓ in. long. Sepals egg-shaped, sharp-pointed, ⅛ in. long. Corolla blue, much longer than the calyx, limb ⅔ in. diameter, throat furnished with 5 almost square scales. Nutlets egg-shaped, ⅙ in. long, margin densely and outer face sparingly covered with hooked bristles, inner face smooth, scar rather large, oblong-egg-shaped.

Flowers.—July.

Locality.—Gorai; Margan Pass.

Distribution.—Alpine W. Himalaya, from Kashmir to Garhwal, 7,000-14,000 ft.

LINDELOFIA, Lehm.

(Lehmann gave this name in honour of Fr. a Lindelof, a great patron of botanical science.)

I. Margin of nutlets toothed.
   1. Leaves lance-shaped or oblong-lance-shaped ... ... *L. longiflora.*
   2. Leaves elliptic or egg-shaped ... *L. longiflora*, var. *Levingii.*

II. Margin of nutlets not toothed ... ... *L. angustifolia.*

Fig. 3. Lindelofia longiflora, Baillon (=**Lindelofia spectabilis**, Lehm.). Showy Lindelofia.

(*Longiflora* means long-flowered.)

Stems solitary or several, ½-2 ft. high, hairy. Radical leaves long-stalked, lance-shaped or oblong-lance-shaped, 2½-18 in. long including the stalk, ⅓-⅘ in. broad, narrowed at

both ends, hairy on both surfaces, stem-leaves stalkless, 1⅖-3 in. long, ¼-⅘ in. broad, rounded at the base or heart-shaped and stem-clasping. Racemes axillary and terminal. Sepals oblong-elliptic, ⅕ in. long, hairy on the margin. Corolla blue, cylindric, up to ⅜ in. long, limb cleft to the base, much shorter than the tube, lobes broadly egg-shaped, blunt, provided at the throat with trapeziform scales. Anthers as long as the filaments. Style ½ in. long. Nutlets egg-shaped, ⅛ in. long, toothed, teeth bent inwards, margin with hooked bristles.

Flowers.—June to September.

Locality.—Gulmarg, open margs, about 8,000 ft., common; Hayan Pass, on a grassy hillock, 9,800 ft.; Basam Gali, at higher level in open localities; Khur Mt., 13,100 ft.

Distribution.—Alpine W. Himalaya, 9,000-13,000 ft., from Kashmir to Garhwal.

Fig. 4. Lindelofia longiflora, Baillon, var. **Levingii**, C. B. Clarke. Levinge's Lindelofia.

Like the preceding plant, but the leaves are elliptic and egg-shaped, the calyx-lobes are ¼-⅓ in. long and egg-shaped, the corolla-tube ⅔ by ¼ in., lobes ⅓ in. diameter, round, and the style ¾ in. long. A more showy plant than the type.

Flowers.—June to August.

Locality.—Gulmarg, open margs, above 8,000 ft., not common; Pir Panjal, 11,500 ft.

Fig. 5. Lindelofia angustifolia, Brand. (=**Lindelofia Benthami**, Hook. f.). Narrow-leafed Lindelofia.

A hairy plant. Stems several, simple, hollow, ⅔-1⅔ ft. high. Radical leaves long-stalked, lance-shaped or linear-lance-shaped, including the stalk ⅔-1 ft. long, ⅘-1⅕ in. broad, slowly narrowed into the stalk, stem-leaves few, stalkless, much smaller. Racemes short, dense-flowered, crowded towards the top of the stem. Sepals ¼-⅓ in. long, oblong-lance-shaped, sharp-pointed, densely hairy on the margin. Corolla bluish, tube-shaped about ½ in. long, limb ⅙-⅛ in. long, cleft to the base, lobes oblong, blunt, provided at the throat with large, trapeziform scales. Style ½-⅔ in. long. Nutlets triangular-egg-shaped, almost ⅛ in. long, covered all over, except for the large scar, by hooked bristles.

Flowers.—June, July.

Locality. — Hayan Pass, 9,800 ft.; Ladakh; Ẓaskar; Baltistan.

Distribution. — W. Himalaya, 11,000-15,000 ft., Central Asia.

MERTENSIA, Roth.

(After F. K. Mertens, a German botanical author, 1764-1831.)

A. Corolla-lobes erect ... ... *M. echioides.*
B. Corolla-lobes not erect.
  I. Corolla-tube $\frac{2}{3}$-$\frac{3}{4}$ in. long, 4-5 times as long as the calyx ... ... *M. tibetica.*
  II. Corolla-tube $\frac{1}{2}$ in. long or less.
    1. Corolla-tube $\frac{1}{6}$ in. long, a little longer than the calyx ... ... *M. elongata.*
    2. Corolla-tube $\frac{1}{4}$-$\frac{1}{3}$ in. long, twice as long as the calyx. Lower leaves very shortly stalked ... ... *M. primuloides.*
    3. Corolla-tube $\frac{1}{3}$-$\frac{1}{2}$ in. long, about thrice as long as the calyx. Lower leaves long-stalked ... ... *M. moltkioides.*

Fig. 6. Mertensia echioides, Benth.

(*Echioides* means resembling *Echium*, another genus of the same order.)

A softly hairy plant. Stems 6-15 in. high. Leaves oblong, $1\frac{1}{2}$ by $\frac{1}{2}$ in., lower long-stalked, spoon-shaped. Racemes 1-3 in. long, dense, many-flowered. Flower-stalks $\frac{1}{8}$-$\frac{1}{5}$ in. long, linear. Corolla-tube $\frac{1}{5}$-$\frac{1}{4}$ in. long, lobes $\frac{1}{6}$ in., $\frac{1}{3}$ longer than the calyx-lobes, erect, scales in the throat obsolete. Filaments of stamens linear, not united, anthers protruding from the tube, but not reaching above the corolla-lobes. Styles $\frac{1}{3}$ in. long. Nutlets $\frac{1}{10}$ in. long, white or pale, shining. Can always be distinguished by the erect corolla-lobes.

Flowers.—July, August.

Locality.—Lian Marg, rocks along torrent, about 10,000 ft.

Distribution.—W. Himalaya, 5,000-12,000 ft.

Fig. 7. Mertensia tibetica, C. B. Clarke. Tibetan Mertensia.

A rough, hairy plant. Leaves all near the base, $\frac{2}{3}$ by $\frac{1}{4}$ in., elliptic, long-stalked, stalk 1 in. long. Peduncles 2-4 in. long. Racemes 1-4 in. long, flower-stalks $\frac{1}{5}$ in. long. Sepals $\frac{1}{8}$ in., narrowly oblong, in fruit $\frac{1}{5}$ in. long. Corolla-tube funnel-shaped, $\frac{2}{3}$-$\frac{3}{4}$ in. long, 4-5 times as long as the calyx, $\frac{1}{8}$ in. wide in the throat, lobes $\frac{1}{8}$ in. and longer, almost square, throat with large scales as long as the lobes. Anthers included in the tube, entirely below the scales. Style $\frac{3}{4}$ in. long. Nutlets more than $\frac{1}{8}$ in. long, brown-black.

Flowers.—July, August.

Locality.—Aporwat above Gulmarg, open stony ground and big rock above 12,000 ft. common; Karakoram.

Distribution.—W. alpine Himalaya, 12,000-16,000 ft.

1 2 9 5 1

Mertensia elongata, Benth.

A hairy plant. Rootstock stout, annual stems 8 in. high. Leaves oblong, radical ones 2 by $\frac{1}{2}$ in., spoon-shaped, stalk $1\frac{1}{2}$ in. long, stem-leaves 2 by $\frac{1}{2}$ in., stalkless, sharp-pointed, hairs arising from bulbous bases. Racemes many-flowered, long-stalked, in fruit $3\frac{1}{2}$ in. long. Flower-stalks $\frac{1}{6}$ in. long, rigid, almost erect. Calyx-lobes $\frac{1}{6}$ in. long, linear, hairy, in fruit $\frac{1}{6}$ in. long. Corolla $\frac{1}{3}$ in. diameter, tube $\frac{1}{6}$ in. long, a little longer than the calyx, scales in the throat very small, lobes spreading. Anthers almost stalkless, above the scales. Style $\frac{1}{3}$ in. long. Nutlets $\frac{1}{10}$ in., white or pale, shining.

Locality.—At elevations of 5,000-8,000 ft.

Distribution.—Apparently endemic in Kashmir.

Mertensia primuloides, C. B. Clarke. Primrose-like Mertensia.

A hairy plant. Stems 3 in. high, densely leafy below. Leaves small, elliptic, $\frac{1}{3}$ by $\frac{1}{6}$ in., narrowed at both ends, lower ones short-petioled. Racemes dense, not many-flowered, $\frac{1}{2}$ in. long in flower. Flower-stalks $\frac{1}{12}$ in. long. Calyx-lobes $\frac{1}{8}$ in. long, narrowly oblong. Corolla $\frac{1}{4}$ in. diameter, tube $\frac{1}{4}$ in. long, twice as long as the calyx. Scales in the throat distinct, but small. Anthers overtopping the scales. Style $\frac{1}{3}$ in. long.

Flowers.—July.

Locality.—Khur Mt., 13,500 ft., on rocks; Damam Sar; Gilgit, 15,000 ft.

Distribution.—Alpine W. Himalaya.

Mertensia moltkioides, C. B. Clarke.

(*Moltkioides* means resembling *Moltkia*, another genus of *Boraginaceae*.)

A hairy plant, hairs spreading. Leaves oblong or elliptic, lower ones spoon-shaped, long-stalked, sometimes 3 by $1\frac{1}{2}$ in. Racemes many-flowered. Corolla dark blue-purple, tube $\frac{1}{3}$ by $\frac{1}{16}$ in., about thrice as long as the calyx. Scales in the throat small. Tips of anthers reaching tips of scales. Filaments very short, but distinct. Nutlets brown-black, up to $\frac{1}{8}$ in. and more.

Resembles *Mertensia elongata*, but the leaves are more softly hairy, the hairs on the midrib beneath are spreading or

bent back, the racemes are shorter-stalked, and the calyx is larger.

Flowers.—June.

Locality.—In forest N. of Hayan Pass close to top of ridge; Islamabad, 11,000 ft.

Distribution.—Kashmir, Chamba.

LAPPULA, Moench.

Fig. 8. Lappula glochidiata, Brand. (=**Paracaryum glochidiatum,** Benth.).

(*Glochidiatum* means having hooked bristles.)

A softly pubescent herb. Stems 2-3 ft. high, erect. Radical leaves long-stalked, heart-egg-shaped, 3-6 by 2-4 in., entire, sharp-pointed, stalks often 6 in. long, stem-leaves alternate, smaller short-stalked, round or elliptic-lance-shaped, uppermost stalkless. Flowers pale blue, $\frac{1}{8}$ in. diameter, in long, usually forked racemes 2-6 in. long. Calyx deeply lobed. Corolla-tube very short, mouth furnished with 5 small, blunt scales, lobes rounded, spreading. Stamens enclosed in the tube. Ovary conical, 4-lobed, 4-celled. Style simple, inserted between the lobes. Nutlets 4, small, egg-shaped, margins beset with tapering hooked bristles nearly $\frac{1}{4}$ in. long, faces smooth.

Flowers.—July.

Locality.—Aporwart above Gulmarg, amongst scrub on hill-side, about 11,000 ft., common; Gangabal.

Distribution.—Temperate Himalaya, 9,000-12,000 ft., from Kashmir to Simla.

ADELOCARYUM, Brand.

(Derived from the Greek *adelos*, uncertain, and *caryon*, nutlet, so called because the nutlets of this genus agree partly with those of the genus *Cynoglossum*, and partly with those of *Paracaryum*. It was, therefore, doubtful to which genus this species of the new genus *Adelocaryum* should be ascribed.)

I. Style long, much exceeding the nutlets ... ... *A. anchusoides.*

II. Style short, only slightly exceeding the nutlets.

1. Style about half as long as the calyx ... ... *A. Schlagintweitii.*
2. Style as long as the calyx or slightly longer ... ... *A. flexuosum.*

Fig. 9. Adelocaryum anchusoides, Brand. (= **Paracaryum heliocarpum**, A. Kerner).

(*Anchusoides* means looking like *Anchusa*, a genus of *Boraginaceae*.)

Rootstock stout, woody. Stem erect, simple, 1-3 ft. high, hairy. Radical leaves long-stalked, elliptic-lance-shaped, $\frac{1}{2}$-$1\frac{1}{3}$ ft., including the stalk, $\frac{3}{4}$-$1\frac{4}{5}$ in. broad, more or less distinctly 3-nerved, gradually narrowed into the stalk, stem-leaves much smaller, stalkless. Racemes 4-10 in. long, forming a large lax panicle. Sepals oblong, $\frac{1}{6}$ in., 1-nerved, densely hairy. Corolla blue, bell-shaped, $\frac{3}{8}$ in. long, limb cleft for $\frac{2}{3}$, lobes broadly egg-shaped, scales in the throat triangular-oblong. Stamens attached to the middle of the tube, filaments slightly shorter than the anthers. Style $\frac{3}{8}$ in. long. Nutlets almost round, $\frac{1}{5}$ in. diameter, margin broad-membranous, white, bent back, with lance-shaped hooked bristles.

Flowers.—June, July.

Locality.—Aporwat, flat damp places on grassy hill-side, about 12,000 ft., not common.

Distribution.—Temperate W. Himalaya.

Adelocaryum Schlagintweitii, Brand. Schlagintweit's Adelocaryum.

(After Schlagintweit who travelled and collected in the Himalayas.)

A tufted plant, densely covered with bulbous-based hairs. Radical leaves long-stalked, lance-shaped or oblong, 2-3 in. long including the long stalk, $\frac{1}{5}$-$\frac{1}{4}$ in. broad, blunt, narrowed into the stalk. Lower stem-leaves short-stalked, the upper stalkless and very small. Racemes lax, many-flowered. Sepals oblong, blunt, $\frac{1}{12}$ in. long, hairy. Corolla bell-shaped, $\frac{1}{8}$ in. long, lobes broadly egg-shaped, shorter than the tube, scales in the throat almost half moon-shaped, broader than long. Stamens fixed to the lower part of the tube, filaments very short. Nutlets (of which 2 are usually not developed) boat-shaped, in the middle of the outer face keeled and covered with hooked hairs, $\frac{1}{6}$ in. long, egg-shaped.

Flowers.—October.

Locality.—Dras; Kargil, between Suru and Tsringmat.

Distribution.—W. Himalaya.

Adelocaryum flexuosum, Brand.

A hairy plant. Stems slender, flexuose, 1 ft. high and more. Lower stem-leaves short-stalked, upper stalkless, oblong or lance-shaped, $1\frac{1}{3}$-$1\frac{3}{4}$ in. long, $\frac{2}{5}$-$\frac{2}{3}$ in. broad, narrowed

at both ends. Racemes at the end of the stems, lax, many-flowered. Sepals oblong-elliptic, blunt, scarcely $\frac{1}{8}$ in. long. Corolla cylindric-bell-shaped, about $\frac{1}{6}$ in. long, tube as long as the limb, scales in the throat almost square, notched at the tip. Stamens fixed to the middle of the tube, filaments very short, anthers reaching the base of the scales. Style as long as the calyx or slightly longer. Nutlets $\frac{1}{8}$ in. long, in the middle of the outer face provided with hooked bristles.

Locality.—N. of Srinagar.

Distribution.—Apparently endemic in Kashmir.

Plate 45

LYCOPSIS, Linn. The Bugloss.

(From the Greek *lycos*, wolf, and *ops*, face, because the flowers were supposed to resemble a wolf's face.)

Fig. 1. Lycopsis arvensis, Linn. Field Bugloss.

(*Arvensis* indicates the preference of the plant for arable land.)

A tall, erect, slender, usually unbranched plant. Stem nearly angular, very hairy or prickly, 1-2 ft. high. Leaves oblong, sharp-pointed, 2 by $\frac{1}{3}$ in., hairy, the hairs bulbous-based, lower ones stalked, upper stem-clasping. Flowers deep-blue or white, more or less turned to one side in turned-back drooping cymes, stalks $\frac{1}{8}$ in. long. Sepals $\frac{1}{6}$ in., hairy, oblong-linear, erect. Corolla funnel-shaped with a crooked limb, with a closed mouth and 5 white hairy scales, tube curved and longer than the limb. Stamens fixed near the base of the tube. Nutlets $\frac{1}{8}$-$\frac{1}{6}$ in.

Flowers.—May.

Locality.—Srinagar, in field on left bank of Jhelum; Gagribal; Skardo.

Distribution.—W. Himalaya, from Peshawar to Kashmir, 3,000-8,000 ft., N. and W. Asia, Europe.

MACROTOMIA, DC.

1. Leaves narrow-lance-shaped; radical leaves 11 by $\frac{1}{2}$ in.... ... ... *M. Benthami.*
2. Leaves oblong. Radical leaves 5 by $\frac{1}{3}$ in. *M. perennis.*

Fig. 2. Macrotomia Benthami, DC. Gazabam (vernacular).

(After George Bentham, a distinguished English botanist, 1800-1884.)

An erect, tall, hairy plant. Stem simple, 1-3 ft. high. Leaves narrow-lance-shaped, radical ones 11 by $\frac{1}{2}$ in., stem-

leaves 3 by ½ in. Spikes at the end of the stem, solitary, 12 by 2-3 in., usually very dense. Sepals 5, linear, 1-1½ in. long. Corolla purple, tube ⅔ in. long, mouth ¼-⅓ in. diameter. Stamens 5, in the throat of the corolla. Ovary deeply 4-lobed, style bifid, stigmas 2. Nutlets 4, egg-shaped, ⅙ in. long, suddenly sharp-pointed, nearly as broad as long.

Flowers.—June to August.

Locality.—Tosh Maidan, 11,000-12,000 ft., not common; Aporwat, open hill-side, above 11,000 ft., fairly common.

Distribution.—W. Himalaya, from Kashmir to Kumaon, 10,000-13,000 ft., Afghanistan.

Macrotomia perennis, Boiss.

A hairy, perennial herb. Stems 8-20 in. high, solitary or several, unbranched. Leaves oblong, radical ones 5 by ⅓ in., streaked, stem-leaves 1-2 in., stalkless. Spikes 3-4 in. diameter, short, many-flowered. Flower-stalks 0-¼ in. long. Sepals 5, lance-shaped-linear, ⅓-¾ in. long in flower, in fruit sometimes nearly 1 in., hairy. Corolla-tube as long as the sepals in flower or longer by $\frac{1}{10}$-⅛, lobes ⅙ in. long. Nutlets resembling those of the preceding species, but larger.

The flowers vary, some have half-protruding anthers and short 2-lobed stigmas, others have the anthers included in the tube.

Locality.—Karakoram.

Distribution.—Alpine W. Himalaya, from Kashmir to Kumaon, 10,000-14,000 ft., Afghanistan, Kashgar, Yarkand, Alatau Mts.

ONOSMA, Linn.

(From *onos*, ass, and *osme*, odour. Asses are said to fancy the odour of the plant.)

1. Leaves oblong. Anthers included in the tube or slightly protruding ... ... *O. echioides.*
2. Leaves linear, white-hairy beneath. Anthers more than half their length protruding ... ... *O. Thomsoni.*
3. Leaves lance- to egg-lance-shaped. Anthers included in the tube ... ... *O. bracteatum.*

Fig. 3. Onosma echioides, Linn.

(*Echioides* means resembling the *Echium*, a genus of *Boraginaceae.*)

The whole plant covered with bulbous-based hairs. Stem 8-20 in. high. Leaves oblong, stem-leaves 2½ by ½ in. Racemes often forked, 1-6 in. long in fruit. Bracts ½-1 in.

long, leaf-like. Flower-stalks 0-½ in. long. Calyx-lobes 5, ⅓ in. long, narrowly oblong, in fruit often 1 in. Corolla yellow, ¾ in. long, ¼ in. diameter at top, slightly widened upwards, hairless without. Filaments of stamens linear, anthers included in the tube or slightly protruding. Style overtopping the anthers. Nutlets ⅛-¼ in. long, shining, smooth, white, often speckled.

Flowers.—May, June.

Locality.—Steep hill-side S. of Sarban-Lake; near Shirazia Bagh; towards top of Hayan Pass, on grassy ground, above 9,000 ft.

Distribution.—W. Himalaya, from Kashmir to Kumaon, 5,000-10,000 ft.

Onosma Thomsoni, C. B. Clarke.

(After Thomas Thomson, surgeon of the Bengal Army and renowned botanist, 1817-1878; wrote "Western Himalaya and Tibet" in 1852.)

A hairy plant. Stems 1-2 ft. high. Leaves linear, white-woolly beneath, stem-leaves 1½ by ⅛-⅙ in., stiff-hairy above from bulbous bases. Racemes 1-3 in. long, divided. Bracts ⅓ in. long, linear. Flower-stalks 0-¼ in. long. Calyx-lobes 5, linear, ⅓ in. long, scarcely larger in fruit. Corolla ⅓-½ in. long, cylindric, slightly widened upwards, finely hairy, mouth ⅛-⅙ in. wide. Anthers more than half their length protruding. Style overtopping the stamens. Nutlets ⅛ in. long, egg-shaped, somewhat bent, hairless, sides indistinctly angular.

Flowers.—May.

Locality.—Banehal, 6,000 ft.

Distribution.—Apparently endemic in Kashmir.

Onosma bracteatum, Wall.

(*Bracteatum* means provided with bracts.)

A hairy plant. Stems 15 in. high, erect, stout, covered with spreading hairs. Radical leaves lance-shaped, 6 by 1 in., stalked, stem-leaves egg-lance-shaped, 2 by ⅔ in., long-pointed, upper surface stiff-hairy from bulbous bases, silky-white beneath. Flowers in dense, silky heads 2-3 in. diameter. Calyx-lobes in fruit 1 in. long, linear, silky. Corolla ⅙ in. diameter at the mouth, hairy without, tube ½ in. long, slightly widened upwards. Anthers included in the tube; filaments linear. Nutlets ⅙ in. long, egg-shaped, rough.

Distribution.—W. Himalaya, from Kashmir to Kumaon, 11,500 ft.

MYOSOTIS, Linn. The Forget-me-not.

(*Myosotis* from the Greek *mys*, a mouse, and *ous*, *otos*, the ear, alluding to the leaves.)

A. Hairs of stem spreading.
  I. Flower-stalks longer than the calyx.
    1. Corolla ¼-⅓ in. diameter. Limb flat ... ... *M. sylvatica.*
    2. Corolla ⅛-¼ in. diameter. Limb concave ... ... *M. arvensis.*
  II. Flower-stalks shorter than the calyx *M. stricta.*
B. Hairs of stem not spreading (lying flat) ... *M. caespitosa.*

Fig. 4. Myosotis sylvatica, Hoffm. Wood Forget-me-not.

(*Sylvatica* refers to the woodland habitat of this species.)

Stems up to 2 ft. high, with spreading hairs, usually growing in dense clumps, erect, branching above. Leaves oblong, lance-shaped, 1½ by ¼ in., lowest broader and stalked. Flowers a beautiful pale blue, borne on large, loose, one-sided racemes on stalks, usually longer than the calyx. Calyx 5-fid, divided more than half its length, lobes unequal, spreading, but erect in fruit. Corolla ¼-⅓ in. diameter, limb flat, longer than the tube, which is straight. Nutlets 4, brown, keeled, attached by the narrow end.

Flowers.—May to August.

Locality.—Gulmarg, margs, about 8,000 ft., common; Tangmarg in forest, 7,200-8,700 ft., abundant; Khelanmarg, 10,000 ft.; Basam Gali in stony ground, above 10,000 ft.

Distribution.—Alpine W. Himalaya, from Kashmir to Kumaon, 7,000-12,000 ft., arctic Europe, Canaries, Siberia, Dahuria, W. Asia.

Myosotis arvensis, Hoffm. Field Forget-me-not, Field Scorpion Grass.

(*Arvensis* used in allusion to the predilection of this plant for cultivated land.)

Stems erect, many, 6-18 in. high, with spreading hairs. Lower leaves stalked, oblong, blunt, upper sharp-pointed. Flowers blue, bell-shaped. Flower-stalks longer than the calyx. Calyx 5-fid, cleft to the middle, with spreading hairs, lobes lance-shaped. Corolla ⅙-¼ in. diameter, limb concave, as long as the tube. Style very short. Nutlets small, flattened at the sides, brown, bordered, keeled in front.

Locality.—Subalpine regions.

Distribution. — Kashmir, Afghanistan, from Siberia to Europe and N. Africa.

Myosotis stricta, Link.

Stems 3-8 in., erect, with spreading hairs. Leaves oblong, lower almost stalkless, $\frac{3}{4}$ by $\frac{1}{5}$ in., narrowed at both ends. Racemes 3-5 in. Flower-stalks shorter than the calyx. Calyx hairy, some of the hairs spreading at the base, lobes lance-shaped, longer than the tube, erect in fruit. Corolla very small, blue, tube shorter than the calyx, limb concave.

Locality.—At elevations from 5,000-6,000 ft.

Distribution.—Kashmir, Chamba, Afghanistan, W. Asia, Europe, N. Africa.

Myosotis caespitosa, Schultz. Tufted Scorpion Grass.

(*Caespitosa* means tufted.)

A perennial herb with a felt of distant, lying-flat hairs. Stem much-branched, round, 4-20 in. high, branches slender. Leaves bright, shining-green, the radical ones spoon-shaped to oblong, polished, stem-leaves linear to oblong, blunt, or notched, narrowed to the stalkless base. Sepals with straight, closely appressed hairs, blunt, triangular, oblong to egg-shaped, as long as the tube. Flowers bright-blue with a yellow centre, forming a raceme 2-8 in. long. Style not as long as the calyx. Nutlets black, short, broad, bordered, not keeled in front, hairless.

Flowers.—May.

Locality.—Zewan, abounds in damp localities, associating with *Veronica anagallis*; Baltistan.

Distribution.—Temperate and subalpine Himalaya, from Kashmir to Kunawer, Afghanistan to Siberia, Europe, N. Asia, N. America.

MOLTKIA, Lehm.

(After Moltke, the Prussian general.)

Fig. 5. Moltkia parviflora, C. B. Clarke. Small-flowered Moltkia.

A finely hairy herb. Rootstock woody. Annual stems 3-10 in. high, almost erect, sometimes with a long, trailing stem added. Leaves linear-oblong, 2 by $\frac{1}{5}$ in. Racemes 1-2 in. long, dense, sometimes forked, without bracts. Flower-stalks 0-$\frac{1}{6}$ in. Calyx-lobes $\frac{1}{8}$ in. long, narrowly oblong, in fruit $\frac{1}{5}$ in. long. Corolla white with small, erect lobes, hardly overtopping the calyx without scales in the throat. Anthers purple. Filaments of stamens protruding $\frac{1}{8}$ in. Style $\frac{1}{4}$ in. long, violet. Nutlets egg-shaped-oblong, sharp-

pointed, smooth, shining, scar small at the base on the inner side.

Resembles *Mertensia echioides*, but can be distinguished by the short corolla and the longer filaments.

Flowers.—May to August.

Locality.—Tangmarg, forests, 7,200-8,700 ft.; Gulmarg, amongst rocks in wood and by watercourses, 8,000 ft., common.

Distribution.—Kashmir, Afghanistan.

ERITRICHIUM, Schrad.

(From the Greek *erion*, wool, and *trix*, *trichos*, hair, alluding to the hairiness of most species.)

1. Leaves $1\frac{1}{2}$ by $\frac{1}{8}$ in., linear, silky-hairy *E. strictum.*
2. Leaves $\frac{3}{4}$ by $\frac{1}{3}$ in., elliptic, with sharp hairs ... ... *E. tibeticum.*
3. Leaves $\frac{2}{3}$ by $\frac{1}{8}$ in., broadly lance-shaped, softly hairy ... ... *E. basifixum.*

Fig. 6. Eritrichium strictum, Done. (excluding var. **Thomsoni** in Hooker's "Flora of British India").

(*Strictum* means strict, alluding to the stems.)

A perennial herb, silky-white. Rootstock woody. Stems 2-8 in. high, many, undivided. Leaves linear, $1\frac{1}{2}$ by $\frac{1}{8}$ in., softly-silky, lowest ones larger, scarcely stalked. Racemes 1-3 in. long, branched, with very small bracts in the upper part. Flowers $\frac{1}{4}$ in. diameter, blue. Sepals 5, in fruit $\frac{1}{16}$-$\frac{1}{12}$ in. long, oblong. Nutlets forming a pyramid, $\frac{1}{12}$-$\frac{1}{10}$ in. high, with hooked bristles on the margin whose bases are united.

Flowers.—August.

Locality.—Hills above Lian Marg on big rocks, about 11,000 ft.; Baltistan.

Distribution.—W. Himalaya, 7,000-13,000 ft., from Kashmir to the Sutlej.

Eritrichium tibeticum, C. B. Clarke. Tibetan Eritrichium.

A lax, weak, spreading herb. Stems 2-10 in. high, many, slender. Leaves elliptic, mostly stalked, $\frac{3}{4}$ by $\frac{1}{3}$ in. or smaller, blunt, covered with stiff hairs. Racemes long, in fruit 6 in. long. Flower-stalks $\frac{1}{8}$ in. long. Flowers $\frac{1}{8}$ in. diameter. Calyx-lobes egg-shaped-oblong, $\frac{1}{12}$ in. long. Nutlets $\frac{1}{16}$ in. long, egg-shaped, shining, margins entire, somewhat prominent.

Locality.—Ladakh.

Distribution.—W. Himalaya, 9,000-10,000 ft.

Eritrichium basifixum, C. B. Clarke.

(*Basifixum* means fixed to the base, alluding to the peculiar attachment of the nutlets.)

Stems erect, solitary or few, 3-7 in. high, branching at the top. Leaves stalkless, broadly lance-shaped, softly hairy, $\frac{2}{3}$ by $\frac{1}{6}$ in., lower ones densely tufted, upper distant. Racemes dense with bracts, in fruit, $1\frac{1}{2}$ in. long. Flower-stalks 0-$\frac{1}{8}$ in. long. Bracts $\frac{1}{8}$ in. long. Calyx-lobes in fruit $\frac{1}{8}$ in. long, narrowly oblong. Flowers $\frac{1}{4}$ in. diameter and more, blue, purplish. Nutlets $\frac{1}{12}$ in. long, apparently attached by their base, circular back within the margin finely hairy.

Locality.—At altitudes from 13,000-15,000 ft.

Distribution.—Alpine W. Himalaya, from Kashmir to Garhwal.

Plate 46

ASCLEPIADACEAE.

(After *Asclepios* or *Aesculapius*, the Greek god of the healing art.)

CYNANCHUM, Linn.

(From the Greek *kyon*, *kynos*, a dog, and *ancho*, to strangle, alluding to the poisonous properties of some species.)

In this genus the 5 stamens form round the pistil a solid mass which bears appendages. The whole is 5-lobed or bell-shaped, sometimes with small scales within, and is called crown or corona. The pollen of each anther is fused into two waxy masses. Fruit consisting of two long follicles.

A. Twining.
  I. Corolla hairy within ... *C. auriculatum.*
  II. Corolla hairless.
    1. Basal lobes of leaf bent inwards ... ... *C. Heydei.*
    2. Basal lobes of leaf not bent inwards... ... *C. acutum.*

B. Not twining.
  I. Corolla hairless ... ... *C. Vincetoxicum.*
  II. Corolla hairy within.
    1. Corolla yellow ... ... *C. glaucum.*
    2. Corolla dark purple ... *C. Arnottianum.*
    3. Corolla pale greenish ... *C. Jacquemontianum.*

Fig. 1. Cynanchum auriculatum, Wight.

(*Auriculatum* means ear-shaped, alluding to the basal lobes of the leaves.)

Stems twining, hairless except a line of hairs running down between the joints. Leaves broadly egg-shaped or egg-lance-shaped, long-pointed, deeply heart-shaped, 3½-7 by 2-5 in.; stalks with a pair of leaf-like, basal lobes. Flowers forming long-stalked cymes. Flowers many, ⅛-½ in. diameter, yellow-green, Calyx much shorter than the corolla. Corolla hairy within. Corona much shorter than the corolla, cup-shaped, bearing 5 scales near the base within, deeply 5-lobed, lobes free. Fruit consisting of 2 follicles which are 4 by ½ in. long and straight. Seeds ⅓ in. long, flat, flask-shaped, with a toothed broader end.

Flowers.—June.

Locality.—Along road to Kangan; Ferozepore nala, open dry stony hill-side, about 7,000 ft.

Distribution. — Temperate Himalaya, from Kashmir to Sikkim, 6,000-12,000 ft.

Cynanchum Heydei, Hook. f.

Twining, nearly hairless. Leaves lance-shaped, long-pointed, deeply heart-shaped, basal lobes long, bent inwards, often overlapping. Flowers forming slender-stalked corymbs. Corolla hairless. Corona bell-shaped, mouth with 5 long awl-shaped teeth projecting beyond the corolla, each tooth with a short process at its inner base.

Locality.—Ladakh.

Distribution.—Apparently endemic in Kashmir.

Cynanchum acutum, Linn.

Twining, hairless or nearly so. Leaves 1-5 in. long, base broad, 3-lobed or halbert-shaped, or halbert-heart-shaped; on the whole linear or lance-shaped, long-pointed, basal lobes up to 1½ in. long. Flowers forming umbels or corymbs, stalks hairy. Sepals egg-shaped, usually hairy. Corolla ¼ to ¾ in. diameter, hairless, segments egg-shaped-oblong. Corona very variable, sometimes quite simple and cleft deeply into triangular, erect or spreading lobes; sometimes cup-shaped and 5-lobed or with 2-5 awl-shaped lobes. Follicles 4-6 in. long, ⅛-½ in. diameter, straight or slightly curved, narrowed into a slender point. Seeds ¼ in. long, flat.

Locality.—At altitudes of 11,000-13,000 ft.

Distribution.—Kashmir, Afghanistan, Central and W. Asia, Mediterranean.

Cynanchum Vincetoxicum, Pers.

(*Vincetoxicum* is derived from *vincere*, to conquer, and *toxicum*, poison, because the root was used in cases of poisoning.)

Hairy or almost hairless. Stems erect, up to 2 ft. high. Leaves shortly stalked, egg-shaped or heart-shaped, sharp-pointed, 2 by 1½ in. Cymes stalked. Flowers ⅛ in. diameter. Calyx nearly as long as the corolla. Corolla yellow, segments hairless or nearly so. Corona deeply 5-lobed, lobes triangular, oblong or rounded, very variable, without processes inside.

Locality.—At elevations above 7,000 ft.

Distribution.—Temperate Himalaya, from Kashmir to Sikkim, 7,000-11,000 ft., westwards to Norway and Spain.

Cynanchum glaucum, Wall.

(*Glaucum* means sea-green, or bluish-green, alluding to the colour of the leaves.)

Hairy. Stems erect, up to 2 ft. high. Leaves egg-lance-shaped, pale green, 1-3 by 1½-2½ in., very variable in length and breadth, leathery, stalk ¼-½ in. long. Cymes short-stalked or almost stalkless, few- or many-flowered; flower-stalks short. Calyx about half as long as the corolla. Corolla about ⅛ in. diameter, variable in size, yellow, hairy on the inner surface. Corona deeply 5-lobed, lobes broader than long, fleshy. Follicles 2-4 in., slender. Seeds ¼-⅓ in. long, broadly egg-shaped, concave-convex.

Flowers.—May to July.

Locality.—At elevations from 5,000-9,000 ft.

Distribution.—From Kashmir to Nepal, Afghanistan and westward to the Greek Archipelago.

Cynanchum Arnottianum, Wight.

(After George Arnott Walker Arnott, 1799-1868, a distinguished botanist.)

Hairy. Stems erect. Leaves egg-shaped, oblong or lance-shaped, sometimes in whorls. Flowers forming stalkless cymes. Corolla dark purple, lobes hairy within. Corona 5-lobed, lobes oblong or rounded, fleshy, no internal processes.

Flowers.—June.

Locality.—Dara village, 6,000 ft.; along road to Kangan.

Distribution.—W. Himalaya, 6,000-8,000 ft.; Baluchistan.

Cynanchum Jacquemontianum, Dcne.

(After Jacquemont, a French botanist and traveller in India. Died in Bombay.)

Not twining, almost hairless, much-branched, up to 2 ft. high. Branches slender, spreading, or erect from a woody stock. Leaves 1-1½ by ½-⅔ in., sometimes faintly hairy, lance-shaped, long-pointed, heart-shaped at the base, stalk ¼-⅓ in. Flowers forming long-stalked corymbs; flower-stalks slender. Flowers many, ¼-⅓ in. diameter. Sepals egg-shaped. Corolla pale greenish, hairy within. Corona white, as long as the corolla, 5-cleft, lobes awl-lance-shaped, entire or cleft with a small flat process below them.

Flowers.—June.

Locality.—Near Shirazia Bagh, on rocky top of hill

Distribution.—Apparently endemic in Kashmir.

OROBANCHACEAE. The Broom-rape Family.

(Derived from the Greek *orobus*, a vetch, and *ancho*, to strangle, alluding to the parasitic nature of the plants belonging to that family.)

OROBANCHE, Linn. The Broom-rape.

A. No bracteoles (=small leaflets immediately below the flower).
  I. Calyx cleft to the base all round; segments not divided ... ... *O. epithymum.*
  II. Calyx cleft to the base at the back and almost so in front, segments divided.
    1. Flowers blue.
      a. Bracts shorter than the corolla.
        aa. Bracts lance-shaped ... *O. cernua.*
        bb. Bracts egg-shaped ... *O. Hansii.*
      b. Bracts as long as or longer than the corolla ... ... *O. borealis.*
    2. Flowers yellow ... ... *O. Solmsii.*
  III. Calyx cleft to the base at the back, entire in front, equally 5-toothed. Flowers pale brown ... ... *O. kashmirica.*

B. Bracteoles 2.
  I. Calyx cleft to the base only at the back ... ... *O. racemosa.*
  II. Calyx cleft to the base all round ... *O. psila.*

Fig. 2. Orobanche epithymum, DC. Red Thyme Broom-rape.

(*Epithymum* means "on Thymus," alluding to the fact that the plant is parasitic on the Thyme.)

A perennial glandular-hairy, red or purple-brown herb. Stems erect, rather slender, unbranched, scaly, thickened below, 3-12 in. high, leafless. Flowers red-brown, irregular, each in the axil of a bract, forming a spike 1-3 in. long. Calyx deeply divided to the base into 4 unequal, lance-shaped lobes. Corolla 2-lipped, $\frac{2}{3}$ in. long, hairy; tube cylindric, curved; upper lip erect, arched, notched, lower spreading, 3-lobed, margins wavy, finely toothed. Stamens 4, included in the tube, in unequal pairs, attached near the base of the tube; filaments hairy at the base. Ovary egg-shaped, 1-celled. Style long, curved; stigma broad, indistinctly 2-lobed, dark brownish-purple. Capsule opening by 2 valves. Seeds many, very small.

Flowers.—June.

Locality.—Neighbourhood of Srinagar; Chashma.

Distribution.—W. Himalaya, from Kashmir (7,000-11,000 ft.) to Kumaon (13,000 ft.); W. and Central Asia, Europe.

Fig. 3. Orobanche cernua, Loeffl.

(*Cernua* means curved, alluding to the corolla.)

Stems one or more, stout or slender, 6-12 in. high, pale brown or bluish, scales egg-shaped, upper ones sharp- or long-pointed. Flower-spikes dense, about half as long as the stem or longer. Flowers blue; bracts lance-shaped, shorter than the corolla, cleft to the middle, segments lance-shaped; bracteoles none. Calyx half as long as the corolla, segments cleft to the middle or entire. Corolla $\frac{1}{2}$-$\frac{3}{4}$ in. long, curved outwards, glabrous or sometimes slightly hairy above, lobes crenate, not hairy on the margin, the 2 upper broad, the 3 lower egg-shaped, long-pointed. Filaments hairless; anther-cells long-pointed, hairless or slightly hairy. Style glabrous; lobes of stigma short, thick.

Flowers.—June.

Locality.—Neighbourhood of Srinagar; Baltistan and Gilgit up to 12,000 ft.; Chashma.

Distribution.—W. Himalaya, from Kashmir to Nepal,

Punjab, Bengal, Central India, Central Provinces to S. India, extending to N. Africa and Spain, extra-tropical Australia.

Orobanche Hansii, Kerner.

A hairy plant. Flower-spikes dense. Flowers deep blue. Bracts egg-shaped, shorter than the corolla, with strong, parallel nerves. Calyx half as long as the corolla, divided to the base at the back, entire in front, segments cleft to the middle, lobes lance-shaped. Corolla 1 in. long, nearly straight, hairless, lobes crenate, not hairy on the margin. Filaments hairless; anthers hairy.

Locality.—Karakoram, 8,000-12,000 ft.

Distribution.—Kashmir, Lahul.

Orobanche borealis, Turcz. Northern Broom-rape.

A mealy-hairy plant. Stem stout, simple, 6-10 in. high, rarely more. Scales few, ¼-⅔ in. long, oblong or egg-lance-shaped. Flower-spikes 2-4 in. long, dense-flowered. Bracts egg-lance-shaped, as long as or longer than the flower. Calyx half as long as the corolla-tube or less, with 4, awl-shaped, long teeth and a middle very short one. Corolla ½ in. long, hairy, tube broad, curved; lobes crenate, blue. Filaments and anthers hairless.

Locality.—Kishtwar, 7,000-8,000 ft.; Karakoram, 13,000 ft

Distribution.—Kashmir, Central Asia.

Orobanche Solmsii, C. B. Clarke.

A robust, hairy plant. Stems 12-18 in. high. Scales ½-1 in. long, lance-shaped. Bracts very variable, narrow, usually longer than the flowers, lance-shaped. No bracteoles. Flower-spikes 6-10 in. long, dense-flowered. Calyx half as long as the corolla, 5-toothed, cleft to the base at the back, nearly so in front, with a very small tooth in the sinus, side-lobes 2-fid to the middle. Corolla yellow, 2-lipped, ½-¾ in. long, curved, lobes crenulate. Pistil and stamens hairless, except for the style which has a few small weak hairs. Stamens 6.

Flowers.—June.

Locality.—Neighbourhood of Srinagar; Chashma; Kishtwar, up to 11,000 ft.

Distribution.—W. Himalaya, from Kashmir to Kumaon.

Orobanche kashmirica, C. B. Clarke. Kashmir Broom-rape.

A hairy, pale brown plant. Stem simple, up to 1 ft. high. Scales lance-shaped, ¼-½ in. long, few, distant. Bracts lance-shaped, ¼-⅓ in. long, longer than the calyx. No bracteoles. Calyx ¼ in. long, equally 5-toothed, cleft to the base at the back, entire in front, short, teeth broad, sharp-pointed. Corolla pale brown, ½-⅔ in. long, softly hairy, tube broad, lobes rounded. Filaments attached to the base of the corolla, hairy below; anthers small, included in the tube, minutely hairy.

Locality.—Tilail, 11,000 ft. (Clarke).

Distribution.—Apparently endemic.

Orobanche ramosa, Linn. Branching Broom-rape.

Mealy-hairy or almost hairless. Stem 6-12 in. high, usually thick below and at once dividing into rather slender erect branches. Scales few. Flower-spikes slender, longer than the stem, lax-flowered, narrowed upwards. Bracts egg-shaped, long-pointed, shorter than the corolla-tube, variable in length. Bracteoles filiform. Calyx half the length of the corolla-tube, lobes slender, awl-shaped, broad at the base. Corolla ½-⅔ in. long, hairy within and without, tube narrow, white, lobes blue, hairy on the margin. Filaments hairless, anthers sparsely hairy or hairless.

Locality.—Jammu.

Distribution.—From Kashmir to Europe and N. Africa.

Orobanche psila, C. B. Clarke.

(*Psila* is a Greek word and means naked.)

Mealy-hairy. Stem 12-18 in. high, simple, slender. Scales long, awl-lance-shaped, ½-1 in. long. Flower-spike short, lax-flowered, 2-3 in. long, blunt at tip. Bracts lance-shaped, as long as the flower, lower ones ¾ in. long. Bracteoles filiform. Calyx half as long as the corolla. Corolla blue, ½-⅔ in. long, curved, hairy within and without, lobes very hairy within, 2 upper ones rounded, 2 lower elliptic. Filaments and anthers hairy.

Locality.—Mapanon, 9,000 ft. (Clarke).

Distribution.—Apparently endemic.

CONVOLVULACEAE. The Convolvulus Family.

CUSCUTA, Linn. The Dodder.

(*Cuscuta* is the Italian name of the plant, also called *cassuto* and perhaps derived from this. *Cassuto* comes from the Greek *kassyo*, to stick together, because the Dodder entwines other plants; according to others it is derived from the Arabic *Chasuth.*)

Leafless, twining parasites.

A. Styles 2, distinct.

I. Flowers forming heads. Stigmas elongate or linear.

1. Styles as long as the stigmas ... *C. capitata.*
2. Styles shorter than the stigmas.
   a. Corolla-tube as long as the calyx *C. europaea.*
   b. Corolla-tube longer than the calyx *C. planiflora.*

II. Flowers not forming heads. Stigmas pin-head shaped ... ... *C. chinensis.*

B. Style 1.

I. Corolla $\frac{1}{4}$-$\frac{1}{3}$ in. long ... ... *C. reflexa.*
II. Corolla $\frac{1}{6}$-$\frac{1}{5}$ in. long ... ... *C. gigantea.*

Fig. 4. Cuscuta capitata, Roxb.

(*Capitata* means head-shaped, alluding to the flowers forming heads.)

A slender, rose-coloured plant. Flowers small, forming heads. Sepals $\frac{1}{20}$-$\frac{1}{16}$ in. long, egg-shaped. Corolla scarcely $\frac{1}{8}$ in. long, contracted at the mouth, covered with very small warts without, lobes 5, small, triangular, almost erect, small scales low in the corolla slightly fringed. Styles linear-lance-shaped, as long as the short-linear stigmas. Stamens inserted near the throat of the corolla-tube, filaments short, linear. Fruit a capsule, $\frac{1}{12}$ in. long, very thin and fragile, enclosed by the unchanged corolla, irregularly breaking up from the base. Seeds 4, brown, ellipsoid.

Flowers.—June.

Locality.—Takht, on a shrub belonging to the *Labiatae.*

Distribution.—Temperate W. Himalaya, 6,000-12,000 ft., from Kashmir to Simla, Afghanistan.

Cuscuta europaea, Linn. Greater Dodder, Beggarweed, Devil's Guts, Hairweed, Strangle Tare.

Stems pale yellow or pink. Flowers waxy white, often tinged with pink, stalkless in many small globose heads. Calyx-tube hardly $\frac{1}{12}$ in. long, cylindric, becoming globose in fruit, lobes 5-4, egg-shaped-triangular, erect. Corolla $\frac{1}{12}$ in. long, egg-shaped, lobes 5-4, egg-shaped or triangular, scales near the base of the filaments, blunt or notched. Anthers yellow. Styles 2, distinct, shorter than the linear, purple stigmas. Capsule $\frac{1}{12}$ in. long, fragile. Seeds usually 4, brown, ellipsoid.

Flowers.—May, June.

Locality.—Gagribal; near Shirazia Bagh.

Distribution.—Temperate Himalaya, 5,000-12,000 ft., from Kashmir to Sikkim, Central and W. Asia, Europe.

Cuscuta planiflora, Tenore.

Resembling the preceding species. Flowers in stalkless, globose heads. Calyx and corolla often glistening on account of their large, lax tissue. Sepals egg-shaped-oblong. Corolla-tube longer than the calyx; scales in the tube fringed. Styles 2, shorter than the linear stigmas.

Locality.—At elevations up to 6,000 ft.

Distribution.—Kashmir, Punjab, Central Asia, Mediterranean.

Cuscuta chinensis, Lam. Chinese Dodder.

Stems filiform, twining, much-branched, often forming a tangled mass. Flowers solitary or in short-stalked cymes; flower-stalks short. Bracts egg-shaped, $\frac{1}{20}$ in. long. Calyx $\frac{1}{10}$ in. long, cleft rather less than half-way down, lobes triangular-egg-shaped, often with a tubercular keel on the back. Corolla $\frac{1}{10}$ in. long; lobes about as long as the tube, egg-shaped-oblong; scales at the base of the filaments fringed. Styles 2, distinct. Capsules hardly $\frac{1}{10}$ in. diameter, globose, divided into 2 lobes by a deep furrow on top. Seeds usually 4.

Locality.—At altitudes up to 7,000 ft.

Distribution.—Kashmir to Chamba, throughout the greater part of India, Ceylon, Persia, eastwards to Australia.

Cuscuta reflexa, Roxb.

(*Reflexa* means bent back, alluding to the lobes of the corolla.)

Stems long, branching, closely twining, hairless; branches stout, fleshy, forming dense, yellow masses on low trees and shrubs. Flowers solitary or in clusters or forming short

racemes; flower-stalks short, usually curved, often warty, rarely absent. Bracts small, fleshy. Calyx cleft almost to the base, segments egg-shaped, blunt. Corolla white; tube ¼-⅓ in. long, almost cylindrical, lobes short, triangular, bent back; scales prominent, attached near the base of the corolla-tube, fringed. Style 1, short, stout; stigmas large, distinct, wide apart. Capsule ¼-⅓ in. diameter, globose, depressed. Seeds 2-4, large.

Flowers.—July, August.

Locality.—At elevations up to 8,000 ft.

Distribution.—Throughout India, Ceylon, Burma, Malaya, China.

Cuscuta gigantea, Griff. Gigantic Dodder.

A much more slender plant than the preceding species. Flowers in irregular clusters or short spikes, not in heads. Bracts ½-¼ in. long, egg-shaped. Sepals ⅛ in. long, egg-shaped, blunt. Corolla ⅙-⅕ in. long, cylindric; lobes 5, erect or bent back; scales near the base of the corolla-tube, elliptic, shortly fringed. Style short, stigmas tongue-shaped. Capsule ⅙-⅕ in. long, membranous. Seeds 2, broadly rhombiform, black.

Locality.—At higher altitudes.

Distribution.—W. Himalaya, Afghanistan.

POLEMONIACEAE. The Jacob's Ladder Family.

(Derivation of the word *Polemonion* very uncertain. The name was already used by Dioscorides, but we do not know what plant he meant. Pliny, xxv, 28, derives the word from *polemos*, war, because several kings are said to have quarrelled over the priority of having discovered the medicinal qualities of a certain plant. Equally uncertain is the derivation from *Polemon*, a king of Pontus).

POLEMONIUM, Linn.

Fig. 5. Polemonium coeruleum, Linn. Jacob's Ladder.

Coventry, pl. XXXV.

(*Coeruleum* means sky-blue.)

A perennial herb. Stem 1-4 ft. high, erect, leafy, hairless below, glandular above. Leaves pinnate, 5 by 3 in., the lower ones long-stalked, the upper ones short-stalked, the uppermost sessile; leaflets about 27, stalkless, oblong-lance-shaped, long-pointed, oblique-rounded at the base. Flowers many, forming a corymb, often clustered, stalks glandular,

shorter than the calyx. Calyx bell-shaped, lobes egg-shaped or lance-shaped-oblong. Corolla blue, sometimes white, 2-3 times longer than the calyx, 1 in. diameter or more. Stamens 5, attached near the base of the corolla, bearded at the base, generally as long as the corolla. Style slightly longer than the corolla. Capsule $\frac{1}{5}$ in. long, ellipsoid, overtopped by the persistent calyx. Seeds $\frac{1}{10}$ in. long, many, oblong, smooth, black, not winged.

Flowers.—May to August.

Locality.—Gulmarg, fir forests, above 8,000-8,700 ft., very common; Tangmarg, forests 7,200-8,700 ft.; below Tosh Maidan, 9,600 ft.; Basam Gali in Juniper tract, above 10,000 ft.

Distribution.—Alpine W. Himalaya, 7,000-12,000 ft., from Kashmir to Kumaon, Central and N. Asia, Europe, N. America.

LENTIBULARIACEAE. The Butterwort Family.

(Derived from *lens*, a lentil, and *tubulus*, a small tube, in allusion to the lenticular shape of the air-bladders borne on the leaves of many species.)

UTRICULARIA, Linn. The Bladderworts.

(From *utriculus*, a small bag or bottle made from an animal's hide, so named from the bladders connected with the leaves.)

A. In water.

I. Stems stout. Leaves 1½-3 in. long ... *U. flexuosa.*

II. Stems very slender.

1. Leaves not much dissected, about ¼ in. long. Corolla yellow with darker streaks ... ... *U. exoleta.*
2. Leaves much dissected. Corolla pale yellow... ... ... *U. minor.*

B. On land ... ... *U. striatula.*

Fig. 6. Utricularia flexuosa, Vahl. Bladderwort. Coventry, pl. XXXIX.

(*Flexuosa* means full of windings, tortuous, alluding to the stem.)

An aquatic herb, all, except the inflorescence, under water. Stolons stout, much-branched and often very long. Leaves 1½ to 3 in. long, usually in whorls of 4, pinnately divided into many filiform comblike segments, each leaflet usually bearing at its base a small, almost globose bladder which becomes

black by age. Flowers 3-8, in erect racemes; stalk of raceme up to 9 in. long, rather stout, naked or with a few small scales, without a whorl of floats below the flowers, but the whorl of leaves at the base of the raceme-stalk has often its rhachis more or less inflated and thus acts as a float. Bracts small, egg-shaped. Flower-stalks $\frac{1}{4}$ to $\frac{3}{4}$ in. long, bent down in fruit. Calyx $\frac{1}{8}$-$\frac{1}{6}$ in. long, lobes almost equal, egg-shaped. Corolla yellow, $\frac{1}{3}$-$\frac{1}{2}$ in. across; spur nearly as long as the lower lip. Capsule almost globose, $\frac{1}{6}$ in. long. Seeds $\frac{1}{30}$-$\frac{1}{20}$ in. diameter, disc-shaped, irregularly 4-6-angled.

Flowers.—July.

Locality.—Dal Lake.

Distribution.—Throughout the greater part of India and in Ceylon, extending to Malaya, tropical Africa and N. Australia.

Utricularia exoleta, R. Br.

(*Exoleta* means grown up, full grown, mature.)

A small, aquatic herb floating in water or growing on liquid mud. Stolons very slender, varying in length; branches slender, flattened. Leaves variable, rarely more than $\frac{1}{4}$ in. long, not much dissected, the segments all capillary, but one or more represented by bladders, or the whole leaf transformed into a bladder. Racemes 1-3-flowered; raceme-stalk slender, $1\frac{1}{2}$-3 in. long, with a very small, bract-like scale below the middle. Flower-stalks slender, $\frac{1}{6}$-$\frac{1}{3}$ in. long, erect in fruit; bracteoles very small, egg-shaped. Calyx $\frac{1}{10}$ in. long, segments broadly elliptic. Corolla yellow with darker streaks, $\frac{1}{5}$-$\frac{1}{4}$ in. long; spur as long as or slightly longer than the lower lip. Capsule globose, $\frac{1}{8}$-$\frac{1}{6}$ in. diameter. Seeds disc-shaped, with a broad, corky ring.

Locality.—At lower elevations.

Distribution.—Throughout India from the N.W. Himalaya and Assam to Ceylon, extending to S.E. Asia, Malaya and N. Australia.

Utricularia minor, Linn. Smaller Bladderwort.

Stems thread-like, 4-12 in. high. Leaves regularly forked in two parts, much divided, loose, broad, round, with awl-like, entire segments, not fringed with hairs. Bladders with slender stalks. Flowering stem 3-9 in. long, 2-8-flowered. Flowers small, pale yellow; stalks 2-3 times as long as the calyx, bent down in fruit. Sepals round, long-pointed. Corolla $\frac{1}{3}$ in. long, lower lip much longer than the upper, broadly egg-shaped, with a flat, spreading margin. Spur very short, small, blunt. Capsule globose, as long as the calyx.

Locality.—Nubru, 11,000 ft.

Distribution.—Alpine W. Himalaya, Central and W. Asia, Europe.

Utricularia striatula, Smith (= **U. orbiculata,** Wall.). Round-leafed Bladderwort.

A small, delicate herb. Stems thread-like, creeping, leafy. Leaves forming rosettes or alternate, crowded, round or inversely egg-shaped, about $\frac{1}{8}$ in. diameter, interspersed with very small, bladder-like vessels. Flowers few, lilac, irregular, $\frac{1}{4}$ in. long, forming racemes on very slender erect, naked stalks 2-6 in. high. Calyx divided nearly to the base into 2 unequal, rounded segments. Corolla 2-lipped; spur curved, pointed; upper lip very short, erect or bent back, notched; lower much larger, spreading, obscurely 3-lobed. Capsule globose, surrounded by the enlarged calyx. Seeds many, very small.

The colour of the flower varies. It may be lilac or violet, with a yellow spot at the base of the lower lip, or the upper lip is white and the lower white with lilac margins and yellow in the throat, or the lower lip may be pinkish or whitish with the spots of yellow prevailing.

Locality.—At elevations up to 8,000 ft.

Distribution.—More or less throughout India in the hills, Ceylon, Malaya, S. China, tropical Africa.

SOLANACEAE.

(*Solanum* was already used by Pliny for this genus, and very likely for other genera of the family. Derived, in all probability. from *solare*, to cause sunstroke or madness, on account of the poisonous properties of many species.)

ATROPA, Linn.

(From the Greek *Atropos*, the name of one of the Fates, who was fabled to cut the thread of life, alluding to the toxic properties of the plant.)

Figs. 7 and 8. Atropa belladonna, Linn. Deadly Nightshade Belladonna, Banewort, Naughty Man's Cherry, Death's Herb, Dwale.

(*Belladonna* means a beautiful woman. Tournefort gave the plant this name because in Italy the women used the berry to give lustre to their eyes.)

An erect, glandular-hairy or almost hairless herb, 2-5 ft. high. Leaves stalked, egg-lance-shaped, 4-8 in. long, entire,

long-pointed, upper ones usually with a much smaller leaf arising from the same point. Flowers pale purple, tinged with yellow or green, $\frac{1}{4}$ in. diameter, single on drooping, usually axillary stalks. Calyx cleft nearly to the base, segments leaf-like. Corolla bell-shaped; lobes 5, short, broad, spreading. Style longer than the corolla; stigma green: Berry globose, $\frac{3}{4}$ in. diameter, purple-black, surrounded at the base by the enlarged spreading calyx.

Flowers.—August, September.

Locality. — Gulmarg, edge of woods and margs, above 7,500 ft., common.

Distribution.—W. Himalaya, 6,000-11,000 ft., from Kashmir to Simla, W. Asia, Europe.

Plate 47

SCROPHULARIACEAE. The Figwort Family.

(So named in reference to the medicinal qualities of *Scrophularia nodosa* in cases of scrofula.)

VERONICA, Linn. The Speedwell.

(*Veronica* is said by some to be a corruption of the Arabic *viroonikoo*, beautiful remembrance; others derive it from the Greek *hiera eicon*, sacred image. It is also possible that the name was given in honour of St. Veronica, or it may be a corruption of *Betonica*, more correctly *Vettonica*, which was united with *Veronica* by former writers.)

The flowers are never yellow in this genus.

A. Racemes axillary.

I. Capsule not notched at tip (fig. 3) ... *V. deltigera.*

II. Capsule notched at tip.

1. Leaves 2-6 in. long, entire or nearly so ... ... *V. anagallis.*
2. Leaves 1-2 in. long, coarsely toothed.
   - *a.* Racemes 3-10 in. long (fig. 2) *V. laxa.*
   - *b.* Racemes 2-4 in. long (fig. 1) ... *V. Beccabunga.*

B. Racemes terminal.

I. Capsule egg-shaped-oblong. Seeds flattened.
1. Capsule blunt at tip (fig. 3) ... *V. deltigera.*
2. Capsule notched at tip ... ... *V. ciliata.*

II. Capsule 2-lobed, lobes globose or flattened. Seeds cup-shaped or deeply grooved on one side.
1. Leaves 5-7-lobed ... ... *V. hederaefolia.*
2. Leaves not lobed.
a. Flower-stalks about as long as the leaves ... ... *V. agrestis.*
b. Flower-stalks longer than the leaves.
aa. Cells of capsule 5-12-seeded *V. persica.*
bb. Cells of capsule 2-5-seeded.
* Capsule cleft nearly to the base ... ... *V. Hallbergii.*
** Capsule less deeply cleft *V. biloba.*

III. Capsule laterally flattened, broadly, inversely heart-shaped. Seeds much flattened.
1. Leaves deeply divided ... ... *V. verna.*
2. Leaves simple.
a. Capsule smooth ... ... *V. serpyllifolia.*
b. Capsule glandular-hairy ... *V. arvensis.*

The three species figured will be described first, the rest follow in alphabetical order.

Fig. 1. Veronica Beccabunga, Linn. Brooklime, Becky-leaves, Cow-cress, Horse-well Grass, Water Pimpernel, Well-ink.

(*Beccabunga* is the German *Bachbunge: Bach*, a brook, *Bunge*, a drum or an inflated body. The plant was used against abdominal dropsy, which disease was, therefore, called Bungensucht or Trommelsucht.)

A half-aquatic fleshy plant, hairless or slightly hairy, reddish, branched. Stem hollow, prostrate, ascending at the tip, giving off roots at intervals, up to 2 ft. high, branches 6-18 in. long, spreading. Leaves 1-2 in. long, stalkless or short-stalked, oval, rarely inversely egg-shaped, blunt, coarsely toothed, smooth, fleshy, opposite. Flowers few or many, forming axillary racemes 2-4 in. long. Bracts usually shorter

than the flower-stalks, which are spreading. Sepals egg-shaped-oblong, not as long as the corolla. Corolla $\frac{1}{3}$ in. diameter, blue or pink; petals oval, unequal. Capsule round, flat, slightly larger than the sepals, swollen, notched at tip. Seeds winged, flattened, smooth.

Flowers.—May to October.

Locality.—Between Srinagar and Gulmarg on damp ground; Gulmarg, among stones in watercourses, about 8,000 ft., common; Dachigam Rakh.

Distribution.—W. Himalaya, from the Punjab and Kashmir to Kunawer, 9,000-12,000 ft., Afghanistan, N. Asia to Japan, Abyssinia, Europe.

Fig. 2. Veronica laxa, Benth.

(*Laxa* means loose, alluding to the loose racemes.)

A perennial herb, hairless or hairy. Stems 10-20 in. high, ascending, weak. Leaves stalkless, egg-shaped or heart-shaped, 1-2 by $\frac{3}{4}$-$1\frac{1}{4}$ in., coarsely toothed, hairy on both surfaces. Racemes in the axils of the leaves, 3-10 in. long, loose-flowered. Bracts linear-oblong, longer or shorter than the flower-stalks. Sepals unequal, enlarged in fruit. Corolla $\frac{1}{4}$-$\frac{1}{3}$ in. diameter, blue or purplish-blue, throat more reddish. Filaments purplish, anthers white. Style purple. Capsule $\frac{1}{6}$ in. diameter, as long as or shorter than the sepals, notched, ciliate.

Flowers.—May to August.

Locality.—Gulmarg, open margs, above 7,000 ft., common; Tangmarg 7,100 ft., forests 7,200-8,700 ft.; towards top of Hayan Pass, above 9,000 ft.

Distribution.—W. Himalaya, from Kashmir to Kumaon, 5,000-11,000 ft., Japan.

Fig. 3. Veronica deltigera, Wall.

Stems many from the root, more or less erect, 6-18 in. high, leafy, slightly hairy. Leaves stalkless or short-stalked, egg-shaped or egg-shaped-oblong or oblong-lance-shaped, toothed, $\frac{3}{4}$-$1\frac{1}{2}$ by $\frac{1}{4}$-$\frac{3}{4}$ in., base rounded or sharp-pointed. Racemes terminal or in the axils of the leaves, 3-6 in. long, many- and lax-flowered, slender, erect, hairy; lower bracts often leaf-like, upper oblong. Stalks of lower flowers often $\frac{1}{2}$-$\frac{3}{4}$ in. long, of the upper shorter. Sepals 4, linear-oblong, $\frac{1}{3}$-$\frac{1}{2}$ in. long. Corolla $\frac{3}{4}$ in. across or less, lobes broad. Stamens 2, protruding. Fruit $\frac{1}{6}$ in. long, oblong-egg-shaped, blunt at tip, as long as or much shorter than the sepals.

Flowers.—August.

Locality.—Lian Marg, on big rocks by nala, about 9,000 ft., local.

Distribution.—W. alpine Himalaya, from Kashmir to Nepal, 8,000-12,000 ft., Afghanistan.

Veronica agrestis, Linn. Green Field Speedwell.

A prostrate, more or less hairy annual. Stem spreading, 6-18 in. long, much-branched. Leaves short-stalked, $\frac{1}{8}$-1 in. long, broadly egg-shaped, heart-shaped, coarsely toothed. Flower-stalks axillary, solitary, about as long as the leaves, bent down in fruit. Sepals $\frac{1}{4}$ in. long, egg-shaped, blunt, fringed with hairs, 3-nerved in fruit, unequal. Corolla shorter or longer than the sepals, blue or white. Capsule $\frac{1}{4}$ in. diameter, 2-lobed, swollen, cells 4-10-seeded. Seeds oblong or rounded, cup-shaped, tubercled, pale.

Flowers.—March.

Locality.—Srinagar on the banks of the Jhelum near the Residency; Baltistan.

Usually in cultivated ground, fields and waste places, or the wayside.

Distribution.—Punjab Plain and W. Himalaya, from Kashmir to Kumaon up to 9,000 ft., Central Bengal, extending to Europe, N. Africa, China, Japan and the Loochoo Islands.

Veronica anagallis, Linn. Speedwell.

(Called so because the plant resembles somewhat *Anagallis*, the Pimpernel, a genus of the family *Primulaceae.*)

A fleshy, usually hairless herb. Stems hollow, erect or ascending, 6-24 in. high, up to 1 in. diameter. Leaves stalkless and half-stem-clasping or the lowest stalked, $1\frac{1}{4}$-6 by $\frac{1}{4}$-$\frac{3}{4}$ in., oblong or oblong-lance-shaped, entire or nearly so, hairless, usually heart-shaped at the base. Flowers in axillary, lax, slender racemes, 3-6 in. long. Bracts beneath the pedicels linear-lance-shaped, $\frac{1}{10}$-$\frac{1}{6}$ in. long. Flower-stalks $\frac{1}{8}$-$\frac{1}{4}$ in. long, filiform. Calyx $\frac{1}{16}$-$\frac{1}{8}$ in. long, cleft to the base; sepals egg-shaped. Corolla $\frac{1}{6}$-$\frac{1}{4}$ in. across, pale purple, or pink, or white; tube very short. Fruit compressed, $\frac{1}{8}$-$\frac{1}{6}$ in. long, notched, hairless. Seeds ellipsoid-oblong, biconvex.

A very variable plant and many forms have been distinguished.

Flowers.—May.

Locality.—In a marsh above Drogjun; Baltistan.

Distribution.—Punjab, Kashmir, Bhutan, Bengal, Assam, W. Peninsula, N. Asia, Europe, S. Africa, N. America.

Veronica arvensis, Linn. Wall Speedwell, Corn Speedwell.

(*Arvensis* refers to a supposed preference for arable land.)

An annual herb, hairy or glandular hairy. Stems erect or ascending, 2-10 in. high, often branching from the base. Leaves stalkless, or the lowest short-stalked, egg-shaped, ¼-½ in. long, crenate ; lower opposite, without flowers, gradually passing into small, alternate, entire bracts, each bearing in its axil a single flower. Flowers very small, pale or deep blue, almost stalkless, falling off at the least touch. Sepals narrow, blunt, ciliate. Corolla wheel-like, with a short white tube, segments 4. Capsule flat, inversely heart-shaped, pale brown, up to ⅛ in. broad, glandular-hairy, shorter than the calyx. Seeds about 6, oval, flattened at the border, with a depression down the middle.

Flowers.—May.

Locality.—Srinagar, on the banks of the Jhelum ; Dachigam Rakh ; Kishtwar.

Distribution.—W. Himalaya, from Kashmir to Garhwal, 7,000-9,000 ft., temperate Asia, N. Africa, Europe, introduced into America.

Veronica biloba, Linn.

(*Biloba* means 2-lobed, alluding to the deeply lobed fruit.)

An annual, pubescent herb. Stems erect or ascending, diffusely branched from the base. Branches 4-18 in. long, sparsely leafy, running into very loose racemes. Leaves stalkless or very short-stalked, oblong or egg-lance-shaped, ¼-1 in. long, more or less toothed ; the lowest opposite, without flowers ; upper alternate, gradually passing into short, entire bracts, each bearing in its axil a single flower. Flowers blue, ¼ in. diameter, drooping, stalk longer than the leaves or bracts. Sepals ⅛ in. long, in fruit up to ½ in., spreading. Corolla shorter than the calyx. Capsule deeply lobed, much broader than long, flattened, cells 2-4-seeded. Seeds oblong, boat-shaped, more or less deeply pitted.

Flowers.—May, June.

Locality.—Srinagar, on the banks of the Jhelum near the Residency ; Tangmarg, 7,100 ft., forests 7,200-8,700 ft. ; Gulmarg, 8,600-8,700 ft. ; Tosh Maidan, 11,500 ft.

Distribution.—W. Himalaya, from Kashmir to Kumaon, up to 15,000 ft., westward to Asia Minor, Soongaria.

Veronica ciliata, Fisch. Hairy Speedwell.

Hairy all over. Stem 4-12 in. high, stiff, erect, usually simple. Leaves stalkless, egg-shaped or oblong, blunt at the tip, entire or toothed, $\frac{2}{3}$-$1\frac{1}{2}$ in. long, hairy on both surfaces. Flowers stalkless, forming stalkless or stalked hairy heads; bracts as long as the heads. Sepals 4, oblong, blunt at tip, $\frac{1}{4}$ in. long. Corolla $\frac{1}{4}$ in. diameter, lobes broad. Stamens 2, included. Fruit egg-shaped-oblong, blunt and notched at tip, very variable in size, as long as or longer than the calyx. Seeds round, compressed, plano-convex.

Flowers.—July.

Locality.—Tosh Maidan to Damam Sar, 13,000 ft.

Distribution.—Alpine Himalaya, from Kashmir to Sikkim, 11,000-16,000 ft., Central Asia, Siberia.

Veronica Hallbergii, Blatter, sp. nov. Hallberg's Speedwell.

This species is nearly related to *Veronica biloba*, Linn., but can be distinguished by the following: Corolla small, bluish. Calyx in fruit smaller. Capsule less flattened, divided nearly to the base, lobes diverging. Seeds about 5 in each cell, caterpillar-like, pale brown, with a deep groove on one side, the other side being very strongly transversely ribbed, with about 6 constrictions.

Flowers.—May.

Locality.—Srinagar on the banks of the Jhelum, near the Residency.

Veronica hederaefolia, Linn. Ivy-leafed Speedwell, Bird's Eye, Botherum, Corn Speedwell, Hen-bit, Ivy Chickweed.

(*Hederaefolia* means having leaves like the *Hedera* or Ivy.)

An annual. Stem trailing, many-branched, round, soft, covered with soft hair. Leaves $\frac{1}{3}$-$\frac{2}{3}$ in. diameter, stalked, round-egg-shaped, 5-7-lobed with wide angles, alternate, heart-shaped at the base, fleshy, hairy. Flowers pale blue, in the axils, borne on 1-flowered stalks which in fruit are turned back. Flower-stalks about as long as the leaves. Sepals 4, heart-shaped, long-pointed, hairy on the margins, longer than the corolla. Corolla $\frac{1}{6}$ in. diameter, bell-shaped, petals oval, the lower of which are less than the calyx and hairy within. Capsule consisting of 2 swollen heart-shaped lobes, containing 1-2 seeds in each. Seeds large, wrinkled, hemispherical, with

a very deep cup-shaped depression on the inner face, very light brown to black.

Flowers and Fruits.—May.

Locality.—Srinagar on the banks of the Jhelum near the Residency; Tangmarg, 7,100 ft.; Gadsar; nearly always found on sand soil or gravel.

Distribution.—Kashmir, China, Japan, W. Asia, N. Africa, Europe.

Veronica persica, Poir. Persian Speedwell.

A prostrate, hairy annual. Branches 6-12 in. long. Leaves short-stalked, oblong or egg-shaped, $\frac{1}{2}$-$1\frac{1}{3}$ in. long, blunt at tip, coarsely toothed, base rounded or heart-shaped. Flowers solitary in the axils of leaves. Flower-stalk slender, much longer than the leaves, bent down in fruit. Sepals $\frac{1}{4}$ in. long, egg- or lance-shaped, in fruit much longer than the capsule, spreading. Corolla $\frac{1}{2}$ in. diameter, bright blue. Capsule $\frac{1}{3}$-$\frac{1}{2}$ in. diameter, very much broader than long, flattened, cells 5-12-seeded. Seeds boat-shaped, deeply pitted.

Flowers.—May.

Locality.—Srinagar on the banks of the Jhelum near the Residency.

Distribution.—W. Himalaya, up to 7,000 ft., Central and W. Asia, Europe, N. Africa.

Veronica serpyllifolia, Linn. Thyme-leafed Speedwell.

A perennial herb, hairless or hairy, often glandular. Stems ascending, 3-12 in. high. Leaves stalkless or the lowest short-stalked, oblong-egg-shaped; lower opposite, without flowers, gradually passing into small, alternate bracts, each bearing in its axil a single flower. Flowers small, $\frac{1}{4}$ in. diameter, pale blue or white, short-stalked. Sepals $\frac{1}{8}$-$\frac{1}{6}$ in. long, inversely egg-shaped, oblong, fringed with hairs, shorter than the corolla. Corolla $\frac{1}{4}$ in. diameter. Anthers blue. Styles as long as the capsules, purplish. Capsule inversely heart-shaped, not as long as broad, smooth, shorter than the calyx. Seeds small, plano-convex.

Flowers.—May.

Locality.—Tangmarg, 7,100 ft.; Gulmarg, 8,600-8,700 ft. Khelanmarg, 10,000 ft.

Distribution.—Temperate and subalpine W. Himalaya, from Kashmir to Kumaon, 7,000-13,000 ft., N. Asia, N. Africa, Europe, N. and S. America.

Veronica verna, Linn. Vernal Speedwell.

An erect annual. Stem 2-6 in. high, simple or branched below, hairy or downy, glandular above. Leaves $\frac{1}{8}$-$\frac{1}{2}$ in. long, deeply divided to the base, the lower stalked, coarsely toothed, lobed, the upper bract-like, lance-shaped. Flowers deep blue, with darker lines, axillary stalks very short. Calyx longer than the flower-stalk, sepals linear-lance-shaped. Corolla shorter than the calyx. Capsule flattened at the margin, fringed with hairs on the keel, inversely heart-shaped, $\frac{1}{8}$ in. diameter, about as long as the sepals. Seeds flat.

Locality.—At altitudes of 5,000-7,000 ft.

Distribution.—W. Himalaya, N. Asia, Europe.

LEPTORHABDOS, Schrenk.

(From the Greek *leptos*, slender, and *rhabdos*, a rod, alluding to the stems.)

Fig. 4. Leptorhabdos Benthamiana, Walp.

An erect, nearly hairless herb. Stems 1-3 ft. high, branching. Leaves stalkless, 1-3 in. long, pinnately cut, segments linear, entire or toothed; lower leaves opposite or clustered, upper alternate. Flowers pale pink, $\frac{1}{5}$ in. diameter, forming slender glandular racemes. Calyx bell-shaped, 5-toothed. Corolla about twice the length of the calyx, $\frac{1}{6}$ in. diameter, lobes nearly equal. Stamens 4, in unequal pairs; anthers free. Style long, stigma very small. Ovules 2 in each cell. Capsule oblong, $\frac{1}{6}$ in. long, as long as the calyx, flattened, enclosed in the calyx. Seeds 2-4.

Flowers.—August, September.

Locality.—Sind Valley; Dachigam; Dras.

Distribution.—W. temperate Himalaya, from Kashmir to Kumaon, 5,000-11,000 ft.; Afghanistan, Persia.

EUPHRASIA, Linn. The Eyebright.

(From the Greek *euphrasia*, gladness, joy, alluding to a reputed power of restoring impaired eyesight.)

Fig. 5. Euphrasia officinalis, Linn. Eyebright, Adhib, Euphrasy, Ewfras.

(*Officinalis* refers to its medicinal properties.)

An erect, hairy, often glandular herb. Stems 6-18 in. high, slender, branching. Leaves opposite, stalkless, egg-shaped, $\frac{1}{4}$-$\frac{1}{2}$ in. long, sharply and deeply toothed. Flowers white or

lilac with purple veins, usually tinged with yellow in the throat, forming spikes at the end of stem and branches; bracts leaf-like. Calyx tube-shaped, 4-lobed. Corolla 2-lipped, $\frac{1}{6}$-$\frac{1}{2}$ in. long; tube cylindric, longer than the calyx; upper lip erect, 2-lobed, lower spreading, 3-lobed, lobes usually notched. Stamens 4, in unequal pairs; anthers hairy, cohering in pairs under the upper lips, lower pair long-spurred. Style long; stigma small. Capsule as long as the calyx, oblong, flattened.

Flowers.—June to August.

Locality.—Abundant on grassy banks near Kangan; Gulmarg, open marg, above 8,000 ft., common; Baltistan.

Distribution.—Temperate Himalaya, from Kashmir to Kumaon, 4,000-13,000 ft., Sikkim, 10,000-12,000 ft., Afghanistan and N. Persia, N. temperate regions.

SCROPHULARIA, Linn. The Figwort.

(The name alludes to a former use of the plants against scrofula.)

A. Upper corolla lobes longer than the others.
- I. Stamens included ... ... *S. Scopolii.*
- II. Stamens far protruding ... ... *S. himalensis.*
- III. Stamens hardly protruding.
  - 1. Leaves once or twice pinnately cut; segments horizontal ... ... *S. lucida.*
  - 2. Leaves crenate above, cut towards the base; segments bent back ... *S. variegata.*

B. Upper corolla-lobes almost equal; stamens included ... ... *S. calycina.*

Fig. 6. Scrophularia Scopolii, Hoppe. Scopoli's Figwort.

(After J. A. Scopoli, 1723-1788, zoologist and botanist.)

Stems 2-3 ft. high, stout, branched, hairless. Leaves stalked, egg-shaped-oblong or heart-shaped-egg-shaped, coarsely irregularly toothed, 1-3 in. long; stalk $\frac{1}{2}$-1 in. long. Cymes forming stiff, stout panicles about 1 ft. long. Flower-stalks short, stout, erect. Sepals 5, round, with a membranous margin. Corolla greenish, lobes 5, the upper 4 erect, lower spreading. Stamens 4, in unequal pairs, included; staminode 1, round. Capsule egg-shaped-globose, beaked. Seeds finely wrinkled. A very variable plant.

Flowers.—June.

Locality.—Gulmarg, woods and margs, about 8,000 ft., common.

Distribution.—W. Himalaya, Afghanistan, and westwards to Spain.

Scrophularia himalensis, Royle (including **S. polyantha,** Royle).

Himalayan Figwort. Collett, fig. 109.

Stems 3-4 ft. high, stout below. Leaves egg- or lance-shaped, 2-8 in. long, often heart-shaped, sharp-pointed, sometimes lobed at the base; stalk about ½-1 in. long. Cymes long-stalked, few-flowered, loosely spreading, sometimes forming a large panicle. Flowers greenish. Sepals 5, rounded with a membranous margin, $\frac{1}{10}$ in. long, half as long as the very broad short corolla. Corolla-lobes 5, the two upper ones much longer than the 2 lateral. Stamens 4 in unequal pairs, far protruding; staminode spoon-shaped. Style filiform. Capsule globose. Seeds wrinkled.

Flowers.—June.

Locality.—Harwan.

Distribution.—W. temperate Himalaya, from Kashmir to Kumaon, 4,000-11,000 ft.

Scrophularia lucida, Linn.

(*Lucida* means clear, bright, shining.)

Stems 2-3 ft. high, obscurely 4-angled. Leaves 1-2 in. long, once or twice pinnately cut; segments spreading, horizontal, very unequal, oblong-egg-shaped or lance-shaped, toothed. Cymes few-flowered, short-stalked, forming long panicles; flower-stalks very short; bracts linear. Sepals rounded with a broad membranous margin, half as long as the corolla. Corolla ¼-⅓ in. broad, the 2 upper lobes longer than the others. Stamens 4 in unequal pairs, hardly protruding, staminode rounded or kidney-shaped. Capsule globose, pointed. Seeds oblong.

Flowers.—May.

Locality.—Khelanmarg, 10,000 ft.

Distribution.—W. Himalaya, from Kashmir to Kumaon, 8,000-13,000 ft., Afghanistan and westwards to Italy.

Scrophularia variegata, Bieb. Variegated Figwort.

A perennial herb. Stems 1-2 ft. high, stout, obscurely 4-angled. Leaves 1-2½ in. long, short-stalked, inversely egg-shaped-oblong or spoon-shaped, crenate above, cut towards the base with the lobes bent back. Cymes few-flowered, forming long narrow panicles. Flower-stalks very short. Sepals rounded with a broad membranous margin, about half as long as the corolla. Corolla ¼-⅓ in. long, tube broad, the 2 upper lobes longer than the others. Stamens 4, in 2 unequal pairs, hardly protruding; staminode large, rounded or kidney-shaped. Capsule small, globose, pointed.

This species resembles *S. lucida* very much and can only be distinguished by the less divided leaves.

Flowers.—May.

Locality.—Srinagar; Tangmarg, forest, 7,200-8,700 ft.; Karakoram.

Distribution.—W. Himalaya, from Kashmir to Kumaon, 9,000-14,000 ft., Asia Minor.

Scrophularia calycina, Benth.

Stems 1-2 ft. high, stout, sparingly branched. Leaves egg-shaped or egg-lance-shaped, 1-4 in. long, usually heart-shaped and sharp-pointed, coarsely toothed. Cymes short-stalked, forming an erect, stiff, narrow panicle. Flowers many, crowded. Sepals 5, lance-shaped, long-pointed, as long as or longer than the capsule. Stamens 4, in unequal pairs, included; staminode egg-shaped, sharp-pointed. Upper corolla-lobes equal. Capsule ¼-⅓ in. long, egg-shaped, long-pointed. Seeds oblong.

Locality.—Tosh Maidan.

Distribution.—W. temperate Himalaya, from Kashmir to Kumaon, 6,000-12,000 ft.

PICRORHIZA, Royle.

(From the Greek *picros*, bitter, and *rhiza*, root.)

Fig. 7. Picrorhiza Kurrooa, Benth.

A low, more or less hairy herb. Rootstock 6-10 in. long, bitter, clothed with withered leaf-bases. Leaves almost radical, spoon-shaped, toothed, 2-4 in. long, rather leathery,

base narrowed into a winged sheathing stalk. Flowering stems stout, longer than the leaves; naked or with a few bracts below the inflorescence. Flower-spikes 2-4 in. long, many-flowered; bracts oblong or lance-shaped, as long as the calyx. Flowers white or bluish, dimorphic, i.e., some with longer and others with shorter stamens. Sepals 5, ¼ in. long. Corolla of the long-stamened form short, 5-cleft to the middle, lobes egg-shaped, long-pointed; of the short-stamened, corolla-tube curved, broad; limb 2-lipped, upper lip longer, notched, lower of 3 shorter, egg-shaped lobes, the middle one smallest. Stamens 4. Ovary 2-celled, many-ovuled. Capsule ½ in. long egg-shaped.

Locality.—Thajwas; Gangabal.

Distribution.—Alpine Himalaya, from Kashmir to Sikkim 9,000-15,000 ft.

WULFENIA, Jacq.

(After F. X. Wulfen, an Austrian Jesuit and author of several botanical works, 1728-1805.)

Fig. 8. Wulfenia Amherstiana, Benth.

(After Lady Sarah E. Williams *née* Amherst who travelled in India, 1823-1828.)

A perennial, nearly hairless herb. Flowering stems 6-12 in. high, slender, erect. Leaves almost radical, crowded, inversely egg-shaped-oblong, 2-6 by 1-2 in., irregularly crenate or toothed, narrowed into the stalk ½-1½ in. long. Flowers blue-purple, varying to white, forming dense, 1-sided, spike-like racemes 3-6 in. long. Calyx 5-parted, segments narrow, sharp-pointed. Corolla ⅓ in. long; tube cylindric, longer than the calyx; lobes 4, nearly erect, acute, upper one slightly notched. Stamens 2, protruding. Style long, protruding. Capsule oblong, 2-lobed, as long as the calyx. Seeds many, egg-shaped.

Flowers.—August.

Locality.—Gulmarg, by rocks in woods and by water, above 7,000 ft., common.

Distribution.—W. Himalaya, from Murree and Kashmir to Kumaon, 7,000-11,000 ft., Afghanistan.

Plate 48

PEDICULARIS, Linn. Lousewort.

(From the Latin *pediculus*, a louse, because one of the species, *Pedicularis palustris*, was said to produce a lousy disease in sheep.)

Key after Prain. It contains all the species of Plates 48 and 49. Under Plate 48 only those species will be described which are figured on that plate; under Plate 49, first those that are figured on that plate and the rest in alphabetical order.

A. Upper lip beaked.

I. Stamens inserted below the top (often near or below the middle) of the tube which is more or less widened upwards.

1. Leaves opposite or in whorls.

a. All the filaments of stamens hairy.

aa. Stamens inserted in the middle of the tube. Corolla pink (Pl. 48, figs. 1 and 2) *P. pyramidata.*

bb. Stamens inserted opposite the top of the ovary.

* Flowers purple or pink (Pl. 48, fig. 3) ... ... *P. pectinata.*

** Flowers yellow (Pl. 48, fig. 4) ... ... *P. tenuirostris.*

b. All the filaments hairless.

aa. Beak bifid at tip ... ... *P. brevifolia.*

bb. Beak entire.

* Stamens inserted above the middle of the tube *P. porrecta.*

** Stamens inserted at the middle of the tube ... *P. gracilis.*

2. Leaves scattered (not opposite or in whorls).

a. Beak turned inwards (Pl. 48, fig. 5) ... ... *P. Garckeana.*

b. Beak straight (Pl. 48, fig. 6) ... *P. Wallichii.*

forming dense spikes. Corolla-tube protruding or not; lower lip broadly inversely heart-shaped, with a small mid-lobe; upper lip erect, much inflated at the base, then bent down, with a long flexuous beak. Filaments inserted opposite the top of the ovary, at the base and above the middle densely hairy, otherwise hairless. Ovary egg-shaped. Stigma included. Capsule broadly egg-shaped, slightly protruding. Seeds egg-shaped, deeply netted.

Nearly related to *P. pyramidata* and *P. pectinata*, but can be distinguished by the yellow corolla.

Flowers.—August, September.

Locality.—Gulmarg, wooded hill-side, about 8,500 ft., rare; above Gagangir; Sonamarg, 10,500 ft.; Kunzalwan, 7,500 ft.; Sind Valley.

Distribution.—Kashmir to Garhwal, 7,000-11,000 ft.

Fig. 5. Pedicularis Garckeana, Prain. Garcke's Lousewort.

Stems 2-6 in. high, slender, erect, many-leafed. Leaves stalked, linear, pinnatifid, $1\frac{2}{5}$-$2\frac{2}{5}$ in. long, $\frac{1}{5}$ in. broad; segments 12-20 pairs, close together, egg-shaped, toothed. Flowers variously rose-coloured or whitish-rose, axillary, long-stalked, forming dense racemes. Calyx cylindrical-bell-shaped, hairy, 5-toothed; segments elliptic. Corolla-tube slightly hairy outside, more than by $\frac{1}{2}$ longer than the calyx, lower lip 3-fid, lateral lobes egg-shaped, the mid-lobe oblong, truncate; upper lobe inflated, turned inwards, erect in the basal part, anther-bearing part sickle-shaped, prolonged into a slender, bifid beak. Stamens inserted midway between the top of the ovary and the top of the tube. Filaments hairy. Ovary lance-shaped. Stigma included. Capsule obliquely oblong, with a short cusp, by $\frac{1}{2}$ longer than the calyx.

Flowers.—August.

Locality.—Aporwat above Lian Marg, moist turf on hill-tops, 12,000 ft.

Distribution.—Kashmir, Eastern Himalaya.

Fig. 6. Pedicularis Wallichii, Bunge. Wallich's Lousewort.

A low hairless plant, 1-4 in. high. Stems subsolitary or many from the root. Radical leaves few (1-4), long-stalked; stem-leaves 1-3, linear-lance-shaped, pinnatifid, segments 12-25 pairs, egg-lance-shaped, toothed. Flowers red, few, 2-5

forming a raceme, distinctly stalked; bracts leafy, short-stalked, toothed. Calyx inflated-bell-shaped, leathery, hairless, 5-toothed, segments lance-shaped. Corolla-tube by ½ longer than the calyx; lower lip 3-lobed, lobes rounded with sinuate margins, the lateral ones by ½ broader than the mid-lobe; upper lip curved inwards, basal part erect, anther-bearing part sickle-shaped, prolonged into an almost horizontal beak which is truncate and fringed at the tip. Stamens inserted halfway between the top of the ovary and the top of the tube. All the filaments bearded above. Ovary egg-shaped. Stigma protruding. Capsule lance-shaped, obliquely long-pointed. Seeds few, narrowly elliptic, blackish, scarcely netted.

Flowers.—July, August.

Locality.—Above Zoji La.

Distribution.—Kashmir, Central and E. Himalaya.

Fig. 7. Pedicularis Roylei, Maxim. (= **P. verticillata**, Benth.) Royle's Lousewort.

Stems 4-10 in. high, simple or branched, 2-4-fariously hairy, slender or strict, erect or ascending. Radical leaves 2-3 in. long, stalk 1-2½ in. long. Stem-leaves few, whorled, short-stalked, stalk about 1 in. long, oblong, or linear-oblong, pinnatifid, segments 6-9 pairs, oblong, sharp-pointed, deeply toothed. Flowers red (pink-purple), almost stalkless; whorls mostly 4-flowered, many, often distant from each other. Bracts leafy, the lowest distinctly stalked, the uppermost shorter than the calyx. Calyx hairy, bell-shaped, 5-toothed, the uppermost segment triangular or lance-shaped, entire, the rest lance-shaped from a broad base, and toothed up to the middle. Lower lip 3-lobed, lobes rounded, the lateral ones twice as long as the mid-lobe; upper lip slightly curved, without a beak. Stamens inserted a little above the top of the ovary. Filaments hairy near the insertion, otherwise quite smooth. Ovary globose-egg-shaped. Stigma protruding. Capsule egg-shaped, obliquely long-pointed. Seeds egg-shaped, pale, distinctly netted.

Flowers.—August.

Locality.—Hills above Lian Marg, damp hill-tops, short turf, about 12,000 ft.

Distribution.—Alpine Himalaya, from Kashmir to Sikkim, 11,000-16,000 ft.

Plate 49

Figs. 1 and 2. Pedicularis rhinanthoides, Schrenk.

(*Rhinanthoides* means resembling *Rhinanthus*, another genus of *Scrophulariaceae*.)

Stems 2-12 in. high, curved, usually quite hairless. Leaves linear-oblong, the radical ones tufted, long-stalked, pinnatisect, segments 9-12 pairs, egg-shaped, toothed; stem-leaves few, scattered, short-stalked. Flowers purple or pink, pale rose, or white with salmon-coloured spots, axillary, stalked, forming dense-flowered racemes. Calyx egg-shaped, 5-toothed, uppermost segment lance-shaped, entire, the others egg-shaped, toothed. Corolla-tube almost twice as long as the calyx. Lower lip 3-fid, lobes rounded, lateral ones twice as broad as the mid-lobe. Upper lip sickle-shaped, inflated in the middle with a slender, incurved or S-shaped, sharp-pointed, entire beak. Stamens inserted at the top of the tube; front-filaments hairy. Ovary lance-shaped. Stigma protruding. Capsule egg-shaped-oblong, obliquely long-pointed. Seeds egg-shaped, pale, netted.

Can be distinguished from *P. siphonantha* by the 5-toothed calyx and the entire beak. In *P. siphonantha* the calyx is 3-toothed and the beak 2-fid.

Flowers.—June-August.

Locality.—Aporwat above Gulmarg, damp places on open hill-side, above 10,000 ft., common; below Garam Gali; Diskhal in Juniper tract, abundant; Zoji La; Ladakh, 11,000 ft.

Distribution.—Alpine W. Himalaya, 10,000-17,000 ft., E. Himalaya, Alatau Mts., Turkestan, Yarkand, Kansu, N. Tibet, Yunnan.

Fig. 3. Pedicularis bicornuta, Klotzsch. Two-horned Lousewort.

More or less hairy. Stem usually very stout, tall, erect, simple, leafy, 6-24 in. high. Leaves alternate, all stalked, linear or linear-oblong, pinnatifid to the middle, lobes rounded, toothed or lobed. Radical leaves many in small stemless specimens, falling off soon in large ones, blade 3-4 by $\frac{1}{12}$ in., segments $\frac{1}{5}$-$\frac{1}{3}$ in. long; stem-leaves like the rest; stalk 1-2 in. Raceme often 8 in. long, with many rather crowded flowers; bracts usually shorter than the calyx; flower-stalks $\frac{1}{8}$-$\frac{1}{4}$ in.

long. Calyx ½-¾ in. long, globose, hairy between the ribs, 5-toothed. Corolla yellow, or upper lip white and lower yellow, tube ¾-1⅛ in. long, hairy outside, by ½ or twice as long as the calyx. Lower lip 1-1⅕ in. broad, 3-lobed, lateral lobes rounded, twice as large as the oblong mid-lobe; upper lip often S-shaped or spirally curved, produced into a slender, curved, deeply bifid beak about ⅓-½ in. long. Stamens inserted at the top of the tube. Filaments hairless. Ovary lance-shaped. Stigma protruding. Capsule 1-1¼ in. long, egg-lance-shaped, finely long-pointed. Seeds deeply netted.

Nearly related to *Pedicularis elephantoides*, but can be distinguished by the deeply bifid beak. In *P. elephantoides* it is entire.

Flowers.—June, July.

Locality.—Aporwat above Gulmarg, open, grassy, damp hill-side, about 10,000 ft., common; below Basam Gali in damp ground, above 10,000 ft.; Tosh Maidan, common in certain places, 11,000-12,000 ft.; Damam Sar, 13,100 ft., not very common.

Distribution.—W. Himalaya, from Kashmir to Garhwal, 9,000-17,000 ft., Kurram Valley, Afghanistan.

Fig. 4. Pedicularis elephantoides, Benth.
Elephant Lousewort.

(Called so on account of the long beak of the upper lip.)

Stem erect, hairy, stout. Leaves stalked, oblong, pinnatifid, lower stem-leaves soon withering; segments 6-12 pairs, oblong, blunt at tip, toothed. Flowers yellow, or the lower lip yellow and the upper purple, axillary, stalked, stalk ⅛-¼ in. long; racemes dense or interrupted below. Calyx ⅜-¾ in. long, globose, densely netted between the ribs, 5-toothed, segments broadly lance-shaped, twice toothed, the uppermost half the length of the others. Corolla-tube ¾-1 in. long; lower lip 3-lobed, 1⅛ in. broad, lateral lobes rounded, twice as large as the oblong mid-lobe; upper lip rolled inwards, basal part ⅛ in. long, erect, anther-bearing part ¼ by ⅛ in. sickle-shaped, prolonged into an entire beak ¾ in. long. Stamens inserted at the top of the tube. Filaments hairless. Ovary lance-shaped. Capsule egg-lance-shaped, long-pointed.

Flowers.—August.

Locality.—Hills above Gulmarg, damp ground in woods and amongst scrub, above 10,000 ft., common.

Distribution.—Apparently endemic in Kashmir.

Figs. 5 and 6. Pedicularis siphonantha, D. Don.

Hairless or hairy. Stem 1-14 in. high, lying down or ascending. Radical leaves tufted, stalked, pinnately cut; segments 8-15 pairs, lance- or egg-shaped, pinnatifid or toothed, $\frac{1}{12}$-$\frac{1}{2}$ in. long; stem-leaves few, scattered, short-stalked. Flowers pink, or rose-pink, or deep purple, or the upper lip deep purple and lower lip and tube pale pink, or white, or pink outside and white within, or cherry-coloured with splashes of white, or pink with white centre, axillary, stalked, forming dense racemes; flower-stalks $\frac{1}{5}$-$\frac{1}{3}$ in. Calyx egg-shaped, $\frac{1}{3}$-$\frac{1}{2}$ in. long, 3-toothed, uppermost segment awl-shaped or absent, entire, lateral ones egg-shaped, toothed. Corolla-tube 2-5 times as long as the calyx, $\frac{3}{4}$-$2\frac{4}{5}$ in. long; lower lip 3-fid, hairy on the margin, $\frac{3}{5}$-$\frac{4}{5}$ in. broad, lateral lobes almost rounded, mid-lobe notched at the tip; upper lip rolled inwards, basal part $\frac{1}{12}$-$\frac{1}{6}$ in., erect, throat with 2 teeth or lobes or entire, anther-bearing part sickle-shaped, $\frac{1}{8}$ by $\frac{1}{10}$ in., passing into a 2-fid, $\frac{1}{3}$ in. long beak. Stamens inserted at the top of the tube, front-filaments hairy. Stigma protruding. Capsule $\frac{3}{4}$ by $\frac{1}{4}$ in., egg-shaped-oblong, long-pointed. Seeds $\frac{1}{12}$ in. long, egg-shaped, pale, distinctly netted.

Flowers.—August-September.

Locality.—Gangabal; Thajwas, abundant; Nagmarg, rare; Zaskar.

Distribution.—Alpine Himalaya, from Kashmir to Sikkim, 9,000-16,000 ft., Afghanistan, Persia, China.

Figs. 7 and 8. Pedicularis Oederi, Vahl. (= **P. versicolor,** Wahlb.). Oeder's Lousewort.

(After G. C. Oeder, a botanist, 1728-1791.)

Hairy above. Stem usually solitary, 1-12 in. high, with 1-2 leaves, rather stout. Radical leaves tufted, stalked. Stem-leaves scattered, long-stalked, linear-lance-shaped, sharp-pointed, pinnately cut, $1\frac{1}{2}$-$2\frac{1}{2}$ in. long, segments 18-25 pairs, oblong or egg-shaped, deeply toothed. Flowers uniformly yellow, or lemon-yellow with purplish tip of upper lip, or tawny-red, or yellow with anther-bearing part of upper lip reddish-brown, or this reddish-brown replaced by 2 red or pink spots at the edge of the throat, short-stalked, erect, forming dense racemes 1-$2\frac{1}{2}$ in. long; bracts egg- or tongue-shaped, pinnatifid, longer than the calyx. Calyx $\frac{1}{2}$-$\frac{3}{5}$ in. long, bell-shaped, more or less hairy, 5-toothed, segments lance-

shaped, entire or toothed near the tip. Corolla-tube cylindric ½-⅜ in. long. Lower lip 3-lobed, lobes rounded or egg-shaped, rarely slightly notched; upper lip ⅛ in. long, compressed, tip rounded, erect, linear-oblong, slightly incurved, longer than the lower. Stamens fixed to the middle of the tube or slightly above it; front-filaments hairy. Ovary egg-shaped. Stigma protruding. Capsule obliquely egg-lance-shaped, by ½ longer than the calyx. Seeds elliptic, pale ash-grey, distinctly netted.

Flowers.—June, July.

Locality.—Aporwat, above Gulmarg, damp and stony turf on hill-top, above 12,500 ft., common; above Tosh Maidan; Basam Gali; top of Pass up to 12,000 ft.; Khur Mt. 14,000 ft.; Damam Sar, 13,000-14,000 ft.; Pir Panjal.

Distribution.—Alpine Himalaya, from Kashmir to Nepal, 10,000-16,000 ft., European and Siberian Alps, arctic Europe, Asia and America, N. Tibet and China.

Pedicularis cheilanthifolia, Schrenk. Cheilanthus-leafed Lousewort.

(*Cheilanthus* is a genus of Ferns.)

Sparingly hairy or hairless. Stems 2-9 in. high, tufted, simple, sometimes branched. Radical leaves long-stalked, densely tufted, 1-4 by ⅙-⅓ in., stem-leaves short-stalked, opposite and 3-6 in a whorl, ½-2 in. long, pinnately cut, segments 8-12 pairs, egg-lance-shaped or linear, toothed. Flowers whitish-rose, red or rose, almost stalkless, the lower ones rarely distinctly stalked, arranged in crowded whorls or the lower whorls distant. Lower bracts leafy, the uppermost egg-lance-shaped, pinnately cut, shorter than the calyx. Calyx about ⅓ in. long, with the ribs densely hairy, 5-toothed, lobes short, obtuse. Corolla-tube about ½ in. long. Lower lip slightly broader than long, 3-lobed, upper lip much longer than the lower, bent, dilated at the tip or not, tip blunt, bent down. Stamens fixed opposite the middle of the ovary; filaments hairy quite at the base, otherwise hairless. Stigma protruding. Capsule lance-shaped, sharp-pointed, twice as long as the calyx. Seeds egg-shaped, pale, netted.

Locality.—Ladakh; Karakoram, 13,000 ft.

Distribution.—W. Himalaya, 11,000-16,000 ft., Soongaria, N. Tibet, N. China.

Pedicularis brevifolia, D. Don. Short-leafed Lousewort.

Hairy or hairless. Stem 4-12 in. high, slender, erect, rounded, simple or branching from the base. Leaves stalked, the radical ones tufted, soon disappearing; stem-leaves 2-4 in a whorl, lance- or egg-shaped, $\frac{4}{5}$ in. long, pinnately cut, segments 7-9 pairs, close together, deeply toothed or pinnatifid. Flowers purple or rose, stalkless, 4 in a whorl, lower whorls distant, arranged in a spike. Bracts leafy, short-stalked, the uppermost crowded, stalkless. Calyx $\frac{1}{4}$ by $\frac{1}{8}$ in., membranous, shortly bell-shaped, 5-toothed, uppermost tooth awl-shaped, entire, the others oblong, toothed. Corolla-tube twice as long as the calyx; lower lip 3-lobed, $\frac{3}{5}$ in. broad, lateral lobes egg-shaped; upper lip sickle-shaped, erect, then inflated with a long straight or bent down beak which is blunt and more or less deeply notched. Stamens inserted opposite the top of the ovary. Filaments hairless. Stigma protruding. Capsule $\frac{1}{2}$ in. long, $\frac{1}{5}$ in. broad, egg-shaped, obliquely long-pointed, by $\frac{1}{2}$ longer than the calyx. Seeds egg-shaped, yellow, netted.

Locality.—Alpine region.

Distribution.—From Kashmir to Nepal, 10,000-12,000 ft.

Pedicularis gracilis, Wall. Slender Lousewort.

Stems 6 in. to 4 ft. high, tall, slender, branched, 4-fariously hairy, branches opposite or whorled, simple or again branched, all very slender. Leaves 1-2 by $\frac{3}{4}$-$1\frac{1}{2}$ in., rarely hairy. Stem-leaves in whorls, deeply pinnatifid, segments oblong-lance-shaped, 6-9 pairs, blunt, toothed or pinnatifid. Flowers pink-purple, short-stalked, forming slender, lax-flowered racemes or spikes, or flowers all axillary and distant. Calyx $\frac{1}{4}$ in. long, $\frac{1}{10}$ in. diameter, 5-toothed, segments short, often entire. Corolla-tube $\frac{1}{3}$ in. long. Lower lip broadly inversely egg-shaped or rounded, 3-lobed, $\frac{2}{5}$ in. broad; upper lip sickle-shaped, swollen in the middle, erect, with a horizontal flexuous slender beak $\frac{1}{5}$ in. long. Stamens inserted in the middle of the tube or slightly higher up. Filaments hairless. Ovary egg-shaped. Stigma protruding. Capsule $\frac{1}{3}$-$\frac{1}{2}$ in. long, broadly egg-shaped, sharp-pointed. Seeds egg-shaped; yellowish-grey, netted.

Locality.—Temperate and alpine region.

Distribution.—From Kashmir to Sikkim, 6,000-13,000 ft., Assam.

Pedicularis longiflora, Rudolph. (=**P. tubiflora,** Fisch.).
Long-flowered Lousewort.

Hairless or nearly so. Stems 1-8 in. high, many from the root, leafy, erect or ascending, stout, often branched. Radical leaves very many, stalked, linear, pinnately cut, 1-3 by $\frac{1}{4}$-$\frac{1}{2}$ in., segments 5-8 pairs, lance-shaped, pinnatifid; stem-leaves many, scattered, short-petioled, stalks $\frac{2}{5}$-$1\frac{2}{5}$ in. long, stout. Flowers yellow, or white, or yellow tube and purple upper lip, or bright yellow with two purple marks on the lower lip, axillary in very short dense racemes. Bracts leaf-like. Calyx about $\frac{1}{2}$ in. long, narrowly egg-shaped, 3-toothed, top-segment awl-shaped or absent, lateral ones lance-shaped, usually toothed. Corolla-tube $1\frac{4}{5}$-$2\frac{1}{5}$ in. long. Lower lip above $\frac{1}{2}$ in. broad, 3-fid; upper lip erect, inflated with a slender, blunt, slightly notched, bent down beak about $\frac{1}{4}$ in. long. Stamens inserted near the top of the tube. All filaments hairy. Stigma protruding. Capsule $\frac{3}{4}$ in. by $\frac{1}{5}$ in., egg-shaped, sharp-pointed. Seeds $\frac{1}{12}$ in. long, egg-shaped, black, streaked, scarcely netted.

Nearly related to *P. siphonantha*, but differs from it by having all the filaments hairy, whilst in *P. siphonantha* only the front ones are so.

Locality.—Ladakh.

Distribution.—Alpine Himalaya, from Kashmir to Sikkim, 11,000-18,000 ft., N. Tibet and China, Siberia, N. Mongolia.

Pedicularis mollis, Wall. Soft Lousewort.

Sparsely hairy. Stem 1-3 ft. high, strict, hollow, simple or with whorled slender branches. Leaves all on the stem, 3-5 in a whorl, the lower ones short-stalked, the uppermost and the bracts stalkless, blade pinnately cut, segments 10-15 pairs, lance-shaped, toothed or again pinnatifid. Spikes on the branches and main stem, 6-16 in. long. Flowers red or purple, short-stalked; lower whorls of flowers distant, the uppermost crowded, bracts leaf-like. Calyx $\frac{1}{4}$ in. long, hairy, short, broad-bell-shaped, deeply 5-toothed, segments lance-shaped, toothed on the margin. Corolla-tube $\frac{1}{5}$ in. long. Lower lip 3-lobed, $\frac{1}{5}$ in. broad, lobes rounded, hairy on the margins. Upper lip narrow, straight, with the margin of throat hairy, long-pointed, entire. Stamens inserted opposite the middle of the ovary. Filaments hairless. Stigma included. Capsule $\frac{1}{2}$ by $\frac{1}{5}$ in., egg-lance-shaped. Seeds $\frac{1}{12}$ in. long, egg-shaped, yellow, netted.

Locality.—Ladakh.

Distribution.—Alpine Himalaya, from Kashmir to Sikkim, 10,000-14,000 ft.

Pedicularis porrecta, Wall.

(*Porrecta* means stretched out, alluding perhaps to the habit of the plant.)

Slightly hairy. Stems 4-6 in. high, slender, tufted, ascending, simple. Leaves hairless, radical ones tufted, long-stalked, stalk $\frac{2}{5}$-$\frac{4}{5}$ in. long, ; stem-leaves 1-2 pair, opposite, oblong, pinnatifid, $\frac{3}{5}$-$\frac{4}{5}$ in. long, segments 6-8 pair, oblong, blunt at tip, deeply toothed. Flowers axillary, short-stalked, stalks 0-$\frac{1}{4}$ in. long. Racemes short, few-flowered. Bracts stalkless. Calyx $\frac{1}{3}$ in. long, oblong, leathery, hairless, 5-toothed, uppermost segment triangular, entire, lateral ones egg-shaped with a toothed margin. Corolla-tube about $\frac{1}{2}$ in. long. Lower lip $\frac{2}{5}$ in. broad, almost round, 3-lobed, lateral lobes egg-shaped, mid-lobe rhomboid-egg-shaped. Upper lip sickle-shaped, erect, swollen, then shortly bent downwards and sharp-pointed, entire. Stamens inserted below the top of the tube. Filaments hairless. Stigma protruding. Capsule $\frac{2}{5}$ in. long, egg-shaped, Seeds egg-shaped, yellow, netted.

Locality.—Shalum.

Distribution.—Kashmir to Kumaon, 13,000-15,000 ft., Sikkim, Yunnan.

Plate 50

LATHRAEA, Linn. The Toothwort.

(From the Greek *lathraios*, hidden, alluding to the fact that the greater part of the plant is underground.)

Fig. 1. Lathraea squamaria, Linn. Toothwort.

(*Squamaria* means provided with *squamae*, scales.)

A white or purplish, leafless, perennial herb, parasitic on roots of shrubs and trees. Stems underground, much branched, creeping, fleshy, covered with close-set, short, thick scales. Flowering branches erect, 4-12 in. high, provided with a few thin scales. Flowers cream-white, tipped with pink-purple, horizontal, almost $\frac{3}{4}$ in. long, crowded, forming a terminal raceme. Calyx hairy, 4-lobed, tube-shaped. Corolla 2-lipped, tube as long as the calyx; upper lip entire, margins bent inwards at the tip; lower 3-lobed, both lips almost erect. Stamens 4, in unequal pairs, attached near the top of the tube; anthers hairy. Ovary 1-celled; style curved, stigma protruding. Capsule egg-shaped.

Flowers.—June.

Locality.—Gulmarg, in damp forests, about 8,500 ft., not common; Banehal, 6,000 ft.

Distribution. — W. Himalaya, 6,000-9,000 ft., Siberia, Europe.

ACANTHACEAE.

Fig. 2. A species of *Acanthaceae.*

Locality.—Sind Valley; Nil Nag.

STROBILANTHES, Blume.

(From the Greek *strobilos*, a fir-cone, and *anthos*, a flower, alluding to the appearance of the inflorescence whilst still in bud.)

I. Bracts falling off before the flowers open.
   1. Leaves stalked, heart-shaped ... *S. alatus.*
   2. Leaves nearly stalkless or tapering into a winged stalk ... ... *S. Dalhousianus.*

II. Bracts persistent.
   1. Stems rounded. Tube of corolla cylindric in the lower half ... *S. glutinosus.*
   2. Stems 4-angled or deeply furrowed. Tube of corolla cylindric at the base only ... ... *S. atropurpureus.*

Fig. 3. Strobilanthes alatus, Nees. (Including **S. angustifrons**, C. B. Clarke, in the "Flora of British India.")

(*Alatus* means winged, alluding to the winged leaf-stalks.)

Stems 2-4 ft. high, slightly hairy. Leaves hairy, mostly long-stalked, heart-shaped, sharply toothed, long-pointed, 2½-9 by 1¾-4 in.; stalks winged, at least near the top. Flowers dark blue, forming glandular-hairy, usually panicled spikes. Bracts small, narrowly oblong, falling off before the flowers open. Calyx 5-parted, glandular-hairy; segments linear. Corolla 1¼ in. long, tube curved, gradually widening from near the base, bulging in the middle, limb ¾ in. across. Stamens 4. Style-tip linear. Ovules 2 in each cell.

Flowers.—July to October.—Flowers every year.

Locality.—Below Gulmarg, woods and shady nalas, above 7,000 ft., common; Ganderbal.

Distribution.—W. Himalaya, from Kashmir to Kumaon 6,000-10,000 ft., Afghanistan.

Strobilanthes Dalhousianus, C. B. Clarke. Collett, fig. 118.

(After Christina Ramsay, Countess of Dalhousie, who collected extensively in Simla and other places.)

Stems 2-3 ft. high, hairy, at least when young. Leaves hairy on both surfaces, nearly stalkless or narrowed into a winged stalk, egg-shaped, 3-6 by $1\frac{1}{4}$-$2\frac{1}{2}$ in., toothed, long-pointed. Flowers dark blue, in heads of very short spikes; bracts small, concave, falling off before the flowers open. Calyx 5-parted, usually glandular-hairy. Corolla $1\frac{1}{2}$-2 in. long; tube curved, gradually dilated from near the base; limb $\frac{1}{2}$-$\frac{3}{4}$ in. across. Stamens 4.

Flowers.—July to September.—Flowers every year.

Locality.—Temperate region.

Distribution.—W. Himalaya, from Kashmir to Kumaon, 6,000-8,000 ft.

Strobilanthes glutinosus, Nees.

(*Glutinosus* means sticky, the plant being viscous-hairy.)

Stem 2-5 ft. high, viscous-hairy, rounded. Leaves stalked, hairy on both sides, egg-shaped, about 3 by $1\frac{1}{4}$ in., crenate or sharply toothed. Flowers pale blue, forming short spikes; bracts leaf-like, egg-shaped, persistent. Calyx 5-parted, glandular-hairy. Corolla $1\frac{1}{2}$-2 in. long; tube cylindric in the lower half, widened in the upper; limb 1-$1\frac{1}{2}$ in. across. Stamens 4, hairless. Style-tip linear, bent back. Capsule $\frac{3}{4}$ in. long, oblong, viscous-hairy. Seeds 4, $\frac{1}{8}$-$\frac{1}{6}$ in., egg-shaped, shaggy.

Flowers.—October.—Flowers every year.

Locality.—Temperate region.

Distribution.—W. Himalaya, from Kashmir to Nepal, 3,000-6,000 ft.

Strobilanthes atropurpureus, Nees. (Including **S. Wallichii**, Nees, var. **microphyllus**, Nees.)

(*Atropurpureus* means black-purple.)

Stems 6-24 in. high, hairy, sometimes sticky, 4-angled or deeply furrowed. Leaves hairless or almost so, egg-shaped or egg-lance-shaped, usually 2-4 by $1\frac{1}{2}$-2 in., crenate or sharply toothed, narrowed into a winged stalk. Flowers blue, forming interrupted spikes; bracts leaf-like, persistent. Calyx 5-parted, glandular-hairy. Corolla 1-$1\frac{3}{4}$ in. long; tube pale blue or nearly white, curved, broadly widened from a short cylindrical base; limb dark blue, $\frac{1}{2}$-$\frac{3}{4}$ in. across.

Flowers.—August, September.—Flowers at intervals of often several years (Collett).

Locality.—Jammu.

Distribution.—Subalpine Himalaya, from Jammu to Bhutan, 7,000-11,600 ft.

SELAGINACEAE.

(From *Selago*, a name known to the ancients and which Linneus used without any reference to his genus *Selago*.)

LAGOTIS, Gaertn.

I. Calyx spathe-like, plane and 2-nerved on the back ... ... *L. glauca.*

II. Calyx consisting of 2 oblong sepals.
1. Leaves cut to the midrib ... ... *L. globosa.*
2. Leaves crenate ... ... *L. decumbens.*

Figs. 4 and 5. Lagotis glauca, Gaertn.

(*Glauca* means bluish-green.)

A perennial, fleshy herb; no runners; rootstock stout, with thick fleshy root-fibres. Leaves fleshy, oblong-egg-shaped or inversely egg-shaped, or elliptic or oblong, toothed or crenate, radical ones 2-3 in. long, variable in breadth and toothing, narrowed into a very stout stalk, stem-leaves ½-1½ in., half-stem-clasping, often quite entire. Flowering stems several, 3-10 in. high, decumbent below, stout, leafy above. Flowers deep blue, purplish, rose or white, forming spikes 2-5 in. long. Bracts inversely egg-shaped or elliptic, ⅓-½ in. long. Calyx spathe-like, nearly as long as the corolla-tube or shorter, lobes finely fringed. Corolla-tube curved, rather slender; limb 2-lipped; lower lip 2- or 3-cleft. Stamens 2, inserted on the throat of the corolla; anthers kidney-shaped. Ovary 2-celled.

Flowers.—June, July.

Locality.—Aporwat; Khelanmarg, open hill-side by water, above 10,000 ft., common, at the foot of big rocks, near nala, stony ground, 10,000 ft., very rare; Basam Gali, on top; Damam Sar, 13,000-14,000 ft., abundant everywhere; Tosh Maidan; Thajwas; Khur Mt., 14,000 ft.

Distribution.—Alpine Himalaya, from Kashmir to Sikkim, 10,000-17,000 ft., mountains of Central and N. Asia, arctic Asia and America.

Lagotis globosa, Kurz.

A fleshy perennial herb. Rootstock slender. Leaves few, long-stalked, oblong, cut to the midrib; lobes linear-oblong, getting wider towards the blunt or notched tips. Flowering stem slender, almost naked, shorter than the leaves, with a few leafy bracts at the tip. Bracts much longer than and concealing the flowers, $\frac{1}{2}$ in. long, round to inversely egg-shaped. Flowers in a head 1-1$\frac{1}{2}$ in. diameter. Sepals 2, inversely egg-shaped-oblong, one blunt, the other 2-toothed. Corolla-tube curved, limb 2-lipped. Filaments slender, as long as the upper lip. Style included; stigma notched. Fruit $\frac{1}{6}$ in. long, ellipsoid.

Locality.—Gilgit.

Distribution.—Apparently endemic in Kashmir.

Lagotis decumbens, Ruprecht.

A fleshy, perennial herb. Rootstock small. Leaves long-stalked, egg-shaped or oblong, coarsely crenate, blunt at apex, wedge-shaped at the base, 1-1$\frac{1}{2}$ in. long; stalk 2-4 in., tapering downwards. Flowering stems longer than the leaves, with a few leafy bracts near the top. Bracts much longer than and concealing the flowers, broadly egg-shaped, forming an oblong head. Flower-spike 1$\frac{1}{2}$-2 in. long. Flowers $\frac{1}{6}$ in. long. Sepals inversely egg-shaped-oblong, one blunt, the other 2-toothed. Lower lip of corolla 3- or 4-cleft. Anthers almost stalkless. Style short, included; stigma notched. Fruit narrowly oblong.

Locality.—Karakoram, 16,000-18,000 ft.

Distribution.—Kashmir, Thian Shan Mts.

EUPHORBIACEAE. The Spurge Family.

(*Euphorbia* is the Greek *euphorbion* of Dioscorides, so named after Euphorbios, the medical attendant of Juba, King of Mauritania, about 54 B.C.)

EUPHORBIA, Linn.

A note is necessary to explain the structure of the flowers of this genus: The flowers are small and either male or female. Both male and female are contained in a cup-shaped, 4- or 5-toothed or -lobed involucre. The teeth or lobes of the involucre are almost hidden by 5 horizontal glands placed in their angles. The glands are fleshy, smooth,

usually yellow-green and purple; sometimes conspicuous from a petal-like border. The margins of the gland are rounded and entire, or crescent-shaped with projecting horns. In the same involucre there are many male flowers. Each male flower consists of one stamen without sepals or petals. In the centre of each involucre there is a female flower surrounded by the male flowers. The female flower consists only of a 3-celled ovary supported on a stalk and protruding from the involucre and from between the male flowers. The ovary is surmounted by 3 usually branched styles. The fruit is a 3-lobed capsule which splits into 3 cocci, each containing one seed.

A. Leaves alternate.

I. Glands of involucre kidney-shaped... *E. Wallichii.*

II. Glands of involucre crescent-shaped.

1. Glands also 2-horned.
   a. Leaves linear or oblong ... *E. prolifera.*
   b. Leaves inversely egg-spoon-shaped ... ... *E. Maddeni.*
2. Glands not horned ... ... *E. falcata.*

III. Glands of involucre rounded, entire.

1. Styles united for about half their length ... ... *E. pilosa.*
2. Styles free to the base ... ... *E. helioscopia.*

IV. Glands of involucre with crisply wavy margin ... ... *E. Jacquemontii.*

V. Glands of involucre transversely oblong.

1. Involucre with 4 hairy lines within *E. Thomsoniana.*
2. Involucre hairless within ... *E. tibetica.*

B. Leaves opposite.

I. Glands of involucre green. Styles short.

1. Leaves $\frac{1}{2}$-1 in. long ... ... *E. hypericifolia.*
2. Leaves $\frac{1}{4}$ in. long... ... ... *E. thymifolia.*

II. Glands of involucre purple. Styles long ... ... *E. Emodi.*

Fig. 6. Euphorbia Wallichii, Hook. f. Wallich's Spurge.

Stems 1-2 ft. high, hairy above. Leaves 3-5 in. long, alternate, stalkless, linear- or elliptic-oblong or inversely egg-shaped. Involucres hemispheric, $\frac{1}{6}$ in. diameter, hairy, lobes very broad, rounded, margins woolly; glands large, kidney-shaped. Styles slender, united to the middle. Capsule $\frac{1}{2}$ in. diameter, depressed-globose, smooth; cocci woody; stalk very short. Seeds $\frac{1}{6}$ in. long, smooth, grey-blue.

Can be distinguished from all other species by the large involucres, capsules and seeds.

Grows in clumps and turns crimson in autumn.

Flowers.—July, August.

Locality.—Gulmarg, open grassy margs and hill-sides, above 8,000 ft., common; Jammu.

Distribution.—W. and Central Himalaya, Kurram Valley, Afghanistan, 10,000-12,000 ft.

Fig. 7. Euphorbia prolifera, Ham.

A perennial hairless herb. Rootstock thick and woody. Stems 6-24 in. high, erect, often sending off barren, densely leafy, rooting shoots from near the base. Stem-leaves alternate, stalkless, thick, usually linear, 1-3 by $\frac{1}{6}$ in., sometimes oblong, $1\frac{1}{2}$ by $\frac{1}{3}$ in., entire, with sharp-pointed or blunt tips. Inflorescence umbellate. Involucres $\frac{1}{8}$ in. diameter; teeth 4-5; glands yellow, crescent-shaped, horns usually short and blunt, the margins between them entire or toothed. Styles united below the middle. Capsule $\frac{1}{6}$-$\frac{1}{4}$ in. diameter, long-stalked, rather depressed, smooth. Seeds mottled or not.

Flowers.—July, August.

Locality.—Gulmarg, open margs about 8,000 ft., common.

Distribution.—W. and Central Himalaya, from Kashmir to Nepal, up to 6,000 ft., plains from the Punjab to Oudh, Yunnan.

Euphorbia Maddeni, Boiss. Madden's Spurge.

(After Edward Madden of the Bengal Artillery, died 1856.)

A hairless, erect, annual herb. Stems 6-24 in., usually much-branched. Stem-leaves alternate, stalkless, inversely egg-spoon-shaped, 2 by $\frac{1}{2}$ in. or smaller, narrowed to the base, tip rounded. Involucres solitary in the forks of the branches or in the axils of the opposite leaves on the flowering branches or sometimes in umbels; teeth 4 or 5; glands

yellow, crescent-shaped with long and slender horns. Styles free almost to the base. Capsule $\frac{1}{8}$ in. diameter smooth. Seeds smooth.

Flowers.—May, June.

Locality.—Up to 9,000 ft.

Distribution.—W. Himalaya, from Murree and Kashmir to Kumaon.

Euphorbia falcata, Linn.

A small, hairless annual, 6-12 in. high, with pale rigid stems and branches. Leaves alternate, stalkless, oblong-inversely egg-shaped or linear, sharp-long-pointed, 1 in. and less long. Involucres hairless, hidden by the floral leaves, very small, lobes fringed; glands very small, half moon-shaped. Styles free. Capsule $\frac{1}{10}$ in. long, thin, egg-shaped; cocci keeled. Seeds transversely furrowed.

Locality.—Gilgit.

Distribution. — Kashmir, Punjab, Afghanistan, Persian Baluchistan, westward to Arabia, Central and S. Europe, N. Africa.

Euphorbia pilosa, Linn. Hairy Spurge.

A hairless or hairy perennial herb. Stems 1-3 ft., erect, branched at the top. Leaves alternate, stalkless, oblong, $\frac{3}{4}$-$2\frac{1}{2}$ in. long, entire, narrowed to the base or rounded, tip rounded. Inflorescence umbellate; bracts yellow-green. Involucres $\frac{1}{8}$ in. diameter, 5-toothed; glands yellow, margins rounded, entire. Styles long, united about half-way up. Capsule $\frac{1}{4}$ in. diameter, more or less covered with small, often firmly hairy tubercles. Seeds smooth.

Flowers.—May.

Locality.—Gulmarg, 8,700 ft.; Tangmarg, forest, 7,200-8,700 ft.

Distribution.—W. Himalaya, up to 9,000 ft., N. and W. Asia, Europe.

Euphorbia helioscopia, Linn. Sun Spurge.

A hairless annual herb. Stems 6-18 in. high, usually much-branched at the top. Stem-leaves alternate, short-stalked, inversely egg-shaped or spoon-shaped, $\frac{1}{2}$-2 in. long; lower ones smaller, tip finely toothed. Inflorescence umbellate, rays often very short. Involucres 4-toothed; glands yellow, rounded, entire. Styles free. Capsules $\frac{1}{8}$ in. diameter, smooth. Seeds finely net-veined.

Flowers.—May.
Locality.—Chenar Bagh.
Distribution.—Punjab, W. Himalaya, up to 8,000 ft., in fields, Afghanistan and westward to the Atlantic, Japan.

Euphorbia Jacquemontii, Boiss. Jacquemont's Spurge.

A perennial herb. Stems 1½ ft. high. Leaves 2-2½ in. long, almost stalkless, lance-shaped, hairless, often reddish, beautifully nerved, base narrowed. Involucres bell-shaped, hairy without, velvety within, lobes elongate, ciliate, glands stalked, margins crisply wavy. Styles rather long, shortly bifid, united for ⅓ their length. Capsule small. Seeds smooth.
Locality.—Pir Panjal; Iskardo.
Distribution.—W. Himalaya.

Euphorbia Thomsoniana, Boiss. Thomson's Spurge.

A perennial, hairless herb. Stems simple, sparingly leafy, 1 ft. high, unbranched, scaly at the base. Leaves ¾-1½ in. long, stalkless, alternate, elliptic or egg-shaped, more or less blunt, leathery. Involucres bell-shaped, ⅛ in. broad, hairless without, with 4 hairy lines within, lobes short, fringed; glands almost stalkless, transversely oblong. Styles long, slender. Capsule large, oblong, short-stalked, ⅓ in. long, ¼ in. diameter; cocci separated by a shallow furrow. Seeds ⅙ in. long, pale, smooth, oblong.
Locality.—Leh, 10,000-12,000 ft.; Gilgit.
Distribution.—Apparently endemic in Kashmir.

Euphorbia tibetica, Boiss. Tibetan Spurge.

A perennial herb, quite hairless. Stems many, almost erect or straggling, 6-12 in. high, with forked branching. Leaves ½-¾ in. long, alternate, stalkless, linear- or spoon-shaped-oblong, tip rounded or truncate, notched or toothed. Involucres axillary or in the forks, very short, 1/12 in. broad, hairless within, lobes small, egg-shaped, lobulate or toothed; glands large, transversely oblong. Styles short, stout. Capsule ⅛-⅙ in. diameter, pale green, smooth, furrows between the oblong cocci shallow. Seeds smooth.
Locality.—Karakoram, 10,700 ft.
Distribution.—W. Himalaya, up to 15,000 ft.

Euphorbia hypericifolia, Linn. Collett, fig. 145.

(*Hypericifolia* means having leaves like a *Hypericum*, St. John's Wort.)

A hairless or slightly hairy annual herb. Stems 6-16 in. high, erect or decumbent. Leaves opposite short-stalked, oblong, ½-1 by ¼-½ in., blunt at the tip, rounded or heart-shaped at the base, margins toothed except near the base. Involucres very small, forming terminal or axillary cymes, often with 2 floral leaves at their base; teeth 4; glands green, bordered by a white or pale pink rounded limb. Styles very short. Capsules hairy. Seeds smooth.

Flowers.—April to September.

Locality.—In the hotter regions up to 4,000 ft.

Distribution.—All tropical regions except Australia and the Pacific Islands.

Euphorbia thymifolia, Burm. Thyme-leafed Spurge.

A hairy, much-branched annual herb. Stems 4-12 in. long, spreading flat on the ground. Leaves opposite, oblong, blunt, ¼ in. long, teeth sharp or rounded. Involucres very small, axillary; teeth 4; glands green, narrowly bordered with a white, rounded limb. Styles short. Capsule hairy. Seeds wrinkled.

Flowers.—April to September.

Locality.—Up to 5,500 ft.

Distribution.—All hot countries except Australia.

Euphorbia Emodi, Hook. f.

An annual, usually hairy herb. Stems 4-10 in. high, straggling from the base, ascending or decumbent, often purple. Leaves opposite, nearly stalkless, oblong, blunt, very unequal at the base, margins toothed, ¼-¾ in. long. Involucres very small, axillary, 4-toothed; glands purple, conspicuously bordered with a broad white or pink, rounded limb. Styles long. Capsule hairless. Seeds rough with small points.

Flowers.—April to September.

Locality.—Iskardo, 6,000-7,000 ft.

Distribution.—W. Himalaya, W. Asia.

Plate 51

LABIATAE. The Mint Family.

(*Labiatae* means lipped flowers.)

SALVIA, Linn.

(*Salvia* is Pliny's name for the Sage, *Salvia officinalis*. The word is derived from *salvus*, safe, to be in good health, alluding to the healing properties of the plant.)

A. Flowers 1 in. long or longer.

I. Flowers blue or lilac or nearly white or rose.

1. Leaves egg-shaped or oblong ... *S. Moorcroftiana.*
2. Leaves egg-halbert- or egg-heart-shaped ... . *S. hians.*

II. Flowers yellow ... ... *S. glutinosa.*

B. Flowers ½-⅔ in. long.

I. Leaves stalked.

1. Flowers white ... ... *S. asperata.*
2. Flowers blue ... ... *S. dumetorum.*

II. Leaves stalkless ... . *S. lanata.*

C. Flowers hardly ¼ in. long ... ... *S. plebeia.*

Fig. 1. Salvia Moorcroftiana, Wall. Moorcroft's Salvia.

(After William Moorcroft; collected in Nepal and N. W. India; died in 1825 in Afghanistan.)

A tall robust woolly herb. Stems 1½-3 ft. high. Leaves thick, long-stalked, egg-shaped or oblong, 5-8 by 2½-6 in., sinuately and irregularly lobed; upper surface nearly hairless or cottony, wrinkled; lower white-hairy. Flower-whorls many, distant, 6-10-flowered. Flowers 1 in. long, pale blue, lilac, nearly white or rose-coloured; bracts large, pale, green-veined, round, abruptly pointed. Calyx ⅓ in. long, bell-shaped, spinous-5-toothed, upper lip 3-toothed. Corolla 1 in. long,

tube much longer than the calyx; upper lip long, curved, very narrow. Nutlets almost globose.

Flowers.—May, June.

Locality.—Nasim Bagh; near Shirazia Bagh; Drogjun, on dry soil.

Distribution.—W. temperate Himalaya, from Kashmir to Kumaon, 6,000-9,000 ft.

Figs. 2 and 3. Salvia hians, Royle. Gaping Salvia.

A tall, robust, perennial, sticky-hairy herb. Leaves long-stalked, egg-halbert- or egg-heart-shaped, toothed; stalks often 10 in. long. Flower-whorls distant, few (6-) and lax-flowered. Calyx broadly and shortly bell-shaped, upper lip entire, truncate, the lower longer with egg-shaped teeth. Corolla very large, 1½ in. long, blue; throat very inflated. Nutlets ⅙ in. long, elliptic-inversely egg-shaped, compressed.

Resembles *Salvia glutinosa*, but can be distinguished by shorter racemes, longer leaf-stalks, broader leaves, blue flowers, broader calyx, larger corolla with the throat very inflated.

Flowers.—June to August.

Locality.—Gulmarg, margs and hills, grassy and rocky ground, above 8,000 ft., common; Tosh Maidan, 11,000-12,000 ft.

Distribution.—Kashmir, apparently endemic.

Figs. 4 and 5. Salvia glutinosa, Linn.

(*Glutinosa* means sticky.)

A tall, perennial herb, viscidly hairy, strongly scented. Stems 2-3 ft. high. Leaves stalked, egg-shaped-oblong, 3-8 by 1½-4 in., crenate or sharply toothed, base usually prolonged outwards in 2 pointed lobes, rarely heart-shaped or tapering downwards; stalk 1-3 in. long. Flower-whorls distant, few- and lax-flowered, forming large, branched, spreading panicles. Flowers 1-1½ in. long, yellow, upper lip purple, dotted. Bracts small, leaf-like. Calyx ½ in. long, broadly bell-shaped, upper lip entire, teeth of lower egg-shaped. Corolla 1-1½ in. long, tube longer than the calyx; upper lip long, curved, flattened, concave. Nutlets ⅛ in. long, elliptic-inversely egg-shaped, compressed, smooth.

Flowers—June, July.

Locality.—Drang, above village, 7,000 ft.; Gulmarg, woody hill-sides, common; Ganderbal.

Distribution.—Temperate Himalaya, from Kashmir, 6,000-9,000 ft., to Sikkim, 10,000-12,000 ft., Afghanistan, W. Asia, S. Europe.

Salvia asperata, Falc.

(*Asperata* means rough or harsh.)

A harsh, coarse herb. Stems stout, erect, glandular-hairy. Leaves 3-6 by 2-3 in., stalked, oblong-egg-shaped, heart-shaped, crenate, very much wrinkled. Flower-whorls distant, 6-10-flowered. Calyx broadly bell-shaped, stiff-hairy, rigid, $\frac{1}{2}$ in. long, teeth spinous, upper lip with 3 teeth. Corolla $\frac{3}{4}$ in. long, white; tube short, slender; throat shortly inflated; upper lip long, narrow, arched, lower shorter. Nutlets $\frac{1}{10}$ in. long, almost globose.

Locality.—Has been found between 5,000 and 6,000 ft.

Distribution.—Kashmir, endemic.

Salvia dumetorum, Andrz.

(*Dumetum* means a thicket, alluding to the predilection of this plant for brushwood.)

Stems herbaceous, erect, robust, hairy, 1-3 ft. high, much branched. Lower leaves long-stalked, egg-shaped or oblong-heart-shaped, doubly crenate, wrinkled above; stem-leaves few, stalkless, broadly heart-egg-shaped. Flower-whorls 6-flowered, distant. Calyx almost stalkless, bell-shaped, $\frac{1}{4}$ in. long, glandular-hairy, teeth of upper lip very short. Corolla $\frac{1}{2}$-$\frac{2}{3}$ in. long, blue, tube as long as the calyx, throat inflated.

Locality.—Found by Falconer at about 6,000 ft.

Distribution.—Vodhynia, Podolia, Altai.

Salvia lanata, Roxb. Woolly Salvia. Collett, fig. 126.

A robust, tall, densely and softly woolly herb. Stems usually many from the root, 12-18 in. high, simple or branched. Leaves mostly radical, stalkless, oblong-lance-shaped, 3-6 by $\frac{3}{4}$-$1\frac{1}{2}$ in., toothed; upper surface densely hairy or almost hairless, wrinkled, lower densely hairy. Flower-whorls many, distant, sticky-hairy, 6-8-flowered. Bracts sticky-hairy, large, round, abruptly pointed. Calyx bell-shaped, glandular-hairy, teeth spinous, upper lip 3-toothed. Corolla $\frac{2}{3}$ in. long; tube slender, not longer than the calyx; throat inflated; upper lip long, curved, flattened, concave, lower small. Nutlets $\frac{1}{10}$ in., brown.

Flowers.—May, June.

Locality.—Srinagar.

Distribution.—W. Himalaya, from Kashmir to Kumaon.

Salvia plebeia, R.Br.

(*Plebeia* means common, vulgar.)

A roughly hairy annual herb. Stems 6-18 in. high. Leaves stalked, 1-3 in. long, oblong or egg-shaped, blunt, toothed. Flower-whorls numerous. Bracts small, lower leaf-like, upper lance-shaped. Flowers hardly $\frac{1}{4}$ in. long, lilac or nearly white. Calyx bell-shaped, $\frac{1}{8}$ in. long, upper lip entire. Corolla-tube very short, included; upper lip short, nearly straight, slightly flattened, concave. Nutlets very small, ellipsoid.

Flowers.—May.

Locality.—Dal District; Chenar Bagh.

Distribution.—Throughout India, up to 5,000 ft., China, Malay Islands, Australia.

Plate 52

NEPETA, Linn.

(So called after the town Nepete, now Nepi, in Etruria.)

A. Leaves stalkless or almost so.

I. Stems woolly, or white-hairy, or glandular-hairy.

1. Flowers about $\frac{1}{3}$ in. long ... *N. elliptica.*
2. Flowers more than $\frac{1}{2}$ in. long.
   - *a.* Calyx $\frac{1}{3}$ in. long.
     - *aa.* Corolla $\frac{3}{4}$ in. long ... *N. glutinosa.*
     - *bb.* Corolla 1 in. long ... *N. leucolaena.*
   - *b.* Calyx $\frac{1}{2}$ in. long (fig. 1) ... *N. connata.*

II. Stems hairless, or slightly or finely hairy.

1. Calyx $\frac{1}{3}$ in. long ... ... *N. supina.*
2. Calyx $\frac{1}{4}$ in. long.
   - *a.* Leaves linear, entire ... ... *N. linearis.*
   - *b.* Leaves not linear, not entire.
     - *aa.* Stems hairless ... ... *N. nervosa.*
     - *bb.* Stems slightly hairy.
       - i. Calyx-teeth much shorter than the tube ... *N. Thomsoni.*
       - ii. Calyx-teeth as long as the tube.
         - a. Leaves broadly egg-shaped ... ... *N. eriostachya.*
         - aa. Leaves narrowly oblong-lance-shaped *N. campestris.*

B. Leaves distinctly stalked.

I. Calyx $\frac{1}{6}$ in. long ... ... *N. raphanorhiza.*

II. Calyx $\frac{1}{4}$-$\frac{1}{3}$ in. long.

1. Flowers not more than $\frac{1}{2}$ in. long.

a. Teeth of calyx as long as the tube.

aa. Leaves $1\frac{1}{2}$-4 in. long ... *N. spicata.*

bb. Leaves $\frac{1}{2}$ in. long ... *N. discolor.*

b. Teeth of calyx shorter than the tube.

aa. Corolla rose-coloured ... *N. mollis.*

bb. Corolla white, dotted with purple (fig. 5) ... ... *N. Cataria.*

cc. Corolla blue ... ... *N. Clarkei.*

2. Flowers more than $\frac{1}{2}$ in. long.

a. Flowers yellow (fig. 2) ... *N. Govaniana.*

b. Flowers not yellow.

aa. Leaves $\frac{1}{2}$ in. long ... *N. longibracteata.*

bb. Leaves 1-$1\frac{1}{2}$ in. long (fig. 6) *N. salviaefolia.*

cc. Leaves 2-3 in. long (fig. 3) *N. erecta.*

The plants figured on Plate 52 will be described first. The rest will follow in alphabetical order.

Fig. 1. **Nepeta connata,** Royle.

(*Connata* means grown together, referring to the bases of the leaves.)

Rootstock tuberous. A tall, stout herb. Stem simple, 1-2 ft. high, hairless or woolly. Leaves stalkless, lance-shaped or narrowly linear-lance-shaped, long-pointed, entire, sometimes toothed, 3-6 by $\frac{1}{6}$-$\frac{3}{4}$ in., leathery, heart-shaped and stem-clasping at the base and often more or less united. Flower-spikes 1-5 in. long, oblong, dense, or interrupted at the base. Bracts lance-awl-shaped, ciliate. Floral leaves egg-lance-shaped, long-pointed. Calyx stalked, hairy, $\frac{1}{2}$ in. long, teeth very long-awned, as long as the tube. Corolla blue, a little longer than the calyx. Stamens included. Nutlets $\frac{1}{12}$ in. long, round, compressed, brown, shining.

Locality.—Sonamarg.

Distribution.—W. temperate Himalaya, from Kashmir to Dalhousie, 8,000-11,000 ft.

Fig. 2. Nepeta Govaniana, Benth.

(After George Govan, correspondent of Wallich and Superintendent, Botanical Garden of Saharanpur.)

A tall, erect, branched, finely hairy herb. Stems 2-4 ft. high, 4-angled. Leaves 3-6 by 1½-3 in., very variable, stalked, egg-shaped, oblong, or elliptic, sharp-pointed, crenate, base sharp-pointed, rounded or heart-shaped; stalk ½-2 in. Whorls few-flowered, distant, long-stalked, in axillary and terminal racemes. Flowers 1-1¼ in. long, yellow. Calyx ⅓ in. long, straight, tubular, 2-lipped in fruit; teeth triangular, much shorter than the tube. Corolla 1 in. long, tube much longer than the calyx, curved, widely dilated towards the mouth. Nutlets $\frac{1}{16}$ in. long, broadly inversely egg-shaped to oblong, smooth.

Locality.—Gangabal.

Distribution.—W. temperate Himalaya, from Kashmir to Kumaon, 8,000-11,000 ft.

Fig. 3. Nepeta erecta, Benth.

Stems erect, finely hairy, 1-3 ft. high. Leaves stalked, heart-shaped, egg-shaped or oblong, 2-3 by 1¼-1½ in., crenate, sharp-pointed or blunt. Whorls distant, many-flowered, stalkless or nearly so, axillary or in terminal spikes. Flowers ¾-1 in., blue. Calyx ⅓ in., hairy, tube-shaped, curved; teeth triangular, much shorter than the tube. Corolla ½-1 in. long, blue, tube much longer than the calyx, curved, widely dilated towards the mouth. Nutlets broadly oblong. Aromatic.

Flowers.—June to September.

Locality.—Gulmarg, woods, over 7,000 ft., common; in forest north of Hayan Pass, 8,500 ft.; along stony path to Hayan Pass, 9,700 ft.; Tosh Maidan, on steep stony hill-side, 9,600 ft.

Distribution.—Kashmir.

Fig. 4. A hybrid between **Nepeta Govaniana,** Benth. and **N. erecta,** Benth.

Locality.—Gangabal (Hallberg).

Fig. 5. Nepeta Cataria, Linn. Catmint.

(*Cataria* is derived from *catus*, cat, because cats are fond of this plant.)

A perennial herb. Stems 2-3 ft. high, erect, branched, hairy, leafy, sharp-angled. Leaves 1-3 in. long, stalked (¼-¾ in.), egg-shaped or egg-heart-shaped, sharp-pointed, crenate or toothed. Flower-spikes, 4-10 in. long, terminal,

narrow, dense-flowered, with 6-20 whorls. Bracts awl-shaped, as long as the calyx or shorter. Flowers stalked. Calyx $\frac{1}{4}$ in. long, curved, hairy, mouth oblique, teeth almost equal, awl-shaped, shorter than the tube. Corolla $\frac{1}{2}$ in. long, white, dotted with purple. Nutlets $\frac{1}{20}$ in. long, smooth, broadly oblong.

Smells strongly like camphor, rather disagreeably.

Flowers.—May to July.

Locality.—Srinagar; Aidgah; Dal Kutwal, abundant.

Distribution.—W. temperate Himalaya, from Kashmir, up to 5,000 ft., to Dalhousie, Afghanistan to W. Europe.

Fig. 6. **Nepeta salviaefolia**, Royle.

(*Salviaefolia* means having the leaves of a *Salvia.*)

Stems slender, erect, branched, nearly cylindric, densely white-hairy, 1-2 ft. high. Leaves 1-1$\frac{1}{2}$ in. long, short-stalked, oblong or egg-shaped, blunt, crenate, base sharp-pointed, rounded or heart-shaped, wrinkled above, densely woolly beneath. Whorls or cymes short-stalked, distant, forming up to 1 ft. long, strict, narrow racemes or spikes. Bracts very small, awl-shaped. Calyx $\frac{1}{4}$ in. long, stalked, rough; teeth triangular, almost equal, shorter than the tube. Corolla $\frac{1}{2}$-$\frac{3}{4}$ in. long, pale blue or white; tube very slender, shortly dilated, limb $\frac{1}{4}$ in. across. Nutlets oblong, $\frac{1}{12}$ in. long, smooth.

Locality.—Takht.

Distribution.—Kashmir, 6,000-12,000 ft.

Nepeta campestris, Benth.

A hairy or almost hairless herb. Stem ascending, almost simple, branching from the base, $\frac{1}{2}$-1$\frac{1}{2}$ ft. high. Leaves almost stalkless or stalkless, narrowly oblong-lance-shaped, toothed, rounded at the base, green on both surfaces. Spikes slender, interrupted at the base. Bracts egg-shaped, sharp-pointed, almost as long as the calyx. Flowers blue, $\frac{1}{2}$ in. long. Calyx stalkless, $\frac{1}{4}$ in. long, teeth very slender, hairy or ciliate, almost as long as the tube. Corolla-tube longer than the calyx, widely dilated near the mouth.

Resembles *N. nervosa*, but the spikes are much longer and more slender, the calyx-teeth more spreading and the corolla-tube more slender.

Locality.—Temperate regions.

Distribution.—W. temperate Himalaya, from Kashmir to Kumaon, 7,000-9,000 ft.

Nepeta Clarkei, Hook. f.

Stems erect, strict, finely hairy, obtusely angled, branched. Leaves short-stalked, egg-shaped-oblong, or egg-lance-shaped, toothed or crenate, base sharp-pointed or heart-shaped, 1-2 in. long, stalk ¼-½ in. Whorls dense-flowered, distant, in terminal, 3-6 in. long spikes and shortly stalked in the lower axils. Bracts lance-shaped, lower leafy. Calyx ⅓ in. long, hairy, nearly straight, mouth oblique; teeth almost equal, triangular, sharp-pointed, much shorter than the tube. Corolla ½ in. long, blue; tube very slender, 3 times as long as the calyx, mouth dilated; lips small, less than ¼ in. across. Nutlets linear.

Locality.—Tilail, 11,000 ft.; Kunylwan, 7,500 ft. (Clarke).

Nepeta discolor, Benth.

(*Discolor* means having various colours.)

Rootstock elongate. Stems weak, erect or ascending, hairy or hairless. Leaves stalked, ½ in. long more or less, broadly egg-shaped or egg-heart-shaped, crenate, often white with appressed hairs beneath. Spikes egg-shaped or cylindric, 1½ in. long. Bracts elliptic, very sharp-pointed, as long as the calyx. Calyx ¼ in. long, stalkless, hairy, teeth filiform, awl-shaped, as long as the tube. Corolla white or pale blue.

Resembles *N. raphanorhiza*, but has not the tuberous rootstock of that species.

Locality.—Temperate and alpine regions.

Distribution.—From Kashmir to Garhwal, 10,000-15,000 ft., Afghanistan.

Nepeta elliptica, Royle.

Stem 1-2 ft. high, erect or ascending, often flexuous, usually woolly, branched. Leaves stalkless or almost so, ½-1½ in. long, elliptic-oblong or oblong-heart-shaped, tip rounded or sharp-pointed, margin sharply toothed, nerves on lower surface prominent. Spike interrupted at the base, 1½-3 in. long. Bracts egg- or lance-shaped, awned. Flowers about ⅓ in. long, pale blue or nearly white. Calyx stalkless, ¼ in. long, teeth filiform, ciliate, as long as the tube. Corolla-tube hardly longer than the calyx.

Locality.—Temperate region.

Distribution.—W. temperate Himalaya, from Kashmir to Kumaon, 7,000-9,000 ft.

Nepeta eriostachya, Benth.

(From the Greek *erion*, wool, and *stachys*, an ear, or spike, or plant, here alluding to the densely hairy spike.)

Stem ascending or erect, 6-10 in. high, almost simple, sparsely hairy. Leaves stalkless or almost so, broadly egg-shaped, blunt, crenate, cordate at the base, hairy beneath, $\frac{1}{2}$-$\frac{3}{4}$ in. long, sometimes nearly as broad. Flower-spike oblong, dense-flowered, densely long-hairy, 1-3 in. long. Bracts oblong-linear and awl-shaped, as long as the calyx. Calyx stalkless, $\frac{1}{4}$ in. long, membranous, teeth slender, very hairy, as long as the tube. Corolla bright blue, twice as long as the calyx. Stamens included.

Locality.—Sonamarg.

Distribution.—W. temperate Himalaya, from Kashmir, 11,500 ft., to Garhwal, 11,000-12,000 ft.

Nepeta glutinosa, Benth.

(*Glutinosa* means sticky.)

A glandular-hairy, strongly scented herb. Stems stout, strict, erect, leafy, $1\frac{1}{2}$-2 ft. high. Leaves small, $\frac{3}{4}$-1 in. long, stalkless, egg-heart-shaped, sharp-pointed, deeply cut, often half-stem-clasping. Flower-whorls few-flowered, distant, or the uppermost forming a spike. Bracts linear-oblong, long-pointed, slightly shorter than the calyx. Calyx stalked, $\frac{1}{3}$ in. long, teeth egg-shaped, suddenly sharp-pointed, much shorter than the tube. Corolla $\frac{3}{4}$ in. long, white or blue, tube curved, slender, lips short. Nutlets smooth.

Locality.—Subalpine region.

Distribution.—Kashmir, 11,000-13,000 ft.

Nepeta leucolaena, Benth.

Stems 2-3 ft. high, erect, branched, nearly cylindric, white-hairy, leafy. Leaves small, $\frac{1}{3}$-1 in. long, almost stalkless, egg-shaped, sharp-pointed or blunt, crenate, hairy on both surfaces; stalks 0-$\frac{1}{6}$ in. long. Spikes terminal, interrupted. Whorls distant, few-flowered, the lower very shortly stalked, axillary. Bracts lance-shaped. Calyx $\frac{1}{3}$ in. long, woolly, upper teeth much shorter than the tube, triangular, lower awl-shaped, much shorter. Corolla thrice as long as the calyx; tube curved, funnel-shaped; lips short. Nutlets linear-oblong.

Locality.—Zaskar; Ladakh, 12,000-13,000 ft.

Distribution.—Kashmir, endemic.

Nepeta linearis, Royle.

(*Linearis* means linear, in allusion to the shape of the leaves.)

Rootstock often the size of a walnut. Stems 6-18 in. high, ascending, stout, sparsely leafy, hairless or slightly hairy. Leaves stalkless, linear, sharp-pointed or blunt, 1-3 by $\frac{1}{8}$ in., entire. Flowers $\frac{1}{2}$-$\frac{3}{4}$ in. long, blue, in stalkless whorls which are crowded in small heads or terminal spikes up to 2 in. long, often interrupted near the base; bracts lance- or awl-shaped. Calyx $\frac{1}{4}$ in. long, tube-shaped, hairy; teeth linear-lance-shaped, spinous, shorter than the tube. Corolla-tube twice as long as the calyx, throat dilated, lips short. Very variable regarding the size of all parts.

Flowers.—May to July.

Locality.—Near Shirazia Bagh; Tangmarg, in forest, 7,200-8,700 ft.; Mekhowali, 9,000 ft.

Distribution.—W. temperate Himalaya, from Kashmir to Simla, 7,000-11,000 ft.

Nepeta longibracteata, Benth.

(*Longibracteata* means having long bracts.)

Rootstock long, stout, much divided at the top. Stems dwarf, 3-6 in. high, almost erect or prostrate, simple or branched, softly hairy. Leaves stalked, fan-shaped or wedge-shaped and inversely egg-shaped, crenate or lobed, $\frac{1}{2}$ in. long or broad, or less; stalk about the same length. Spikes head-shaped, 1 in. diameter. Uppermost bracts crowded, long-silky, lower bracts fan-shaped, comb-shaped. Calyx $\frac{1}{3}$ in. long, silky, teeth almost equal, nearly as long as the tube. Corolla blue, twice as long as the calyx, tube curved, funnel-shaped, limb small. Stamens included. Nutlets $\frac{1}{20}$ in. long. Lemon-scented.

Locality.—Alpine region.

Distribution.—Kashmir, 14,000-17,000 ft.

Nepeta mollis, Benth. (Including **N. distans**, Benth., of the "Flora of British India.")

(*Mollis* means soft, alluding to the fact that the plant is softly hairy.)

Rootstock elongate, woody. Stems 6-18 in. high, slender, softly hairy, sparingly leafy. Leaves 1-2 by $\frac{1}{2}$-1 in., short-stalked, egg-heart-shaped, blunt, crenate, grey-hairy; stalk $\frac{1}{6}$-$\frac{1}{3}$ in. long. Spikes 3-8 in. long; whorls white, softly hairy,

few-flowered. Bracts elliptic-egg-shaped or lance-shaped, awned, as long as the calyx. Calyx ¼ in. long; mouth oblique; teeth lance-shaped, softly hairy, shorter than the tube. Corolla rose-coloured; tube shortly exserted, limb small.

Locality.—Temperate region, 8,000-9,000 ft.

Distribution.—W. temperate Himalaya, from Kashmir to Mussoorie, Punjab Himalaya.

Nepeta nervosa, Royle.

(*Nervosa* means being provided with nerves, alluding to the prominent nerves on the lower surface of the leaves.)

Rootstock long, woody. Stems 1-2 ft. high, tall, erect, ascending, hairless. Leaves stalkless or short-stalked, linear-lanceolate, long-pointed, toothed, rounded at the base or heart-shaped, veins on lower surface prominent. Flower-spike stout, oblong, dense, 1-3 in. long. Outer bracts egg- or lance-shaped, longer than the calyx. Calyx stalkless, ¼ in. long, teeth very slender, filiform, as long as the tube. Corolla twice as long, pale blue or yellow. Stamens included.

Locality.—Kashmir Valley.

Distribution.—Apparently endemic.

Nepeta raphanorhiza, Benth.

(*Raphanorhiza* means having roots like a radish.)

Rootstock globose, black, the size of a walnut. Stems spreading or ascending, weak, 6-18 in. high, simple or branched, hairy or hairless. Leaves stalked, small, ½-1 in. long, sometimes nearly as broad, broadly egg-shaped or egg-heart-shaped, crenate or toothed. Spikes 1 in. long and less, egg-shaped, more or less hairy, dense. Bracts egg-lance-shaped, almost as long as the calyx. Calyx ⅙ in. long, stalkless, teeth lance-shaped, ciliate, shorter than the tube. Corolla purplish-blue, tube slender, twice as long as the calyx.

Locality.—Temperate region.

Distribution.—W. temperate Himalaya, from Kashmir to Chamba, 5,000-12,000 ft., Afghanistan.

Nepeta spicata, Benth.

(*Spicata* means spiked, referring to the long spikes.)

A hairless or hairy herb. Stems erect, 1-3 ft. high, branched, branches often spreading. Leaves stalked, usually heart-shaped, egg-shaped or triangular, 1½-4 by ½-3 in., crenate

or sharply toothed; stalk 1-3 in. long. Flower-whorls stalkless, crowded in terminal spikes up to 4 in. long, sometimes interrupted near the base, stout or slender. Bracts egg- or lance-shaped, awned. Flowers $\frac{1}{2}$ in. long, purple-blue or pale blue. Calyx stalkless, $\frac{1}{4}$ in. long, teeth linear-lance-shaped, sharp-pointed, as long as the tube. Corolla-tube much longer than the calyx.

Flowers.—May, June.

Locality.—Between Srinagar and Gulmarg, in ditches along road; along stony path to Hayan Pass, 9,700 ft.

Distribution.—W. temperate Himalaya, from Kashmir to Kumaon, 6,000-12,000 ft., Afghanistan.

Nepeta supina, Stev.

Stems erect, branched, 8-18 in. high, finely hairy. Leaves stalkless, small, egg-shaped, blunt, crenate, $\frac{1}{2}$-1 in. long, densely hairy beneath. Flower-whorls dense-flowered, lower axillary, upper in an egg-shaped spike. Bracts oblong-lance-shaped, almost as long as the calyx. Calyx $\frac{1}{3}$ in. long, curved, narrow, long-hairy, mouth very oblique, teeth bristle-shaped, shorter than the tube. Corolla $\frac{1}{2}$-$\frac{3}{4}$ in. long, blue. Nutlets nearly $\frac{1}{12}$ in. long, linear, trigonous.

Locality.—Iskardo, 12,000 ft.

Distribution.—W. temperate Himalaya, from Kashmir to Garhwal, up to 15,000 ft., Caucasus.

Nepeta Thomsoni, Benth.

A finely hairy herb. Stems up to 1 ft. high, stout, very leafy, simple or with simple ascending branches from the base. Leaves stalkless or short-stalked, oblong-heart-shaped, blunt or sharp-pointed, crenate, close-set, 1-2 by $\frac{1}{2}$-$\frac{3}{4}$ in., stalk rarely $\frac{1}{6}$ in.; floral leaves similar. Flower-whorls forming a dense egg-shaped or conical spike. Bracts green, large, leafy, far exceeding the calyces. Calyx $\frac{1}{4}$ in. long, hairy, teeth egg-lance-shaped, much shorter than the tube. Nutlets large, nearly $\frac{1}{14}$ in., almost round.

Locality.—Hanle.

Distribution.—Kashmir, 14,000-16,000 ft., E. Tibet north of Sikkim.

Plate 53

ELSHOLTZIA, Willd.

(After J. Sigismund Elsholtz, a German botanist, 1623-1688.)

A. Spikes bearing flowers all round.
  I. Spikes ¼-2 in. long.
    1. Bracts nearly concealing the flowers. Flowers pale purple... *E. strobilifera.*
    2. Bracts shorter than the flowers. Flowers lilac ... ... *E. densa.*
  II. Spikes 2-10 in. long.
    1. Leaves nearly stalkless, 3-6 in. long *E. polystachya.*
    2. Leaves long-stalked, 1-2 in. long *E. incisa.*

B. Spikes bearing flowers only on one side... *E. cristata.*

Fig. 1. Elsholtzia strobilifera, Benth.

(From the Greek *strobilos*, a cone, and *ferre*, to bear, alluding to the peculiar appearance of the spike.)

A sparsely hairy herb, 2-18 in. high. Stem simple, filiform, or much-branched. Stem and branches usually with a line of crisp hairs. Leaves ½-1 in. long, stalked, egg-shaped, blunt, crenate or toothed; stalk ⅙-¼ in. long. Spikes ¼-2 in. long, in fruit sometimes ⅓ in. diameter, cone-like, cylindric, hairy. Bracts membranous, persistent, forming broad, fringed, overlapping involucres nearly concealing the flowers. Calyx narrow-tubular, in fruit $\frac{1}{10}$ in. long; teeth lance-shaped. Corolla pale purple; tube very slender, much longer than the calyx; lobes very small, hairless. Nutlets $\frac{1}{30}$ in. long, oblong, red-brown, not shining.

Flowers.—June to September.

Locality.—Gangabal.

Distribution.—Temperate and alpine Himalaya, from Kashmir to Sikkim, up to 14,000 ft.

Elsholtzia densa, Benth.

An annual, sparingly hairy herb, 6-18 in. high, branched from the base. Stem slender to very stout, 4-angled. Leaves 1-3 in. long, short-stalked, oblong-lance-shaped or elliptic, sharp-pointed or blunt, toothed; stalk ¼-½ in. long. Spikes 1-1½ in. long, or more, oblong or shortly cylindric, hairy,

interrupted. Bracts shorter than the flowers. Calyx in flower very small, cup-shaped, in fruit greatly enlarged, $\frac{1}{4}$ in. long, broadly funnel-shaped, inflated, membranous; teeth short, rounded. Corolla lilac, very small, hairy, tube very short. Nutlets $\frac{1}{10}$ in. long, ellipsoid.

Locality.—Ladakh.

Distribution.—W. Himalaya, from Kashmir to Kumaon, 10,000-13,000 ft.

Elsholtzia polystachya, Benth. Many-spiked Elsholtzia. Collett, fig. 123.

A perennial bush, 3-6 ft. high, branched, more or less hairy, branches obscurely 4-angled. Leaves 3-6 in. long, almost stalkless, lance-shaped or elliptic-lance-shaped, long-pointed, toothed. Spikes slender, cylindric, 4-10 in. long, often fascicled, when flowering $\frac{1}{3}$ in. diameter, narrower in fruit. Bracts very small. Flowers white or pale yellow. Calyx in fruit $\frac{1}{6}$ in. long, stalked, narrowly tubular, curved, teeth erect. Corolla hairy; tube twice as long as the calyx. Nutlets narrow.

Flowers.—June to September.

Locality.—Along path to Hayan Pass, 9,700 ft.

Distribution.—Temperate Himalaya, from Kashmir to Sikkim, 7,000-9,000 ft., Khasia Hills, 4,000-5,500 ft.

Elsholtzia incisa, Benth.

(*Incisa* means cut, alluding to the coarsely toothed leaves.)

A tender, slightly hairy herb, 1-3 ft. high, branches quadrangular. Leaves 1-2 in. long, fragrant, membranous, long-stalked, broadly egg-shaped, blunt, coarsely toothed; base tapering, lower surface gland-dotted, stalk as long as the blade. Spikes very slender, cylindric, 2-6 in. long; when in flower $\frac{1}{6}$ in. diameter, in fruit $\frac{1}{3}$ in. Bracts bristle-shaped, often longer than the flowers. Flowers white. Calyx in fruit $\frac{1}{6}$ in. long, stalkless, glandular-hairy; teeth erect, lance-shaped. Corolla very small; tube short, lobes hairless. Nutlets ellipsoid.

Flowers.—July to September.

Locality.—Temperate and subtropical region.

Distribution.—From Kashmir to Mishmi, 3,000-5,000 ft. Chittagong, Ava.

Fig. 2. **Elsholtzia cristata**, Willd.

(*Cristata* means crested, alluding to the one-sided spike.)

An erect, nearly glabrous, fragrant herb, from ½-2 ft. high. Stem simple or branched. Leaves 1-4 in. long, long-stalked, lance-shaped or egg-lance-shaped, long-pointed, coarsely toothed, base wedge-shaped; stalk half as long as the blade or longer. Spikes 1-3 in. long, broad, in fruit ½ in. diameter or less, hairy, flat, bearing flowers only on one side. Bracts conspicuous, round, abruptly pointed. Flowers purple. Calyx very small in flower, in fruit bladder-shaped; teeth triangular. Corolla-tube protruding, curved; limb very hairy. Nutlets oblong, smooth.

Flowers.—August-September.

Locality.—Thajwas.

Distribution.—Tropical and temperate Himalaya, from Kashmir to Mishmi, 9,000-11,000 ft., N. Europe, N. Asia, China, Japan.

SCUTELLARIA, Linn.

(From the Latin *scutella*, a small cup, alluding to the shape of the calyx.)

A. Leaves linear, $\frac{1}{10}$-$\frac{1}{5}$ in. broad ... ... *S. linearis.*

B. Leaves not linear, over ½ in. broad.

I. Flowers ½ in. long, dull yellow, sometimes tinged with purple ... ... *S. repens.*

II. Flowers ⅔ in. long, blue, white inside *S. galericulata.*

III. Flowers ¾-1 in. long.

1. Flowers dark blue or blue-purple, partly white ... ... *S. grossa.*

2. Flowers yellow or nearly white, tipped with purple or violet or blue or rose.

a. Leaves not more than 1 in. long.

i. Calyx with long spreading white hairs... ... ... *S. Heydei.*

ii. Calyx without long spreading white hairs... ... ... *S. prostrata.*

3. Leaves 1-3 in. long ... ... *S. angulosa.*

Scutellaria linearis, Benth.

A dwarf, slightly hairy plant. Rootstock stout, woody. Stems numerous, 4-8 in. high, tufted, slender, rounded, prostrate and ascending. Leaves almost stalkless, linear, ½-1½ by $\frac{1}{10}$-⅛ in., entire, margins bent back. Racemes ½-1 in. long, hairy, often glandular. Bracts egg-shaped, entire, ¼-⅓ in. long. Flowers ¾-1 in. long, pale purple, tip of lower lip yellow. Corolla ¾-1 in. long, throat much inflated, tube nearly straight. Nutlets slightly hairy.

Locality.—Temperate region.

Distribution.—Murree, Kashmir to Kumaon, 3,000-8,000 ft., Afghanistan.

Scutellaria repens, Ham.

(*Repens* means creeping.)

A more or less hairy herb. Stems long, stout, curved, brittle, obtusely 4-angled ; branches crowded, curved, ascending. Leaves ½-1½ in. long, stalked, egg-shaped, sharp-pointed, entire or toothed ; stalk ¼-1 in. Racemes 6-10 in. long, stout or slender, glandular, curved. Bracts ¼-⅓ in. long, egg-shaped, entire or crenate. Flowers ⅓-½ in. long, dull yellow, sometimes tinged with purple ; stalks very short. Corolla ½ in. long, sharply recurved, much narrowed at the base ; throat inflated ; lips almost alike.

Locality.—Subtropical region.

Distribution.—From Kashmir to Sikkim, 1,000-5,000 ft., Ava.

Fig. 4. Scutellaria galericulata, Linn. Scull-cap, Hooded Willow Herb.

(*Galericulata* means being provided with a *galericulum*, a cap, alluding to the shape of the corolla.)

A perennial marsh plant, growing in small clusters or groups. Stems 2-3 ft. high, creeping below, then erect, 4-angled. Leaves 1½-2½ in. long, short-stalked, egg-lance-shaped, heart-shaped, blunt, crenate, or upper entire. Flowers blue, in pairs, all turned one way, axillary, softly and loosely hairy, whitish below. Corolla ⅔ in. long, white inside, much longer than the calyx and gaping, with a short turned-back tube, and the throat long, with hollow upper lip, the lower lip being notched.

Flowers.—July.

Locality.—Nil Nag, round lake, 6,900 ft.

Distribution.—Temperate Kashmir, 5,000-8,000 ft., Central and N. Asia, from the Caucasus westward to Europe, N. America.

Scutellaria grossa, Wall.

A hairy plant. Stems slender, creeping at the base, 1-2 ft. high, much-branched, branches ascending. Leaves stalked, egg- or lance-shaped, heart-shaped or truncate at the base, sharp-pointed or blunt, coarsely crenate, 1-3 by $\frac{3}{4}$-2 in., nearly hairless; stalk $\frac{1}{4}$-1 in. long. Racemes slender, glandular, 3-6 in. long, flower-stalks very short. Bracts elliptic, $\frac{1}{4}$-$\frac{1}{3}$ in. long, longer than the calyx. Flowers $\frac{3}{4}$ in. long, dark blue or blue-purple, lip partly white. Nutlets slightly hairy.

Locality.—Temperate region.

Distribution.—W. Himalaya, from Kashmir to Kumaon, 4,000-8,000 ft.

Scutellaria Heydei, Hook. f.

A dwarf, prostrate, branching herb. Branches hairy with long, spreading hairs. Leaves very small, short-stalked, egg- or heart-shaped, blunt, crenate, woolly. Spikes short, 4-gonous, leafy, terminal. Bracts egg-shaped, leafy. Calyx covered with long, spreading hairs. Corolla $\frac{3}{4}$ in. long, yellow, tipped with blue or rose.

Resembles *S. prostrata*, but the leaves are smaller, more woolly, the leaf-stalks shorter and the branches and calyx have long, spreading, white hairs.

Locality.—Ladakh; Zaskar, 15,000-16,000 ft.

Distribution.—Alpine Kashmir, Afghanistan.

Fig. 3. Scutellaria prostrata, Jacquem.

A dwarf, hairy, prostrate herb. Rootstock stout. Stems many, 4-8 in., flexuous, almost rounded. Leaves $\frac{1}{2}$-1 in. long, stalked, egg-shaped, coarsely toothed, base heart- or wedge-shaped, softly hairy, green on both sides. Spikes 1-2 in. long, 4-gonous, oblong, leafy, terminal. Bracts leafy, egg-shaped, entire, overlapping. Corolla 1 in. long, yellow, tipped with violet. Nutlets hairy.

Locality.—Sonamarg.

Distribution.—W. Himalaya, from Kashmir to Kumaon, 8,000-14,000 ft.

Scutellaria angulosa, Benth.

(*Angulosa*, angular, referring to the angular branches.)

A tall, sparsely hairy herb. Stems very stout below. Branches rambling for several feet, 4-angled, angles with slender ribs. Leaves 1-3 in. long, egg- or lance-shaped, blunt or sharp-pointed, coarsely crenate, base rounded or almost heart-shaped, with a few small, scattered hairs, often purple beneath; stalk $\frac{1}{6}$-$\frac{1}{2}$ in. long. Racemes 3-4 in. long, hairy, axillary or terminal. Bracts all leafy, upper small, entire. Flowers $\frac{3}{4}$-1 in. long, pale yellow or nearly white, tip tinged with purple. Corolla slightly narrowed at the base, throat widened. Nutlets granulate.

Locality.—Temperate region.

Distribution.—W. and Central Himalaya, from Kashmir to Nepal, 4,000-9,000 ft.

AJUGA, Linn.

(Said to be a corruption of the Greek *aguios*, weak in limbs, because *Ajuga reptans* was used against gout, for which reason it was also called *Iva arthritica*.)

1. Stamens protruding ... ... *A. bracteosa.*
2. Stamens included ... ... *A. parviflora.*

Fig. 5. Ajuga bracteosa, Wall.

(*Bracteosa* means that the bracts form a conspicuous feature.)

A softly hairy herb. Stems erect or ascending, usually diffusely branching from the base, 4-12 in. high, usually stout and leafy. Leaves 1-4 in. long, egg-shaped, toothed or nearly entire, lower ones stalked, upper stalkless. Flower-whorls axillary or crowded in spikes which are much shorter than the leafy egg-shaped or wedge- inversely egg-shaped, entire or toothed bracts. Flowers nearly $\frac{1}{3}$ in. long, pale blue or lilac. Calyx $\frac{1}{6}$ in. long, hairy; teeth half the length of the tube, egg-lance-shaped. Corolla-tube nearly twice as long as the calyx; upper lip erect, 2-fid; side lobes of lower oblong, midlobe dilated, variable in length. Stamens protruding. Nutlets $\frac{1}{10}$ in. long, ellipsoid, deeply pitted.

Flowers.—May.

Locality.—Dachigam Rakh, on rocks; hill above Sarban Lake, in cleft of rocks; Wangat Nala; Takht.

Distribution.—Abyssinia, Afghanistan, from Peshawar to Oudh, W. Himalaya, from Kashmir to Nepal, 1,000-7,000 ft., China, Japan.

Ajuga parviflora, Benth.

(*Parviflora* means small-flowered.)

A softly hairy herb. Stems ascending, diffusely branched from the base. Leaves stalkless or short-stalked, egg-shaped or oblong, 2-6 in. long, toothed or almost entire, lower surface often tinged with purple; radical leaves spreading. Spikes 1-4 in. long; whorls usually crowded, lower sometimes distant. Bracts egg-shaped or oblong, much longer than the flowers. Calyx $\frac{1}{10}$-$\frac{1}{8}$ in. long; teeth lance-shaped, as long as the tube. Corolla blue, tube slender, $\frac{1}{8}$-$\frac{1}{6}$ in. long, protruding, hairless or hairy; limb very small; upper lip very short, 2-lobed. Stamens included in the tube. Nutlets $\frac{1}{16}$ in. long, pitted.

Locality.—At elevations up to 7,000 ft.

Distribution.—W. Himalaya, from Kashmir to Kumaon, Afghanistan.

Plate 54

LEONURUS, Linn.

(From the Greek *leon*, lion, and *oura*, a tail, alluding to the inflorescence.)

Fig. 1. Leonurus cardiaca, Linn. Motherwort.

(From the Greek *kardiakos*, suffering from heart-disease.)

Rootstock stout. Stems stout, erect, 2-4 ft. high. Leaves stalked; lower egg-lance-shaped, about 5 by 3 in., deeply and irregularly cut into several coarsely toothed lobes; upper narrow, lobed or nearly entire. Flowers $\frac{1}{2}$ in. long, pink, crowded in axillary whorls which form long, terminal, more or less interrupted spikes. Bracts spinous. Calyx $\frac{1}{8}$ in. long, shortly tubular; teeth 5, triangular, spine-tipped, spreading. Corolla hairy, especially the upper lip; tube hardly longer than the calyx-tube; limb 2-lipped, upper lip erect, hood-like, entire, lower spreading, 3-lobed, midlobe longest, entire. Stamens 4, in unequal pairs, ascending under the upper lip, outer or anterior pair longer than the inner.

Flowers.—June.

Locality.—Srinagar; Aidgah; below Basam Gali, in open situations, above 10,000 ft.

Distribution.—Temperate W. Himalaya, from Kashmir to Kumaon, 6,000-10,000 ft., N. Asia, W. Asia, Europe.

STACHYS, Linn. The Woundwort.

(The Greek word for an ear or spike of corn, alluding to the inflorescence. Was the classical name for *S. palestina*.)

A. Herbs.

I. Whorls many-flowered.

1. Calyx-tip thickened ... ... *S. melissaefolia.*
2. Calyx spine-tipped.
   a. Stem clothed with soft white wool ... ... *S. floccosa.*
   b. Stem clothed with long silky hairs ... ... *S. sericea.*

II. Whorls few- (up to 12-) flowered.

1. Corolla-tube included in the calyx *S. palustris.*
2. Corolla-tube protruding from the calyx ... ... *S. sylvatica.*

B. An undershrub ... ... *S. tibetica.*

Fig. 2. Stachys melissaefolia, Benth. Balen-leafed Woundwort.

(*Melissaefolia* means having leaves like *Melissa officinalis*, the Balen.)

A tall, erect, hairy herb. Stem 4-angled. Leaves stalkless or short-stalked, egg-shaped or oblong-heart-shaped, sharp-pointed, crenate. Whorls many-flowered, axillary, distant. Bracts as long as the calyx. Calyx short, as broad as long; teeth triangular, sharp-pointed or with a thickened tip (not ending in a pale spine as does *S. sericea*).

Locality.—Gangabal; Drang, above village, 7,000 ft.

Distribution.—Temperate Himalaya, from Kashmir to Sikkim, 8,000-10,000 ft.

Fig. 3. Stachys sp.

Flowers.—June.

Locality.—Srinagar; Sudar Khun Lake, in flax-field (Hallberg).

Stachys floccosa, Benth. Woolly Woundwort.

(*Floccosa* means covered with wool-like tufts.)

Stems 2-4 ft. high, stout, erect, simple, obtusely 4-angled, densely covered with soft white wool. Leaves 3-4 by 1-2 in., stalked, egg- or egg-lance-shaped, heart-shaped, sharp-pointed, crenate, thick, velvety above; stalk ½-1 in. long, very stout. Whorls dense, many-flowered, axillary and in a terminal spike, hairy, depressed. Bracts nearly as long as the calyx. Flowers stalkless. Calyx ¼ in. long, when fruiting ⅓ in., hairy, teeth triangular, with a spinous point, coloured. Corolla-tube shortly protruding. Nutlets inversely pear-shaped, smooth.

Locality.—Temperate region, 5,000-6,000 ft.

Distribution.—Kashmir, Afghanistan.

Stachys sericea, Wall. Silky Woundwort.

An erect herb, covered with long, silky hairs. Stems 2-4 ft. high, usually unbranched. Leaves stalked, egg-shaped or oblong, heart-shaped, 2½-4 by 1½-2½ in., crenate or toothed. Flowers ½-¾ in. long, pink, spotted with purple, crowded in axillary whorls. Spikes long, terminal, more or less interrupted. Calyx bell-shaped, 10-nerved; teeth 5, lance-shaped; spine-tipped, often tinged with pink. Corolla hairy; tube cylindric, scarcely longer than the calyx; limb 2-lipped, upper lip erect, hood-like, entire, lower spreading, 3-lobed, mid-lobe broad, notched, much longer than the lateral. Stamens 4, in unequal pairs, ascending under the upper lip.

Locality.—Temperate region.

Distribution.—From Kashmir to Nepal, 6,000-9,000 ft., Afghanistan, Central Asia.

Stachys palustris, Linn. Marsh Woundwort.

An erect, perennial herb, 1-3 ft. high. Stem 4-angled, hollow, stout, with fine, turned-back hairs. Stem-leaves 3-4 by ¾-1 in., short-stalked or stalkless, egg-shaped, oblong to lance-shaped, narrow, linear, more or less heart-shaped below, scalloped or coarsely toothed. Flowers dull purple, in whorls of 8-10. Bracts very small. Calyx ⅓ in. long, hairy; teeth lance-shaped, spine-tipped, as long as the tube. Corolla-tube included in the calyx. Nutlets broadly and inversely egg-shaped, shining, with small dots.

Locality.—At elevations of 5,000-6,000 ft.

Distribution.—Kashmir, N. and W. Asia, Europe, N. America.

Stachys sylvatica, Linn. Hedge Woundwort.

Rootstock creeping, stoloniferous. Stem 1-3 ft. high, erect or ascending, solid, rather slender. Leaves 2-4 in., long-stalked, radical, soon withering. Stem-leaves egg-shaped, heart-shaped, coarsely toothed, stalk ¼-½ in. long, rough. Flowers purplish red or pink, in whorls of 6-12. Lower bracts toothed, upper lance-shaped, entire. Bracteoles very small. Calyx ⅓ in. long; teeth triangular, awl-shaped. Corolla ½ in. long, longer than the calyx; lower lip with white markings. Nutlets almost globose.

Locality.—Temperate region.

Distribution.—Kashmir, N. Asia, Europe.

Stachys tibetica, Vatke. Tibetan Woundwort.

Rootstock stout, woody. Stems 1-2 ft. high, hairless or hairy, much-branched; branches slender. Leaves ½-1½ in., short-stalked or stalkless, oblong, egg-lance-shaped or linear, entire or irregularly lobed. Whorls 1-2-flowered, axillary. Flowers stalkless. Calyx ⅓ in. long, bell-shaped, hairless or very hairy; teeth as long as the tube, triangular, tips long, hairy, erect or spreading. Corolla ¾-1 in. long, pink, slightly hairy; tube thrice as long as the calyx; upper lip long, narrow. Nutlets ⅛ in. long, broadly and inversely egg-shaped-oblong.

Locality.—At elevations of 10,000-14,000 ft.

Distribution.—Kashmir, Kashgar.

PHLOMIS, Linn.

(Derived from the Greek *phlox*, a flame, used for a species of *Verbascum*, a Mullein.)

I. Stem and branches round.

1. Galea fringed ... ... *P. spectabilis.*
2. Galea not fringed ... ... *P. cashmeriana.*

II. Stem and branches angled.

1. Leaves long-pointed ... ... *P. setigera.*
2. Leaves blunt ... ... *P. bracteosa.*

Fig. 4. Phlomis spectabilis, Falc.

Stems 4-6 ft. high, herbaceous, tall, stout, hairy or downy. Leaves large, sometimes a foot broad, egg-heart-shaped, crenate or small-lobed, wrinkled, covered with star-shaped hairs beneath, nerves beneath softly hairy; stalk 6-12 in. Whorls many-flowered, axillary, 1½-2 in. diameter. Bracts filiform, rigid, hairy. Calyx ½-¾ in. long, hairy, teeth spine-tipped, ⅓ shorter than the tube. Corolla rose or rose-purple; galea beautifully fringed with silvery hairs. Nutlets ¼ in. long, linear.

Flowers.—June.

Locality.—Dachigam Rakh; Sind Valley.

Distribution.—Kashmir, 3,000-8,000 ft., Afghanistan.

Phlomis cashmeriana, Royle.

Stems several from a very stout rootstock, 2-3 ft. high, erect, round, clothed with wool. Radical leaves long-stalked, 5-9 by 2-4 in., leathery, finely hairy above, nerves netted beneath; stalk 4-6 in. Whorls many-flowered, 1-1½ in. diameter. Bracts numerous, ⅔ in. long, filiform, hairy, ciliate. Calyx ½-¾ in. long, hairy; teeth spine-tipped, half the length of the tube. Corolla pale purple; galea very large, hairy, not fringed; lower lip very broad, adze-shaped. Nutlets broadly oblong, ⅛ in. long.

Locality.—At elevations of 5,000-6,500 ft.

Distribution.—Kashmir, Afghanistan.

Phlomis setigera, Falc.

(*Setigera* means bearing bristles, alluding to the bracts.)

Stems tall, erect, nearly hairless or slightly hairy, 4-angled. Leaves short-stalked, egg-shaped, long-pointed, crenate, base rounded or heart-shaped; stalks ½-1 in. long. Whorls many-flowered, dense. Bracts short, rigid, covered with bristles, tips spinous. Calyx ⅓-½ in. long, hairy; teeth erect, awl-shaped, ciliate, half as long as the tube. Upper lip almost erect, inside and on the margin bearded with long hairs; midlobe of lower lip scarcely longer than the lateral ones. Nutlets ⅛ in. long, inversely egg-shaped, top truncate.

Locality.—Palgam, 7,000 ft.

Distribution.—Temperate Himalaya, from Kashmir to Sikkim, 10,000-12,000 ft.

Phlomis bracteosa, Royle.

An erect, hairy herb, 1-3 ft. high. Stem simple or branched, 4-angled. Leaves 2-4 in. long, stalked, egg-shaped, blunt, crenate, base broadly heart-shaped. Flowers nearly 1 in. long, dull blue-purple, crowded in large axillary whorls, 1-1½ in. diameter. Bracts long, ciliate, outer membranous, lance-shaped or linear, tip not spinous, inner narrower. Calyx ⅛-½ in. long; teeth 5, linear-lance-shaped, ciliate, half as long as or shorter than the tube. Corolla-tube included; limb 2-lipped, upper lip erect, hood-like, very hairy, lower spreading, 3-lobed, midlobe the longest. Stamens 4, in unequal pairs, ascending under the upper lip. Nutlets ⅛-⅙ in. long, inversely egg-shaped, tip rounded.

Flowers.—June.

Locality.—Hayan Pass; below Basam Gali; Dudhganga forest in stony river-bed; Tragbol and Shapryon, 7,000-8,500 ft.

Distribution.—W. temperate Himalaya, from Kashmir to Kumaon, 5,000-11,000 ft., Afghanistan.

THYMELAEACEAE.

(From the Greek *thymos*, thyme, and *elaia*, the olive, alluding to the leaves and fruit of the genus *Thymelaea*.)

WIKSTROEMIA, Endl.

(After J. E. Wikström, a Swedish botanist of the last century.)

Fig. 5. Wikstroemia canescens, Meissn.

(*Canescens* means hoary.)

A small shrub, 1-3 ft. high, silky-hairy. Leaves 1-3 in. long, alternate or nearly opposite, short-stalked, thin, oblong-lance-shaped, sharp-pointed, usually hairless above and hairy beneath; stalk ⅛ in. long, often with a small white bud in the axil. Flowers yellow or white, in heads or spikes forming terminal panicles. Perianth-tube ¼ in., slender, hairy outside; lobes small, blunt. Filaments short. Disk of 4 or 5 erect, linear scales. Ovary hairy; styles short; stigma large, globose. Fruit ¼ in. long, narrowly egg-shaped, silky, enclosed at first in the perianth which at last splits and falls off, black when ripe.

Locality.—Kishenganga Valley.

Distribution. — Afghanistan, temperate Himalaya, from Kashmir to Central Nepal, 5,000-9,000 ft., Khasia Hills, 5,000-6,000 ft., Upper Assam, Central Provinces, 6,000-8,000 ft., Ceylon, N. China.

DAPHNE, Linn.

(Is the Greek name of the Bay-tree, *Laurus nobilis.*)

1. Leaves 2-5 in. long, blunt ... ... *D. papyracea.*
2. Leaves 1-2 in. long, sharp-pointed... ... *D. oleoides.*

Fig. 6. Daphne papyracea, Dcne. (Under **D. cannabina**, Wall. in Hooker's "Flora of British India.") Collett, fig. 140.

An evergreen shrub, 5-8 ft. high; young shoots hairy, soon becoming hairless. Leaves 2-5 by $\frac{3}{4}$-$1\frac{1}{3}$ in., narrowly elliptic-lance-shaped or inversely lance-shaped, narrowed at both ends, thick, hairless; stalk up to $\frac{1}{5}$ in. long. Flowers white or rose-purple, in terminal heads. Bracts $\frac{1}{3}$-$\frac{2}{3}$ in. long, oblong or lance-shaped, falling soon. Flower-stalks very short. Perianth-tube $\frac{1}{3}$-$\frac{2}{5}$ in. long, silky; lobes $\frac{1}{5}$ in. long, egg-shaped, sharp-pointed, with a tuft of hairs at the tip. Ovary hairless. Fruit egg-shaped, $\frac{2}{5}$ in. long.

Flowers.—June.

Locality.—Tosh Maidan, 11,000-12,000 ft., very rare.

Distribution.—W. Himalaya, 5,000-12,000 ft.

Daphne oleoides, Schreb.

(*Oleoides* means resembling *Olea*, the Olive tree.)

A much-branched shrub, 4-8 ft. high; young shoots hairy. Leaves 1-2 by $\frac{1}{5}$-$\frac{2}{5}$ in. oblong or linear, narrowed at both ends, mucronate, thick, hairless, stalkless. Flowers white or tinged with pink, forming terminal, bractless, 3-9-flowered heads; stalks very short. Perianth $\frac{2}{5}$-$\frac{3}{4}$ in. long, very hairy outside; lobes oblong, shorter than the tube. Ovary densely hairy. Fruit egg-shaped, $\frac{1}{3}$-$\frac{2}{3}$ in. long, orange or scarlet, when young enclosed in the perianth-tube.

Flowers.—May.

Locality.—Dachigam Rakh; Gagribal.

Distribution.—W. Himalaya, 3,000-9,000 ft., W. Asia, S. Europe.

Plate 55

CHENOPODIACEAE. The Goosefoot Family.

(From the Greek *chen*, a goose, and *pous*, a foot, alluding to the shape of the leaves of the Goosefoot.)

CHENOPODIUM, Linn.

A. Scentless herbs. Sepals 1-3 ... ... *C. Blitum.*

B. Strongly aromatic, glandular herbs.
  I. Style-branches 3, or 2 with a smaller branch ... ... *C. ambrosioides.*
  II. Style-branches 2 ... ... *C. Botrys.*

C. Scentless or slightly fetid herbs. Sepals 5.
  I. Seeds lying horizontally (nearly always) in the fruiting perianth.
    1. Leaves triangular ... ... *C. hybridum.*
    2. Leaves not angular.
      a. Lower and middle stem-leaves always longer than broad ... *C. album.*
      b. Middle stem-leaves as long as broad ... ... *C. opulifolium.*
  II. Seeds lying horizontally and vertically in the fruiting perianth ... ... *C. glaucum.*

Fig. 1. Chenopodium Blitum, Hook. f.

(*Blitum* is the Greek *bliton*, a vegetable, either our *Amarantus Blitum* or *A. capitatum*.)

A hairless, erect or ascending herb. Stems 1-3 ft. high, rather stout, white. Leaves stalked, 1-3 in. long, triangular, halbert-shaped, heart-shaped, long-pointed, deeply and unequally toothed, bright green; stalk slender, shorter or longer than the blade. Flower-clusters ¼-½ in. diameter, stalkless, axillary and in terminal leafy spikes. Perianth of 1-3 sepals, not enclosing the fruit. Stamen 1. Seeds vertical, smooth, opaque, margin blunt.

Flowers.—August.

Locality.—Gulmarg, edges of wood and rough places, about 8,000 ft., common; Ferozepore Nala; also at elevations of 12,000-14,000 ft.

Distribution.—Kashmir, N.W. India, N. and W. Asia, N. Africa, Europe.

Chenopodium ambrosioides, Linn.

(*Ambrosioides* means resembling *ambrosia*, the food of gods, alluding to the aromatic qualities of the plant.)

A tall, much-branched, highly aromatic herb with a camphoraceous odour, hairy and glandular, not mealy. Stem and branches streaked, more or less glandular-hairy. Leaves often with glands, 1½-3¼ by ¼-1 in., oblong-lance-shaped, blunt or sharp-pointed, sinuately toothed, the upper leaves almost entire, base tapering, running down into a short stalk. Flowers very small, clustered, forming slender, axillary and terminal, simple or paniculate leafy spikes. Sepals round-egg-shaped, concave, blunt, not keeled, closing over the fruit. Stigmas usually 5. Fruit membranous. Seeds $\frac{1}{20}$ in. diameter, round, smooth, shining, margin blunt.

Locality.—Srinagar.

Distribution.—Widely spread in the Old World.

Chenopodium Botrys, Linn. Collett, fig. 133.

(*Botrys* is the Greek name for grape and was used by Dioscorides for this species.)

Strongly aromatic, glandular-hairy. Stems 6-18 in. high, erect, hairy in the upper part; branches numerous, spreading and bent back. Leaves of the middle stem 1-3 in. long, oblong, pinnately lobed, the upper ones nearly entire. Flower-clusters in numerous, short, axillary panicles which form large terminal panicles. Perianth-segments elliptic-triangular, with stalked glands on the back, without meal or hairs, almost erect on the ripe fruit. Style-branches 2. Seed horizontal, almost globose, smooth, margin blunt.

Locality.—Srinagar; at elevations from 4,000-14,000 ft.

Distribution.—Kashmir to Sikkim, N. and W. Asia, N. Africa, Europe.

Chenopodium hybridum, Linn. Thorn-apple Goosefoot.

An erect herb, 6 in. to 3 ft. high, having a heavy odour. Stem stout, branched. Leaves large, 3-5 in. long, broadly egg-shaped, heart-shaped, long-pointed, pale green, membranous, angular, toothed, the teeth large, distant, 2-4 on each side, 3-5-nerved at the base. Flowers in loose, axillary, nearly leafless corymbs or spikes, forming large clusters. Perianth of 5 sepals not covering the fruit. Seeds coarsely minutely pitted, not keeled, opaque, large.

Locality.—Ladakh, 12,000 ft.

Distribution.—Kashmir, Punjab, Baluchistan, N. Asia, N. Africa, Europe.

Chenopodium album, Linn. White Goosefoot.

An erect herb, 1-10 ft. high, erect or ascending, mealy or green or reddish, scentless. Stems angled, often tinged with red or purple. Leaves very variable in size and shape, entire, toothed or lobed; stalks slender, often as long as or longer than the blade. Flowers in clusters, forming compact or loosely panicled spikes. Sepals 5, $\frac{1}{16}$-$\frac{1}{12}$ in. long, oblong-lance-shaped, keeled, closely investing the thinly membranous fruit. Stigmas 2. Seeds $\frac{1}{16}$ in. diameter, round, compressed with a sharp margin, smooth, shining, black.

Locality.—Up to 12,000 ft.

Distribution.—Cosmopolitan.

Chenopodium opulifolium, Schrad.

(*Opulifolium* means having leaves like those of *Viburnum Opulus*, Linn., the Guelder Rose.)

An erect or ascending, mealy, annual herb, 1-3 ft. high. Leaves long-stalked, broadly triangular, about $1\frac{1}{2}$ in. each way, margins sinuate or irregularly lobed; upper leaves similar to the lower. Inflorescence bluish-green. Cymes axillary, lax-flowered, usually shorter than the leaves. Sepals 5, keeled, only partially covering the fruit. Seeds dotted.

Very nearly related to *C. album.* It is not easy to distinguish the two, as both are very variable. *C. opulifolium* can always be made out by the dotted seeds.

Locality.—At elevations of 6,000-14,000 ft.

Distribution.—Kashmir to Nepal, N. and W. Asia, Europe.

Chenopodium glaucum, Linn. Oak-leafed Goosefoot.

(*Glaucum* means bluish-green, referring to the lower surface of the leaves.)

A prostrate, annual herb, 4-18 in. high. Stems usually spreading, widely branched, shining, smooth. Leaves green above, white, bluish-green, mealy below, oblong, wavy, toothed, blunt or round, wedge-shaped below. Flowers in short, erect, simple, leafless, terminal and axillary, dense spikes. Perianth-segments 5, keeled, almost covering the fruit, leaving a narrow, membranous border. Seeds with a sharp keel, reddish, very small, the horizontal ones largest, the others vertical, netted, granular.

Locality.—Ladakh, 12,000-14,000 ft.

Distribution.—Kashmir, N. and W. Asia, Europe, N. America, Chili, Australasia.

POLYGONACEAE. The Buckwheat Family.

From the Greek *polys*, many, and *gony*, the knee, alluding to the stem being often enlarged and bent at the joints.)

POLYGONUM, Linn.

1. Stipules very small, bipartite.
   - I. Flowers in terminal clusters. Nut almost round ... ... *P. islandicum.*
   - II. Flowers in terminal and axillary clusters. Nuts 3-angled.
     1. Leaves $\frac{1}{6}$-$\frac{1}{4}$ in. long ... ... *P. delicatulum.*
     2. Leaves $\frac{1}{3}$-$\frac{2}{3}$-1 in. long ... ... *P. filicaule.*

3. Stipules tube-shaped.
   - I. Stems erect or prostrate.
     1. Flowers axillary.
        - *a.* Nerves of stipules prominent.
          - *aa.* Stems rough.
            - i. Two outer sepals awned on back ... ... *P. paronychioides.*
            - ii. Two outer sepals not awned on back (fig. 2) ... *P. recumbens.*
          - *bb.* Stems smooth.
            - i. Perianth cleft $\frac{1}{3}$ way down *P. cognatum.*
            - ii. Perianth cleft to near the base ... ... *P. aviculare.*
        - *b.* Nerves of stipules none or very faint.
          - *aa.* Perianth shortly toothed ... *P. tubulosum.*
          - *bb.* Perianth deeply toothed ... *P. plebejum.*
     2. Flowers in terminal racemes.
        - *a.* Bracts tube-shaped.
          - *aa.* Nuts biconvex.
            - i. Bracts hairy.
              1. Leaves egg-shaped ... *P. orientale.*

2. Leaves not egg-shaped.
   A. Styles hooked, persistent ... ... *P. virginianum.*
   B. Styles not hooked nor persistent.
      1. 1-2 ft. high ... *P. Persicaria.*
      2. Less than 1 ft. high ... ... *P. minus.*

ii. Bracts hairless.
   1. Perianth not glandular (fig. 3) ... ... *P. amphibium.*
   2. Perianth glandular ... *P. lapathifolium.*

bb. Nuts 3-angled.
   i. Perianth glandular ... *P. Hydropiper.*
   ii. Perianth not glandular ... *P. serrulatum.*

b. Bracts not tube-shaped.
aa. Stems solitary, simple, erect.
   i. Radical leaves almost stalkless (fig. 7) ... *P. perpusillum.*
   ii. Radical leaves long-stalked *P. viviparum.*
bb. Stems tufted together with erect flowering stems.
   i. Leaves round or elliptic... *P. vaccinii-folium.*
   ii. Leaves egg-heart-shaped (figs. 4 and 5) ... ... *P. amplexi-caule.*
   iii. Leaves linear- or elliptic-lance-shaped (fig. 6) ... *P. affine.*

3. Flowers in heads or short spikes.
a. Nuts biconvex ... ... *P. humile.*
b. Nuts 3-angled.
aa. Leaf-stalk winged (nut sometimes biconvex) ... ... *P. alatum.*
bb. Leaf-stalk winged above only *P. glaciale.*

4. Flowers in branched panicles.
a. Only 1-2 in. high ... ... *P. nummulari-folium.*
b. Much taller.
aa. Perianth $\frac{1}{8}$-$\frac{1}{6}$ in. diameter ... *P. alpinum.*
bb. Perianth $\frac{1}{4}$ in. diameter.
   i. Shrubby, 3-6 ft. high ... *P. polystachyum.*
   ii. Herbaceous, 6-18 in. high *P. rumicifolium.*

II. Stems twining.

1. Stems angular ... ... *P. Convolvulus.*
2. Stems round ... ... *P. dumetorum.*

In the following the species figured will be described first, the rest follow in alphabetical order.

Fig. 2. Polygonum recumbens, Royle.

(*Recumbens* means prostrate.)

Rootstock stout. Stems and branches prostrate, 1-2 ft. high, rough, leafy, flowering throughout their length or sometimes barren, rooting at the base. Leaves short-stalked, rough especially on the edges and lower surface, broadly egg-shaped, ½-1 in. long, nerves obscure. Stipules tubular, with 2 long bristles. Flowers small, white or pink, in axillary clusters; stalks short, jointed at the tip. Perianth 4-5-parted. Stamens 4 or 5. Styles 3, free, very small. Nut $\frac{1}{16}$ in. long, broadest below the middle, 3-angled, smooth, black, shining.

Flowers.—July to September.

Locality.—Thajwas; Zoji La.

Distribution.—W. Himalaya, from Kashmir to Kumaon, 4,000-8,000 ft.

Fig. 3. Polygonum amphibium, Linn. Amphibious Knotgrass, Arsmart, Flatter-dock, Lake-weed.

A perennial herb, growing both in water and on land. When aquatic it is smooth, prostrate or floating, the flower-stalks erect; when on land it is extremely hairy, erect from a creeping, fibrous, long root. Stems 1-2 ft. high. Leaves stalked, heart-shaped, lance-shaped, finely long-pointed, hairy or smooth, rigid, sometimes spotted, alternate and spreading. Stipules membranous, large, closely pressed, blunt, nearly always without cilia, smooth. Flowers bright pink, in solitary terminal racemes 1-2 in. long, dense, on hairy flower-stalks which are paired. Perianth 5-partite; segments oval, blunt. Stamens 5. Styles 2. Nut egg-shaped, shining, faces convex.

Flowers.—May to July.

Locality.—Between Srinagar and Gulmarg in ditches along road; Anchar Lake; Nil Nag in lake, 6,900 ft.

Distribution.—W. Himalaya, from Kashmir to Kumaon, 7,000 ft., westward to Europe, N. Asia and America.

Figs. 4 and 5. Polygonum amplexicaule, Don.

(*Amplexicaule* means stem-clasping, alluding to the upper leaves of the plant.)

A nearly glabrous, erect herb. Rootstock stout, woody, branched. Stems tufted, 2-3 ft. high, slender. Lower leaves 3-6 in. long, few, long-stalked, egg-shaped, heart-shaped, long-pointed, crenate, upper leaves stem-clasping. Stipules tubular, 1-2 in. long, narrow, tips torn. Flowering stems 2-3 ft. high. Flowers pink or deep red, varying to white, $\frac{1}{6}$-$\frac{1}{3}$ in. diameter, crowded in 1 or 2 erect racemes 2-6 in. long. Bracts flat, membranous, hairless, egg-shaped, sharp-pointed. Perianth 5-parted. Stamens 8, anthers protruding. Styles 3, free, long, slender. Nut 3-angled, smooth, shining.

Flowers.—June, July.

Locality.—Near Shirazia Bagh, on top of hill in rocky and gravelly soil; Gulmarg, rough hill-sides, nalas and round the edges of fields, 6,000 ft., common; Gangabal.

Distribution.—Temperate Himalaya, from Kashmir (6,000-8,000 ft.) to Sikkim (9,000-13,000 ft.).

Fig. 6. Polygonum affine, Don.

Rootstock woody, long, branched, 4-8 in. long, crown clothed with membranous old stipules. Stems hairless, densely tufted. Flowering stems 4-12 in. high. Leaves chiefly radical, 2-4 in. long, stalkless or short-stalked, linear- or elliptic-lance-shaped, or inversely lance-shaped, crenate, bluish-green beneath, margins bent back; stem leaves few. Stipules $\frac{1}{2}$-1 in. long, entire or split, many-nerved, brown. Racemes 2-3 in. long, stout, erect. Flowers crowded, almost erect, rosy, $\frac{1}{6}$-$\frac{1}{4}$ in. diameter. Sepals elliptic-oblong. Styles free, slender. Nuts 3-angled.

Flowers.—July, August.

Locality.—Aporwat, hill-sides and watercourses, above 10,000 ft., common, growing in masses; Iskardo.

Distribution.—Alpine and subalpine Himalaya, from Kashmir (8,000-14,000 ft.) to Kumaon (11,000-13,000 ft.).

Fig. 7. Polygonum perpusillum, Hook. f.

(*Perpusillum* means very small, tiny.)

A dwarf, tufted, hairless plant. Rootstock stout, clothed with membranous torn stipules. Radical leaves almost stalkless, narrowly linear, blunt, quite entire, margins recurved, $\frac{1}{4}$-$\frac{3}{4}$ by $\frac{1}{20}$ in., spreading. Stipules tubular, not ciliate. Flowering stem very slender, 1-leafed, $\frac{1}{4}$-$1\frac{1}{2}$ in. high, erect.

Flowers few in a head, hanging, $\frac{1}{16}$ in. long, white or pink. Bracts crowded, blunt. Flower-stalks short, jointed at the top. Sepals 4, broad, blunt, very unequal, the inner round or oblong. Stamens 1-3, perfect. Styles 2-3, nearly free. Nut 3-angled, or biconvex, pale, smooth.

Flowers.—July.

Locality.—Top of Aporwat on stony ground, about 13,000 ft., common.

Distribution.—Alpine Himalaya, 12,000-15,000 ft., from Kashmir to Sikkim.

Polygonum alatum, Ham. Winged Polygonum.

(*Alatum* alludes to the winged leaf-stalk.)

A very variable plant. An erect or procumbent, hairless or sparsely hairy annual. Stems 1-2 ft. long, rooting at the nodes; branches many, ascending. Leaves $\frac{3}{4}$-$1\frac{1}{2}$ in. long, egg-shaped, sharp-pointed or blunt, entire, hairless, rarely hairy, gland-dotted, rough with small points, abruptly or gradually narrowed into a winged stalk which is sometimes eared at its base. Stipules membranous, tubular, hairy or glandular towards the base, not fringed. Flowers white, purple or red, in heads $\frac{1}{5}$-$\frac{1}{2}$ in. diameter, usually with a stalkless involucral leaf; stalks of heads glandular-hairy near the top. Bracts flat, membranous, hairless. Perianth 4- or 5-parted, $\frac{1}{8}$ in. long. Stamens 6 or 8. Styles 2 or 3, united to near the top. Nut quite enclosed in the perianth, 3-angled, or flattened and round, finely dotted.

Flowers.—June.

Locality.—Dara Village, 6,000 ft.; Sind Valley.

Distribution.—Throughout the Himalaya, from Kashmir to Sikkim, 4,000-10,000 ft., Khasia Hills, 4,000-6,000 ft., W. and S. India, Ceylon, Java, China, Japan, Afghanistan, Africa.

Polygonum alpinum, All. Alpine Polygonum.

Root perennial. Stems hairless or young parts softly hairy, 6 ft. high, grooved, pale reddish or white. Leaves 3-5 in., hairless or finely hairy, short-stalked, lance- or linear-lance-shaped, long-pointed, margins flat, base sharp-pointed. Stipules long, lax, falling off above the base. Inflorescence 1 ft. long or more, of myriads of white or pale pink flowers, terminal, dense. Flower-stalks much longer than the short, blunt bracts, jointed close below the perianth or lower down. Perianth $\frac{1}{8}$-$\frac{1}{6}$ in. diameter, cleft nearly to the wedge-shaped

base; inner segments inversely egg-spoon-shaped. Nut $\frac{1}{6}$ in. long, broadly egg-shaped, sharply 3-angled, pale, rather longer than the enlarged perianth.

Flowers.—June, July.

Locality.—Gulmarg; Liddarwat; Gadsar; at higher elevations up to 12,000 ft.

Distribution.—Kashmir, Kulu, Turkestan, westward to Spain, Siberia, N. America.

Polygonum aviculare, Linn. Knotgrass, Pig-weed, Red Legs, Nine-joints, Sparrow-tongue.

(*Aviculare* from the Latin *avis*, bird, because it is used for bird-seed.)

A very variable plant, widely spreading, trailing, twining, with numerous branched, slender, finely furrowed, smooth, jointed stems with swollen joints, flowering throughout their length or sometimes barren. Leaves nearly stalkless, narrowly lance-shaped, $\frac{1}{2}$-1 in. long, sometimes gland-dotted. Stipules tubular, long, nerves several, strong, straight, the tips more or less projecting. Flowers small, green, tipped with white or red, in axillary clusters. Perianth 4- or 5-parted, cleft to near the base. Stamens 4 or 5. Styles 3, free, minute. Nut ovoid, obtusely 3-angled, minutely wrinkled.

Flowers.—June to September.

Locality.—At altitudes of 6,000-12,000 ft.

Distribution.—Punjab, Kashmir, N. and W. Asia, arctic and temperate Europe, introduced into N. America.

Polygonum cognatum, Meissn.

(*Cognatum* means to be related to something or somebody.)

A more or less hairless herb. Stems short, almost simple, prostrate and ascending, angled. Branches many, stout, 2-6 in. long, from a woody stock, scaly at the base, but not rooting. Leaves rarely 1 in. long, stalked, elliptic, blunt or sharp-pointed, thick, nerveless. Stipules egg-shaped, silvery, blunt, sharp- or long-pointed. Flowers in axillary clusters; flower-stalks crowded, short, jointed at the tip. Perianth very thick, lobes with white margins, fruiting perianth pitcher-shaped, tube twice as long as the rounded lobes. Stamens very short. Styles 3, free. Nutlets $\frac{1}{10}$ in. long, egg-shaped, compressed, or obtusely 3-angled, black, shining.

Locality.—At elevations of 11,000-16,500 ft.

Distribution.—Kashmir to Garhwal, Afghanistan, Caucasus, W. Asia, Soongaria.

Polygonum Convolvulus, Linn. Black Bindweed.

(Called *Convolvulus*, bindweed, on account of the twining habit of the plant.)

An annual, prostrate or twining herb. Stem 1-4 ft. high, angles slightly hairy. Leaves 1½-4 in. long, arrow-heart-shaped, gradually long-pointed, slightly hairy beneath; stalks slender. Stipules short. Flowers in axillary clusters and terminal cymes, which are almost erect, short, slender; flower-stalks bent back, short, jointed above the middle. Three outer sepals bluntly keeled, rarely winged; segments $\frac{1}{8}$ in. long in fruit, blunt, green with white margins. Nut $\frac{1}{10}$ in. long, black, 3-angled, finely furrowed.

Locality.—At higher altitudes.

Distribution.—From Kashmir to Kunawer, N. and W. Asia, N. Africa, Europe.

Polygonum delicatulum, Meissn.

A slender annual, 4-12 in. high, quite hairless, tufted. Stems filiform. Leaves stalkless or almost so, $\frac{1}{8}$-$\frac{1}{4}$ in. long, elliptic, egg-shaped, or egg-heart-shaped, distant, nerves obscure; stalk rarely $\frac{1}{10}$ in. long. Stipules 2-partite, segments blunt or sharp-pointed, entire or crenate. Flowers in axillary clusters. Perianth minute, 5-cleft, $\frac{1}{20}$ in. long, segments blunt, or sharp-pointed, 2 outer smaller. Stamens 2-3, very short. Nut very variable in size, egg-lance-shaped, twice or thrice as long as the perianth, pale, leathery, the 3 angles very prominent, the faces concave. Seed loose in the nut.

Locality.—Nund Kol; on wet rocks in alpine region.

Distribution.—Alpine Himalaya, from Kashmir to Sikkim 10,000-16,000 ft.

Polygonum dumetorum, Linn. Climbing Bush Knotweed.

(From *dumetum*, scrub, bushes, referring to the predilection of the plant for thickets.)

A climbing or twining, annual herb. Stem 2-3 ft. high, wiry, furrowed, round or angled. Leaves heart-shaped, arrow-shaped. Perianth in fruit broadly oblong or inversely egg-shaped; 3 outer sepals broadly winged. Flower-stalks hair-like, slender, jointed below the middle. Nut $\frac{1}{8}$ in. long, smooth, highly polished.

The perianth in fruit distinguishes this species from *P. Convolvulus*.

Locality.—Temperate regions.

Distribution.—From Kashmir to Kumaon, 4,000-9,000 ft., N. and W. Asia, Europe.

Polygonum filicaule, Wall.

(*Filicaule* from *filum*, thread, and *caulis*, stem, referring to the slender stem.)

An annual herb. Stems nearly erect, very slender, straw-like, tufted, 4-18 in. high, hairy below the joints and on the upper parts, otherwise hairless. Leaves short-stalked, egg- or egg-lance-shaped, blunt or sharp-pointed, distant, rarely 1 in. long, soft. Stipules minute, 2-parted, lobes hairless or hairy. Flowers very small, white, short-stalked, in axillary and terminal clusters. Perianth $\frac{1}{20}$ in. long, 5-parted; segments rounded, 2 outer smaller. Stamens 3 or 4; filaments very short. Styles 3, minute, free. Nut 3-angled, pale, leathery, faces concave. Seed loose in the nut.

Flowers.—July, August.

Locality.—Sonamarg; Ladakh, 11,000-12,000 ft.

Distribution.—Subalpine and alpine Himalaya, 9,000-16,000 ft., from Kashmir to Sikkim.

Polygonum glaciale, Hook. f. Glacier Polygonum.

A dwarf, 2-4 in. high, hairless, somewhat fleshy annual. Stems branched from the root; branches spreading. Leaves $\frac{1}{2}$-$\frac{3}{4}$ in. long, long-stalked, broadly egg-shaped, blunt, nerves indistinct, surfaces finely granular when dry; stalk as long as the blade, winged above. Stipules short, simple or 2-lobed, hairless. Flower-heads small, $\frac{1}{6}$-$\frac{1}{4}$ in. diameter, stalkless or stalked, without an involucral leaf, stalk glandular at the tip. Bracts broadly egg-shaped, blunt, hairless, about as long as the nut. Perianth membranous; lobes almost equal, blunt. Stamens 5. Styles 2-3. Nut very small, closely invested by the perianth-tube, black, finely streaked and dotted. Can be distinguished from *P. alatum* by the long leaf-stalks.

Locality.—At elevations of 8,400-12,000 ft.

Distribution.—Alpine and subalpine Himalaya, from Kashmir to Kumaon, up to 13,000 ft., Afghanistan.

Polygonum humile, Meissn. Low Polygonum.

A small, sparsely glandular-hairy annual. Stem 4-6 in. high, filiform, erect or widely branched from the base. Leaves ⅓ in. long, almost stalkless, egg-shaped or rhombic-egg-shaped, very uniform, sometimes narrowed into a short broad stalk. Stipules short, tubular with a very oblique mouth. Flower-heads ¼ in. diameter, long-stalked, without an involucral leaf. Bracts very small, flat, longer than the flowers, egg-lance-shaped, sharp-pointed. Perianth 4-5-lobed, greenish; tube closely investing but not cohering with the nut, glandless; lobes very short, rounded. Stamens 5-6. Styles 2-3, filiform, united below. Nut black, coarsely dotted.

Locality.—Tosh Maidan.

Distribution.—Temperate and alpine Himalaya, from Kashmir to Sikkim, up to 11,000 ft.

Polygonum Hydropiper, Linn. Water-pepper.

(From *hydor*, water, and *piper*, pepper.)

A rather robust hairless annual. Stems much-branched, 12-18 in. high, glandular, swollen at the joints, prostrate, rooting at the lower nodes. Leaves short-stalked, rarely more than 3 in. long, lance-shaped or oblong-lance-shaped, usually covered with impressed glands, hairless or with the midrib rough below. Stipules about ⅓ in. long, tubular, hairless or sparsely hairy with the hairs sunk in the tissue, cilia short or absent. Racemes filiform, drooping, interrupted, 2-3 in. long. Bracts tubular, shortly fringed. Flowers pink or red. Perianth 5-parted, glandular. Stamens usually 6. Styles 2 or 3, free nearly to the base. Nuts finely dotted, of the 2-styled flowers round and flattened, of the 3-styled ones 3-angled.

Flowers.—July to September.

Locality.—Up to 7,000 ft.

Distribution.—N.W. Himalaya, to Bengal and Assam, Java, Australia, N. Africa, Europe.

Polygonum islandicum, Hook. f. Island Polygonum.

A glabrous herb. Stems very slender, fleshy, forming tufts, 1-6 in. high, with matted roots. Leaves ⅛-¼ in. long, stalked, inversely egg-shaped, blunt, often opposite. Stipules very small, 2-partite. Flowers 2-sexual or female, very minute, in terminal or axillary clusters or heads. Bracts not tubular

or sheathing. Perianth 3-cleft; lobes equal or unequal. Stamen usually 1 (rarely 2) in Indian specimens. Stigmas 2-3. Nut rather longer than the perianth.

Locality.—Alpine region, in marshy places, 12,000-14,000 ft.

Distribution.—Alpine W. Himalaya, from Kashmir to Kumaon, arctic and subarctic regions, Altai Mts.

Polygonum lapathifolium, Linn. Dock-leafed Knotweed.

(*Lapathifolium* means having leaves resembling those of *Rumex nemolapathum*, a species of Dock.)

An erect or prostrate annual, 1-3 ft. high, rooting below branched, smooth or glandular, usually pale green, nodes thickened; stems often tinged with red. Leaves almost stalkless, elliptic-egg-shaped or lance-shaped, glandular beneath. Stipules usually shortly ciliate, lower ones loose, not fringed, the upper shortly fringed. Racemes erect or nodding, dense or rather lax, cylindrical, terminal or lateral. Flower-stalks rough. Bracts ciliate. Perianth greenish, glandular, rough, nerves strong. Stamens usually 6, anthers not protruding. Styles free. Nut flattened at the sides.

Locality.—Up to 5,000 ft.

Distribution.—N.W. Frontier to Bengal, ascending to 5,000 ft. on the Himalaya, Assam, Burma.

Polygonum minus, Huds. Small Persicaria.

A slender, erect or ascending, sometimes creeping, hairless, annual herb, 6-18 in. long, much-branched or simple. Leaves stalkless, linear- or oblong-lance-shaped, usually under 2 in. long. Stipules $\frac{1}{4}$-$\frac{1}{2}$ in. long, close, not inflated, ciliate, cilia much shorter than the tube, glandless. Racemes filiform, $\frac{1}{2}$-1 in. long, erect or ascending, loose, straight, solitary, on slender stalks, greenish pink. Bracts close. Flowers very small. Outer perianth-segments glandular at the base only. Nut round, plano-convex or 3-angled, flattened, polished, as long as the outer perianth.

Locality.—Up to 6,000 ft.

Distribution.—Kashmir to Assam and Chittagong, southward to Travancore and Ceylon, temperate and tropical Asia, Europe.

Polygonum nummularifolium, Meissn.

(Derived from *nummularius*, flattened out like a piece of money, and *folium*, leaf, alluding to the shape of the leaves and sepals.)

A very small perennial herb. Stems 1-2 in. high, creeping and forming matted tufts, internodes short, nodes hairy. Leaves $\frac{1}{10}$-$\frac{1}{6}$ in. long, stalked, round, ciliate; stalks as long as the blade. Stipules tubular, hairy, truncate. Flowers numerous, large for the size of the plant, white or bright pink, males largest, many in a cluster, stalked. Sepals round. Stamens 5, very short; anthers purple. Styles 2, quite free. Nut round, biconvex, smooth, pale, included.

The smallest species of the genus.

Locality.—Alpine region.

Distribution.—From Kashmir to Sikkim, up to 17,000 ft.

Polygonum orientale, Linn. Oriental Polygonum.

An erect, tall, branching annual, 3-10 ft. high, usually softly hairy or silky. Stems robust, grooved, branches hollow. Leaves 6-9 by $2\frac{1}{2}$-5 in., egg-shaped or egg-heart-shaped, long-pointed; stalks 1-4 in. long. Stipules short, truncate, hairy, ciliate at the mouth, expanded or tightly embracing the stem. Flowers red or white, in dense, erect or drooping racemes 2-4 in. long, forming terminal panicles. Bracts flat, egg-shaped, densely hairy, each containing 3-6 flowers. Perianth 4- or 5-parted. Stamens 7-8, included. Styles 2, united for half their length. Nutlets $\frac{1}{8}$ in. long, round, flattened with rounded margins and rather concave faces, black and shining when ripe.

Flowers.—April to October.

Locality.—Up to 5,000 ft.

Distribution.—Turkestan, Himalaya, from Kashmir eastwards, Bengal, Assam, Burma, Siam, China, Japan, Java, Borneo.

Polygonum paronychioides, C. A. Mey.

(Resembling *Paronychia.*)

Rootstock very stout, woody, with chestnut, scaly back. Stem 1-4 in. high, fragile, white or red-brown. Branches tufted, erect or ascending, when young hidden by the stipules, internodes very short. Leaves linear, $\frac{1}{2}$ in. long, with a sharp point at the tip, margins bent back. Stipules large,

membranous, lance-shaped, 2-nerved, tip fringed. Flowers in axillary clusters. Flower-stalks short, jointed at the tip. Fruiting perianth pitcher-shaped, lobes rounded, shorter than the tube, 2 outer awned at the back. Nut $\frac{1}{12}$ in. long, broadest in the middle, black, smooth.

Locality.—Zaskar; Baltistan.

Distribution.—Kashmir to Kunawer, Afghanistan, Persia.

Polygonum Persicaria, Linn. Common Red Persicaria.

An erect or ascending annual, 1-2 ft. high. Stems branched, with swollen nodes. Leaves flat, egg-shaped, lance-shaped, spotted, more or less stalkless, sharp-pointed, fringed with hairs, downy, dotted below, without glands. Stipules loose, strongly fringed with hairs. Flowers in dense racemes or spikes, compact, egg-shaped to oblong, cylindrical, terminal and axillary, the lateral stalkless. Perianth-segments red or white, smooth (like the stalk), as a rule without glands. Stamens 5-8; outer anthers opening inwards, the inner outwards. Styles 2-3, united half-way. Fruit plano-convex or 3-angled, flattened, gibbous on one side, hardly covered by the perianth-segments.

Locality.—At elevations up to 14,000 ft.

Distribution.—Kashmir, N. and W. Asia, Africa, Europe, N. America.

Polygonum plebejum, R.Br.

A most variable plant. Stems and branches prostrate, 6-24 in. high, leafy, round, finely grooved, smooth, flowering throughout their length. Leaves $\frac{1}{6}$-$\frac{2}{3}$ in. long, oblong, or linear, or inversely egg-shaped, stalkless or almost so. Stipules tubular, short, transparent, torn to the middle, fringed, nerves none or faint. Flowers minute, white or pale pink, in axillary clusters half hidden among the stipules. Perianth $\frac{1}{10}$ in. long or less, divided nearly to the base into 4 or 5 broad or narrow lobes. Stamens 4 or 5. Styles 3, free. Nut 3-angled, smooth, shining.

Locality.—Up to 6,000 ft.

Distribution.—Throughout tropical India, Kashmir to Bhutan, Afghanistan, Egypt, tropical and S. Africa, Madagascar, Java, Philippines, Australia.

Polygonum polystachyum, Wall. Many-spiked Polygonum. Collett, fig. 135.

Shrubby, 3-6 ft. high. Stem angled, hairy; branches grooved. Leaves 4-9 by 1½-3½ in., stalked or the upper nearly stalkless, oblong-lance-shaped, long-pointed, upper surface hairless or thinly hairy, the lower softly and densely hairy, especially on the midrib and nerves. Stipules tubular, very long, pointed, hairy, strongly nerved. Flowers white or tinged with pink, in terminal, usually erect panicles, 6-18 in. long. Bracts flat. Perianth 5-parted, ¼ in. diameter; segments spreading, the 2 outer narrow, the 3 inner much broader. Stamens 8. Styles 3, free nearly to the base. Nut 3-angled, pale brown, not tightly enclosed in the perianth.

Locality.—Temperate region.

Distribution.—From Kashmir to Sikkim, up to 14,000 ft., Afghanistan.

Polygonum rumicifolium, Royle. Dock-leafed Polygonum.

Root stout, perennial. Stems 6-18 in. high, hairless or sparsely hairy, very robust, simple, pale, grooved. Leaves 3-5 by 1½-3 in., stalked, broadly egg- or egg-heart-shaped, fleshy, green, margin even or wavy, nerves very slender; stalk ½-1 in. long, stout. Stipules large, lax, hairless. Flowers in small axillary and terminal, dense-flowered panicles. Flowers green, ⅙-¼ in. Perianth cleft to near the wedge-shaped base, segments almost equal, rounded, spreading. Nut very broadly egg-shaped, sharply 3-angled, about as long as the perianth, pale.

Locality.—Subalpine region.

Distribution.—From Kashmir to Nepal, 10,000-14,000 ft.

Polygonum serrulatum, Lagasca.

(*Serrulatum* means finely toothed.)

Stems 2-4 ft. high, slender, smooth, often reddish. Leaves almost stalkless, drying green, 3-5 by ⅜-⅝ in. linear, sharp-pointed, smooth or with a few scattered hairs on the upper side and the midrib, the margins usually ciliate, base slightly tapering, rounded. Stipules up to 1½ in. long, hairy, the mouth truncate and ciliate with long stiff bristles which are nearly as long as the tube. Flowers in slender, erect racemes, ¾-2 in. long which form panicles. Flower-stalks short.

Bracts membranous, smooth, strongly ciliate with long hairs, the margins somewhat rose-coloured. Perianth white, $\frac{1}{10}$ in. long, without glands; segments egg-shaped. Stamens 5-8. Styles 3, united at the base, the free portion filiform. Nuts $\frac{1}{12}$ in. long, 3-angled, smooth and polished.

Locality.—Up to 7,000 ft. east of the Indus.

Distribution.—From the Indus on the W. Himalaya to Bengal, Assam and Burma, Central and S. India, Ceylon, China, Malay Peninsula, Australia, W. Asia, S. Europe, Africa, America.

Polygonum tubulosum, Boiss.

(*Tubulosum* means tube-shaped, referring to the shape of the stipules.)

A small, hairless annual. Branches short, prostrate or ascending, leafy, angular, not grooved, rarely more than 6 in. high. Internodes very short. Leaves stalkless, linear, less than $\frac{1}{2}$ in. long, crowded, margins bent back. Stipules conspicuous, tube-shaped, long, white, transparent, almost entire, torn or fringed, nerves none or very faint. Flowers very small, white or pink, stalkless, in axillary clusters. Perianth shortly 4- or 5-toothed. Stamens usually 4 or 5. Styles 3, free. Nut 3-angled, smooth, shining.

Flowers.—June to September.

Locality.—Karakoram; at elevations of 6,000-11,000 ft.

Distribution.—Kashmir to Kunawer, Afghanistan, Persia.

Polygonum vacciniifolium, Wall.

(*Vacciniifolium* means having the leaves of *Vaccinium Myrtillus* Linn., the Whortleberry.)

Rootstock much-branched. Branches trailing and creeping. Leaves $\frac{1}{2}$-$\frac{2}{3}$ in. long, short-stalked, round or elliptic, sharp-pointed at both ends or long-pointed at the tip, quite entire, bluish green beneath. Stipules rigid, fringed, $\frac{1}{3}$-$\frac{1}{2}$ in. long, brown, with many long, strong nerves. Racemes $1\frac{1}{2}$-3 in. long, almost stalkless. Bracts long-pointed. Flowers rose-coloured, $\frac{1}{3}$ in. diameter. Stamens at length protruding. Styles filiform, free.

Locality.—Ladakh, 14,000-16,500 ft.

Distribution.—Temperate and subalpine Himalaya, from Kashmir to Bhutan, 9,000-16,500 ft.

Polygonum virginianum, Linn.

A perennial herb. Stems 5 ft. and higher, sparsely hairy; branches hollow. Leaves 4-10 in. long, short-stalked, elliptic or elliptic-lance-shaped, thin, nerves many, slender; stalk ½-1 in. Stipules ¼-½ in. long, tubular, hairy, mouth truncate and ciliate. Racemes long-stalked, very long and slender. Bracts ¼-1 in. long, distant, 2-fid, 2-flowered. Flower-stalks ⅛ in. long, rigid, stout in fruit. Perianth without glands, thin, 4-partite. Stamens 5, alternating with glands. Styles 2, long, rigid, hooked, persistent, free to the base. Nut ellipsoid, flattened, pale brown, as long as the styles.

Locality.—In the Jhelum river, 2,000-4,000 ft.; Pir Panjal, 7,000-10,500 ft.

Distribution. — Temperate Himalaya, from Kashmir to Sikkim, China, Japan, E. United States.

Polygonum viviparum, Linn. Alpine Knotweed, Viviparous Polygonum.

(Called *viviparum* because the lower flowers are usually replaced by bulbils which develop into new plants.)

Rootstock woody. Stem 4-12 in. long, slender, simple. Root-leaves long-stalked, linear or linear-oblong, 1-6 in. long, sharp-pointed or blunt, crenulate, leathery, sometimes hairy beneath; stem-leaves stalkless, erect. Stipules tubular, not ciliate. Flowers pink, almost erect, in spiciform racemes 1-4 in. long. Bracts egg-shaped, long-pointed, membranous, open, not tubular nor truncate. Perianth very variable in size, 4-5-partite, not enlarged in fruit. Stamens included or protruding. Styles 2-3, long, filiform, slender, free and included or long and united below. Stigma simple. Nut 3-angular or biconvex.

Locality.—Alpine and subalpine region.

Distribution.—From Kashmir to Sikkim, up to 15,000 ft., alpine N. and arctic Europe, Asia and America.

OXYRIA, Hill.

(From the Greek *oxys*, sharp, on account of the sour taste.)

Fig. 8. Oxyria digyna, Hill. Mountain Sorrel.

(*Digyna* means having two wives, here 2 styles.)

A hairless fleshy herb. Rootstock tufted, with many erect stems, 4-18 in. high, usually leafless, nearly simple, stout. Leaves radical, many, long-stalked, round-heart-shaped or kidney-shaped, notched at the tip, 1-4 in. diameter, rarely

3-lobed or almost halbert-shaped, veins radiating from the end of the leaf-stalk. Stem-leaves 1-2. Stalks sometimes 8 in. long. Stipules broad, lax. Flowers in panicled racemes, bisexual, the ultimate flower-stalks slender, jointed in the middle, thickened above. Sepals 4, outer ones spreading or bent back, the inner spoon-shaped, 3-5-nerved. Stamens 6. Ovary compressed. Styles 2, short; stigmas fimbriate. Fruit $\frac{1}{6}$-$\frac{1}{4}$ in. diameter, round-heart-shaped; wing membranous, veined, top notched.

Flowers.—June, July.

Locality. — Tosh Maidan, 11,000-12,000 ft.; Gangabal; Khur Mt., 13,800 ft.

Distribution.—Alpine Himalaya, from Kashmir to Sikkim, 10,000-17,000 ft., mountains of Europe, N. Asia and America arctic regions.

Plate 56

GNETACEAE.

(The name *Gnetum* was formed by Linneus after the Malayan name *gnemon* which he called *Gnetum gnemon.*)

EPHEDRA, Linn.

(A classical Greek name for one of the species.)

Fig. 1. Ephedra Gerardiana, Wall.

A shrub, 1-4 ft. high, rigid, nearly erect, hairless. Branches slender, green, finely grooved, often curved. Leaves reduced to opposite, membranous scales sheathing the joints of the branches. Flowers very small, 1-sexual, in the axils of the uppermost bracts of small cone-like spikes. Bracts opposite, united, the lower ones empty. Male and female spikes on separate plants. Male spikes egg-shaped, solitary or 2-3 together. Flowers 2-4 pairs; perianth shortly tube-shaped, membranous, flattened, mouth 2-lobed; filaments united into a column, protruding from the perianth and carrying a head of 5-8 globose anthers. Female spike solitary; bracts 2-3 pairs; flowers 1 or 2, each consisting of a single, erect, stalkless ovule surrounded by 2 coats, the outer one thick with a hole at the tip, the inner thin and prolonged upwards into a style-like tube, which is persistent in fruit. Fruit egg-shaped,

¼ in. long, pink or red when ripe, edible, containing 1 or 2 hard seeds, more or less enclosed by the fleshy bracts.

Locality.—Above Baltal.

Distribution. — Temperate and alpine Himalaya, 7,000-16,000 ft., Central and W. Asia, Europe.

HYDROCHARITACEAE.

(From *Hydrocharis* which is derived from the Greek *hydor*, water, and *charis*, elegance, grace.)

HYDROCHARIS, Linn.

Fig. 2. Hydrocharis Morsus-ranae, Linn. Frogbit.

(*Morsus* means bite, and *rana* frog.)

A floating, herbaceous, perennial plant with only erect flowering stems, and leaves in clusters at points where roots strike downward and root deeply in the mud below, or it may be floating loose, especially in deeper water. Leaves stalked, rounded, kidney-shaped, fleshy, smooth. Flowering stems 3-4 in. high. Male and female flowers separate, produced on the surface of the water, erect, white, large, with a yellow patch at the base. Petals delicate, inversely egg-shaped. Male flowers 2-3 in a stalked, 2-leafed sheath ; stamens 6 or 9, barren stamens 6 or 3, females solitary within a sheath. Sepals 3, herbaceous. Petals 3. Ovary egg-shaped, 6-celled. Stigmas 6, linear, 2-fid. Fruit an egg-shaped or oblong fleshy berry, 6-celled. Seeds many.

Frogbit does not always flower and rarely produces any seed.

Locality.—Dal Lake.

Distribution.—Kashmir, China, Japan, Australia, N. Asia, Europe.

ORCHIDACEAE. The Orchid Family.

(From the classical Greek *orchis*, meaning *testiculus*, alluding to the shape of the tubers in some orchids.)

LISTERA, R. Br.

(After Martin Lister, 1638 ? - 1712, physician and botanist.)

I. Leaves none.
  1. Flowers yellowish brown ... ... *L. kashmiriana.*
  2. Flowers dull yellowish green ... *L. Lindleyana.*

II. Leaves 2 ... ... *L. ovata.*

Fig. 3. Listera kashmiriana, Duthie.

One foot high more or less, terrestrial. Root-fibres stout, crowded. Stem stout, hairless, lower portion enveloped by 3 or 4 large, loose, blunt sheaths. Leaves none. Raceme laxly many-flowered; bracts below the lowest flowers few, linear-oblong, sharp-pointed. Flowers spreading, $\frac{1}{3}$ in. long from the base of the slender pedicel to the summits of the sepals and petals, yellowish brown. Sepals and petals $\frac{1}{12}$ in. long, slightly hairy; lateral sepals obliquely egg-shaped, long-pointed. Petals rather obliquely spoon-shaped, rounded at the tip. Lip twice as long as the sepals, divided at the tip into 2 spreading blunt small lobes, the margins ciliate except towards the tapering base, upper surface with a stout central callus. Ovary curved, egg-shaped, glandular-hairy.

Resembles *L. Lindleyana*, but the shape of the petals distinguishes it.

Flowers.—August.

Locality.—Sonamarg; Liddar Valley, 8,000-9,000 ft.

Distribution.—Apparently endemic in Kashmir.

Fig. 4. Listera Lindleyana, King & Pantling (=**Neottia Listeroides**, Lindl.).

(After John Lindley, 1799-1885, botanical writer.)

A terrestrial herb, $\frac{4}{5}$-$1\frac{2}{5}$ in. high. Root-fibres rather stout and brittle. Stem longer than the raceme, stout or slender, bearing 3 or 4 loose, blunt sheaths about 1 in. long, nearly hairless below, its upper portion together with the raceme glandular-hairy. Leaves none. Flowers dull yellowish green, $\frac{1}{3}$-$\frac{1}{2}$ in. long, lax; bract egg-shaped-oblong, variable in length. Sepals elliptic-egg-shaped, concave, the lateral ones somewhat sickle-shaped. Petals much narrower. Lip twice or thrice as long as the sepals, narrowly inversely egg-shaped-oblong, brown, the tip cleft into 2 oblong or lance-shaped lobes; upper surface minutely hairy and with a greenish-coloured linear groove which forms a ridge on the back. Fruit $\frac{1}{3}$ in. long, broadly elliptic, pedicel about as long.

Flowers.—May-September.

Locality.—Dachigam Rakh, in dense, shady thickets.

Distribution.—Chitral, throughout the W. Himalaya from Hazara and Kashmir, 5,000-11,000 ft., to Nepal and Sikkim.

Listera ovata, R. Br.

Rootstock short, giving off numerous thick root-fibres. Stem $\frac{2}{5}$-$\frac{3}{5}$ in. long, enclosed within the leaf-sheaths, and with 1 empty sheath at the base. Leaves 2, stalkless, almost opposite, 2-4 in. long, broadly elliptic, many-nerved. Flower-stalk round, $\frac{2}{5}$-$\frac{3}{5}$ in. long, with a few, scattered, egg-shaped, long-pointed bracts below the raceme. Raceme 3-6 in. long, laxly many-flowered; floral bract about as long as the pedicel, egg-shaped, long-pointed. Flowers $\frac{1}{2}$ in. long. Sepals and petals of almost equal length. Sepals egg-shaped, deep green. Petals linear-oblong, pale green. Lip sharply bent down, twice as long as the sepals, yellowish, linear-inversely egg-shaped, deeply notched, upper surface with a linear, nectar-secreting groove towards the base.

Flowers.—June, July.

Locality.—Gurais Valley, 7,000-8,000 ft.; Sind Valley.

Distribution. — Throughout Europe to the Ural and Caucasus Mountains.

SPIRANTHES, Rich.

(From the Greek *speira*, a spiral, and *anthos*, a flower, alluding to the spiral arrangement of the flowers.)

Fig. 5. Spiranthes australis, Lindl. Lady's Tresses.

A slightly hairy, terrestrial herb. Root-fibres thick and fleshy. Stems stout or slender, up to $1\frac{1}{2}$ ft. high. Leaves alternate, clustered near the base of the stem, 2-4 in. long, shortly sheathing, linear or inversely lance-shaped. Flowers very small, white or pink, crowded in a spiral, slender spike 2-6 in. long; bracts egg-shaped, longer than the ovary. Sepals lance-shaped, the 2 side ones spreading, the upper one combined with the petals to form a 3-lobed hood enclosing the column, tips recurved. Lip oblong, crisped, at its base saccate and having 2 glands, tip dilated, recurved; no spur. Capsule about $\frac{1}{2}$ in. long, ridged, hairy.

Flowers.—Throughout the summer.

Locality.—Harwan.

Distribution.—W. Himalaya, up to 10,000 ft., Nepal, Sikkim, Assam, Peninsular India, N.W. Frontier, from Afghanistan to Europe, N. Asia, China, Java, Australia, New Zealand, N. America.

EPIPACTIS, Adans. The Helleborine.

(The classical Greek name of a plant related to this genus.)

I. Flowers crowded ... ... *E. latifolia.*
II. Flowers distant.
1. Basal portion of lip narrow, canoe-shaped ... ... *E. consimilis.*
2. Basal portion of lip relatively large, the sides broad, rounded ... ... *E. gigantea.*

Fig. 6. Epipactis latifolia, All. Broad-leafed Epipactis or Helleborine.

A terrestrial herb, up to 3 ft. high, slender, hairless below, the upper portion including the inflorescence slightly hairy. Lower leaves round, $2\frac{1}{2}$-6 by 2-3 in., smaller upwards, round to egg-lance-shaped or egg-shaped-elliptic, sharp-pointed, many-nerved, hairless. Raceme $\frac{1}{3}$-1 ft. long, many-flowered, usually dense. Flowers about $\frac{1}{2}$-$\frac{4}{5}$ in. diameter, dingy purple or green. Bracts linear-lance-shaped, long-pointed, the lowermost large and leaf-like. Sepals lance-shaped, long-pointed. Petals like the sepals but smaller. Lip $\frac{1}{4}$ in. long, basal part bowl-shaped, margins rounded, terminal part shorter, flat, broadly triangular, bearing 2 protuberances at its base, margins crumpled, obscurely toothed.

Flowers.—May to August.

Locality.—Sind Valley.

Distribution.—Throughout the W. Himalaya between 5,000 and 11,000 ft., Nepal, Sikkim, N. Asia, Japan, Hongkong, Europe, N. Africa.

Epipactis consimilis, Wall.

Flowering stem 1-2 ft. high. Stem slender, hairless. Leaves 6 by $1\frac{1}{4}$ in., lance-shaped, long-pointed, the uppermost much shorter and narrower; nerves prominent and nearly straight. Raceme $\frac{1}{3}$-$\frac{1}{2}$ ft. long, laxly flowered, axis hairy. Flowers about 1 in. diameter, distant, orange-green, sometimes spotted, lip paler. Sepals spreading and hairy outside, unequal, concave, the dorsal one lanceolate, lateral pair much wider. Petals egg-shaped, hairy outside on the thickened midrib. Lip a little shorter than the sepals, basal part narrow, canoe-shaped, terminal part 3-lobed, the side-lobes turned up, the tip lance-shaped, spreading.

Locality.—Gilgit district.

Distribution.—W. temperate Himalaya, from Peshawar and Kashmir to Nepal and Sikkim, Upper Burma, China, near Saharanpur, Kurram Valley, through Afghanistan to Syria.

Fig. 7. Epipactis gigantea, Dougl. (=**E. Royleana,** Lindl.)

Stem 1-2 ft. high, clothed at the base with broad, loose sheaths. Lower leaves round, 3 by $1\frac{3}{4}$ in., the upper lanceolate, nerves nearly straight. Racemes $\frac{1}{3}$-$\frac{2}{3}$ ft. long, the axis, flower-stalks and ovaries finely hairy. Flowers about 1 in. diameter, drooping, distant, red with yellow centre. Bracts longer than the flowers, lance-shaped, long-pointed, the lower ones large and leaf-like. Sepals and petals about $\frac{1}{2}$ in. long. Sepals green, veined with red, dorsal one erect, broadly egg-shaped, the lateral pair egg-lance-shaped. Petals rather shorter, obliquely egg-shaped, blunt, often veined with red. Lip longer than the sepals, basal part large, with prominent nerves, the sides broad, rounded, erect, terminal part shorter, flat, lance-shaped. Fruit $\frac{2}{5}$-$\frac{4}{5}$ in. long, inversely egg-shaped-oblong.

Flowers.—June, July.

Locality.—Srinagar, on a small island in the river; Gulmarg, pine-woods, about 8,500 ft., common; Baltistan, 8,000-9,000 ft.; Gilgit.

Distribution.—Temperate Himalaya, from Hazara and Kashmir, 8,000-12,000 ft. to Kumaon, 7,000-11,000 ft., Nepal, Sikkim, Waziristan, China, N. and Central America.

Plate 57

ORCHIS, Linn. The Orchis.

(The classical Greek name of various ground orchids.)

1. Flowers flesh- or rose-coloured ... ... *O. incarnata.*
2. Flowers purple-lilac or occasionally white, lip usually spotted with darker purple ... ... *O. latifolia.*
3. Flowers pink or occasionally white ... *O. habenarioides.*

Figs. 1 and 2. Orchis incarnata, Linn.

A terrestrial herb. Root tuberous, flattened, divided into finger-like lobes. Stem erect, slender, hollow. Leaves not spotted, erect, lance-shaped, gradually narrowed from a broad base. The tip hooded. Spike dense-flowered, oblong-

cylindrical. Bracts herbaceous, net-veined, the lower ones often longer than the flowers. Flowers flesh- or rose-coloured. The 2 lateral sepals spreading, the middle one and the petals meeting together; lip 3-lobed, the border turned down, scalloped, the spur awl-like, slightly shorter than the ovary.

Flowers.—June, July.

Locality.—Below Basam Gali, in damp ground; Diskhal, in Juniper tract; Tosh Maidan.

Distribution.—Europe, Caucasus, Persia, Kashmir.

Orchis latifolia, Linn. Marsh Orchis.

(*Latifolia* means broad-leafed.)

A hairless, terrestrial herb. Root tuberous, slightly flattened and divided into 2 or 3 finger-like lobes. Stem 1-3 ft. high, robust, erect, hollow, leafy, throughout or in the lower portion a few sheathing scales. Leaves erect, oblong-lance-shaped, $2\frac{1}{2}$-6 in. long, base sheathing. Flowers about $\frac{2}{3}$ in. long, crowded, dull purple, the lip darker spotted. Bracts green, narrowly lance-shaped, the lower much longer than the flowers, the upper slightly so or shorter. Sepals and petals nearly equal, the lateral sepals spreading, the dorsal one forming with the petals a hood. Lip turned downwards, round, obscurely 3-lobed, margins finely toothed; spur straight, cylindric, nearly as long as the ovary.

Flowers.—June to August.

Locality.—Gulmarg, damp, grassy woods and by water-course, above 8,500 ft., common; below the Lal Shah ki Alam, on damp ground, 10,200 ft.

Distribution.—W. Himalaya, 8,000-12,000 ft., eastwards to Nepal, 16,000 ft., and westwards to Afghanistan, N. Africa and Europe, N. Asia.

Orchis habenarioides, King and Pantling.

(*Habenarioides* means resembling *Habenaria*, another genus of Orchids.)

A terrestrial herb. Tuber divided into finger-like lobes. Stems 1-$1\frac{2}{3}$ ft. high, clothed at the base with unequal, tubular sheaths. Leaves 4 or 5, scattered, stalkless, 2-5 in. long, elliptic-oblong to linear-oblong, slightly narrowed into the rather long sheath. Spike 2-5 in. long, cylindric, dense-flowered. Flowers about $\frac{1}{3}$ in. diameter, pink or occasion-

ally white. Bracts longer than the curved beaked ovary, herbaceous. Sepals almost equal, broadly egg-shaped, the dorsal forming a hood with the petals, lateral ones spreading and somewhat bent back. Petals shorter than the sepals, rhombic-round. Tip of lip broad and with a shallow terminal lobe; spur as long as the ovary, flattened, curved, slightly club-shaped. Fruit $\frac{2}{5}$ in. long, egg-shaped-oblong.

Flowers.—August.

Locality.—Liddar Valley, 10,000-12,000 ft.; upper Chenab Valley, 10,000 ft.

Distribution.—From Hazara and Kashmir to Nepal, Sikkim and Bhutan.

EPIPOGUM, Gmel.

(From the Greek *epi*, upon, and *pogon*, a beard, perhaps referring to the glandular hairs on the lip.)

1. Lip 3-lobed ... ... *E. aphyllum.*
2. Lip entire ... ... *E. tuberosum.*

Fig. 3. Epipogum aphyllum, Swartz.

(*Aphyllum* means leafless.)

A brown-coloured saprophyte, i.e., living on dead organic matter, $\frac{1}{3}$-$\frac{2}{3}$ ft. high, hairless. Root creeping, producing a number of short, thick, fleshy branches. Flowering stem stout, often swollen above the base, bearing 2 or 3 unequal sheathing bracts. Raceme $1\frac{2}{5}$ in. long, 3-6-flowered. Flowers about $\frac{3}{4}$ in. long, yellow or yellow-pink. Floral bracts longer than the stalked ovary, concave, oblong-elliptic, membranous. Sepals and petals $\frac{1}{2}$-$\frac{3}{4}$ in. long, nearly equal, free, narrowly lanceolate. Lip uppermost, 3-lobed; midlobe much the largest, pointed, bent back, concave in the centre and bearing a few rows of small, red glands; spur large, blunt, as long as the lip, flattened.

Flowers.—July to September.

Locality.—Gulmarg, bare pine-wood, about 8,500 ft; not very common; Liddar Valley, 8,000-9,000 ft.; Sind Valley, 8,500 ft.

Distribution.—From Kashmir to Kumaon and Sikkim, W. Asia, Europe.

Fig. 4. Epipogum tuberosum, Duthie.

A brown-coloured saprophyte, ⅓-1 ft. high, hairless. Root tuberous. Stem usually swollen above the base and getting thinner upwards, bearing a few membranous broad-based bracts. Raceme laxly 3-5-flowered. Floral bract egg-lance-shaped, long-pointed, entire, longer than the slenderly stalked ovary, 5-nerved. Sepals and petals ½ in. long, all 3-nerved. Lip without side lobes, slightly longer than the sepals, its upper surface with 3 ridges. Spur as in the previous species, but more slender and with a less rounded tip.

Flowers.—July to September.

Locality.—Baltal ; Sind Valley, 6,000 ft. ; Liddar Valley, 8,000-9,000 ft.

Distribution.—Apparently endemic in Kashmir.

CYPRIPEDIUM, Linn.

(Derived, from *Cypris*, the Greek name for Venus, and *pedion*, diminutive of *pede*, shoe, alluding to the shape of the lip.)

Fig. 5. Cypripedium cordigerum, Don. Lady's Slipper.

Hairless or nearly so. Root fibrous. Flowering stem 1-2 ft. high, stout or slender, leafy. Leaves several, spreading, egg- or lance-shaped, 5 by 3 in., from nearly round to lance-shaped, sharp- or long-pointed, membranous, plaited. Flower solitary ; bract large, leaf-like. Sepals green, egg-lance-shaped, 1½-2 in. long, long-pointed, the 2 lateral united and placed under the lip, the third erect and above it. Petals green or white, spreading, lance-shaped. Lip 1-1¼ in. long, white, often with a few purple spots outside and near the base, stalkless, folded to form an oblong, inflated, open-mouthed pouch. Ovary straight.

Flowers.—June.

Locality.—Tosh Maidan, 11,000-12,000 ft., rare.

Distribution.—W. Himalaya, from Hazara and Kashmir to Nepal, 8,000-12,000 ft.

HERMINIUM, Linn.

(From the Greek *hermis* or *hermin*, a column, support, foot, alluding perhaps to the appearance of the stem or the solitary tuber.)

A. Lip 3-lobed.
  I. Lip as long as the petals ... ... *H. Monorchis.*
  II. Lip longer than the petals.
    1. Petals as long as the sepals ... *H. angustifolium.*
    2. Petals a little longer than the sepals ... ... *H. congestum.*
B. Lip entire ... ... *H. pugioniforme.*

Fig. 6. Herminium sp.

Locality.—Gulmarg, in forest (Hallberg).

Herminium Monorchis, R. Br. Musk Orchid.

(From the Greek *monos*, one, and *orchis*, tuber.)

A terrestrial herb, up to ½ ft. high. Tuber globose or ellipsoid. Stem with 1 or 2 sheaths at the base, the upper one often leaf-like. Leaves 2 or 3, near the base of the stem, 1-4 in. long, oblong-lance-shaped, shining. Stem bearing 1 or 2 lance-shaped, long-pointed bracts. Spike 1-2 in. long, densely flowered, cylindrical or flowers all turned one side. Flowers bent down, ⅛ in. diameter, yellowish green, musk-scented. Floral bract lance-shaped, long-pointed, shorter than or as long as the ovary. Sepals ⅛ in. long, oblong, the lateral pair narrower. Petals meeting with the sepals and a little longer, tips fleshy. Lip as long as the sepals, 3-fid, concave at the base, lobes narrow, blunt, the middle one the longest. Fruit ⅓ in. long, swollen, its beak bent downwards.

Flowers.—July, August.

Locality.—Baltistan.

Distribution.—W. Himalaya, 9,000-14,000 ft., from Kashmir to Kumaon, Sikkim, China, N. Asia, Europe.

Herminium angustifolium, Benth.

(*Angustifolium* means narrow-leafed.)

A terrestrial herb. Tuber small, oblong or ellipsoid. Stem 1-2½ ft. high, clothed at the base with tubular sheaths. Leaves usually 3, up to ⅝ ft. long, linear, long-pointed, with long sheaths. Spike ⅛-⅝ ft. long, narrow, cylindric, many-flowered.

Flowers crowded, very small, green. Floral bract linear-lance-shaped, long-pointed, shorter than or as long as the ovary. Sepals almost equal, oblong, blunt, the dorsal one meeting with the petals to form a hood, lateral pair spreading. Petals linear, as long as the sepals. Lip much longer than the sepals, bent down from the base, with ear-like ears on its lower half, tip 3-fid, midlobe much shorter than the slender, curved, filiform side-lobes.

Flowers.—July to August.

Locality.—At elevations of 4,000-10,000 ft.

Distribution.—From Kashmir to Kumaon, Nepal, Sikkim, Bhutan, Khasia and Naga Hills, Tenasserim, China, Japan, Java and Timor.

Herminium congestum, Lindl.

(*Congestum* means brought together, heaped up, alluding to the mass of flowers on the spikes.)

A terrestrial herb, 4-8 in. high. Tuber almost globose, hairy. Lower portion of stem clothed with 1 or 2 short wide sheaths. Leaves 2 or 3, near the base of the stem, up to 4 in. long, narrowly oblong-elliptic or inversely lance-shaped. Spike rather narrow, up to 4 in. long, many- and dense-flowered. Flowers green, very small, bent down. Floral bract egg-shaped, sharp-pointed, much shorter than the beaked ovary. Sepals almost equal, blunt, the dorsal broadly egg-shaped, lateral pair narrower, slightly spreading, oblong. Petals a little longer than the sepals, obliquely lance-shaped. Lip longer than the sepals, fleshy, triangularly egg-lance-shaped, blunt; side lobes very narrow, finely scalloped, terminal lobe entire; spur sack-shaped, almost globose.

Flowers.—July, August.

Locality.—Baltistan.

Distribution.—From Kashmir to Kumaon, 8,000-9,000 ft., Nepal, Sikkim, Aleutian Islands.

Herminium pugioniforme, Lindl.

(*Pugioniforme* means dagger-shaped, referring to the front portion of the lip.)

A terrestrial herb, 2-7 in. high. Tuber small, globose. Stem with 1 or 2 loose sheaths at the base. Leaf solitary, almost at the base of the stem, 1-2½ in. long, oblong to linear-lance-shaped. Flowering stem naked, firm and rather stout towards

the base. Spike $\frac{2}{5}$ to 2 in. long, lax-flowered. Flowers very small, few, almost erect, green; floral bract almost round, much shorter than the ovary. Dorsal sepal round, forming with the petals a hood, lateral pair very broad, blunt. Petals smaller, concave, the edges scalloped. Lip as long as the lateral sepals, fleshy, base expanded and with 2 deep oval pits, front portion dagger-shaped.

Flowers.—August.

Locality.—Above Gulmarg, about 12,000 ft.

Distribution.—From Kashmir to Garhwal, between 14,000 and 15,000 ft., Sikkim.

HAEMODORACEAE.

(After the genus *Haemodorum*; *haima* means blood, and *doron* gift, so-called on account of the blood-red roots.)

ALETRIS, Linn.

(From the Greek *aletron*, meal, alluding to the powdery appearance of some species.)

Fig. 7. Aletris nepalensis, Hook. f.

A small herb. Leaves radical, grass-like, 3-8 by $\frac{1}{8}$-$\frac{1}{4}$ in., 5-7-nerved. Flowering stems leafless, 4-12 in. high, glandular-hairy or woolly above, bearing 1 or 2 short leaves near the top. Raceme or spike 1-4 in. long, few- or many-flowered. Bracts linear, erect. Flowers white or pale pink. Perianth $\frac{1}{5}$ in. long; lobes short, blunt, bent back. Lower half of ovary attached to the perianth-tube; ovules many in each cell. Stamens 6, on the bases of the lobes. Style shorter than the stamens, 3-parted at the top. Fruit globose, opening by 3 valves. Seeds many, very small, oblong.

Flowers.—June to August.

Locality.—Above Thajwas.

Distribution. — Temperate and alpine Himalaya, from Kashmir to Bhutan, 10,000-15,000 ft., China.

Plate 58

IRIDACEAE.

(*Iris* is the Greek name for the rainbow, alluding to the hues of the flower.)

IRIS, Linn. The Iris.

A. Sepals bearded.
  I. Blade of sepal ¾ in. broad ... ... *I. kumaonensis.*
  II. Blade of sepal ¼ in. broad ... ... *I. gilgitensis.*
B. Sepals crested ... ... *I. nepalensis.*
C. Sepals neither crested nor bearded.
  I. Perianth-tube absent ... ... *I. ensata.*
  II. Perianth-tube present.
    1. Flowers bright lilac ... ... *I. spuria.*
    2. Flowers yellow ... ... *I. aurea.*

Fig. 1. Iris kumaonensis, Wall.

A perennial herb. Rootstock thick, creeping. Stems 2-12 in. high, crowded. Leaves 4-14 in. by ⅓ in. at the time of flowering, lengthening afterwards, linear. Spathes 2-3 in., often enveloped by the uppermost leaf. Perianth-tube 2-2½ in. long; limb bright lilac, 1½-2 in. long. Blade of sepals ¾ in. broad, mottled and bearded with a central line of yellow-tipped hairs. Blade of petals ½ in. broad. Style-arms ¾ in. long, margins entire, the tip deeply 2-lobed and toothed. Capsule 1-2 in. long, egg-shaped, ends pointed.

Flowers.—May, June.

Locality.—Gulmarg, open grassy margs, 6,000-13,000 ft., common; Tangmarg, forest, 7,200-8,700 ft.; Khelanmarg, 10,000 ft.; below Basam Gali, in open situations, above 10,000 ft.

Distribution.—W. Himalaya, from Kashmir to Kumaon.

Iris gilgitensis, Baker.

A dwarf, perennial herb. Stems 4-6 in. high, tufted, basal sheaths entire. Leaves 6-9 by ⅛-⅙ in., linear. Spathes 1½-2 in. long, 2-flowered. Flowers bright lilac, stalked. Perianth-tube less than 1 in. long; limb 1¼ in. long. Blade of sepals ¼ in. broad, narrow-oblong, much shorter than the strongly bearded claw. Petals oblong, clawed. Style-branches ¾ in. long, crests small.

Locality.—Gilgit, 12,000 ft.

Distribution.—Endemic in Kashmir.

Iris nepalensis, Don. Collett, fig. 172.

A perennial herb. Rootstock stout, prostrate. Stems 6-12 in. high, slender. Leaves 6-12 in. long at the time of flowering, lengthening to 2 ft. by ¼ in. afterwards. Spathes 1½-2 in. long. Flowers pale lilac, short-stalked. Perianth-tube 1½ in. long; limb 1-1½ in. long. Blade of sepals ½ in. broad, oblong, as long as the claw, crest yellow. Petals ⅓ in. broad, oblong. Style-arms 1 in. long and less, deeply 2-lobed, margins toothed. Capsule 1-1½ in. long, oblong, enclosed in the persistent spathes.

Locality.—At elevations of 5,000-10,000 ft.

Distribution.—Temperate Himalaya, from the Punjab and Kashmir eastwards, Khasia Hills.

Fig. 2. Iris ensata, Thunb.

(*Ensata* means sword-like, referring to the leaf-blade.)

A perennial herb. Rootstock stout, prostrate and creeping. Stems tufted, short, or 1½-2 ft. high, stout or slender. Leaves 1½ ft. by ¼-⅓ in., linear, rigid, grooved, greenish blue. Spathes 3-4 in. long, 1-3-flowered. Flowers lilac or white, sepals and petals often with purplish veins, stalked. Perianth-tube absent; blade of sepals rhomboidly egg-shaped, blunt, entire, shorter than the claw, neither crested nor bearded, 1½-2 by ½-¾ in. Petals inversely lance-shaped, erect, ¼ in. broad. Stamens 3, at the base of the outer perianth-segments; filaments distinct; anthers linear. Ovary 3-celled, 1 in. long, cylindric; ovules many. Style linear, style-arms 3, 1 in. long, linear, crests large, tip sharply bifid. Capsule 1½-3 by ½-⅔ in., 6-ribbed, beaked, ribs rounded.

Flowers.—May.

Locality.—Srinagar, in field on left bank of Jhelum; above Drogjun, in a marsh.

Distribution.—Kashmir, 5,000-9,000 ft., temperate Asia.

Iris spuria, Linn. Spurious Iris.

A perennial herb. Rootstock stout, prostrate and creeping. Stem 2-3 ft. high, sheathed. Leaves 1-3 ft. by ½-1½ in., sword-shaped, leathery, strongly streaked. Spathes 2-3 in. long, 2-3-flowered, linear-oblong, firm, green. Flowers 2-3 in. diameter, bright lilac. Perianth-tube long; sepals ½ in. broad, blade round, half as long as the claw, claw keeled. Petals

⅓-½ in. broad, inversely lance-shaped. Style-arms 1 in. long, bent down, crests small. Capsule 1-2 in. long, 6-ribbed, long-beaked.

Locality.—At elevations of 6,000 ft.

Distribution.—From Kashmir to Russia.

Iris aurea, Lindl. Golden Iris.

A perennial herb. Rootstock stout, prostrate. Stems 3-3½ ft. high, stout, round, with leafy sheaths. Leaves 1½-2 ft. by ¾-1 in., sword-shaped. Spathes 3-4 in. long, 2-3-flowered. Flowers yellow, long-stalked. Sepals 2½-3½ in. long, blade 1 in. broad, oblong, as long as the claw. Petals shorter, inversely lance-shaped. Style-arms 1¼-1½ in. long, crested. Ovary as long as the perianth-tube. Capsule 1½ in. long, oblong, 6-angled, beaked.

Locality.—Not known to me.

Distribution.—Endemic in Kashmir.

LILIACEAE. The Lily Family.

COLCHICUM, Linn.

(The Greek *colchicon* of Dioscorides, a poisonous plant growing in Colchis on the Black Sea.)

Fig. 3. Colchicum luteum, Baker. Yellow Saffron.

Corm gibbously egg-shaped, coats dark brown. Leaves few, appearing with the flowers, linear-oblong, or inversely lance-shaped, blunt, short at the flowering time, at fruiting 6-12 by ⅓-½ in. Flowering stalk very short, amongst the leaf-sheaths, 1-2-flowered. Flowers 1-1½ in. diameter when expanded, golden yellow. Perianth-tube 3-4 in. long, segments 6, oblong or inversely lance-shaped, blunt, many-nerved. Stamens 6, shorter than the perianth, inserted in the bases of the segments; filaments very much shorter than the long, yellow anthers. Ovary stalkless, 3-celled; styles 3, filiform, much longer than the perianth. Capsule 1-1½ in. long. Seeds almost globose.

Flowers.—May.

Locality.—Dachigam Rakh, in shady places; Gulmarg, open grassy marg, about 8,500 ft., rare.

Distribution.—W. temperate Himalaya, from Kashmir to Chamba, 4,000-9,000 ft., Afghanistan, Turkestan.

HEMEROCALLIS, Linn.

(From the Greek *hemera*, day, and *callos*, beauty, alluding to the flower that lasts only one day.)

Fig. 4. Hemerocallis fulva, Linn.

Rootstock very short, with fleshy root-fibres. Leaves 1-2 ft. by 1-1½ in., erect-spreading, narrowly linear, many-nerved, somewhat bluish green beneath. Flowering stem 2-3 ft. high, round, naked, bearing a 6-12-flowered panicle. Flower-stalks short. Bracts small, membranous, soon falling off. Flower large, almost erect, 1-2 in. diameter. Perianth funnel-shaped, 6-partite; segments united at the base into a tube, which is yellow-red; outer segments orange-yellow, oblong, sharp-pointed, inner ones much larger and broader, margins wavy. Stamens 6, inserted at the mouth of the tube, protruding; filaments filiform. Ovary 3-celled; style filiform. Capsule 3-sided, leathery. Seeds angled, black, shining.

Flowers.—July.

Locality.—Gulmarg, clearing in forest on hill-top, 8,500 ft., local.

Distribution.—Himalaya, Khasia Hills, cultivated throughout India, N. Asia to Japan, Caucasus, S. Europe.

Plate 59

AMARYLLIDACEAE.

Amaryllis was the name of a country-woman in Virgil's Eclogues.)

IXIOLIRION, Fisch.

(*Ixiolirion* means a lily resembling *Ixia*, a genus of *Iridaceae*.)

Fig. 1. Ixiolirion montanum, Herb. Mountain Ixiolirion.

Bulb egg-shaped, 1 in. thick, with a neck 2-3 in. long below the basal tuft of leaves. Stem about 1-1½ ft. long. Leaves about 4, persistent, and a few smaller ones above. Flowers on long, unequal stalks, about 4, and often 1 or 2 flowers below. Perianth bright lilac, 1½ in. or less long, regular, 6-lobed, without tube above the ovary; segments inversely lance-shaped, sharp-pointed. Stamens shorter than the segments, attached to their claws. Ovary club-shaped. Capsule 3-celled.

Locality.—Srinagar, fields, about 5,000 ft., common, grown in many places; introduced.

Distribution.—Syria, Persia to Siberia.

LILIACEAE. The Lily Family.

GAGEA, Salisb. Star-of-Bethlehem.

(After Sir Thomas Gage, British botanist, died 1820.)

I. Inflorescence umbellate.
   1. Leaf ¼-½ in. broad ... ... *G. lutea.*
   2. Leaf grass-like ... ... *G. reticulata.*

II. Inflorescence cymose.
   1. 1 radical leaf ... ... *G. persica.*
   2. 2 radical leaves ... ... *G. kashmirensis.*

Fig. 2. Gagea lutea, Schult. f. Yellow Star-of-Bethlehem.

A small, hairless, bulbous herb. Bulb about as large as a hazel-nut. Radical leaf solitary, linear-lance-shaped, 4-6 by ¼-½ in. Stem 2-5 in., hairless or hairy. Inflorescence umbellate. Bracts 2, unequal, leaf-like, usually nearly opposite. Flowers 3-6, yellow, star-like. Perianth ½ in. long; segments 6, linear-oblong, blunt or sharp-pointed. Stamens 6, at the base of and shorter than the segments; anthers oblong. Ovary small, 3-sided, 3-celled; ovules many in each cell; style straight, thick, tapering downwards. Capsule not half as long as the perianth, broader than long, 3-grooved. Seeds many, flat.

Flowers.—May, June.

Locality.—Gulmarg, open grassy marg and short turf, above 8,000 ft., common; Khelanmarg, 10,000 ft.

Distribution.—W. Himalaya, from Kashmir to Kumaon, 6,000-13,000 ft., N. Asia, N. Africa, Europe.

Gagea reticulata, Schult. f.

A small bulbous herb. Stem 2-3 in. high, stout or slender. Leaves 4-8 in. long, filiform, grass-like, stem-leaves usually very many, bent back, long, rarely few and short. Flowers many, umbellate, very variable in size, green with a white border. Perianth ½-¾ in. long; segments linear, finely pointed. Anthers linear-oblong. Capsule as long as the perianth. Seeds flat, angular.

Locality.—At elevations below 6,000 ft.

Distribution.—From Kashmir to Almora, Punjab Plains, Turkestan, westwards to N. Africa and Greece.

Fig. 3. Gagea persica, Boiss. Persian Star-of-Bethlehem.

A bulbous small herb. Stem 2-6 in., hairless, very slender. Radical leaf 4-6 by $\frac{1}{4}$-$\frac{1}{3}$ in., linear or linear-lance-shaped. Flowers many, in one-sided forked cymes 1-2 in. long. Bracts many, very short, linear, each bearing a flower or a little bulb in its axil. Perianth $\frac{1}{4}$-$\frac{1}{3}$ in. long; segments linear, blunt. Filaments nearly as long as the segments. Capsule nearly as long as the perianth. Seeds compressed, not angled or winged.

Flowers.—May.

Locality.—Gulmarg, open margs in short grass, 8,600 ft., not as common as *G. lutea.*

Gagea kashmirensis, Turrill. Kashmir Star-of-Bethlehem.

Bulbs 2, unequal, $\frac{1}{5}$-$\frac{1}{3}$ by $\frac{1}{5}$ in. Stem erect, about 6 in. high, more or less densely covered with white hairs. Radical leaves 2, very narrowly linear, almost filiform, almost $\frac{2}{5}$ in. long; stem-leaves alternate, unequal, lance-shaped from a broadened base, narrowed towards the tip, with the margin more or less white-ciliate, the lower one over 2 in. long, often shorter, the upper $\frac{2}{5}$-1 in. long. Inflorescence 3-6-flowered; stalks erect or almost so, often $\frac{2}{5}$-$\frac{4}{5}$ in. long, provided with white hairs. Bracts linear. Flowers yellow, hairless. Perianth-segments narrowly elliptic or elliptic-lance-shaped, slightly narrowed at the base, about $\frac{1}{2}$ by $\frac{1}{8}$ in., the outer ones sharp-pointed, 5-7-nerved, the inner ones almost blunt, 3-4-nerved. Stamens about $\frac{1}{4}$ in. long; anthers oblong. Ovary inversely egg-shaped. Style $\frac{1}{5}$ in. long.

Flowers.—March.

Locality.—Srinagar, 5,100 ft.

Distribution.—So far endemic in Kashmir.

ALLIUM, Linn.

(The old Latin name of Garlic, *Allium sativum.*)

A. Leaves flat.
  AA. Bulbs solitary or clustered upon a rootstock.
    I. Scales of bulb membranous, not of netted fibres.
      1. Stamens longer than the perianth.
        a. Flowers rosy or pale yellow — *A. Stracheyi.*
        b. Flowers golden yellow ... *A. consanguineum.*
        c. Flowers red-purple ... *A. Thomsoni.*
      2. Stamens as long as or shorter than the perianth ... *A. Wallichii.*

II. Outer scales of bulb of netted fibres.
1. Stamens longer than the perianth ... ... *A. victorialis.*
2. Stamens shorter than the perianth.
a. Flowering stem sharp-angled (fig. 4) ... ... *A. humile.*
b. Flowering stem round ... *A. Clarkei.*
BB. Bulbs not seated upon a root-stock.
I. Flowers rose-purple ... ... *A. atropurpureum.*
II. Flowers white ... ... *A. loratum.*
B. Leaves hollow.
I. Flowers dark red ... ... *A. atrosanguineum.*
II. Flowers pink or pale purple... *A. Schoenoprasum.*
III. Flowers pale yellow.
1. Bulbs tufted ... ... *A. Semonovii.*
2. No bulbs ... ... *A. Fedschenkoanum.*
C. Leaves filiform ... ... *A. rubellum.*

The species will be described in alphabetical order.

Allium atropurpureum, Waldst. & Kit.

(*Atropurpureum* means dark purple.)

Bulb round-egg-shaped, scales entire. Leaves 2-4, narrowly linear-oblong or lance-shaped, 1-2 ft. by 1-2 in., shorter than the tall, erect, hollow flowering stem; sheaths sometimes slightly hairy. Flowering stem 2-2½ ft. high. Heads usually hemispheric, 2-2½ in. diameter, very many- and dense-flowered; spathes 2-4. Flower-stalks ½-1 in. long, much longer than the rose-purple, star-shaped flowers. Perianth-segments linear-oblong, pale or dark purple. Filaments awl-shaped, about as long as the segments, inserted at the bases of the segments, united at the base. Ovary almost globose or depressed. Style short. Capsule globose.

Flowers.—June.

Locality.—Near Shirazia Bagh, on rocky and gravelly top of hill; Kishtwar, 8,000-10,000 ft.

Distribution.—Kashmir, westwards to Hungary, Turkestan, Siberia.

Allium atrosanguineum, Schrenk.

(*Atrosanguineum* means dark blood-red.)

Bulb narrow; coats membranous, at length fibrous. Leaves 1-2, hollow, 8-12 by $\frac{1}{6}$-$\frac{1}{4}$ in., linear, blunt, as long as the flowering stem; sheaths very long. Flowering stem stout, hollow. Flower-head $\frac{3}{4}$-1 in. diameter, almost globose, dense-flowered; spathes persistent. Perianth $\frac{1}{4}$-$\frac{1}{3}$ in. long, bell-shaped, dark red; segments oblong, united below. Filaments short, triangular-awl-shaped, almost equal, inserted at $\frac{1}{3}$ distance from their base, united at the base, about $\frac{1}{4}$ the length of the perianth. Ovary globose, style short.

Locality.—Gilgit.

Distribution.—Kashmir, Turkestan.

Allium Clarkei, Hook. f.

Bulb small, egg-shaped, 1 in. diameter, outer scales closely and finely netted, pale. Leaves 4-8, almost at the base, erect, very narrowly linear or filiform, flat, blunt, shorter than the slender flowering stem which is round and 1-1½ ft. long. Head 1-1½ in. diameter, lax-flowered; spathes 2, one or both as long as the flower-stalks or shorter. Flower-stalks ½-⅔ in. long, much longer than the star-like white flowers. Perianth-segments $\frac{1}{6}$ in. long, linear-oblong, long-pointed, inner broadly oblong, bluntly toothed below the middle. Filaments inserted near the bases of the segments. Anthers large. Ovary almost globose. Style included. Capsule broadly inversely egg-shaped, $\frac{1}{6}$ in. diameter.

Locality.—Skardo, 7,000-11,000 ft.

Distribution.—Endemic.

Allium consanguineum, Kunth.

Leaves slender, narrowly linear, blunt, flat, keeled. Flower-heads hemispheric. Flower-stalks as long as or rather longer than the flowers. Flowers bell-shaped, golden yellow. Filaments simple, filiform, much longer than the oblong, blunt perianth-segments, inserted on the bases of the perianth-segments. Style slender, far exserted.

Nearly related to *Allium Stracheyi*, but is larger, the flowers are golden yellow, and the flower-stalks are longer.

Locality.—Between 8,000 and 10,000 ft.

Distribution.—Apparently endemic.

Allium Fedschenkoanum, Regel.

No bulb. Leaves 1-2, 3-5 by $\frac{1}{3}$ in., shorter than the tall, stout, flowering stem, hollow, blunt; sheath very long. Flowering stem 2-3 ft. by $\frac{1}{4}$-$\frac{1}{3}$ in. Heads $\frac{3}{4}$-1 in. diameter, globose, dense-flowered; spathes persistent. Flower-stalks about as long as the bell-shaped, pale yellow flowers. Perianth segments $\frac{1}{4}$-$\frac{1}{3}$ in. long; segments oblong-lance-shaped, long-pointed. Filaments united at $\frac{1}{3}$ distance from the base, very short, inner ones with a widened 2-toothed base, outer ones simple, not $\frac{1}{4}$ the length of the perianth. Capsule globose; style very short.

Locality.—Barzil, 12,000 ft.

Distribution.—Kashmir, Turkestan.

Fig. 4. Allium humile, Kunth (= Govanianum, Wall.).

(After George Govan, correspondent of Wallich.)

Bulbs clustered. Stem-base clothed with leaf-sheaths Leaves many, linear, flat, blunt, 6 by $\frac{1}{4}$ in., about as long as the sharp-angled flowering stem, which is 4-12 in. long and robust. Heads 2-3 in. diameter, many-flowered. Flower stalks as long as or longer than the white star-shaped flowers. Perianth segments $\frac{1}{2}$ in. long, narrow, at length bent back. Stamens shorter than the segments, included, bases widened, united.

Locality. — Damam Sar; Khur Mt., 13,000-13,400 ft., common.

Distribution. — Temperate Himalaya, from Kashmir to Kumaon.

Allium loratum, Baker.

Bulb small, egg-shaped, outer scales membranous, grey. Leaves 2-5, linear-lance-shaped, flat, ciliolate, 6-9 by $\frac{1}{2}$-1 in., narrowed from above the base, longer than the slender, round flowering stem which is 3-6 in. high. Head 30-50-flowered; spathes 2. Flower-stalks $\frac{1}{3}$-$\frac{1}{2}$ in. long, tip thickened, longer than the bell-shaped white perianth. Perianth-lobes $\frac{1}{10}$-$\frac{1}{8}$ in. long, lance-shaped, sharp-pointed, midrib brown, inner awl-shaped, outer linear with awl-shaped tips. Filaments as long as the segments. Ovary globose-triangular. Style very short.

Resembles *A. atropurpureum*, but the leaves are broader, the head not hemispheric, and the flower-stalks shorter.

Locality.—Kishtwar and Banehal, 10,000-14,000 ft.

Distribution.—Endemic.

Allium rubellum, M.Bieb.

(*Rubellum* means reddish.)

Bulb solitary, egg-shaped-oblong, small, outer coats streaked, inner membranous. Leaves 4-6 in. long, longer than the flowering stems, filiform, narrow, half-round or flattish; sheaths elongate. Flower-heads $\frac{2}{3}$-1 in. diameter, almost globose. Flower-stalks much longer than the very small, bell-shaped, rosy flowers. Perianth-segments pink, $\frac{1}{8}$-$\frac{1}{6}$ in., twice as long as the stamens, oblong or elliptic-oblong, long-pointed. Filaments included, united at the very base, linear-lance-shaped, simple from a broad wedge-shaped base, inner broadest. Style short.

Locality.—Up to 8,000 ft.

Distribution.—W. Himalaya, from Kashmir to Kumaon, Punjab, westward to the Ural and Caucasus, Siberia.

Allium Schoenoprasum, Linn. Chives.

Bulbs narrow, small, tufted. Stem 6-15 in., leafless, or there may be 1 leaf. Leaves hollow, rounded, grooved or flattened above, awl-like, straight, smooth-ribbed, with barren bulbs, 4-6 in. long. Flowering stems slender or stout, hollow, as long as the leaves. Flowers light purple or pink, small and many in a globular head, without bulbs. Spathes 2, egg-shaped, pointed, as long as the flowers. Stamens united below, included, about $\frac{1}{2}$ the length of the lance-shaped, bell-shaped, perianth-segments.

Locality.—Between 8,000 and 11,000 ft.

Distribution.—W. Himalaya, from Kashmir to Kumaon, westwards to Europe, N. America.

Allium Semonovii, Regel.

Bulbs tufted, cylindric, not seated on a rootstock; scales membranous. Leaves 2-3, stout, about as long as the flowering stem, hollow, $\frac{1}{4}$-$\frac{1}{2}$ in. diameter, sharp-pointed. Sheaths very long. Flower-heads $1\frac{1}{2}$ in. diameter, almost globose, dense-flowered. Spathes persistent. Flowers pale yellow, bell-shaped; stalk shorter than the flowers. Perianth 6-parted. Segments $\frac{1}{2}$-$\frac{2}{3}$ in. long, oblong-lance-shaped, long-pointed. Stamens 6, at the base of the segments; filaments included. Ovary 3-angled, 3-celled. Style straight. Capsule 3-valved, seeds 1 or 2 in each cell, black.

Locality.—At elevations of 8,000-14,000 ft.

Distribution.—From Kashmir to Garhwal, Alatau and Thian Shan Mts.

Allium Stracheyi, Baker.

Bulbs small, clustered, narrowly egg-shaped, outer scales fibrous, produced into a long neck. Leaves 3-4, narrowly slender, linear, blunt, 12 by $\frac{1}{12}$ in. Flowering stem slender, compressed above. Flower-head 1 in. diameter, globose or hemispheric, dense-flowered; spathes small, triangular. Flower-stalks $\frac{1}{12}$-$\frac{1}{4}$ in. long, shorter than the flowers. Flowers bell-shaped, rosy or pale yellow; segments oblong, blunt. Filaments filiform, inserted on the bases of the sepals, simple, free, much protruding. Ovary globose-triangular.

Locality.—At elevations of 9,000 ft.

Distribution.—W. Himalaya, from Kashmir to Kumaon, 10,000-12,000 ft.

Allium Thomsoni, Baker.

Bulbs tufted, narrowly egg-shaped, outer scales hard, chestnut-brown, entire. Leaves 4-5, rather stout, linear, flat, fleshy, blunt, 6-9 by $\frac{1}{6}$-$\frac{1}{3}$ in., shorter or longer than the flowering stem, sheathing the lower third of the stout, round flowering stem, which is 1-2 ft. long. Flower-head 1-1½ in. diameter, globose. Spathes short, triangular. Flower-stalks as long as or shorter than the red-purple, bell-shaped flowers. Perianth-segments ¼ in. long, oblong-lance-shaped, sharp-pointed. Filaments simple, filiform, much protruding, attached to the bases of the perianth-filaments. Ovary globose, cells 2-ovuled. Style much protruding.

Locality.—Up to 12,000 ft.

Distribution.—Endemic in Kashmir.

Allium victorialis, Linn.

Bulbs 2-3 in. long, clustered on an oblique rootstock, outer scales fibrous. Flowering stem round below, angled above. Leaves from below the middle of the flowering stem, 6-10 by 1-3½ in., stalked, elliptic- to oblong-lance-shaped, blunt or sharp-pointed, rarely long-pointed, bluish green, narrowed into the stalk, shorter than the flowering stem, which is round below and angled above. Head 1-1½ in. diameter, drooping in bud, then erect, lax-flowered. Spathes 2, shorter or longer than the flowers. Flower-stalks ½-1 in. long, much longer than the star-shaped, greenish white or yellowish flowers. Perianth-segments ¼-⅓ in. long, spreading and bent back,

.ong, gradually broadened from the middle to the base. aments inserted on the bases of the segments, simple, ıger than the segments, outer narrowly awl-shaped, inner .ce-shaped. Ovary broadly inversely heart-shaped; style)truding. Capsule ¼ in. diameter.
Locality.—Temperate region.
Distribution.—From Kashmir to Sikkim, N. Asia to Japan, rope, N.W. America.

Allium Wallichii, Kunth.

Bulbs small, clustered. Stem-base clothed with leaf-sheaths. aves basal, 4-6, linear or narrowly sword-shaped, flat, 2-3 ⅛-⅜ in., longer than the stout, 3-angular, 1-2½ ft. long, wering stem. Flower-head 2-3 in. diameter, lax-flowered.)wer-stalks 1-1½ in. long, much longer than the star-shaped, :ple flowers. Spathes as long as the flower-stalks. Perianth-ments linear, ½ in. long, narrow, blunt, bent back, longer ın the simple filaments, which are inserted on their bases.
Locality.—Gilgit.
Distribution.—Temperate Himalaya, from Kashmir to :kim.

LLOYDIA, Salisb.

ter Edward Lloyd, an antiquary of the 18th century, who discovered the following species in Wales.)

ig. 5. Lloydia serotina, Reichb. Mountain Spiderwort.

A small, hairless herb. Bulb ½-1 in., neck very long. ıms 3-6 in. high, slender, bearing a few small leaves and r 2 nearly erect flowers. Radical leaves 1-3, linear, 4-10 in. g. Perianth bell-shaped, ⅛-⅜ in. long. Segments 6, ersely egg-shaped or spoon-shaped, broad or narrow, ;inct, at length spreading, white with violet veins or yellow, ; rounded. Stamens 6, at the base of the segments, and ch shorter. Anthers attached at the base. Ovary oblong, elled. Style thick, straight, tip minutely 3-lobed. Capsule bose, ¼ in. diameter. Seeds many, small, flattened.
Flowers.—June, July.
Locality.—Aporwat, big rocks on open hill-side, above 000 ft., common; Tosh Maidan, on rocks; below l Shah ki Alam, 11,000 ft.
Distribution.—Alpine Himalaya, from Kashmir to Sikkim, 000-17,000 ft., high mountains of Asia, Europe and America.

Plate 60

TULIPA, Linn. The Tulip.

(From the Persian *toliban*, *tuliban* or *thoulyban*, a turban, which the inverted flower resembles.)

1. Perianth scarlet, base purplish black, margined with yellow ... ... *T. praecox.*
2. Perianth white within, base yellow, rosy or greenish without ... ... *T. stellata*

Fig. 1. Tulipa praecox, Tenore.

(*Praecox* means ripening early, perhaps alluding to the early flowers.)

Stem 12-18 in. high, slender, hairless. Leaves 3-5, lorate-lance-shaped, sharp-pointed, with a wavy margin. Perianth beautiful scarlet, bell-shaped, 2-3 in. long, 3 in. across, erect, scentless, basal blotch oblong or inversely lance-shaped, purplish black, margined with yellow. Segments widely imbricated, outer slightly longer, sharp-pointed, finely hairy at the tip, inner shorter, bluntly cusp-shaped. Filaments long, dark purple, hairless. Anthers yellow. Ovary prismatic; stigmas hairy, reddish.

Flowers.—April.

Locality.—Srinagar, fields, 5,000 ft., not very abundant, introduced.

Distribution.—Italy, S. France, Greece, Algeria, Syria, Palestine, Persia.

Fig. 5. Tulipa stellata, Hook. Star-shaped Tulip.

A hairless, bulbous herb. Stems 12-18 in. high, erect. Leaves 4-6, alternate on the lower part of the stem, linear, 9-12 in. long, sharp-pointed, channelled and sheathing towards the base. Flowers terminal, usually only 1. Perianth 1½-2 in. long. Segments 6, inversely lance-shaped, distinct, spreading when fully expanded, white within, base yellow, rosy or greenish without. Stamens 6, much shorter than the perianth. Anthers oblong, attached at the base. Ovary oblong, 3-celled. Style very short. Stigma 3-lobed. Ovules many in each cell. Capsule oblong, 1 in. long. Seeds many, small, flat.

Flowers.—April, May.

Fruits.—May, June.

Locality.—Eastern side of Sarban Lake; Pampur village; near Shirazia Bagh; Gulmarg, open, stony, dry hill-sides and fields, up to 8,000 ft., common.

Distribution.—Temperate W. Himalaya, from Kashmir to Kumaon, 5,000-8,000 ft.

LILIUM, Linn. The Lily.

1. Flowers dull yellowish or greenish outside, white within speckled with long purple streaks ... ... *L. polyphyllum.*
2. Flowers pale rose or rose-purple ... *L. Thomsonianum.*

Fig. 2. Lilium polyphyllum, D. Don. Many-leafed Lily. Collett, frontispiece.

Bulb narrow, of few, long, narrow, fleshy scales. Stem 3-4 ft. high, slender. Leaves 3-5 by $\frac{1}{8}$-$\frac{1}{2}$ in., stalkless, linear or inversely lance-shaped, many-nerved, lower sometimes whorled. Flowers fragrant, solitary or whorled or racemed, pendulous; stalks $1\frac{1}{2}$-4 in. long. Bracts leaf-like, often whorled. Perianth $2\frac{1}{2}$-3 in. long, dull yellowish or greenish outside, white within speckled with long purple streaks, broadly funnel-shaped. Segments blunt, bent back when fully expanded, $\frac{3}{4}$ in. broad. Stamens protruding; anthers $\frac{1}{2}$ in. long. Capsule 1-$1\frac{1}{4}$ in. long.

Flowers.—June to August.

Locality.—Sonamarg; near Shirazia Bagh, on jungly slope near top of hill; Gulmarg, woods, about 8,000 ft., common; Baltal.

Distribution.—W. temperate Himalaya, 6,000-12,000 ft., from Kashmir to Kumaon, Afghanistan.

Lilium Thomsonianum, Royle.

Bulb 2-$2\frac{1}{2}$ in. Stem very stout, 2-4 ft. high. Leaves 2-8 by $\frac{1}{4}$-$\frac{1}{3}$ in., thin, stalkless, alternate, narrowed to a very fine point. Bracts leaf-like, lance-shaped. Racemes dense-flowered, 1-2 ft. long. Flower-stalks $\frac{1}{4}$-$\frac{1}{2}$ in. long. Perianth 2-$2\frac{1}{2}$ in. long, sweet-scented, pale rose or rose-purple; segments narrowly spoon-shaped, bent back, tips rounded. Filaments long. Style much longer than the ovary, tip bent upwards; stigma 3-lobed. Capsule 1 in. long.

Flowers.—April.

Locality.—At elevations between 5,000-7,000 ft.

Distribution.—From Kashmir to Kumaon, Afghanistan.

FRITILLARIA, Linn.

(From the Latin *fritillus*, a dice-box, alluding to the 6 glands within the perianth, or also to the dice-like spots on the perianth of some species.)

1. Flowers yellow-green, tessellated with dull purple ... ... *F. Roylei.*
2. Flowers yellow or brick-red, not tessellate *F. imperialis.*

Fig. 3. Fritillaria Roylei, Hook. Royle's Fritillaria.

A hairless, bulbous herb. Bulb small, globose, scales membranous. Stem 6-24 in. high, erect, unbranched, naked below, often mottled green and reddish brown. Leaves 3-6 in a whorl or opposite, linear-lance-shaped, 2-5 by $\frac{1}{8}$-$\frac{1}{2}$ in., the lowest ones sometimes 1-1$\frac{1}{2}$ in. broad, tips of the upper leaves often linear and hooked. Flowers nodding, terminal, solitary or 2-4 in a short raceme. Perianth 1-1$\frac{1}{2}$ in. long, bell-shaped; segments 6, distinct, yellow-green, chequered with dull purple, each with a large gland at the base, tips rounded, not bent back. Stamens 6, at the base of the perianth-segments, and much shorter. Anthers linear-oblong, attached at the base. Ovary oblong, 3-celled. Style thick, straight, divided at the top into 3 short, pointed lobes. Capsule inversely egg-shaped, $\frac{1}{2}$-$\frac{3}{4}$ in., bluntly 6-angled. Seeds many, small, flattened, slightly winged.

Flowers.—April to July.

Locality. — Tangmarg, forest, 8,000 ft. and upwards; Gulmarg, 8,600-8,700 ft.; Khelanmarg, 10,000 ft.; Tosh Maidan on steep, stony hill-side, 9,600 ft.; Basam Gali, in Juniper tract, above 10,000 ft.; Astan Marg; Zojpal.

Distribution.—W. temperate Himalaya, 8,000-13,000 ft., from Kashmir to Kumaon.

Fritillaria imperialis, Linn. Crown Imperial. Frontispiece.

Bulb large, globose, of broad, obtuse, gibbous, fleshy, yellowish scales, strong-smelling. Stem 3-4 ft. high, robust, naked below. Leaves crowded, 6-10 by 1-2 in., lance-shaped, lower opposite, blunt, upper longer, sharp-pointed, often 10 in a whorl. Flowers 5-8 in an umbel, yellow or brick red, not tessellate. Bracts leafy, whorled, erect, linear. Perianth 2-2$\frac{1}{2}$ in. long; segments $\frac{3}{4}$-1$\frac{1}{2}$ in. broad. Filaments flattened below. Capsule 2 in. long, inversely egg-shaped, almost 6-winged.

Flowers.—May.

Fruits.—June.

Locality.—Below Gulmarg, big rocks on hill-side above 5,000 ft., common; near Shirazia Bagh; Gadsar, in shady places.

Distribution. — Kashmir, 7,000-9,000 ft., westwards to Kurdistan.

EREMURUS, Bieb.

Fig. 4. Eremurus himalaicus, Baker.

A stately hairless herb. Leaves 1-3 ft. by $\frac{1}{2}$-3 in., flat. Flowering stem and raceme very stout, 3-5 ft. long. Bracts

awl-lance-shaped, as long as the flower-stalks which measure ¾ in. Flowers white, 1 in. diameter; segments 6, oblong, 1-nerved, about as long as the filaments. Ovary 3-celled · 4-6 ovules in each cell. Capsule ½ in. diameter.

Fruits.—June.

Locality.—Near Shirazia Bagh; hills surrounding Gulmarg, open grassy and stony hill-side, 7,500 ft., common.

Distribution.—Temperate W. Himalaya, in the drier regions, from Kashmir to the Sutlej, 7,000-10,000 ft.

Plate 61

TRILLIUM, Linn.

(From the Latin *trilix*, woven with three sets of leashes, triple-twilled, alluding to the parts of the flower being in threes.)

Figs. 1 and 2. Trillium Govanianum, Wall.

A hairless herb. Rootstock creeping, short, thick. Stems 6-10 in., erect, unbranched. Leaves 3, short-stalked, broadly egg-shaped, 1½-4¼ by 1¼-4 in., sharp-pointed, arranged in a whorl at the top of the stem, with a solitary stalked flower in the middle. Perianth lurid purple, persistent; segments 6, distinct, narrowly lance-shaped, ¾-1 in. long, spreading in flower, bent back in fruit. Stamens 6, attached to the base, erect, much shorter than the perianth, anthers yellow; ovary 3-celled. Style purple, divided to the base into 3 long, linear arms. Berry globose, ½-¾ in. diameter. Seeds many, egg-shaped, with a pulpy appendage at the side.

Flowers.—May, June.

Locality.—Gulmarg, grassy woods, above 8,000 ft., common; Khelanmarg, forest, 9,500 ft.; Tosh Maidan, on steep stony hill-side, 9,600 ft.

Distribution.—Temperate Himalaya, from Kashmir, 8,000-10,000 ft., to Sikkim, 9,000-11,000 ft.

AROIDACEAE. The Arum Family.

(From *Arum*, the ancient name of these plants.)

ARISAEMA, Mart.

(From the Greek *arisamos*, conspicuous, distinguished.)

Many small, 1-sexual flowers are usually crowded on a fleshy erect column, called spadix, which is enclosed in a large bract, called spathe; the lower portion is called spathe-tube, the upper spathe-limb. The male and female flowers are on the same or on different plants. If the two sexes are on the same spadix, they are in distinct zones. The female below

the male and usually neutral flowers between the two sexual zones. If the spadix is prolonged beyond the flowers, that barren tail-like or club-shaped appendage is called appendix. There are neither sepals nor petals.

A. Leaves of 3 leaflets.
   I. Limb of spathe broad ... ... *A. utile.*
   II. Limb of spathe oblong or lance-shaped (fig. 3) ... ... *A. Wallichianum.*
B. Leaves of 5-18 pedately arranged leaflets.
   I. Appendage far exserted (fig. 4) ... *A. tortuosum.*
   II. Appendage included in the spathe *A. flavum.*
C. Leaves of 5-7 whorled leaflets... ... *A. Jacquemontii.*

Arisaema utile, Hook. f.

(*Utile* means useful.)

An erect herb. Leaves consisting of 3 leaflets, solitary; leaflets, stalkless, rhombic-egg-shaped or inversely egg-shaped, crenate, pale green with wavy golden margins. Limb of spathe 4 in. broad or less, broadly and inversely heart-shaped or inversely egg-shaped, notched or 2-lobed, with a short interposed tail that embraces the filiform tail of the naked appendage, not longer than the tube, red-brown or purplish, coarsely netted. Appendage a tortuous, very thin tail, 1-3 ft. long. Sexes on different plants.

Locality.—At elevations of 7,500 ft.; below Tosh Maidan.

Distribution. — Temperate Himalaya, from Kashmir to Sikkim, 9,000-13,000 ft.

Fig. 3. Arisaema Wallichianum, Hook. f.

Tuber depressed. Stems 1½-2 ft. high. Leaf solitary, consisting of 3 leaflets; leaflets stalkless, broadly egg-shaped, short-pointed, the side ones oblique, 3½-10 by 2½-7 in., the middle one round, 3-7½ by 2¾-9 in. Leaf-stalk 6-12 in. Spathe-tube dark green on a pale ground, ribbed; limb oblong or lance-shaped, abruptly contracted in a short, tail-like tip, the centre dark purple striped, the margins chequered with pale green veins. Spadix prolonged in a very slender, far-protruding, purple, tail-like appendage. Sexes on different plants.

Flowers.—June.

Locality.—Gulmarg, woods and thickets, above 8,000 ft., common.

Fig. 4. Arisaema tortuosum, Schott.

A tall plant, reaching 3 ft. high. Tubers almost spherical, up to 4 in. diameter. Leaves 2-3, pedately divided. Stalks 1-3 ft. long, the leaf-sheaths often mottled with purple. Leaflets 4-8 in. long, stalkless or stalked, egg-lance-shaped or linear-lance-shaped, very long-pointed, distant or crowded or almost radiately arranged. Flowering stem 2-4 ft. long. Spathe 4-6 in. long, green outside; tube about as long as the limb, almost cylindric, gradually dilating into the limb, pale purplish inside; limb egg-shaped or egg-shaped-oblong, long-pointed, broadly boat-shaped, curved inwards. Spadix 1- or 2-sexual. Male flowers stalked. Appendage very long, much protruding, like a rat's tail, quite smooth, usually erect at first, then bent forward, and again erect. Ovary egg-shaped, narrowed into a short style. Berry 4-5-seeded.

Flowers.—June, July.

Locality.—Gulmarg, woods and thickets, above 8,000 ft., common.

Distribution.—Subtropical and temperate Himalaya, from Kashmir to Sikkim and Bhutan, Khasia Hills, Manipur, Bengal, W. Peninsula.

Arisaema flavum, Schott. Yellow Arisaema.

Rootstock globose. Stems 6-18 in. high. Leaves usually 2, sometimes only 1, pedately divided. Leaflets 9-11, unequal, stalkless or nearly so, lance-shaped, 3-6 by ½-1½ in., long-pointed. Spathe 1-2 in. long, purple inside, tube very short, green, limb yellow or faintly purple below. Spadix conical, short, prolonged into a yellow, club-shaped appendage included within the spathe. Female flowers forming a few rows of closely packed, globose ovaries, in close contact with the male flowers. Male flowers forming a very dense layer of almost sessile anthers.

Locality.—At elevations of 5,000-9,000 ft.

Distribution. — Temperate Himalaya, from Kashmir to Kumaon, Chamba, N.E. of Sikkim, Afghanistan, Arabia.

Arisaema Jacquemontii, Blume. Jacquemont's Arisaema.

Tuber almost globose. Stems 1-2 ft. high, sometimes mottled. Leaves solitary or 2, digitately divided; leaflets 5-7, unequal, lance-shaped, 3-8 by 1-2 in. long. Spathe 3-5 in. long, green, striped with white, margins narrowly bent back below; tube long, narrow; limb broad, gradually narrowed into a long, green or purple, thread-like tail. Spadix prolonged

into a slender, tapering appendage, much shorter than the spathe, the tip bent forwards and protruding to one side. The sexes on different plants. Anthers purple.

Flowers.—June, July.

Locality.—Tosh Maidan, in open stony places, 10,000 ft.; Mekhowali, in forest clearings, 9,000 ft., abundant.

Distribution.—Temperate Himalaya, from Kashmir, 7,000-8,000 ft., to Bhutan, 10,000-12,000 ft.

Plate 62

NAIADACEAE.

(From *Naias*, a water nymph, alluding to the habitat of most plants belonging to this family.)

POTAMOGETON, Linn.

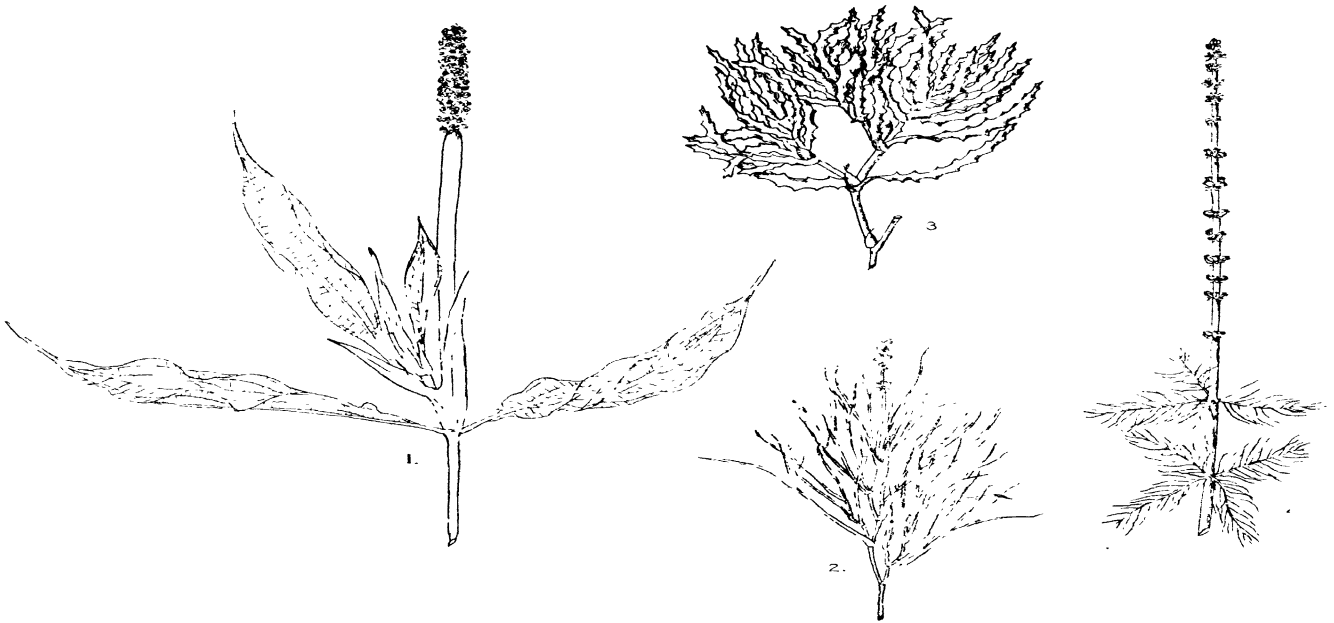
(From the Greek *potamos*, a river, and *geiton*, a neighbour, alluding to the aquatic habitat of the plants.)

A. Upper or all leaves floating.
  I. Stipules 4-5 in. ... ... *P. natans.*
  II. Stipules 1-1½ in.
    1. Floating leaves 3-4 in. long, submerged lance-shaped ... ... *P. indicus.*
    2. Floating leaves ½-1½ in. long, submerged linear or filiform ... *P. javanicus.*

B. Leaves all submerged.
  I. Leaves egg-shaped, oblong or broadly linear.
    1. Leaves entire... ... ... *P. perfoliatus.*
    2. Leaves finely toothed.
      a. Flower-spikes ⅓ in. long ... ... *P. crispus.*
      b. Flower-spikes 1½-2 in. long ... *P. lucens.*
  II. Leaves filiform or narrowly linear.
    1. Stipules united with the leaf-sheath *P. pectinatus.*
    2. Stipules small, free ... ... *P. pusillus.*

Potamogeton natans, Linn. Broad-leafed Pondweed.

Stem creeping below, simple, rounded. Leaves leathery, elliptic; the floating ones alternate, egg-shaped, elliptic to lance-shaped, long-stalked, the blade running down on the leaf-stalk, folded, the leaf-stalk jointed below the limb; the lower leaves linear to lance-shaped, or awl-like. Stipules long and narrow-pointed. Flowers with parts in fours form a dense spike which rises above the water on a stout stalk. Sepals clawed, roundly rhomboidal. Fruit large, rounded,



FIGS.—1, *Potamogeton lucens*, Linn.; 2, *Potamogeton pectinatus*, Linn.,; 3, *Naias major*, All.; 4, *Myriophyllum spicatum*, Linn.

flattened, greenish, round on the back when green, keeled when dry.

Locality.—At 5,000 ft.

Distribution.—Punjab, Kashmir, widely spread, especially in temperate climates.

Potamogeton indicus, Roxb. Indian Pondweed.

Stem round, branched, smooth, its length depending on the depth of the water. Leaves stalked; the upper floating, 2½-4 by 1-1½ in., alternate or uppermost opposite, oblong or elliptic-lance-shaped, sharp-pointed, blunt or long-pointed, opaque, glossy, many-nerved; stipules 1-1½ in. long; the lower leaves submerged, 8 in. long, membranous, wavy, with stalks shorter than the blades. Peduncles axillary or leaf-opposed, 1-2 in. long, stout or slender, not thickened upwards. Flower-spike 1½ in. long, dense-flowered, green. Sepals 4, clawed, $\frac{1}{10}$ in. long including the claw, which is nearly as long as the limb. Limb almost round, concave. Fruit made up of small, ⅛ in. long, shortly beaked drupelets.

Flowers.—July.

Locality.—Nil Nag, in lake, 6,900 ft.

Distribution.—Throughout the plains of India, Ceylon, Malay and Sandwich Islands.

Potamogeton javanicus, Hassk. Java Pondweed.
Collett, fig. 179.

Leaves elliptic-oblong, egg-shaped, oblong or elliptic, sharp-pointed at both ends, or almost blunt, 5-7-nerved including the midrib, $\frac{1}{12}$-1½ in. long, stalk shorter. Stipules ½-1 in. long; submerged leaves linear-long-pointed or filiform. Spike ⅓-½ in. long, with flowers smaller than in *P. indicus*, and the whorls more distant. Peduncles as long as or longer than the spike, very slender. Sepals round-inversely egg-shaped. Fruit made up of druplets which are half-globose with a stout hooked beak and ribs often toothed or tubercled.

Locality.—Up to 7,000 ft.

Distribution.—Plains of India, ascending the N.W. Himalaya to 7,000 ft., and Sikkim to 9,000 ft.

Potamogeton perfoliatus, Linn. Perfoliate Pondweed.

Stem stout, round, slightly branched, regularly forked above. Leaves translucent, 1-2½ by ⅝-1 in., stalkless, egg-lance-shaped, blunt, membranous, stem-clasping, base heart-shaped, 5-9-nerved. Stipules small, falling soon. Peduncle

stout, short, not thickened upwards. Spikes $\frac{1}{4}$-$\frac{7}{8}$ in. long, dense-flowered. Sepals elliptic-inversely egg-shaped, with long claws. Druplets $\frac{1}{8}$ in. long, obliquely egg-shaped, hardly keeled, slightly compressed, with a short, usually curved beak.

Flowers.—July.

Locality.—Nil Nag, in lake, 6,900 ft.

Distribution. — W. Himalaya, Sind, W. Peninsula, N. temperate regions, Australia.

Potamogeton crispus, Linn. Curled Pondweed.

Stem branched, compressed. Leaves 1-3 by $\frac{1}{8}$-$\frac{3}{8}$ in., all submerged, half-stem-clasping, linear or linear-oblong, blunt, with crisped and finely toothed margins, 3-nerved, translucent; stipules small, not persistent. Peduncle long, often curved, tapering upwards. Flower-spike $\frac{1}{4}$-$\frac{1}{3}$ in. long, few-flowered, flowers small. Sepals clawed, $\frac{1}{10}$ in. long including the claw, limb almost round. Druplets obliquely egg-shaped, $\frac{1}{8}$ in. long, ended by a slightly bent back and compressed beak.

Flowers.—June.

Locality.—Anchar Lake.

Distribution.—Plains of India and temperate Himalaya, N. and S. temperate and subtropical regions.

Fig. 1. Potamogeton lucens, Linn. Shining Pondweed.

Stem stout, 3-6 ft. long. Plant shining and glistening. Leaves large, more or less stalkless, translucent, transparent, mainly submerged, oval, oblong or lance-shaped, linear, blunt, wavy, finely toothed, many-nerved. Stipules winged or keeled on the back, large and long. Flower-spikes stout, cylindrical, dense. Flower-stalks varying in length, swollen upwards. Fruit rounded on the back, keeled when fresh; the druplets small and swollen, with a short blunt beak.

Flowers.—June.

Fruits.—July.

Locality.—Anchar Lake; Nil Nag, in lake, 6,900 ft.

Distribution.—From Kashmir, 5,000-6,000 ft., to Kumaon, 6,400 ft., N. temperate regions, Australia.

Fig. 2. Potamogeton pectinatus, Linn. Fennel-leafed Pondweed.

Stem filiform, copiously forked-branching, forming with the leaves tassel-like masses when taken out of the water. Leaves all submerged, alternate, 1-6 by $\frac{1}{25}$-$\frac{1}{10}$ in., narrowly linear or

filiform, sharp-pointed, opaque, 1-3-nerved or the lower sometimes 5-nerved. Stipules united with the leaf-sheaths, the tips free. Peduncle with the spike 2-3 in. long, filiform, usually longer than the leaves, not thickened upwards. Flowers few, in few distant whorls, very small, green. Sepals almost round. Druplets $\frac{1}{8}$-$\frac{1}{6}$ in. long, swollen, slightly compressed, short-beaked, rounded and obscurely 3-keeled on the back.

Flowers.—July.

Locality.—Nil Nag, in lake, 6,900 ft.

Distribution.—Plains of India, the Himalaya, W. and E. Tibet, 12,000-17,000 ft., Ceylon, most regions.

Potamogeton pusillus, Linn. Small Pondweed.

Stem slender, not usually flattened, cylindrical, much-branched. Leaves all submerged, half-stem-clasping, narrow, linear, usually 3-veined (or 5-7), with no intermediate veins, more or less sharp-pointed, the lateral veins half-way between the midrib and margin. Stipules small and sharp-pointed. Spikes short, loose, shorter than the stalk, with 6-10 flowers. Sepals roundish to kidney-shaped. Druplets small, obliquely egg-shaped, swollen, bluntly keeled, with a stout, more or less terminal beak.

Locality.—At about 5,000 ft.

Distribution.—Upper Bengal, Patna, Punjab, Kashmir, N. and S. temperate regions.

NAIAS, Linn.

(The Greek *Naias*, a water nymph.)

Fig. 3. Naias major, All.

A slender, submerged herb. Stems often long-branched and interlacing, rough with short outgrowths. Leaves opposite or in whorls, linear, $\frac{1}{2}$-$1\frac{1}{2}$ in. long. deeply and sharply toothed, sheathing at the base. Flowers very small, axillary, stalkless, 1-sexual, the sexes on different plants. Male flowers: Perianth tube-shaped, 2-3-toothed; anther 1, stalkless, included in the perianth. Female flowers: No perianth; ovary with 1 ovule. Stigmas 3, thread-like. Fruit oblong, smooth.

Flowers.—May to September.

Locality.—Dal Lake.

Distribution.—Throughout India, ascending to 8,000 ft. in the W. Himalaya, Ceylon; almost cosmopolitan except frigid zones.

HALORRHAGIDACEAE.

(After the Australian genus *Halorrhagis* which is derived from *hals*, salt, and *rhax*, *rhagos*, grapes.)

MYRIOPHYLLUM, Linn.

(From the Greek *myrios*, innumerable, and *phyllon*, leaf.)

1. Leaves usually 4 in a whorl ... ... *M. spicatum.*
2. Leaves usually 5 in a whorl ... ... *M. verticillatum.*

Fig. 4. Myriophyllum spicatum, Linn.
Water Milfoil, Spiked Milfoil.

A hairless, nearly submerged herb, the flower-spikes only appearing above the surface. Stems leafy, varying in length according to the depth of the water, more or less branched. Leaves whorled, usually in fours, pinnately divided; segments simple, hair-like, ¼-½ in. long. Flowers stalkless, in whorls of about 4, forming slender, terminal spikes, to every flower 1 large and 2 very small bracts; upper flowers male, lower female. Male flowers: Calyx 4-toothed; petals 4, concave; stamens 8, filaments short; ovary rudimentary. Female flowers: Calyx 4-grooved, 4-toothed; petals very small or absent; stigmas 4, nearly stalkless. Fruit oblong, dividing into 2 or 4 nutlets.

Flowers.—June to August.

Locality.—Anchar Lake.

Distribution.—From Kashmir to Kumaon, 5,000 ft., Punjab, Afghanistan, cold and temperate N. hemisphere.

Myriophyllum verticillatum, Linn. Whorled Milfoil.

Rootstock creeping. Stems floating, leafy. Leaves in whorls of 5, divided nearly to the base; segments awl-like, distant, hair-like, collapsing when taken from the water. Flower-spike long, upright in bud. Flowers white, in axillary whorls. Bracts in whorls of 5, divided nearly to the base, or cut in the shape of a comb, longer than the flowers. No flowers in the upper axils. Anthers linear. Fruit nearly round, green, with carpels round on the back.

Locality.—Ponds above Shupiyon, 7,000 ft. (Clarke).

Distribution.—Kashmir, Persia, Dahuria, N. Asia, Europe, N. America.

INDEX TO VOLUMES I AND II.

POPULAR NAMES.

Aaron's Rod, I, 156
Absinth, I, 170
Adhib, II, 85
Alpine Columbine, I, 25
Alpine Enchanter's Nightshade, I, 136
Alpine Fleabane, I, 154
Alpine Knotweed, II, 153
Alpine Meadow Rue, I, 10
Alpine Polygonum, II, 143
Altai Aster, I, 152
Amber, I, 55
Amherst's Vetch, I, 88
Amphibious Knotgrass, II, 141
Angle-berries, I, 102
Apple-pie, I, 134
Arsmart, II, 141
Arum Family, II, 181
Aster, I, 151
Atkinson's Saw-wort, I, 183
Avens, I, 103

Balen-leafed Woundwort, II, 130
Balfour's Balsam, I, 72
Balsam, I, 71
Baneberry, I, 20
Banewort, II, 77
Banwort, I, 156
Barberry Family, I, 27
Bay-willow, I, 133
Becky-leaves, II, 79
Beggarweed, II, 73
Belladonna, II, 77
Bell-flower, II, 11
Bell-flower Family, II, 9
Bird's Eye, I, 69; II, 83
Bird's Foot Trefoil, I, 79
Bitter Cress, I, 36
Black Bindweed, II, 145
Bladder Campion, I, 57
Bladderwort, II, 75
Blood Vine, I, 133
Blooming Sally, I, 134
Blue Poppy, I, 29
Blue Starry, I, 26
Bog Stitchwort, I, 54
Boots and Shoes, I, 26
Borage Family, II, 50
Botherum, II, 83
Branching Broom-rape, II, 71
Bread-and-cheese, I, 62
Broad-leafed Chickweed, I, 51
Broad-leafed Epipactis, II, 158
Broad-leafed Parsley, I, 137
Broad-leafed Pondweed, II, 184
Brooklime, II, 79
Broom-rape, II, 68
Broom-rape Family, II, 68
Buck, I, 180
Buck's Beard, II, 8
Buckwheat Family, II, 139
Bugloss, II, 59
Bur Marigold, I, 161
Burning Bush, I, 75
Buttercup Family, I, 1
Butterwort Family, II, 75

Canadian Fleabane, I, 155
Carinthian Pleurogyne, II, 43
Carnation, Wild, I, 49
Catmint, II, 116
Cat's Eyes, I, 133
Cat's Valerian, I, 150
Celery-leafed Buttercup, I, 15
Celery-leafed Crowfoot, I, 15
Ceylon Hound's Tongue, II, 51
Cheese-flower, I, 62
Cheilanthus-leafed Lousewort, II, 98
Chinese Dodder, II, 73
Chiretta II, 49
Chives, II, 175
Cinquefoil, I, 104, 115
Clarke's Primrose, II, 21
Clarke's Saw wort, I, 187
Climbing Bush Knotweed, II, 145
Cloud-born Gentian, II, 41
Clove Pink, I, 49
Coddled Apple, I, 134

Columbine, I, 25, 26
Common Balsam, I, 74
Common Chickweed, I, 52
Common Mallow, I, 62
Common Poppy, I, 29
Common Red Persicaria, II, 150
Composite Family, I, 151
Convolvulus Family, II, 72
Corn Buttercup, I, 16
Corn Poppy, I, 29
Corn Rose, I, 29
Corn Speedwell, II, 82, 83
Cow-cress, II, 79
Crane's-bill, I, 64
Crane's-bill Family, I, 64
Craw-peas, I, 102
Creeping Primrose, II, 20
Crosswort Family, I, 34
Crown Imperial, II, 180
Crows'-claws, I, 16
Cuckoo's-eyes, I, 69
Curled Pondweed, II, 186

Deadly Nightshade, II, 77
Death's Herb, II, 77
De Candolle's Saw-wort, I, 185
De Candolle's Scabious, I, 147
Dense-flowered Vetch, I, 83
Devil-on-both-sides, I, 16
Devil's-claws, I, 16
Devil's Coach-wheel, I, 16
Devil's Currycomb, I, 16
Devil's Guts, II, 73
Dioecious Valerian, I, 149
Docked-leafed Knotweed, II, 148
Dock-leafed Polygonum, II, 151
Dodder, II, 72
Dog Violet, I, 46
Dove's-foot, I, 68
Dwale, II, 77

Edgeworth's Balsam, I, 72
Elegant Valerian, I, 149
Elephant Lousewort, II, 96
Enchanter's Nightshade, I, 136
Euphrasy, II, 85
Ewfras, II, 85
Eyebright, II, 85

Falconer's Aster, I, 151
Falconer's Inula, I, 159
Falconer's Leopard's Bane, I, 173
Falconer's Saw-wort, I, 183
Falconer's Tansy, I, 164
Falconer's Vetch, I, 89
Falconer's Violet, I, 46
Falconer's Wind Flower, I, 7
False Dittany, I, 75
Fennel-leafed Pondweed, II, 186
Few-flowered Meadow Rue, I, 9
Field Bugloss, II, 59
Field Crowfoot, I, 16
Field Forget-me-not, II, 62
Field Poppy, I, 29
Field Scorpion Grass, II, 62
Fiflef, I, 115
Figwort, II, 86
Figwort Family, II, 78
Five-finger-blossom, I, 115
Flatter-dock, II, 141
Fleabane, I, 153
Forget-me-not, II, 62
Frogbit, II, 155
Fumitory, I, 30

Gaping Salvia, II, 112
Garcke's Lousewort, II, 93
Gazabam, II, 59
Gentian Family, II, 33
Gentians, II, 33
Gigantic Dodder, II, 74
Glacier Polygonum, II, 146
Goat's Beard, II, 8
Golden-blossom, I, 115
Golden Gentian, II, 35
Golden Iris, II, 168
Golden Rod, I, 156
Goosefoot Family, II, 136
Go-to-bed-at-noon, II, 8
Graceful Goat's Beard, II, 9
Granny's Nightcap, I, 26
Grass of Parnassus, I, 126
Grassy Stitchwort, I, 53
Great Bell-flower, II, 11
Great Chickweed, I, 52
Greater Dodder, II, 73
Great Hairy Willow Herb, I, 134
Great Spearwort, I, 13
Green Field Speedwell, II, 81
Greville's Crane's-bill, I, 66
Grooved Balsam, I, 71
Gye, I, 16

Hairweed, II, 73
Hairy Speedwell, II, 83
Hairy Spurge, II, 108
Hallberg's Speedwell, II, 83
Hardwick's Valerian, I, 150
Hawk's-feet, I, 26
Heather, II, 16
Heath Family, II, 14
Hedgehog, I, 16
Hedge Parsley, I, 138
Hedge Woundwort, II, 132
Helleborine, II, 158
Hellweed, I, 16

Hemlock Chervil, I, 138
Hen and Chickens, I, 26
Hen-bit, II, 83
Herb-Bennet, I, 103
Herb Robert, I, 69
Heyde's Vetch, I, 88
Himalayan Bird's Nest, II, 16
Himalayan Figwort, II, 87
Himalayan Peony, I, 26
Hooded Willow Herb, II, 126
Horse-well Grass, II, 79
Hound's Tongue, II, 50
Hugel's Gentian, II, 40
Hungerweed, I, 16

Indian Pondweed, II, 185
Iris, II, 166
Island Polygonum, II, 147
Ivy Chickweed, II, 83
Ivy-leafed Speedwell, II, 83

Jack-by-the-hedge, II, 8
Jacob's Ladder, II, 74
Jacob's Ladder Family, II, 74
Jacquemont's Arisaema, II, 183
Jacquemont's Pink, I, 48
Jacquemont's Ragwort, I, 175
Jacquemont's Spurge, II, 109
Java Pondweed, II, 185
Joseph's Flower, II, 8

Kashmir Bell-flower, II, 13
Kashmir Broom-rape, II, 71
Kashmir Corydalis, I, 33
Kashmir Gentian, II, 37
Kashmir Star-of-Bethlehem, II, 171
Kashmir Tall Mallow, I, 62
Kashmir Vetch, I, 82
Keeled Gentian, II, 36
Knotgrass, II, 144
Kunth's Saw-wort, I, 184
Kuth Plant, I, 185

Lady's Clover, I, 70
Lady's Fingers, I, 102
Lady's Needlework, I, 138
Lady's Slipper, II, 162
Lady's Slippers, I, 26
Lady's Tresses, II, 157
Lake-weed, II, 141
Lance-leafed Hound's Tongue, II, 52
Large-flowered Himalayan Scabious, I, 146
Large-flowered Inula, I, 159
Large-rooted Lettuce, II, 5
Larkspur, I, 20
Leafless Yellow Vetchling, I, 102
Leafy Androsace, II, 29
Leopard's Bane, I, 173
Lettuce, II, 1
Levinge's Lindelofia, II, 54
Levinge's Ragwort, I, 179
Lily, II, 179
Lily Family, II, 168, 170
Lock's-foot, I, 26
Loder's Gentian, II, 41
Long-flowered Lousewort, II, 100
Long-leafed Lettuce, II, 2
Long-leafed Tansy, I, 164
Lotus, I, 27
Lousewort, II, 90
Low Gentian, II, 40
Low Polygonum, II, 147

Madden's Spurge, II, 107
Maderwort, I, 170
Mallow, I, 62
Mallow Family, I, 62
Many-headed Lettuce, II, 6
Many-leafed Lily, II, 179
Many-spiked Elsholtzia, II, 124
Many-spiked Polygonum, II, 151
Marsh Mallow, I, 62
Marsh Marigold (white), I, 18
Marsh Orchis, II, 160
Marsh Valerian, I, 149
Marsh Willow Herb, I, 135
Marsh Woundwort, II, 131
Meadow Crane's-bill, I, 66
Meadow Rue, I, 9
Meadow Vetchling, I, 102
Mid, I, 26
Mint Family, II, 111
Monkshood, I, 24
Monkshood Aconite, I, 24
Moorcroft's Gentian, II, 35
Moorcroft's Salvia, II, 111
Moorcroft's Saxifrage, I, 119
Moorcroft's Wormwood, I, 168
Motherwort, II, 129
Mountain Bitter Cress, I, 36
Mountain Ixiolirion, II, 169
Mountain Sorrel, II, 153
Mountain Spiderwort, II, 177
Mugwort, I, 167
Munro's Vetch, I, 83
Musk Orchid, II, 163
Musk Thistle, I, 180

Nap-at-noon, II, 8
Narrow-leafed Lindelofia, II, 54
Naughty Man's Cherry, II, 77
Nepalese Crane's-bill, I, 67
Nepalese St. John's Wort, I, 55
Ner, I, 76
Nine-joints, II, 144

Northern Androsace, II, 26
Northern Broom-rape, II, 70
Northern Gentian, II, 39

Oak-leafed Goosefoot, II, 138
Oeder's Lousewort, II, 97
Officinal Valerian, I, 150
Old Woman, I, 170
Orange Family, I, 75
Orange Poppy, I, 28
Orchid Family, II, 155
Orchis, II, 159
Oriental Polygonum, II, 149
Orpine Stonecrop, I, 129

Parsley, I, 137
Penny John, I, 55
Perfoliate Pondweed, II, 185
Perforate St. John's Wort, I, 55
Persian Speedwell, II, 84
Persian Star-of-Bethlehem, II, 171
Pig-weed, II, 144
Pink, I, 48
Poppy, I, 28
Poppy Family, I, 28
Pricklebacks, I, 16
Prickly Lettuce, II, 4
Primrose, II, 17
Primrose Family, II, 17
Primrose-like Androsace, II, 31
Primrose-like Mertensia, II, 56
Purple Scorzonera, II, 8
Purple Swertia, II, 47
Pygmy Gentian, II, 42
Pyramidal Lousewort, II, 91
Pyrenean Columbine, I, 25

Queen Ann's Thrissel, I, 180

Ragwort, I, 174
Rampion, II, 10
Red Legs, II, 144
Red Thyme, Broom-rape, II, 69
Rock Wind Flower, I, 5
Rosebay, I, 133
Rose-coloured Primrose, II, 19
Rose Family, I, 103
Roseroot, I, 129
Rose Willow Herb, I, 135
Rosin Rose, I, 55
Rough Cicely, I, 138
Round-leafed Androsace, II, 28
Round-leafed Bladderwort, II, 77
Round-leafed Crane's-bill, I, 68
Round-leafed Primrose, II, 24
Round-leafed Wintergreen, II, 14
Royle's Balsam, I, 72
Royle's Fritillaria, II, 180
Royle's Inula, I, 159
Royle's Leopard's Bane, I, 173
Royle's Lousewort, II, 94
Royle's Saw-wort, I, 185

Saw-wort, I, 181
Saxifrage, I, 116
Saxifrage Family, I, 116
Scabious I, 146
Scabious Family, I, 146
Schlagintweit's Adelocaryum, II, 58
Schlagintweit's Primrose, II, 24
Schultz's Saw-wort, I, 184
Scopolis Figwort, II, 86
Scotch Thistle, I, 180
Scull-cap, II, 126
Sea Wormwood, I, 169
Semaphore Plant, I, 98
Sheep Sorrel, I, 70
Shepherd's Clock, II, 8
Shining Crane's-bill, I, 69
Shining Pondweed, II, 186
Short-leafed Lousewort, II, 99
Showy Lindelofia, II, 53
Showy Swertia, II, 46
Shrubby Cinquefoil, I, 111
Sibbaldia, I, 107
Siberian Crane's-bill, I, 67
Siberian Primrose, II, 24
Siberian Saxifrage, I, 117
Silky Woundwort, II, 131
Silver-haired Bell-flower, II, 12
Silverweed, I, 109
Silvery Cinquefoil, I, 109
Silvery Gentian, II, 39
Singhara, I, 137
Sleeping Beauty, I, 70
Slender-beaked Lousewort, II, 92
Slender Bell-flower, II, 13
Slender Lousewort, II, 99
Small Crane's-bill, I, 68
Smaller Bladderwort, II, 76
Small-flowered Mallow, I, 63
Small-flowered Moltkia, II, 63
Small-flowered Wormwood, I, 169
Small Persicaria, II, 148
Small Pondweed, II, 187
Small Whitlow Grass, I, 42
Snowdrop Wintergreen, II, 14
Snow Primrose, II, 18
Soft Lousewort, II, 100
Sorrel, I, 70
Sour Clover, I, 70
Sparrow-Tongue, II, 144
Sparrow Weed, I, 13
Spear Crowfoot, I, 13
Speedwell, II, 78, 81
Spiked Milfoil, II, 188

Spurge Family, II, 105
Spurious Iris, II, 167
Star-of-Bethlehem, II, 170
Star-shaped Tulip, II, 178
St. Barbara's Herb, I, 34
Stewart's Vetch, I, 87
St. John's Wort, I, 55
Stonecrop, I, 127
Stonecrop Family, I, 127
Stork's Bill, I, 69
Strachey's Gentian, II, 38
Strachey's Valerian, I, 150
Sweet Violet, I, 45
Strangle Tare, II, 73
Sun Spurge, II, 108

Tansy, I, 163
Teasel, I, 146
Telegraph Plant, I, 98
Tender Gentian, II, 36
Thistle, I, 180
Thomson's Aster, I, 153
Thomson's Balsam, I, 73
Thomson's Ragwort, I, 176
Thomson's Rampion, II, 10
Thomson's Spurge, II, 109
Thomson's Swertia, II, 46
Thomson's Thistle, I, 180
Thorn-apple Goosefoot, II, 137
Three lobed Butterbur, I, 162
Thyme-leafed Speedwell, II, 84
Thyme-leafed Spurge, II, 110
Tibetan Aster, I, 152
Tibetan Eritrichium, II, 64
Tibetan Mertensia, II, 55
Tibetan Spurge, II, 109
Tibetan Stonecrop, I, 130
Tibetan Vetch, I, 85
Tibetan Woundwort, II, 132
Toothwort, II, 101
Tufted Scorpion Grass, II, 63
Tulip, II, 178
Twisted Pod, I, 40
Two-flowered Violet, I, 44
Two-horned Lousewort, II, 95

Unarmed Teasel, I, 146
Urchin Crowfoot, I, 16

Valerian, I, 148
Valerian Family, I, 148
Variegated Figwort, 88
Vernal Speedwell, II, 85
Violet, I, 44
Violet Family, I, 44
Viviparous Polygonum, II, 153

Wall Speedwell, II, 82
Wallich's Crane's-bill, I, 65
Wallich's Lousewort, II, 93
Wallich's Spurge, II, 107
Wallich's Valerian, I, 149
Warmot, I, 170
Water Agrimony, I, 162
Water Crowfoot, I, 17
Water Gentian, II, 38
Water-Lily, II, 49
Water-Lily Family, I, 27
Water Milfoil, II, 188
Water-pepper, II, 147
Water Pimpernel, II, 79
Water-Snowflake, II, 49
Well-ink, II, 79
White Buttercup, I, 126
White Goosefoot, II, 138
White Liverwort, I, 126
White Marsh Marigold, I, 18
Whitlow Grass, I, 40
Whorled Milfoil, II, 188
Wild Carnation, I, 49
Willow Herb, I, 132
Wind Flower, I, 4
Winged Polygonum, II, 143
Winged Swertia, II, 48
Winter Cress, I, 34
Wintergreen, II, 14
Wolf's-bane, I, 24
Wood Forget-me-not, II, 62
Wood Sorrel, I, 70
Woolly Androsace, II, 30
Woolly Salvia, II, 113
Woolly Woundwort, II, 131
Wormwood, I, 166, 170
Woundwort, II, 130

Yellow Arisaema, II, 183
Yellow Cinquefoil, I, 115
Yellow Fitchling, I, 102
Yellow Oxalis, I, 70
Yellow Poppy, I, 28
Yellow Rocket, I, 34
Yellow Saffron, II, 168
Yellow Star-of-Bethlehem, II 170
Yellow Violet, I, 44

INDEX TO VOLUMES I AND II.

BOTANICAL NAMES.

ABUTILON, Gaertn., I, 63
Avicennae, Gaertn., I, 63
Acanthaceae, II, 102
Aconitum, Linn., I, 23
heterophyllum, Wall., I, 23
lycoctonum, Linn., I, 23
napellus var. multifidum, I, 24
napellus var. rotundifolium, I, 24
violaceum, Jacq., I, 24
Actaea, Linn., I, 20
spicata, Linn., I, 20
Adelocaryum, Brand., II, 57
anchusoides, Brand., II, 58
flexuosum, Brand, II, 58
Schlagintweitii, Brand., II, 58
Adonis, Linn., I, 11
aestivalis, Linn., I, 12
chrysocyathus, Hook. f. & T., I, 11
Ainsliaea, DC., I, 171
aptera, DC., I, 171
pteropoda, DC., I, 171
Ajuga, Linn., II, 128
bracteosa, Wall., II, 128
parviflora, Benth., II, 129
Aletris, Linn., II, 165
nepalensis, Hook. f., II, 165
Allardia, Dene., I, 162
glabra, Dene., I, 162
tomentosa, Dene., I, 163
vestita, Hook. f. & T., I, 163
Allium, Linn., II, 171
atropurpureum, Waldst. & Kit., II, 172
atrosanguineum, Schrenk, II, 173
Clarkei, Hook. f., II, 173
consanguineum, Kunth, II, 173
Fedschenkoanum, Regel, II, 174
Govanianum, Wall., II, 174
humile, Kunth, II, 174
loratum, Baker, II, 174
rubellum, M. Bieb., II, 175
Allium, Schoenoprasum, Linn., II, 175
Semonovii, Regel, II, 175
Stracheyi, Baker, II, 176
Thomsoni, Baker, II, 176
victorialis, Linn., II, 176
Wallichii, Kunth, II, 177
Amaryllidaceae, II, 169
Anaphalis, DC., I, 156
araneosa, DC., I, 157
cinnamomea, C. B. Clarke, I, 157
contorta, Hook. f., I, 158
cuneifolia, Hook. f., I, 157
nubigena, DC., I, 156
triplinervis, C. B. Clarke, I, 157
virgata, Thoms., I, 158
Androsace, Linn., II, 25
aizoon, Duby, II, 28
Chamaejasme, Host., II, 29
foliosa, Duby, II, 29
lanuginosa, Wall., II, 30
microphylla, Hook. f., II, 30
mucronifolia, Watt., II, 30
muscoidea, Duby, II, 31
primuloides, Duby, II, 31
rotundifolia, Hardw., II, 28
sarmentosa, Wall., II, 27
sarmentosa var. primuloides, II, 31
sempervivoides, Jacquem., II, 27
septentrionalis, Linn., II, 26
villosa, Linn., II, 32
Anemone, Linn., I, 4
albana, Stev., I, 8
biflora, DC., I, 5
Falconeri, Thoms., I, 7
narcissiflora, Linn., I, 8
obtusiloba, D. Don, I, 6
polyanthes, D. Don, I, 8
rupestris, Wall., I, 6
rupicola, Camb., I, 5
rupicola var. glabriuscula, I, 5
sp., I, 18
tetrasepala, Royle, I, 7

Aquilegia, Linn., 25
vulgaris var. alpina, I, 25
vulgaris var. jucunda, I, 26
vulgaris var. pyrenaica, I, 25
vulgaris var. vulgaris proper, 1, 26
Aralia, Linn., I, 145
cachemirica, Done., I, 145
Araliaceae, I. 145
Arisaema, Mart., II, 181
flavum, Schott., II, 183
Jacquemontii, Blume, II, 183
tortuosum, Schott., II, 183
utile, Hook. f., II, 182
Wallichianum, Hook. f., II, 182
Aroidaceae, II, 181
Artemisia, Linn., I, 166
absintium, Linn., I, 170
amygdalina, Done., I, 166
dracunculus, Linn., I, 169
japonica, Thunb., I, 169
laciniata, Willd., I, 168
maritima, Linn., I, 169
Moorcroftiana, Wall., I, 168
parviflora, Buch., I, 169
scoparia, Waldst. & Kit., I, 170
Sieversiana, Willd., I, 170
Stracheyi, Hook. f & T., I, 168
Tournefortiana, Reichb., I, 167
vestita, Wall., I, 167
vulgaris, Linn., I, 167
Asclepiadaceae, II, 65
Aster, Linn., I, 151
altaicus, Willd., I, 152
Falconeri, Hutch., I, 151
heterochaeta, Benth., I, 153
molliusculus, Wall., I, 152
Thomsoni, Clarke, I, 153
tibeticus, Hook. f., I, 152
Astragalus, Linn., I, 80
adesmiaefolius, Benth., I, 90
Amherstianus, Benth., I, 88
bicuspis, Fisch., I, 93
Candolleanus, Royle, I, 91
cashmirensis, Bunge, I, 82
chlorostachys, Lindl., I, 87
cicerifolius, Royle, I, 93
ciliolatus, Benth., I, 87
densiflorus, Kar. & Kir., I, 83
Falconeri, Bunge, I, 89
frigidus, Bunge, I, 86
gracilipes, Benth., I, 91
graveolens, Ham., I, 85
Heydei, Bak., I, 88
himalayanus, Klotzsch., I, 85
leptocentrus, Bunge, I, 94
leucocephalus, Grah., I, 82
longicaulis, Bak., I, 88
Astragalus, macropterus, DC., I, 86
malacophyllus, Benth., I, 91
melanostachys, Benth., I, 83
Munroi, Benth., I, 83
nivalis, Kar. & Kir., I, 95
ophiocarpus, Benth., I, 90
oxyodon, Bak., I, 84
peduncularis, Royle, I, 96
polyacanthus, Royle, I, 93
pyrrhotrichus, Boiss., I, 92
rhizanthus, Royle, I, 92
Stewartii, Bak., I, 87
strictus, Grah., I, 84
strobiliferus, Royle, I, 94
subulatus, M. Bieb., I, 95
subumbellatus, Klotzsch., I, 89
tibetanus, Benth., I, 85
tribulifolius, Benth., I, 89
trichocarpus, Grah., I, 90
vicioides, Grah., I, 86
zanskarensis, Benth., I, 94
Atropa, Linn., II, 77
belladonna, Linn., II, 77

Balsaminaceae, I, 71
Barbarea, Br., I, 34
praecox, Fries , I, 35
sicula, Presl., I, 35
vulgaris, Br., I, 34
Berberidaceae, I, 27
Bergenia, Moench., I, 125
ciliata, Blatter, I, 125
ligulata, Engl., I, 125
Stracheyi, Engl., I, 126
Bidens, Linn., I, 161
cernua, Linn., I, 161
pilosa, Linn., I, 162
tripartita, Linn., I, 162
Boraginaceae, II, 50
Bupleurum, Linn., I, 142
Candollei, Wall., I, 143
diversifolium, C. B. Clarke, 1, 143
falcatum, Linn., I, 144
jucundum, Kurz., I, 144
lanceolatum, Wall., I, 143
longicaule, Wall., I, 142
longicaule var. Clarkeanum, I, 143
setaceum, Fenzl., I, 145
subuniflorum, Boiss. & Heldr., I, 145
tenue, Buch., I, 144

Callianthemum, C. A. Meyer, 1, 11
cashemirianum, Camb., I, 11
Caltha, Linn., I, 18
palustris var. alba, I, 18

Campanula, Linn., II, 11
alsinoides, Hook. f. & T., II, 12
argyrotricha, Wall., II, 12
aristata, Wall., II, 11
cashmiriana, Royle, II, 13
colorata, Wall., II, 13
latifolia, Linn., II, 11
tenuissima, Dunn., II, 13
Campanulaceae, II, 9
Caragana, Lam., I, 96
brevispina, Royle, I, 96
Cardamine, Linn., I, 35
impatiens, Linn., I, 36
macrophylla, Willd., I, 35
oxycarpa, Collett, I, 36
sylvatica, Link., I, 36
Carduus, Linn., I, 180
acanthoides, Linn., I, 180
nutans, Linn., I, 180
Thomsoni, Hook. f., I, 180
Caryophyllaceae, I, 48, 56
Caucalis, Linn., I, 137
Anthriscus, Scop., I, 138
latifolia, Linn., I, 137
leptophylla, Linn., I, 138
Cassiope, D. Don., II, 16
fastigiata, D. Don., II, 16
Chenopodiaceae, II, 136
Chenopodium, Linn., II, 136
album, Linn., II, 138
ambrosioides, Linn., II, 137
Blitum, Hook. f., II, 136
Botrys, Linn., II, 137
glaucum, Linn., II, 138
hybridum, Linn., II, 137
opulifolium, Schrad., II, 138
Chorispora, DC., I, 43
sabulosa, Camb., I, 43
tenella, DC., I, 43
Christolea, Camb., I, 42
crassifolia, Camb., I, 42
Circaea, Linn., I, 136
alpina, Linn., I. 136
cordata, Royle, I, 136
Clematis, Linn., I, 1
Buchananiana, DC., I, 3
connata, DC., I, 4
gouriana, Roxb., I, 2
grata, Wall., I, 1
graveolens, Lindl., I, 3
montana, Ham., I, 3
orientalis, Linn., I, 2
Codonopsis, Wall., II, 9
ovata, Benth., II, 10
rotundifolia, Benth., II, 9
Colchicum, Linn., II, 168
luteum, Baker, II, 168
Compositae, I, 151; II, 1
Convolvulaceae, II, 72
Cortusa, Linn., II, 32
Matthioli, Linn., II, 32
Corydalis, DC., I, 30
adiantifolia, Hook. f. & T., I, 34
cashemiriana, Royle, I, 33
cornuta, Royle, I, 31
crassifolia, Royle, I, 33
flabellata, Edgew., I, 34
Gortschakovii, Schrenk., I, 30
Govaniana, Wall., I, 32
longipes, DC., I, 31
Moorcroftiana, Wall., I, 31
ramosa, Wall., I, 32
rutaefolia, Sibth., I, 33
stricta, Stephan, I, 32
Crassulaceae, I, 127
Cremanthodium, Benth., I, 173
Decaisnei, C. B. Clarke, I, 173
Cruciferae, I, 34
Cucubalus, Linn., I, 61
bacciferus, Linn., I, 61
Cuscuta, Linn., II, 72
capitata, Roxb., II, 72
chinensis, Lam., II, 73
europaea, Linn., II, 73
gigantea, Griff, II, 74
planiflora, Tenore, II, 73
reflexa, Roxb., II, 73
Cynanchum, Linn., II, 65
acutum, Linn., II, 66
Arnottianum, Wight, II, 67
auriculatum, Wight, II, 66
glaucum, Wall., II, 67
Heydei, Hook. f., II, 66
Jacquemontianum, Dene., II, 68
Vincetaxicum, Pers., II, 67
Cynoglossum, Linn., II, 50
denticulatum, A. DC., II, 50
furcatum, Wall., II, 51
glochidiatum, Wall., II, 50
lanceolatum, Forsk., II, 52
micranthum, Desf., II, 52
microglochin, Benth., II, 51
nervosum, Benth., II, 53
petiolatum, A. DC., II, 52
Wallichii, G. Don., II, 50
zeylanicum, Thunb., II, 51
Cypripedium, Linn., II, 162
cordigerum, Don, II, 162

Daphne, Linn., II, 135
cannabina, Wall., II, 135
oleoides, Schreb., II, 135
papyracea, Dene., II, 135
Delphinium, Linn., I, 20
cashmirianum, Royle, I, 21
denudatum, Wall., I, 22

Delphinium elatum, Linn., I, 22
incanum, Royle, I, 21
incanum, Royle, var., I, 20
sp., I, 22
vestitum, Wall., I, 21
Desmodium, Desv., I, 97
concinnum, DC., I, 99
floribundum, G. Don., I, 97
gangeticum, DC., I, 100
gyrans, DC., I, 98
parvifolium, DC., I, 100
podocarpum, DC., I, 98
polycarpum, DC., I, 99
tiliaefolium, G. Don., I, 98
triflorum, DC., I, 100
Dianthus, Linn., I, 48
anatolicus, Boiss., I, 49
angulatus, Royle, I, 50
caryophyllus, Linn., I, 49
cashemiricus, Edgew., I, 48
Falconeri, Edgew., I, 49
Jacquemontii, Edgew., I, 48
Seguiere, Vill., I, 49
Dictamnus, Linn., I, 75
albus, Linn., I, 75
Dipsaceae, I, 146
Dipsacus, Linn., I, 146
inermis, Wall., I, 146
Doronicum, Linn., I, 173
Falconeri, Hook. f., 173
Roylei, DC., I, 173
Draba, Linn., I, 39
alpina, Linn., I, 39
fladnitzensis, Wulf., I, 41
fladnitzensis var. heterotricha, Hook. f. & T., I, 41
draba glacialis, Adams, I, 40
incana, Linn., I, 40
lasiophylla, Royle, I, 41
muralis, Linn., I, 42
sp., I, 39
stenocarpa, Hook. f. & T., I, 40
tibetica, Hook. f. & T., I, 41

Elsholtzia, Willd., II, 123
cristata, Willd., II, 125
densa, Benth., II, 123
incisa, Benth., II, 124
polystachya, Benth., II, 124
strobilifera, Benth., II, 123
Ephedra, Linn., II, 154
Gerardiana, Wall., II, 154
Epilobium, Linn., I, 132
amplectens, Benth., I, 133
angustifolium, Linn., I, 133
cylindricum, Don, I, 134
hirsutum, Linn., I, 134
latifolium, Linn., I, 133
Epilobium origanifolium, Lam., I, 135
palustre, Linn., I, 135
roseum, Schreb., I, 135
roseum var. Dalhousianum, I, 136
Royleanum, Haussk., I, 136
Epipactis, Adans, II, 158
consimilis, Wall., II, 158
gigantea, Dougl., II, 159
latifolia, All., II, 158
Royleana, Lindl., II, 159
Epipogum, Gmel., II, 161
aphyllum, Swartz., II, 161
tuberosum, Duthie, II, 162
Eremurus, Bieb., II, 180
himalaicus, Baker, II, 180
Ericaceae, II, 14
Erigeron, Linn., I, 153
alpinus forma khasiana, I, 154
andryaloides, Benth., I, 155
bellidioides, Benth., I, 155
canadensis, Linn., I, 155
multiradiatus, Benth., I, 153
patentisquama, J. F. Jeffrey, I, 154
sp., I, 154, 155
Eritrichium, Schrad., II, 64
basifixum, C. B. Clarke, II, 65
strictum, Done., II, 64
tibeticum, C. B. Clarke, II, 64
Eryngium, Linn., I, 141
Billardieri, Delaroche, I, 141
coeruleum, Bieb., I, 141
Erysimum, Linn., I, 37
altaicum, C. A. Mey., I, 37
hieraciifolium, Linn., I, 38
Melicentae, Dunn., I, 37
odoratum, Ehrh., I, 37
repandum, Linn., I, 38
Euphorbia, Linn., II, 105
Emodi, Hook. f., II, 110
falcata, Linn., II, 108
helioscopia, Linn., II, 108
hypericifolia, Linn., II, 110
Jacquemontii, Boiss., II, 109
Maddeni, Boiss., II, 107
pilosa, Linn., II, 108
prolifera, Ham., II, 107
Thomsoniana, Boiss., II, 109
thymifolia, Burm., II, 110
tibetica, Boiss., II, 109
Wallichii, Hook. f., II, 107
Euphorbiaceae, II, 105
Euphrasia, Linn., II, 85
officinalis, Linn., II, 85
Euryale, Salisb., I, 28
ferox, Salisb., I, 28

FRITILLARIA, Linn., II, 179
imperialis, Linn., II, 180
Roylei, Hook., II, 180
Fumariaceae, I, 30

GAGEA, Salisb., II, 170
kashmirensis, Turrill, II, 171
lutea, Schult. f., II, 170
persica, Boiss., II, 171
reticulata, Schult. f., II, 170
Gaultheria, Linn., II, 15
nummularioides, D.Don., II, 15
trichophylla, Royle, II, 15
Gentiana, Linn., II, 33
aquatica, Linn., II, 38
argentea, Royle, II, 39
aurea, Linn., II, 35
borealis, Bunge, II, 39
cachemirica, Decne., II, 37
carinata, Griseb., II, 36
decumbens, Linn. f., II, 39
Hugelii, Griseb., II, 40
humilis, Steven, II, 40
Kurroo, Royle, II, 37
Loderi, Hook. f., II, 41
Moorcroftiana, Wall., II, 35
nubigena, Edgew., II, 41
pedicellata, Wall., II, 41
pseudo-humilis, Burkill, II, 42
pygmaea, C. B. Clarke, II, 42
quadrifaria, C. B. Clarke, II, 41
serrata, Gunner, II, 37
serrata, var. Stracheyi, II, 38
sp., II, 36, 38
squarrosa, Ledeb., II, 42
tenella, Fries., II, 36
venusta, Wall., II, 38
Gentianaceae, II, 33
Geraniaceae, I, 64
Geranium, Linn., I, 64
collinum, M. Bieb., I, 65
Grevilleanum, Wall., I, 66
lucidum, Linn., I, 69
molle, Linn., I, 68
nepalense, Sw., I, 67
ocellatum, Camb., I, 69
pratense, Linn., I, 66
pusillum, Linn., I, 68
rectum, Trautv., I, 65
Robertianum, Linn., I, 69
rotundifolium, Linn., I, 68
sibiricum, Linn., I, 67
tuberaria, Camb., I, 67
Wallichianum, Sw., I, 65
Gerbera, Gronov., I, 172
Kunzeana, Braun & Aschers, I, 172
lanuginosa, Benth., I, 172
lanuginosa var. pusilla, I, 172
Geum, Linn., I, 103
elatum, Wall., I, 103
urbanum, Linn., I, 103
sp., I, 104
Gnetaceae, II, 154

HAEMODORACEAE, II, 165
Halorrhagidaceae, II, 188
Hemerocallis, Linn., II, 169
Hemerocallis fulva, Linn., II, 169
Herminium, Linn., II, 163
angustifolium, Benth., II, 163
congestum, Lindl., II, 164
Monorchis, R.Br., II, 163
pugioniforme, Lindl., II, 164
sp., II, 163
Hibiscus, Medik, I, 63
Trionum, Linn., I, 63
Hydrocharis, Linn., II, 155
Morsus-ranae, Linn., II, 155
Hydrocharitaceae, II, 155
Hypericaceae, I, 55
Hypericum, Linn., I, 55
perforatum, Linn., I, 55
Wightianum, Wall., I, 55
Hypopithys, Scop., II, 16
lanuginosa, Nutt., II, 16

IBERIDELLA, Boiss., I, 42
Andersoni, Hook. f. & T., I, 42
Impatiens, Linn., I, 71
amphorata, Edgew., I, 74
amplexicaule, Edgew., I, 74
Balfourii, Hook. f., I, 72
balsamina, Linn., I, 74
brachycentra, Kar. & Klr., I, 73
Edgeworthii, Hook. f., I, 72
Roylei, Walp., I, 72
scabrida, DC., I, 75
sulcata, Wall., I, 71
Thomsoni, Hook. f., I, 73
Inula, Linn., I, 158
acuminata, DC., I, 159
Cappa, DC., I, 160
cuspidata, C. B. Clarke, I, 161
Falconeri, Hook. f., I, 159
grandiflora, Willd., I, 159
racemosa, Hook. f., I, 160
rhizocephaloides, C. B. Clarke, I, 160
Royleana, DC., I, 159
Iridaceae, II, 166
Iris, Linn., II, 166
aurea, Lindl., II, 168
ensata, Thunb., II, 167
gilgitensis, Baker, II, 166
kumaonensis, Wall., II, 166
nepalensis, Don., II, 167
spuria, Linn., II, 167

Ixiolirion, Fisch., II, 169
montanum, Herb., II, 169
Jaeschkea, Kurz., II, 44
gentianoides, Kurz., II, 44
latisepala, C. B. Clarke, II, 44

KOELPINIA, Pall., II, 7
linearis, Pall., II, 7

LABIATAE, II, 3
Lactuca, Linn., II, 1
decipiens, C. B. Clarke, II, 2
dissecta, D. Don, II, 4
hastata, DC., II, 5
Lactuca Lessertiana, C. B. Clarke, II, 3
longifolia, DC., II, 2
macrorhiza, Hook. f., II, 5
polycephala, Benth., II, 6
rapunculoides, C. B. Clarke, II, 3
scariola, Linn., II, 4
sp., II, 4
Lagotis, Gaertn., II, 104
decumbens, Ruprecht, II, 105
glauca, Gaertn., II, 104
globosa, Kurz., II, 105
Lappula, Moench., II, 57
glochidiata, Brand., II, 57
Lathraea, Linn., II, 101
squamaria, Linn., II, 101
Lathyrus, Linn., I, 101
altaicus, Led., I, 101
Aphaca, Linn., I, 102
inconspicuus, Linn., I, 102
luteus, Bak., I, 101
pratensis, Linn., I, 102
Lavatera, Linn., I, 62
kashmiriana, Camb., I, 62
Lentibulariaceae, II, 75
Leonurus, Linn., II, 129
cardiaca, Linn., II, 129
Leptorhabdos, Schrenk., II, 85
Benthamiana, Walp., II, 85
Lespedeza, Mich., I, 76
elegans, Camb., I, 78
eriocarpa, DC., I, 77
Gerardiana, Grah., 1, 78
juncea, Pers., I, 78
sericea, Miq., I, 77
stenocarpa, Klotzsch., I, 77
tomentosa, Sieb., I, 78
Liliaceae, II, 168, 170
Lilium, Linn., II, 179
polyphyllum, D.Don., II, 179
Thomsonianum, Royle, II, 179
Limnanthemum, S. P. Gmel., II, 49
nymphaeoides, Link., II, 49
Lindelofia, Lehm., II, 53
angustifolia, Brand, II, 54
Benthami, Hook. f., II, 54
longiflora, Baillon, II, 53
longiflora var. Levingii, II, 54
spectabilis, Lehm., II, 53
Listera, R., Br., II., 155
kashmiriana, Duthie, II, 156
Lindleyana, King & Pantling, II, 156
ovata, R. Br., II, 157
Lloydia, Salisb., II., 177
serotina, Reichb., II, 177
Lotus, Linn., I, 79
corniculatus, Linn., I, 79
Lychnis, Linn., I, 58
apetala, Linn., I, 59
cashmeriana, Royle, I, 60
coronaria, Lamk., I., 58
fimbriata, Wall., I, 60
indica, Benth., I, 60
macrorhiza, Royle, I, 59
mutans, Benth., I, 60
pilosa, Edgew., I, 61
Stewartii, Edgew., I., 59
Lycopsis, Linn., II, 59
arvensis, Linn., II, 59

MACROTOMIA, DC., II, 59
Benthami, DC., II, 59
perennis, Boiss., II, 60
Malva, Linn., I, 62
parviflora, I, 63
silvestris, Linn., I, 62
Malvaceae, I, 62
Meconopsis, Vig., I, 29
aculeata, Royle, I, 29
Megacarpaea, DC., I, 44
polyandra, Benth., I, 44
Mertensia, Roth., II, 55
echioides, Benth., II, 55
elongata, Benth., II, 56
moltkioides, C. B. Clarke, II, 56
primuloides, C. B. Clarke, II, 56
tibetica, C. B. Clarke, II, 55
Moltkia, Lekm., II, 63
parviflora, C. B Clarke, II, 63
Moneses, Salisb., II, 14
uniflora, Linn., II, 14
Monotropaceae, II, 16
Morina, Linn., I, 147
Coulteriana, Royle, I, 147
longifolia, Wall., I, 148
persica, Linn., I, 147
Myosotis, Linn., II, 62
arvensis, Hoffm., II, 62
caespitosa, Schultz., II, 63

Myosotis stricta, Link., II, 63
sylvatica, Hoffm., II, 62
Myriophyllum, Linn., II, 188
spicatum, Linn., II., 188
verticillatum, Linn., II, 188

NAIADACEAE, II, 184
Naias, Linn., II, 187
major, All., II, 187
Nelumbium, Juss., I, 27
speciosum, Willd., I, 27
Neottia Listeroides, Lindl., II, 156
Nepeta, Linn., II, 114
campestris, Benth , II, 117
Cataria, Linn., II, 116
Clarkei, Hook. f., II, 118
connata, Royle, II, 115
discolor, Benth., II, 118
distans, Benth., II, 120
elliptica, Royle, II, 118
erecta, Benth., II, 116
eriostachya, Benth., II, 119
glutinosa, Benth., II, 119
Govaniana, Benth., II, 116
leucolaena, Benth., II, 119
linearis, Royle, II, 120
longibracteata, Benth., II, 120
mollis, Benth., II, 120
nervosa, Royle, II, 121
raphanorhiza, Benth., II, 121
salviaefolia, Royle, II, 117
spicata, Benth., II, 121
supina, Stev., II, 122
Thomsoni, Benth., II. 122
Nymphaeaceae, I, 27

ONAGRACEAE, I, 132
Ononis, Linn., I, 79
hircina, Jacq., I, 79
Onosma, Linn., II, 60
bracteatum, Wall., II, 61
echioides, Linn., II, 60
Thomsoni, C. B. Clarke, II,
Orchidaceae, II, 155
Orchis, Linn., II, 159
habenarioides, King & Pantling, II, 160
incarnata, Linn., II, 159
latifolia, Linn., II, 160
Orobanchaceae, II, 68
Orobanche, Linn., II, 68
borealis, Turcz., II, 70
cernua, Loeffl., II, 69
epithymum, DC., II. 69
Hansii, Kerner, II, 70
kashmirica, C. B. Clarke, II, 71
psila, C. B. Clarke, II, 71
ramosa, Linn., II, 71
Solmsii, C. B. Clarke, II, 70
Oxalidaceae, I, 70
Oxalis, Linn., I, 70
acetosella, Linn., I, 70
corniculata, Linn., I, 70
Oxyria, Hill, II, 153
digyna, Hill, II, 153

PAEONIA, Linn., I, 26
Emodi, Wall., I, 26
Papaver, Tourn., I, 28
dubium, Linn., I, 29
nudicaule, Linn., I, 28
Rhoeas, Linn., I, 29
Papaveraceae, I, 28
Papilionaceae, I, 76
Paracaryum glochidiatum, Benth., II, 57
heliocarpum, A. Kerner, II, 58
Paraquilegia, Drum. & Hutch., I, 19
caespitosa, Drum. & Hutch., I, 19
grandiflora, Drum. & Hutch., I, 19
Parnassia, Linn., I, 126
nubicola, Wall., I, 126
palustris, Linn., I, 126
Pedicularis, Linn., II, 90
bicornuta, Klotzsch., II, 95
brevifolia, D. Don, II, 99
cheilanthifolia, Schrenk, II, 98
elephantoides, Benth., II, 96
Garckeana, Prain, II, 93
gracilis, Wall., II, 99
longiflora, Rudolph, II, 100
mollis, Wall., II, 100.
Oederi, Vahl, II, 97
pectinata, Wall., II, 92
pectinata var. palans, II, 92
pectinata var. typica, II, 92
porrecta, Wall., II, 101
pyramidata, Royle, II, 91
rhinanthoides, Schrenk., II, 95
Roylei, Maxim., II, 94
siphonantha, D. Don, II, 97
tenuirostris, Benth., II, 92
tubiflora, Fisch., II, 100
versicolor, Wahlb., II, 97
verticillata, Benth., II, 94
Wallichii, Bunge, II, 93
Phlomis, L., II, 132
bracteosa, Royle, II, 134
cashmeriana, Royle, II, 133
setigera, Falc. II, 133
spectabilis, Falc., II, 133
Phyteuma, Linn., II, 10
Thomsoni, C. B. Clarke, II, 10
Picrorhiza, Royle, II, 88
Kurrooa, Benth., II, 88

Pleurogyne, Eschsch., II, 43
carinthiaca, Griseb., II. 43
spathulata, A. Kerner, II, 43
Pleurospermum, Hoffm., I, 138
angelicoides, Benth., I, 139
Brunonis, Benth., I, 141
Candollii, Benth., I, 39
densiflorum, Benth., I, 140
Govanianum, Benth., I, 139
sp., I, 139
stellatum, Benth., I, 140
stylosum, C. B. Clarke, I, 140
Podophyllum, Linn., I, 27
Emodi, Wall., I, 27
Polemoniaceae, II, 74.
Polemonium, Linn., II, 74
coeruleum, Linn., II, 74
Polygala, Linn., I, 46
abyssinica, Fresen., I, 47
leptalea, DC , I, 47
persicariaefolia, DC., I, 47
sibirica, Linn., I, 46
Polygalaceae, I, 46
Polygonaceae, II, 139
Polygonum, Linn., II, 139
affine, Don, II, 142
alatum, Ham., II, 143
alpinum, All., II, 143
amphibium, Linn., II, 141
amplexicaule, Don, II, 142
aviculare, Linn., II, 144
cognatum, Meissn., II, 144
Convolvulus, Linn., II, 145
delicatulum, Meissn., II, 145
dumetorum, Linn., II, 145
filicaule, Wall., II, 146
glaciale, Hook. f., II, 146
humile, Meissn., II, 147
Hydropiper, Linn., II, 147
islandicum, Hook. f., II, 147
lapathifolium, II, 148
minus, Huds., II, 148
nummularifolium, Meissn., II, 149
orientale, Linn., II, 149
paronychioides, C. A. Mey, II, 149
perpusillum, Hook. f., II, 142
Persicaria, Linn., II, 150
plebejum, R. Br., II, 150
polystachyum, Wall , II, 151
recumbens, Royle, II, 141
rumicifolium, Royle, II, 151
serrulatum, Lagasca, II, 151
tubulosum, Boiss., II, 152
vacciniifolium, Wall., II, 152
virginianum, Linn., II, 153
viviparum, Linn., II, 153
Potamogeton, Linn., II, 184
crispus, Linn., II, 186
indicus, Roxb., II, 185
javanicus, Hassk., II, 185
lucens, Linn., II, 186
natans, Linn., II, 184
pectinatus, Linn., II, 186
perfoliatus, Linn., II, 185
pusillus, Linn., II, 187
Potentilla, Linn., I, 104
albifolia, Wall., I, 108
ambigua, Camb., I, 109
anserina, Linn., I, 109
argentea, Linn., I, 109
argyrophylla, Wall., I, 107
atrosanguinea, Lodd., I, 106
bifurca, Linn., I. 110
Clarkei, Hook. f., I, 110
curviseta, Hook. f., I, 108
desertorum, Bunge, I, 111
eriocarpa, Wall., I, 107
fragarioides, Linn., I, 111
fructicosa, Linn., I, 111
gelida, C. A. Mey., I, 112
Inglisii, Royle, I, 108
kashmirica, Hook. f., I, 112
Kleiniana, Wight & Arn., I, 113
Leschenaultiana, Ser., I, 111
leucochroa, Lindl., I, 106
monanthes, Lindl., I, 113
nultifida, Linn., I, 113
nepalensis, Hook., I, 106
nivea, Linn., I, 114
peduncularis, Don, I, 114
reptans, Linn., I, 115
Salessovii, Steph., I, 115
sericea, Linn., I, 115
Sibbaldi, Haller f., I, 107
supina, Linn., I, 116
Primula, Linn., II, 17
Clarkei, Watt., II, 21
denticulata, Sm., II, 20
elliptica, Royle, II, 21
erosa, Wall., II, 22
floribunda, Wall., II, 22
hazarica, Duthie, II, 22
involucrata, Wall., II, 23
minutissima, Jaquem., II, 23
nivalis, Pall., II, 18
reptans, Hook. f., II, 20
rosea, Royle, II. 19
rotundifolia, Wall., II, 24
Schlagintweitiana, Pax., II, 24
sibirica, Jacq., II, 24
sp., II, 21
Primulaceae, II, 17
Pyrola, Linn., II, 14
rotundifolia, Linn., II, 14

RANUNCULACEAE, I, 1
Ranunculus, Linn., I, 12
affinis, Br., I, 14
aquatilis var. trichophyllus, 1, 17
arvensis, Linn., I, 16
diffusus, DC., I, 16
falcatus, Linn, I, 17
hirtellus, Royle, I, 15
hyperboreus, Rottb., I, 14
laetus, Wall., I, 16
lingua, Linn., I, 13
lobatus, Jacq., I, 14
muricatus, Linn., I, 17
pulchellus, C. A. Mey., I, 13
sceleratus, Linn., I, 15
Rhagadiolus, Juss., II, 6
Hedypnois. Fisch. & Mey., II, 6
Rosaceae, I, 103
Rutaceae, I, 75

SALVIA, Linn., II, 111
asperata, Falc., II, 113
dumetorum, Andrz., II, 113
glutinosa, Linn., II, 112
hians, Royle, II, 112
lanata, Roxb., II, 113
Moorcroftiana, Wall., II, 111
plebeia, R.Br., II, 114
Saussurea, DC., I, 181
albescens, Hook. f. & T., I, 186
Atkinsoni, C. B. Clarke, I, 183
bracteata, Dcne., I, 183
candicans, C. B. Clarke, I, 187
Candolleana, Wall., I, 185
Clarkei, Hook. f., I, 187
elliptica, Hook. f., I, 187
Falconeri, Hook. f., 183
glanduligera, Schultz. & Bip., I, 187
graminifolia. Wall., I, 188
hypoleuca, Spreng., I, 188
Jacea, C. B. Clarke, I, 188
Kunthiana, C. B. Clarke, I, 184
Lappa, C. B. Clarke, I, 185
obvallata, Wall., I, 184
Roylei, C. B. Clarke, I, 185
Schultzii, Hook. f., I, 184
sorocephala, Hook. f. & T., I, 186
taraxicifolia, Wall., I, 182
Saxifraga, Linn., I, 116
cernua, Linn., I, 118
ciliata, Royle, I, 125
diversifolia, Wall., I, 122
Duthiei, Gandoger, I, 124
flagellaris subsp. euflagellaris, I, 121
Saxifraga flagellaris, subsp. mucronulata I, 122
hirculus, Linn., I, 119
hirculus var. alpina, I, 120
hirculus var. hirculoides, I, 120
hirculus var. subdioica, I, 120
imbricata, Royle, I, 124
Jacquemontiana, Dcne, I, 121
Meeboldii, Engl. & Irmsch., I, 123
Moorcroftiana, Wall., I, 119
oppositifolia subsp. asiatica, I, 124
pallida, Wall., I, 118
ramulosa, Wall., I, 123
sibirica, Linn., I, 117
sp., I, 121, 122
Saxifragaceae, I, 116
Scabiosa, Linn., I, 146
Candolliana, Wall., I, 147
speciosa, Royle, I, 146
Scorzonera, Linn., II, 7
divaricata, Turez., II, 7
purpurea, Linn., II, 8
Scrophularia, Linn., II, 86
calycina, Benth., II, 88
himalensis, Royle, II, 87
lucida, Linn., II, 87
polyantha, Royle, II, 87
Scopolii, Hoppe, II, 86
variegata, Bieb., II, 88
Scrophulariaceae, II, 78
Scutellaria, Linn., II, 125
angulosa, Benth., II, 129
galericulata, Linn., II, 126
grossa, Wall., II, 127
Heydei, Hook. f., II, 127
linearis, Benth., II, 126
prostrata, Jacquem., II, 127
repens, Ham., II, 126
Sedum, Linn., I, 127
adenotrichum, Wall., I, 127
asiaticum, DC., I, 129
elongatum, Wall., 1, 131
Ewersii, Ledeb., I, 129
Jaeschkei, Kurz., I, 128
multicaule, Wall., I, 128
quadrifidum, Pall., I, 130
Rhodiala, DC., I, 129
rosulatum, Edgew., I, 128
tibeticum, Hook. f. & T., I, 130
trifidum, Wall., I, 130
Selaginaceae, II, 104
Sempervivum, Linn., I, 131
acuminatum, Dcne., I, 131
mucronatum, Edgew., I, 131
sedoides, Dcne., I, 132

Senecio, Linn., I, 174
amplexicaulis, Wall., I, 176
arnicoides, Wall., I, 175
chenopodifolius, DC., I, 179
chrysanthemoides, DC., I, 176
chrysanthemoides var. chrysanthemoides proper, I, 177
coronopifolius, Desf., I, 178
dubius, Ledeb., I, 178
graciliflorus, DC., I, 178
Jacquemontianus, Benth., 1, 175
Kunthianus, Wall., I, 179
Levingii, C. B. Clarke, I, 179
ligularia, Hook. f., I, 175
nudicaulis, Ham., I, 177
pedunculatus, Edgew., I, 177
Thomsoni, C. B. Clarke, I, 176
Silene, Linn., I, 56
conoidea, Linn., I, 57
Griffithi, Boiss., I, 57
inflata, Sm., I, 57
Moorcroftiana, Wall., I, 56
tenuis, Willd., I, 56
Skimmia, Thunb., I, 76
laureola, Sieb. & Zucc., I, 76
Solanaceae, II, 77
Solidago, Linn., I, 156
Virga-aurea, Linn., I, 156
Spiranthes, Rich., II, 157
australis, Lindl., II, 157
Stachys, Linn., II, 130
floccosa, Benth., II, 131
melissaefolia, Benth., II, 130
palustris, Linn., II, 131
sericea, Wall., II, 131
sp., II, 130
sylvatica, Linn., II, 132
tibetica, Vatke, II, 132
Stellaria, Linn., I, 50
aquatica, Scop., I, 52
bulbosa, Wulf., I, 51
crispata, Wall., I, 52
decumbens var. polyantha, I, 54
glauca, Withering, I, 53
graminea, Linn., I, 53
latifolia, Benth., I, 51
longissima, Wall., I. 53
media, Linn., I, 52
subumbellata, Edgew., I, 54
uliginosa, Murr., I, 54
Webbiana, Wall., I, 51
Strobilanthes, Blume, II, 102
alatus, Nees, II, 102
angustifrons, C. B. Clarke, II, 102
atropurpureus, Nees, II, 103
Dalhousianus, C. B. Clarke, II, 103
Strobilanthes glutinosus, Nees, II, 103
Wallichii var. microphyllus, II, 103
Swertia, Linn., II, 44
alata, Royle, II, 48
angustifolia, Ham., II, 48
angustifolia var. Hamiltoniana, II, 48
Chirata, Ham., II, 49
cordata, Wall., II, 47
paniculata, Wall., II, 47
petiolata, Royle, II, 45
purpurascens, Wall., II, 47
speciosa, Wall., II, 46
tetragona, C. B. Clarke, II, 46
Thomsoni, C. B. Clarke, II, 46

Tanacetum, Linn., I, 163
artemisioides, Hook. f., I, 165
Falconeri, Hook. f., I, 164
fruticulosum, Ledeb., I, 164
gracile, Hook. f. & T., I, 165
longifolium, Wall., I, 164
tibeticum, Hook. f. & T., I, 165
Thalictrum, Linn., I, 9
alpinum, Linn., I, 10
cultratum, Wall., I, 9
elegans, Wall., I, 10
pauciflorum, Royle, I, 9
pedunculatum, Edgew., I, 10
Thymelaeaceae, II, 134
Tragapogon, Linn., II, 8
gracile, D. Don, II, 9
pratense, Linn., II, 8
Trapa, Linn., I, 137
bispinosa, Roxb., I, 137
Trillium, Linn., II, 181
Govanianum, Wall., II, 181
Trollius, Linn., I, 18
acaulis, Lindl., I, 18
Tulipa, Linn., II, 178
praecox, Tenore, II, 178
stellata, Hook., II, 178

Umbelliferae, I, 137
Utricularia, Linn., II, 75
exoleta, R. Br., II, 76
flexuosa, Vahl, II, 75
minor, Linn., II, 76
orbiculata, Wall., II, 77
striatula, Smith, II, 77

Valeriana, Linn., I, 148
dioica, Linn., I, 149
elegans, C. B. Clarke, I, 149
Hardwickii, Wall., I, 150
officinalis, Linn., I, 150

Valeriana pyrolaefolia, Done., I, 149
Stracheyi, C. B. Clarke, I, 150
Wallichii, D.C., I, 149
Valerianaceae, I, 148
Veronica, Linn., II, 78
agrestis, Linn., II, 81
anagallis, Linn., II, 81
arvensis, Linn., II, 82
Beccabunga, Linn., II, 79
biloba, Linn., II, 82
ciliata, Fisch., II, 83
deltigera, Wall., II, 80
Hallbergii, Blatter, II, 83
hederaefolia, Linn., II, 83
laxa, Benth., II, 80
persica, Poir., II, 84
Veronica serpyllifolia, Linn., II, 84
verna, Linn., II, 85
Viola, Linn., I, 44
biflora, Linn , I, 44
distans, Wall., I, 45
Falconeri, Hook. f. & T., I, 46
odorata, Linn., I, 45
Patrinii, Ging., I, 45
sylvatica, Fries., I, 46
Violaceae, I, 44

WIKSTROEMIA, Endl., II, 134
canescens, Meissn., II, 134
Wulfenia, Jacq., II, 89
Amherstiana, Benth., II, 89