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The Naturalised Clovers of Western Australia

By C. A. GARDNER,
Government Botanist

AS this article was written primarily for farmers and others with little or no training in botany, it may be fitting to commence with a few notes on the plants which are referred to as clovers. All the true clovers are species of *Trifolium* (from the Latin, tres—three and folium—leaf). Because of this, the terms “clover” and “trefoil” are somewhat loosely applied and some of the yellow-flowered clovers are commonly but incorrectly referred to as trefoils.

The clovers are very closely related to the true trefoils, which are all species of *Medicago*, and not to be confused with the “birdsfoot trefoils” which are species of *Lotus*.

Apart from bearing similarly-coloured flowers, some of the yellow-flowered clovers also closely resemble the trefoils, in that they have a similar type of leaf, in which the central or terminal leaflet in each group of three is on a longer stalklet than its lateral neighbours. Such a leaf is described as “pinnate” to distinguish it from the “digitate” leaf in which the three leaflets are carried on stalklets of equal lengths (see Plate A).

In general, apart from the exceptions mentioned, the true clovers carry leaflets that are equally stalked (digitate) whereas the trefoils are usually pinnate. The stipules or leaf appendages (see Plate A) are not markedly fringed in the case of the clovers, whereas in the trefoils they are often deeply fringed.

These characteristics are not always constant but serve as a general guide in differentiating between the clovers and trefoils.

The only constant difference is in the pods, which in the clovers are straight, small and more or less concealed by the withered flowers.

In the trefoils, the pods are curved (as in lucerne, for example) or spirally coiled (as in burr trefoil).

THERE ARE NO NATIVE CLOVERS

The clovers are mainly indigenous to the temperate and sub-tropical regions of the Northern Hemisphere with a few species in the mountains of tropical America, in South America and in South Africa.

All the clovers now found in Australia are of European or Eastern Mediterranean origin—the greater number being from Syria and Palestine.

This article contains keys and descriptions covering the 29 clovers naturalised in South-Western Australia, also six other species which, under experimental cultivation, are showing promise as pasture plants.

These are bladder clover, dry-head clover, *Trifolium balansae*, *T. hirtum*, *T. Carmelii*, and *T. Desvauzii*.

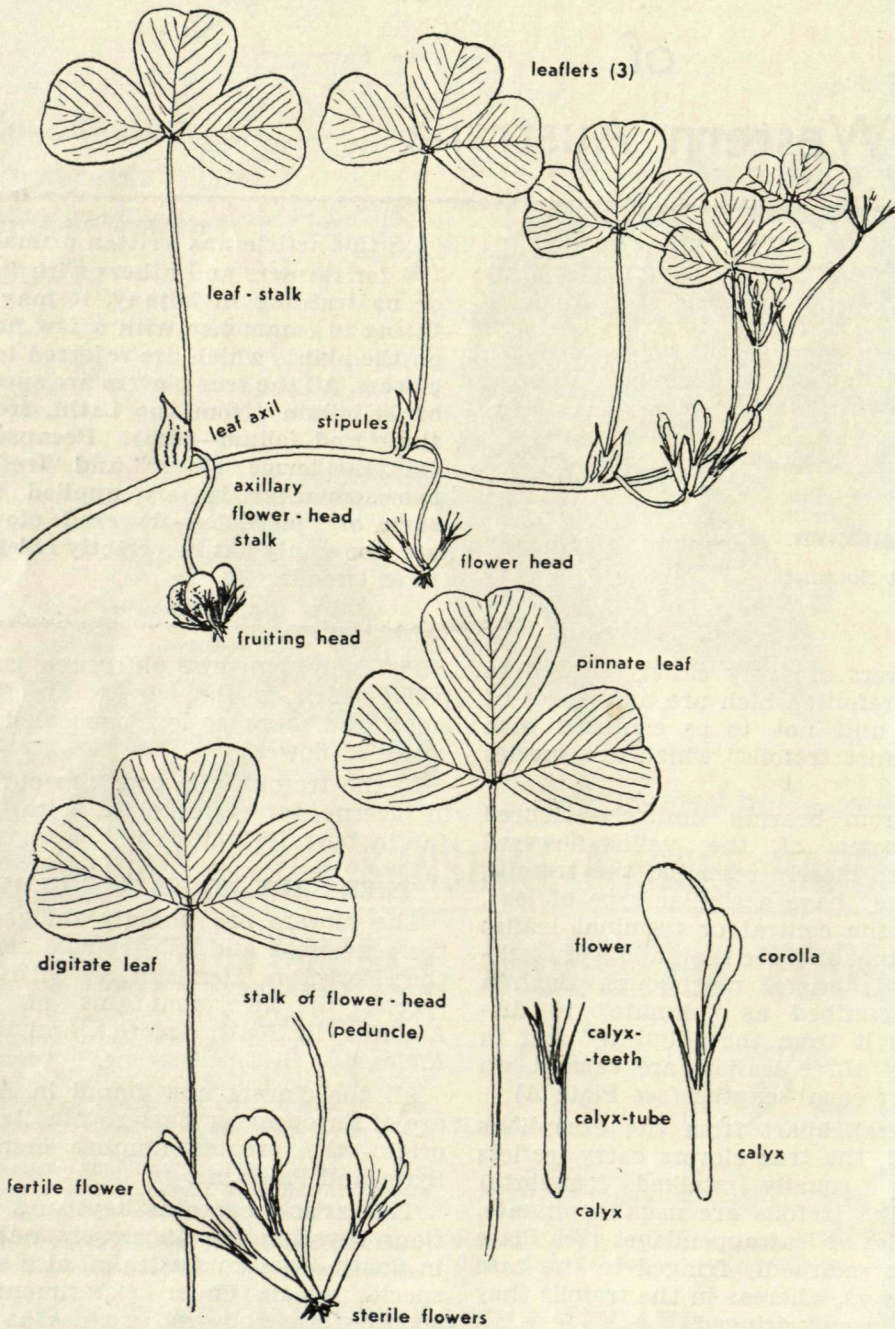


PLATE A.

BOTANICAL TERMS

An attempt has been made in this article to describe the plants in terms which are readily understandable by the layman. Two keys to identification of the various clover species have been incorporated. One is for the trained worker familiar with botanical terms, the other is based on common characters which the farmer should have no difficulty in understanding.

Botanists are often accused of talking and writing in language that is almost incomprehensible to the layman, but there is a very sound reason for using these specialised terms.

When dealing with thousands of plants, many of which are similar in general appearance and only differ in slight details, it is essential that the botanist should be able to describe the various characters briefly and accurately.

Most of the words used by botanists convey a precise shade of meaning that would require several words to explain to the layman. The words "pinnate" and "digitate" used earlier in this article are cases in point.

Where botanical terms have been used to avoid unnecessarily lengthy descriptions, the meaning of such terms can

usually be obtained by referring to the illustrations. Plate A, for instance shows the names of plant organs. Where leaf-shapes are given in technical terms, a glance at the plates or the text illustrations should provide the meaning.

The terms "axillary" and "terminal" refer to organs such as flower-heads which arise in two ways—from the angle formed by the base of the leaf-stalk and the stem (the leaf-axil), or when borne at the end of the stem or its branch.

"Stalkless" has been used instead of "sessile," and "individual flower-stalks" refer to the stalks of the individual flowers in the flower-cluster or "head."

The natural group to which subterranean clover belongs, contains three species which have, as a common characteristic, the presence of imperfect flowers in the middle, which, in the case of subterranean clover become outermost when the pods develop. Reference to the descriptions and the illustrations should overcome any difficulty here. Similarly with strawberry clover, shaftal clover and woolly clover, it may be necessary to observe plants in an advanced stage of flowering in order to understand the changes which take place in the form of the calyx when the plant is in pod.

THE CLOVERS—A GENERAL DESCRIPTION

THE true clovers are annual or perennial herbs. The leaves consist of three leaflets which are digitately, or pinnately arranged at the top of the common petiole or stalk; when digitate the leaflets are on short stalklets all of the same length; when pinnately arranged the middle leaflet is on a longer stalk.

The flowers are formed in dense clusters usually referred to as "heads." Actually the flowers, with few exceptions have short stalks or pedicels, to distinguish them from the common stalk, or peduncle of the flower-head. The heads vary from globular, i.e. more or less spherical in outline, to egg-shaped (ovate), oblong, or long and narrow (cylindrical).

The calyx, the cup-shaped organ which surrounds the base of the corolla, stamens and young pod, consists of a distinct tube with five tooth-like projections—the calyx teeth. These may be all alike, or of differ-

ent shape and size, in which case the lowest is usually longer than the other four. The petals are those of the typical pea flower, consisting of the outermost standard, the wings, and the keel, the latter enclosing the stamens and ovary. The standard is longer than the wings and keel, and the wings longer than the keel. All of these have narrow stalk-like bases.

The stamens are ten in number, the lowest nine being united to form a sheath which surrounds the ovary (immature pod) and style, the uppermost stamen being free.

The pod of the true clovers is small, and usually included in the calyx and withered corolla. The number of seeds varies from one to six. This pod remains unopened, or it opens by splitting longitudinally into two halves, or (as in red clover) it opens

transversely, the upper half falling off as a lid to the pod. The flowers are insect-pollinated.

There are approximately 290 species of *Trifolium*.

KEY TO THE SECTIONS

- A. Flowers in the head of two kinds the outer ones alone fertile and complete, the inner sterile and reduced to a solid calyx Sect. I. *Calycomorphum*.
- A. Flowers in the head all alike, all or mostly fertile.
 - B. Upper lip of the fruiting calyx hooded, much larger than the lower lip Sect. II. *Galearia*.
 - B. Calyx symmetrical swollen or enlarged, or remaining unchanged.
 - C. Calyx symmetrically inflated or enlarged, in fruit, 20-nerved and prominently reticulate between the nerves Sect. III. *Vesicastrum*.
 - C. Calyx not inflated, or if so, then 5-nerved.
 - D. Flowers each in the axil or a small bract, pedicellate.
 - E. Flowers yellow; calyx usually 5-nerved, the three anterior lobes distinctly larger than the two posterior Sect. IV. *Chronosemium*.
 - E. Flowers red, pink, purple or white; calyx usually 10- or more-nerved.
 - F. Calyx-teeth 3-nerved, recurved at maturity; corolla small Sect. V. *Micranthemum*.
 - F. Calyx-lobes straight; corolla much longer than the calyx Sect. VI. *Amoria*.
 - D. Flowers all or mostly without bracts, sessile or subsessile.
 - E. Calyx throat neither constricted by a callous rim nor nearly to completely closed by two callosities; calyx-lobes not spreading.
 - F. Calyx-tube 20-nerved Sect. VII. *Eikosineurum*.
 - F. Calyx-tube 10-nerved
 - G. Annuals; corolla not longer than the calyx; flowers pink Sect. VIII. *Agriophyllum*.
 - G. Perennial; corolla much longer than the calyx; flowers purple Sect. IX. *Leimonophyllum*.
- E. Calyx throat constricted or closed by a callous ring or by two marginal callosities which either completely close the throat or confine it to a straight slit.
 - F. Throat of calyx widely elliptical Sect. X. *Astrostoma*.
 - F. Throat of calyx closed or reduced to a narrow slit.
 - G. Annuals.
 - H. Lateral nerves of the leaflets straight, unthickened, directed forward obliquely, corolla glabrous, deciduous; calyx-lobes strongly spreading at maturity Sect. XI. *Orthoneurum*.
 - H. Lateral nerves of the leaflets with thickened ends, curving outwards; calyx-lobes not nerved Sect. XII. *Camptoneurum*.
 - G. Perennials Sect. XII. *Macrobiotum*.

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KEY TO THE SPECIES

Section I.—CALYCOMORPHUM

- A. Sterile flowers formed after the development of the fertile flowers; calyx teeth glabrous or almost so; pods usually ripening underground 1. *T. subterraneum* L.
- A. Sterile flowers formed simultaneously with the fertile flowers; calyx-tube densely hairy or woolly; fruiting heads deciduous, wind-distributed.
- B. Fertile flowers 15-20 *2. *T. globosum* L.
- B. Fertile flowers two 3. *T. pilulare* Boiss.

Section II.—GALEARIA

- A. Annuals; heads without an involucre of bracts.
- B. Fruiting calyx globular, reticulate, densely tomentose, with two short teeth of the upper lip concealed in the wool 4. *T. tomentosum* L.
- B. Fruiting calyx with a conical upper lip, the two long teeth apical and conspicuous 5. *T. resupinatum* L.
- A. Perennials, rooting at the nodes; flower-heads on peduncles longer than the leaves, surrounded by an involucre of bracts nearly as long as the calyces and united in the lower part 6. *T. fragiferum* L.

Section III.—VESICASTRUM

- A. Calyx 20-nerved, the lobes at length recurved; standard acute *7. *T. spumosum* L.
- A. Calyx \pm 35-nerved, the tube marked by two villous longitudinal lines *8. *T. xerocephalum* Fenzl.

Section IV.—CHRONOSEMIUM

- A. Standard narrowed at the base, \pm spoon-shaped, grooved at the apex; style shorter than the pod; flowers 5-7mm. long.
- B. Stipules half-ovate; flowers 5 mm. long 9. *T. campestre* Schreb.
- B. Stipules linear-oblong; flowers 7 mm. long 10. *T. aureum* Poll.
- A. Standard not narrowed at the base, keeled on the back, flowers 2-3 mm. long.
- B. Leaves pinnate; pedicels rather stout, shorter than the calyx-tube; standard entire; flower-heads usually 10-20 flowered, the flowers rarely reduce to four 11. *T. dubium* Sibth.
- B. Leaflets subsessile; pedicels slender, as long as the calyx-tube or longer; standard notched; heads 2-6 flowered 12. *T. micranthum* Viv.

Section V.—MICRANTHEMUM

- A. Flower-heads sessile in the leaf-axils, the flowers sessile.
- B. Calyx-lobes overlapping at the base, the base broad and rounded; standard pink 13. *T. glomeratum* L.
- B. Calyx-lobes tapering from a triangular base, the bases not overlapping; standard white 14. *T. suffocatum* L.
- A. Flower-heads on short slender peduncles, recurved in fruit; pedicels as long as the calyx-tube or slightly longer 15. *T. cernuum* Brot.

Section VI.—AMORIA

- A. Annual; flower-heads 4 cm. diameter, the upper flowers on long pedicels. Flowers large *16. *T. balansae* Boiss.
- A. Perennials; flower-heads 2 cm. diameter or less; flowers medium-sized; upper pedicels scarcely longer than the lower.
- B. Erect or ascending; stem hollow 17. *T. hybridum* L.
- B. Prostrate and creeping, rooting at the nodes; stems solid 18. *T. repens* L.

* These species are not yet naturalised

Section VII.—EIKOSINEURUM

- A. Heads sessile, sheathed by the uppermost opposite leaves, rarely in pairs, and then one peduncled; plant villous; upper stipules orbicular, sometimes leafless.
- B. Calyx half as long as the purple corolla, the lobes setaceous, equal, twice as long as the tube *19. *T. hirtum* All.
- B. Calyx nearly as long as the white or purplish corolla, the lobes equal, linear, as long as the villous calyx-tube 20. *T. Cherleri* L.
- A. Heads usually peduncled; plant sparingly appressed-hairy; free part of the stipules lanceolate-subulate; calyx shorter than the corolla, the lobes 5-nerved, more than twice as long as the glabrous tube 21. *T. lappaceum* L.

Section VIII.—AGRIOPHYLLUM

- A. Heads ultimately a cylindrical spike, peduncled; calyx-lobes usually 2-6 times as long as the tube, longer than the corolla; stipules caudate 22. *T. arvense* L.
- A. Heads predominantly sessile; calyx-lobes shorter than the tube and as long as corolla 23. *T. striatum* L.

Section IX.—LEIMONOPHYLLUM

- Perennial; peduncles lateral; flowers purple 24. *T. pratense* L.

Section X.—ASTROSTOMA

- A. Stipules acute, entire; flowers pale pink or white, in ovoid spikes.
- B. Corolla 2-6 mm. long, persistent; standard subequal to the lower petals 25. *T. ligusticum* Balb.
- B. Corolla 1-2 cm. long, deciduous; flowers white, the standard much longer than the lower petals.
- C. Leaflets oblong-elliptical to oblong; calyx-lobes thick at the base, nerveless *26. *T. carmelii* Boiss.
- C. Leaflets ovate-elliptical; calyx-lobes 3-nerved at the base 27. *T. Alexandrinum* L.
- A. Stipules broad, obtuse, often dentate; flowers in elongated spikes, the corolla red 28. *T. incarnatum* L.

Section XI.—ORTHONEURUM

- A. Throat of the calyx without a re-entrant callosity, crowned by a tuft of woolly hairs which is formed from the ring of woolly hairs projecting from the throat 29. *T. stellatum* L.
- A. Throat of the calyx with two glabrous, short-haired callosities, without a tuft of woolly hairs.
- B. Calyx-lobes 1-nerved or the lower ones 3-nerved at the base, the sinuses broad and rounded.
- C. Leaflets linear; flowers in elongated spikes 30. *T. angustifolium* L.
- C. Leaflets broad; flowers in globular heads or ovoid spikes *31. *T. Desvaurii* Boiss.
- B. Calyx-lobes 5-7 nerved, with distinct reticulations between, the sinus acute; calyx-tube campanulate *32. *T. clypeatum* L.
- B. Calyx-lobes 1-3-nerved *33. *T. squamosum* L.

Section XII.—CAMPTONEURUM

- Scabrous annual; Calyx-lobes spreading in fruit 34. *T. scabrum* L.

Section XIII.—MACROBIOTUM

- A. Flowers purple; plant stoloniferous 35. *T. medium* Huds.
- A. Flowers cream-coloured; plant erect *36. *T. ochroleucon* Huds.

* These species are not yet naturalised.

THE IDENTIFICATION OF THE SPECIES, BASED ON COMMON CHARACTERS

FOR convenience the clovers can be arranged in six groups according to characteristics common to each.

GROUP A.—THE PERENNIAL CLOVERS

These are plants which live for three or more years. The clovers of the other groups are all annuals, lasting for one season only.

GROUP B.—THE SUBTERRANEAN CLOVER GROUP

The only species of this group which buries its pods in the ground is subterranean clover. The characteristic feature of the group is that the flowers in the flower-head are of two types; an inside (often dense) head of flowers which consist of a solid calyx and no corolla, and an outer series of flowers (usually few) which have both calyx and corolla, and which produce pods.

GROUP C.—THE SUCKLING AND HOP CLOVER GROUP

These annual, often small, clovers have yellow flowers. In all other groups the flowers are purple, red, pink or white. Another characteristic is that, with the single exception of the slender suckling clover, the middle leaflet is on a longer stalk than the two lateral (side) leaflets. This is a useful character in the recognition of the plants before flowering, but does not serve to distinguish them from some of the small trefoils.

GROUP D.—THE BLADDER CLOVERS

In these annual species, the calyx after flowering becomes enlarged and somewhat bladderly. In some, such as shaftal, and woolly clover, the calyx becomes very unequal, the two uppermost teeth being borne on a helmet-shaped upper lip, the three lower remaining unaltered, while in others, such as bladder clover, the calyx remains symmetrical, with five equal teeth. The pod is enclosed in the enlarged calyx.

GROUP E.—THE HAIRLESS CLOVERS

These plants are all annual, with all their flowers perfect, the corolla is never yellow, and the calyx does not become enlarged. The stems, leaves and flowers are quite devoid of hairs.

GROUP F.—THE DOWNY—OR HAIRY—CLOVERS

These are annuals with the characteristics of group E, but the stems and leaves have a covering (loose or dense) of downy, soft, short or long hairs.

GROUP A.—PERENNIAL PLANTS

- A. Prostrate creeping plants which root at the joints of the stems.
- B. Flowers white, rarely pale pink, each flower of the head on a distinct slender stalk; veins of the leaflets not, or scarcely branched; leaflets often with a white crescent-shaped mark 18. White clover.
- B. Flowers rose-pink, each flower of the head stalkless, or the stalk obscure; veins of the leaflets branched and usually continued beyond the leaf-edge to form small teeth; flower-heads with an outside cup of brown toothed scales 6. Strawberry clover.
- A. Plants erect or the stems soon assuming an erect position, rooting only at the base.
- B. Flowers white (rarely pale pink), each flower on a distinct slender stalk, the stems hollow 17. Alsike clover.
- B. Flowers red or purple without individual stalks, or the stalks very short.
- C. Stipules oblong in shape, the upper free portion triangular and ending in a long fine point; flower-heads not or only shortly stalked; pod opening across (transversely), the upper half falling as a cap 24. Red clover.
- C. Stipules very long and narrow, the free part awl-shaped and spreading; flower-heads distinctly stalked; pod splitting lengthwise 35. Zigzag clover.

GROUP B.—THE SUBTERRANEAN CLOVER GROUP

- | | |
|---|-------------------------|
| <p>A. Seed-head burying the pods in the soil or earth debris; inner sterile flowers formed after the development of the outer fertile flowers; calyx of the inner sterile (undeveloped) flowers without any hairs, becoming rigid</p> | 1. Subterranean clover. |
| <p>A. Seed-head not burying the pods in the soil; inner (sterile) flowers densely hairy with long fine hairs, forming a soft cushion-like mass occupying the centre of the flower-head; sterile flowers formed at the same time as the perfect flowers.</p> | |
| <p>B. Perfect flowers several; stalks of the flower-heads longer than the leaves</p> | 2. Globe clover. |
| <p>B. Perfect flowers, one or two; stalks of the flower-heads shorter than the leaves</p> | 3. Pill clover. |

GROUP C.—THE BLADDER CLOVER GROUP

(All plants devoid of hairs except on the calyx, or entirely without hairs)

- | | |
|--|-----------------------|
| <p>A. Calyx when in seed becoming very irregularly swollen, the upper lip formed from the two uppermost calyx-teeth becoming hooded and much longer than the three lower teeth which remain more or less unaltered, densely woolly with matted hairs; flowers purple or pink, the corolla twice as long as the calyx-teeth when in flower.</p> | |
| <p>B. Flowers purple, upper lip of the calyx when in seed becoming conical, with two long bristle-like spreading points</p> | 5. Shaftal clover. |
| <p>B. Flowers pink; upper lip of the calyx when in seed almost globular, covered with brown wool, with two small down-curved points almost hidden in the brown wool</p> | 4. Woolly clover. |
| <p>A. Calyx remaining symmetrical after flowering, the tube becoming enlarged and swollen with the teeth equal and spreading. Flower-heads terminal on the stems and branches, entirely without hairs.</p> | |
| <p>B. Calyx quite hairless, with 20 veins</p> | 7. Bladder clover. |
| <p>B. Calyx with two longitudinal lines of hairs, the tube with about 35 longitudinal veins</p> | 8. Dry-headed clover. |

GROUP D.—THE HOP AND SUCKLING CLOVERS

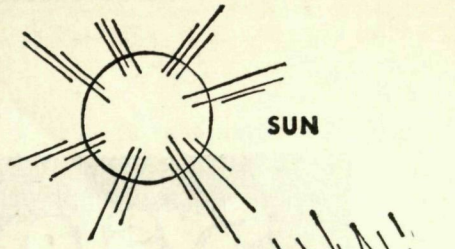
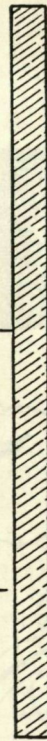
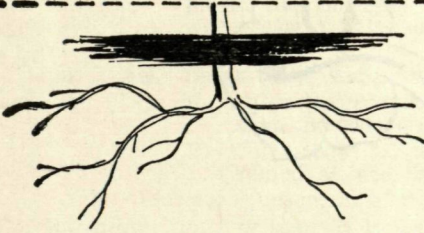
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| <p>A. Middle leaflet of the three leaflets on a longer stalk than the two lateral leaflets. Heads usually several to many-flowered.</p> | |
| <p>B. Standard (largest petal) narrow towards the base and grooved towards the tip, finally curving downwards over the pod.</p> | |
| <p>C. Stipules broad</p> | 9. <i>Trifolium campestre</i> . |
| <p>C. Stipules narrow</p> | 10. <i>Trifolium aureum</i> . |
| <p>B. Standard petal broad at the base, not grooved and remaining erect (not folded forward over the pod)</p> | 11. Common suckling clover. |
| <p>A. All three leaflets on equal very short stalks; flower-heads 2-6-flowered</p> | 12. Slender suckling clover. |

GROUP E.—THE HAIRLESS CLOVERS

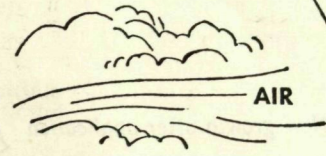
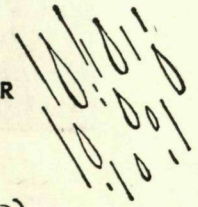
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| <p>A. The drooping-flowered clovers. Flowers, especially the upper or inner flowers of the head on long slender individual flower-stalks, so that the flowers droop.</p> | |
| <p>B. Flower-heads one inch or more in diameter on stalks longer than the leaves; calyx-teeth much longer than the hemispherical tube, finely awl-shaped</p> | 16. <i>Trifolium balansae</i> |
| <p>B. Flower-heads less than an inch in diameter, on stalks shorter than the leaves; calyx-teeth shorter than the tube, lance-shaped</p> | 15. Drooping-flowered clover. |



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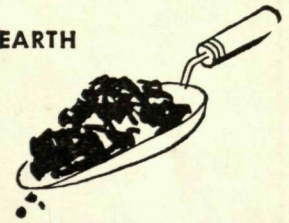


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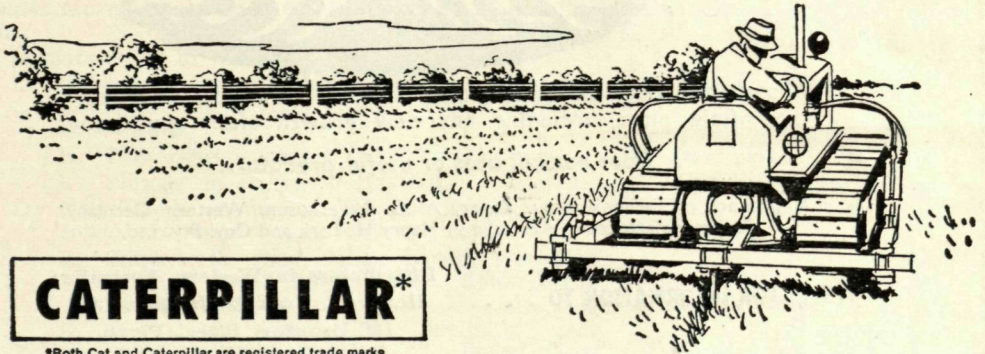
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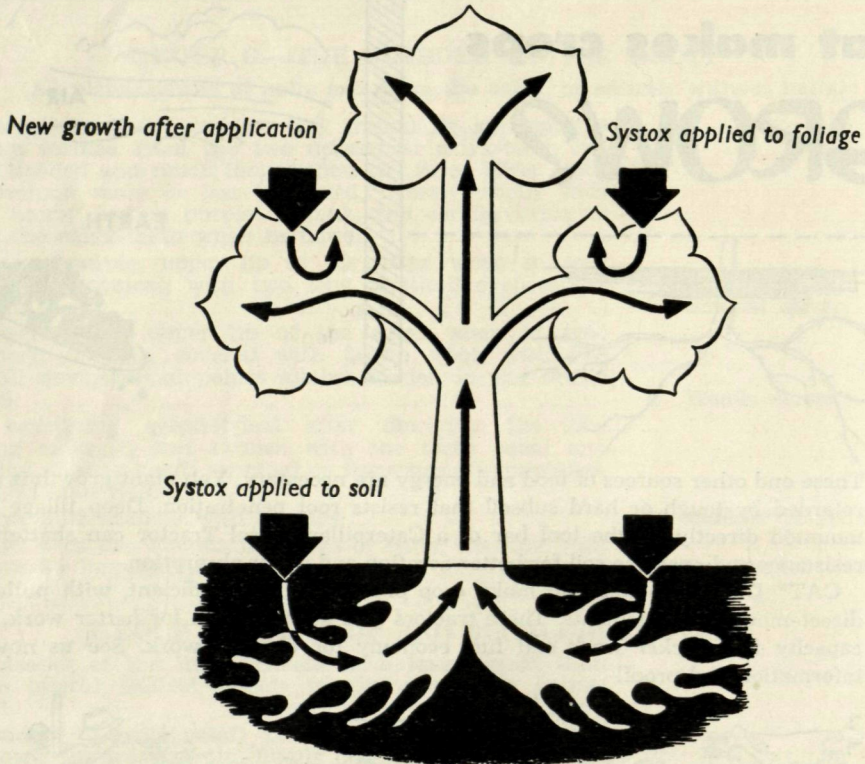
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- A. **The compact clovers**—the cluster-clover type. Flowers in compact heads, the individual flower-stalks absent, or extremely short.
 - B. Calyx-teeth about equal.
 - C. Corolla purplish-pink, longer than the calyx-teeth which are broad and spread when in seed 13. **Cluster clover.**
 - C. Corolla white, shorter than the calyx-teeth which are narrow and finely pointed 14. **Suffocated clover.**
 - B. Calyx-teeth very unequal, the lowest triangular and longer than the others which are shorter than the tube, and spine-like and spreading when in seed 33. **Sea clover.**

GROUP F.—THE HAIRY OR DOWNY CLOVERS

- A. Corolla much longer than the calyx, so that the flowers (corollas) are conspicuous in the flower-head.
 - B. Leaves all alternate; flowers purple-pink 31. **T. Desvauxii.**
 - B. Upper leaves opposite.
 - C. Flower-heads not stalked, the uppermost stipules broad and round, embracing the base of the flower-head 19. **Rose clover.**
 - C. Flower-heads stalked.
 - D. Flowers pink or white.
 - E. Calyx-teeth very unequal and broad, the lowest five times as long as the other four, with several veins or ribs, recurved when in seed 32. **Helmet or Oriental clover.**
 - E. Calyx-teeth ending in bristle-like points.
 - F. Calyx-teeth unequal, the lowest longer than the others, all without veins 26. **Carmel clover.**
 - F. Calyx-teeth all more or less equal, 3-veined at the base 27. **Berseem clover.**
 - D. Flowers crimson, in elongated spikes 28. **Crimson clover.**
- A. Corolla shorter than, or scarcely longer than, the calyx-teeth, so that the flowers are inconspicuous.
 - B. Stipules broad and obtuse.
 - C. Flower-heads loose, 1-1½ inches in diameter; stipules below the slender flower-head stalks, toothed in the upper half 29. **Star clover.**
 - C. Flower-heads compact, less than half an inch in diameter; uppermost stipules opposite, embracing the greater part of the flower-head; stipules broad at top, not toothed 20. **Cupped clover.**
 - B. Stipules tapering into an acute, sometimes a bristle-like point.
 - C. Leaflets broad or wedge-shaped.
 - D. Calyx-teeth much longer than the tube, the heads, especially when in seed, with a burr-like appearance.
 - E. Flower-heads round (globular) 21. **Burr clover.**
 - E. Flowers in elongated spikes 25. **Ligurian clover.**
 - D. Calyx-teeth about as long as the calyx-tube, spikes egg-shaped or shortly cylindrical.
 - E. Calyx-teeth rigid, lance-shaped, spreading when in seed; flowers white; flower-heads not stalked 34. **Rough clover.**
 - E. Calyx-teeth awl-shaped, remaining erect when in seed; flowers pink; flower-heads not stalked 23. **Knotted clover.**
 - C. Leaflets narrow, much longer than broad.
 - D. Corolla shorter than the calyx; stems slender and branched, finely hairy 22. **Hare's foot clover.**
 - D. Corolla as long as the calyx; stem usually single and unbranched; plant coarsely hairy 30. **Narrow-leaved clover.**

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DESCRIPTIONS OF THE SPECIES

1.—SUBTERRANEAN CLOVER

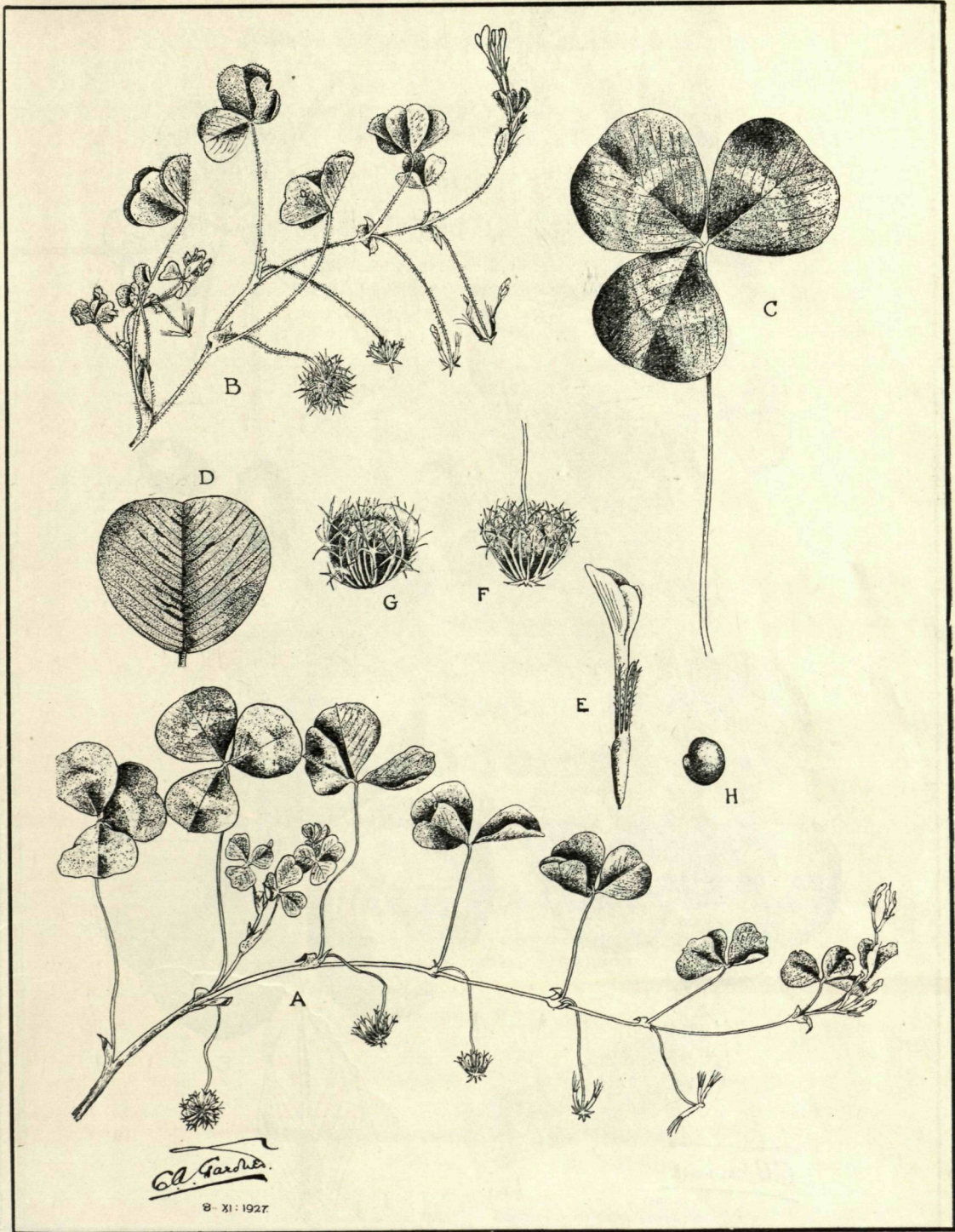
(Trifolium subterraneum L.)

(From the Latin, in reference to its habit of burying its seeds in the soil).

As the name implies, subterranean clover normally buries its seed-pods in the soil, or, if the soil is too hard to allow of penetration, the pods are found among the plant debris on the ground. The mechanism which renders burial possible is found in the centre of the flower-head which consists of a number of infertile flowers of which only the calyx is de-

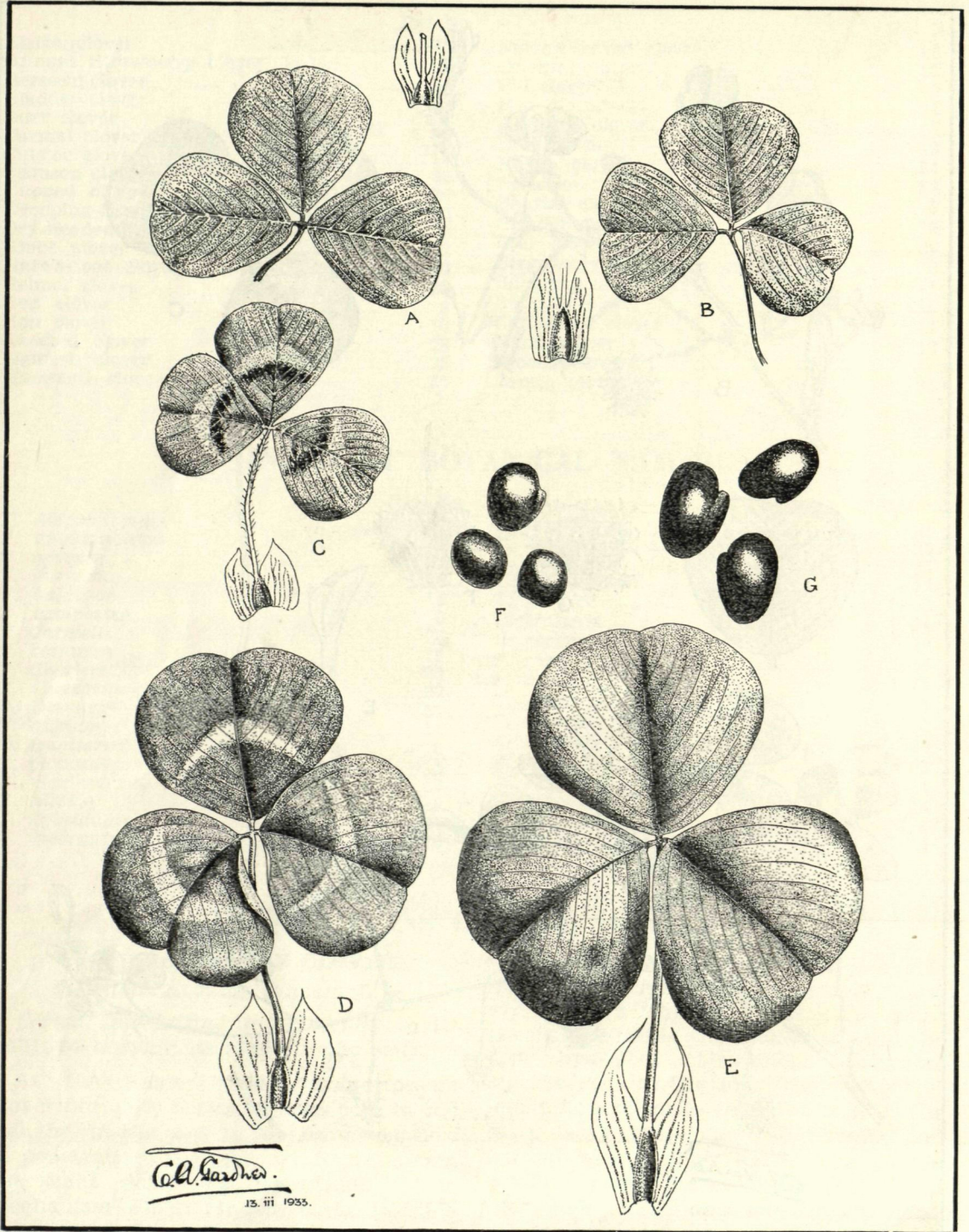
veloped, this being a solid structure with narrow teeth surrounding a central "boss" which has a terminal point. This point assists in burying the seed-head, and the firm calyx-lobes act as anchors in securing the pods in the soil. The number of fertile flowers varies from two to five. The calyx teeth are long and narrow, and fringed with slender hairs. The corolla is white, rarely red or pink often striped with pink. The pods are brown, hard, netted and exserted from the split calyx.

Subterranean clover is native to the Mediterranean region and the Orient.



1.—SUBTERRANEAN CLOVER (*Trifolium subterranean* L.)

A—Habit; B—Stages in floral development; C—Leaf; D—Leaflet; E—Flower; F and G—Seed heads; H—Seed.



1.—SUBTERRANEAN CLOVER (*Trifolium subterranean* L.)

A—Dwalganup strain; B—Daliak strain; C—Northam early strain; D—Mount Barker strain; E—Wenigup strain; F and G—Seeds.

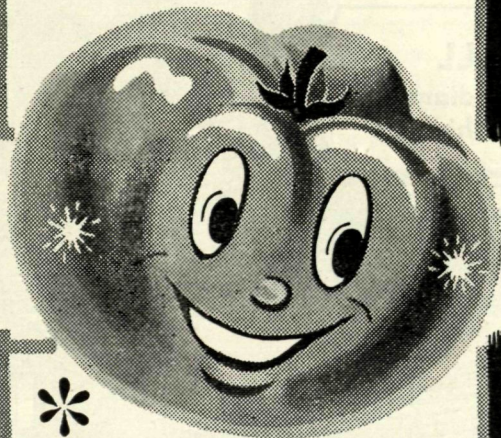
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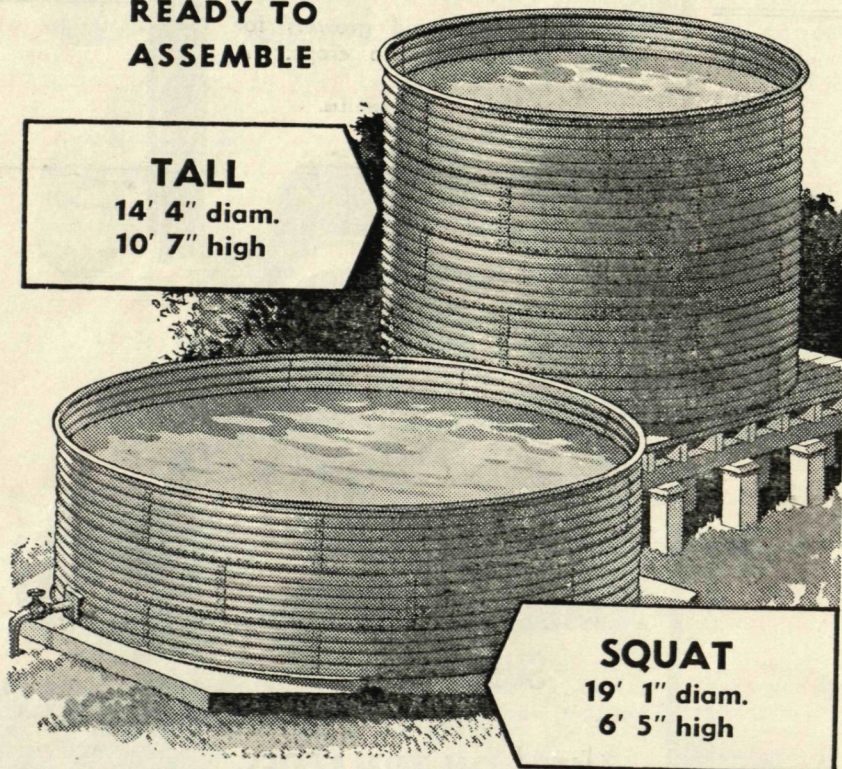
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2.—GLOBE CLOVER
(*Trifolium globosum* L.)

(From the Latin *globosus*—spherical or globular).

Globe clover is an annual plant of low, trailing and spreading growth, attaining to a diameter of two or three feet, with hairy stems and leaves. The stalks of the flower-heads are erect and usually longer than the leaves, the leaflets of which vary from egg-shaped to heart-shaped. The stipules are ovate and acute. Like subterranean clover, there are two types of flowers, the outer fertile, the inner sterile and without any corolla. The number of fertile flowers varies from five to about 20 with very narrow, densely hairy, slender teeth, and a pale pink corolla slightly longer than the calyx. The centre of the head consists of a dense mass of sterile flowers, each devoid of a corolla, and having long, almost filamentous, teeth covered with long fine hairs, and forming

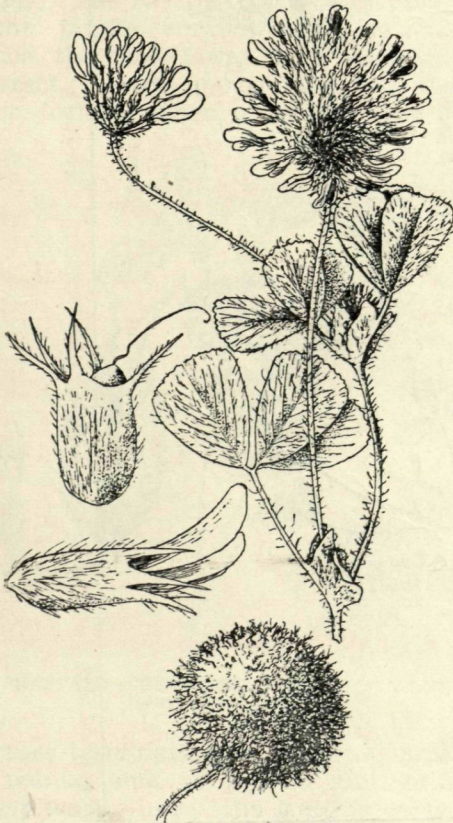
a soft cushion-like mass. The seed-pods are thin, and included in the calyx. The seeds are not buried in the soil.

Globe clover is native to Greece, Turkey and Asia Minor.

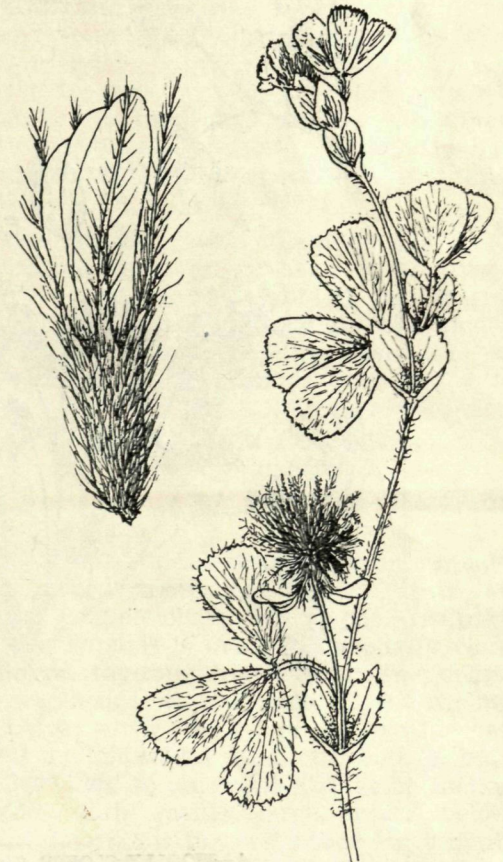
3.—PILL CLOVER
(*Trifolium pilulare* Boiss.)

(From the Latin, *pilula*—a globule).

Pill clover has much the same habit of growth as globe clover, and is similarly hairy. The stalks of the flower-heads however, are usually very short, the free part of the stipules is *obtuse*. There are only one or two fertile flowers with a hairy calyx and thread-like hairy teeth, the greater part of the flower-head consisting of numerous sterile flowers represented by a narrow calyx with very long and slender lobes covered by long hairs. The corolla of the fertile flowers is white. The pod, like that of globe clover is membranous and included in the calyx-tube of the fertile flower.



2.—GLOBE CLOVER (*Trifolium globosum* L.)



3.—PILL CLOVER (*Trifolium pilulare* Boiss.)

This clover is native to Asia Minor and Syria. It has been received as a naturalised clover from the West Pingelly district.

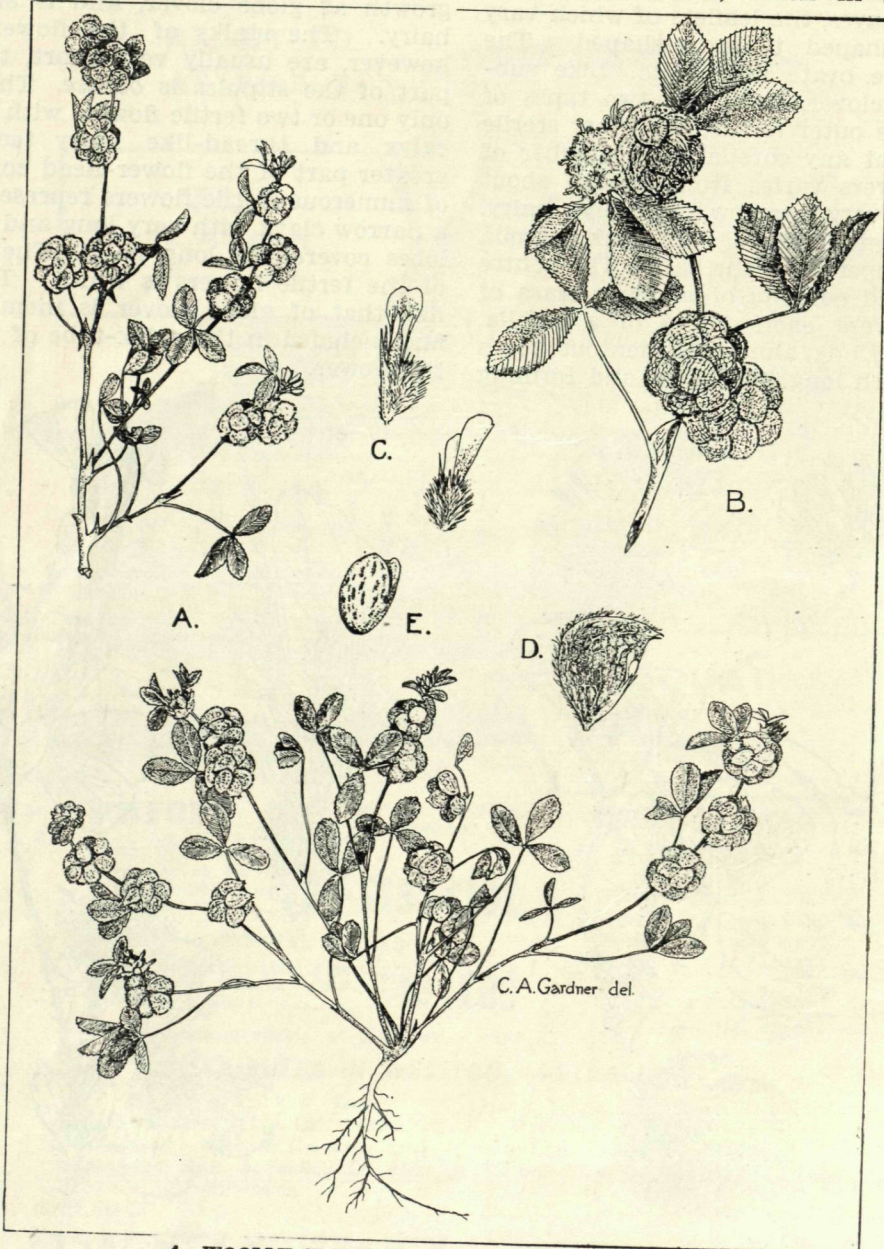
4.—WOOLLY CLOVER

(*Trifolium tomentosum* L.)

(From the Latin *tomentosus*—woolly).

Woolly clover is an annual plant with spreading stems extending to a diameter of 12 inches or more.

There are no hairs on the stems and leaves which are a bright green in colour. The free part of the stipules is narrow and acute. The stalks of the flower-heads are shorter than the leaves, or sometimes almost absent, and the flowers in the head are practically without stalks. The calyx is little more than half as long as the pale pink corolla; when in fruit it is



4.—WOOLLY CLOVER (*Trifolium tomentosum* Linn.).

A—Plant showing habit; B—Flowering and fruiting heads; C—Flower; D—Pod; E—Seed.

bladdery, pink, turning brown, almost globular, and covered with brown wool. The pods are small and compressed.

Woolly clover takes its name from the woolly seeding heads. It is native to the Mediterranean region, and naturalised in South Western Australia, extending inland to the limits of wheat culture.

5.—SHAFTAL CLOVER OR REVERSED CLOVER

(*Trifolium resupinatum* L.)

(From the Latin *resupinatus*—bent back).

This clover is also known as annual strawberry clover. It is an annual spreading plant quite devoid of hairs except on the calyx. The leaves vary considerably in shape and size, and the free part of the stipules tapers to a fine point. The flower-heads vary from longer than the leaves to much shorter. The flowers are not numerous in the head and are almost stalkless. The calyx is about half as long as the purple corolla, and unequally toothed, the three lower teeth being short and erect, the two upper united and much longer, forming when in fruit a cone-like



5.—SHAFTAL or REVERSED CLOVER (*Trifolium resupinatum* L.).

structure terminating in two fine spreading points, pink in colour, and rather densely woolly-hairy, the fruiting calyx is curved downwards. The pod is small and compressed.

Shaftal clover is fairly common in the Vasse district, as a naturalised plant. It is native to western Europe and the Mediterranean region.

6.—STRAWBERRY CLOVER

(*Trifolium fragiferum* L.)

(From the Latin *fraga*—strawberries).

This plant is a strong-rooted perennial with a partiality for soils rich in lime. It has creeping stems which root at the joints, and is entirely without hairs. The leaflets are relatively small, bright green and with close veins which usually project from the leaf margins in minute teeth. The leaf-stalk is generally elongated. The free part of the stipules is lance-shaped, rather small, and ends in a sharp narrow point. The flower-heads are globular, small, and surrounded at the base by a cup of brown, lacerated bracts. The flowers are on very short stalks. The calyx is less than half as long as the pink corolla, and unequally toothed, the three lower teeth straight and small, the two upper much larger and bent forwards, when in pod forming a netted inflated bladder, the two sharp teeth of the upper lip protruding over those of the lower lip. The pod is small, egg-shaped, and enclosed in the inflated calyx.

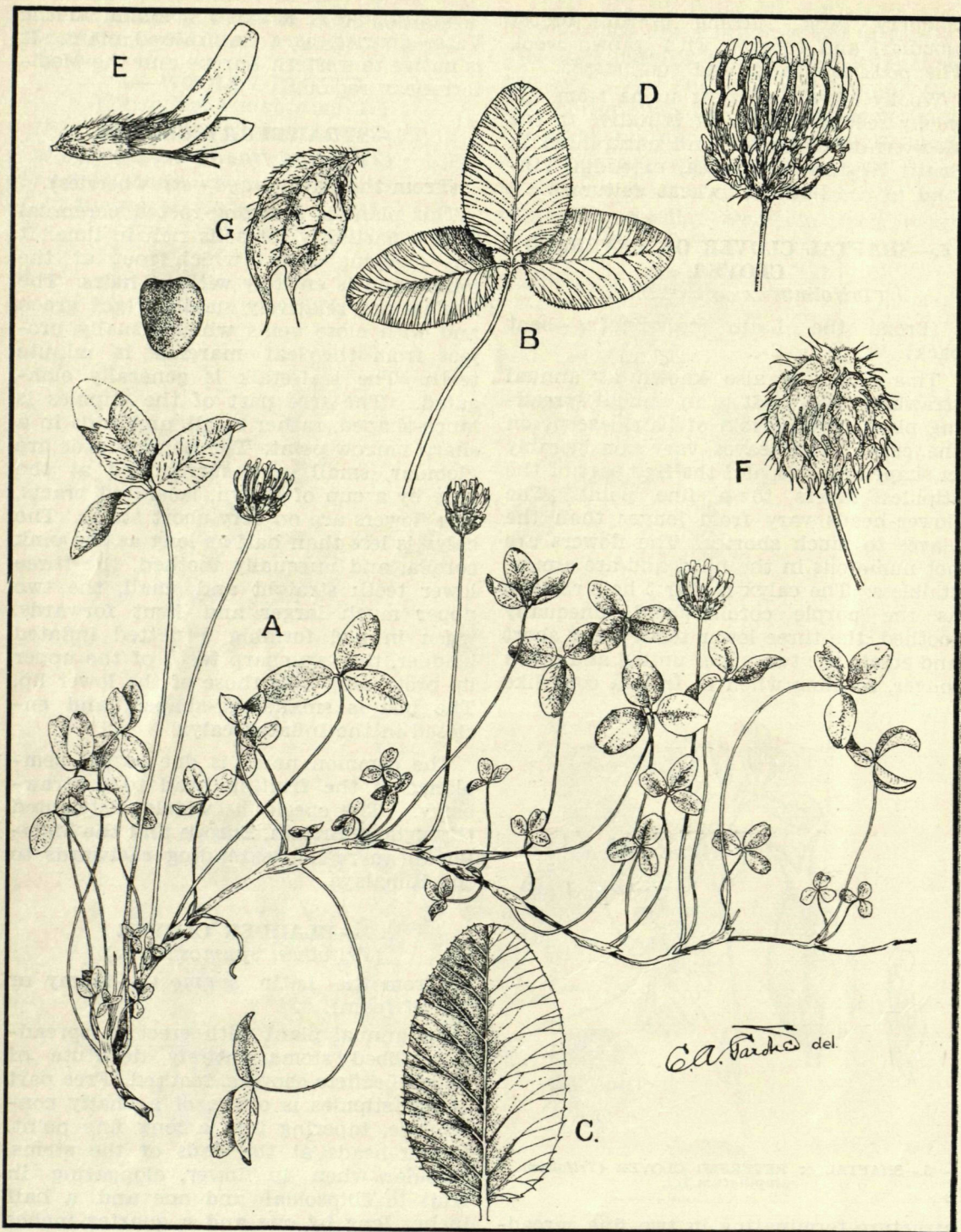
The common name is due to the resemblance of the fruiting head to a strawberry. The species is widely distributed throughout Britain, Europe and the Mediterranean region, extending eastwards to the Himalaya.

7.—BLADDER CLOVER

(*Trifolium spumosum* L.)

(From the Latin, *spumosus*—foamy or full of foam).

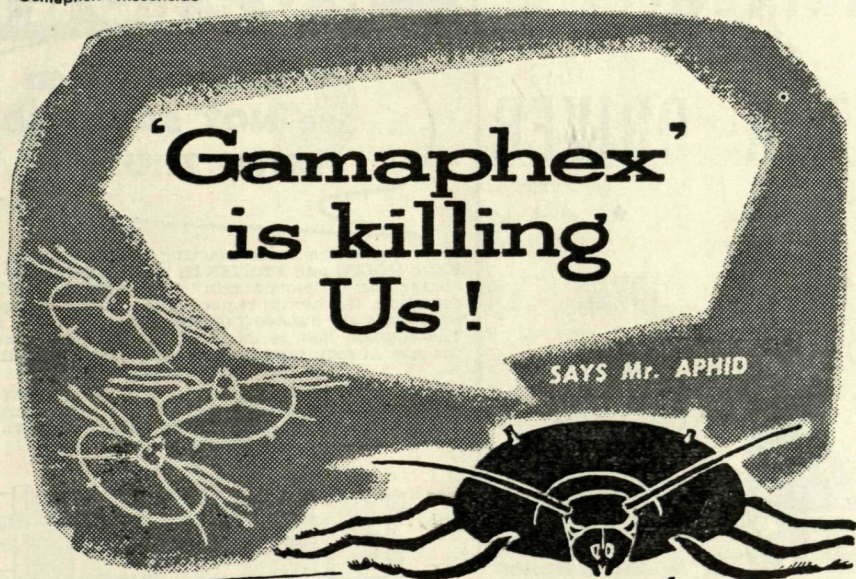
An annual plant with erect or spreading ribbed stems, entirely destitute of hairs. Leaflets obovate, toothed. Free part of the stipules is ovate, of a chaffy consistence, tapering into a long fine point. Flower-heads at the ends of the stems, globular when in flower, elongating in fruit to ellipsoidal and one and a half inches long by one and a quarter inches broad., with rather large bracts below each flower, the flowers rather large, pink in colour. Calyx 20-nerved, the nerves or veins very prominent with the addition



6.—STRAWBERRY CLOVER (*Trifolium fragiferum* L.).

A—Habit; B—Leaf; C—Leaflet; D—Flower head; E—Flower; F—Fruiting head; G—Fruiting calyx and seed.

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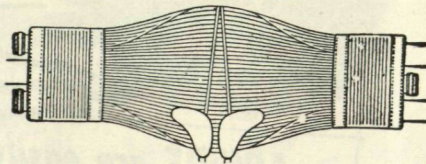
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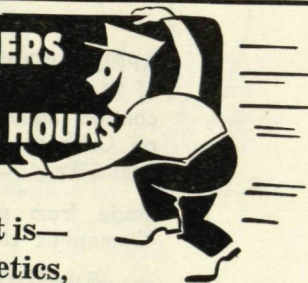
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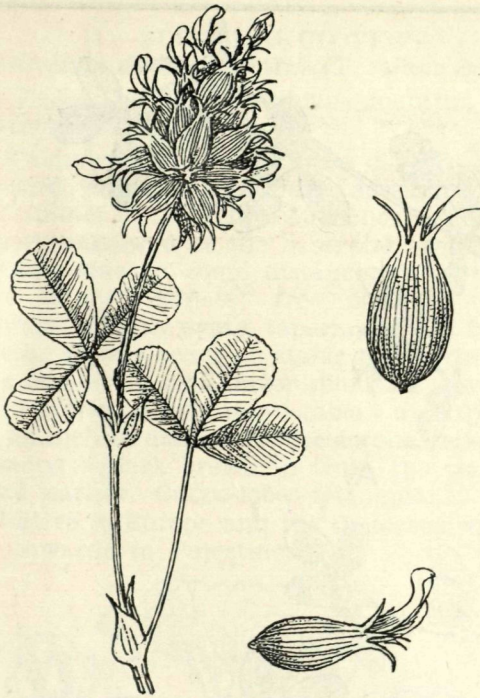
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7.—BLADDER CLOVER (*Trifolium spumosum* L.).

of numerous transverse nerves between and connecting them, very shortly stalked, enlarging and becoming bladder-like when in pod, with rather fine equal spreading or recurved teeth, the tube much narrowed at the top. Corolla much longer than the calyx.

The plant is native to the Mediterranean region. It is not yet naturalised, but under experimental cultivation shows some promise as a pasture species. The large bracts under the individual flowers are finely lined, and characteristic of this plant.

8.—DRY-HEADED CLOVER

(*Trifolium xerocephalum* Fenzl.)

(From the Greek, *xeros*—dry and *kephale*—a head).

An annual plant almost entirely without hairs, the stems spreading or creeping. Leaflets oblong to broadly obovate, with finely toothed margins and usually a small short terminal point. The free part of the stipules has long fine points. Flower-heads at the ends of the stems and its branches, each flower with a bract at the base, the

heads globular, less than an inch in diameter, densely flowered, elongated in fruit. Calyx inflated in fruit, somewhat pear-shaped, with numerous (about 36) nerves or veins, and marked by two hairy longitudinal lines, the lobes equal. Flowers purple.

Native to Asia Minor and Syria. Under experimental cultivation this plant shows some promise under local conditions.

9.—HOP CLOVER

(*Trifolium campestre* Schreb.) (*T. agrarium* L. and *T. procumbens* L.)

(From the Latin, *campestris*—growing in fields).

An annual plant with creeping or ascending stems, sparingly downy. Leaflets obovate to oblong-rhomboidal, obtuse, sometimes notched. The free part of the stipules is ovate, tapering at the end. Stalks of the flower-heads as long as or longer than the leaves. Flower-heads egg-shaped, dense, less than half an inch in diameter, each flower distinctly stalked. Calyx teeth unequal, the upper ones triangular, the three lower narrower, all longer than the tube. Corolla yellow, the standard broad and rounded.

Native to Europe. A common naturalised species.

10.—HOP CLOVER

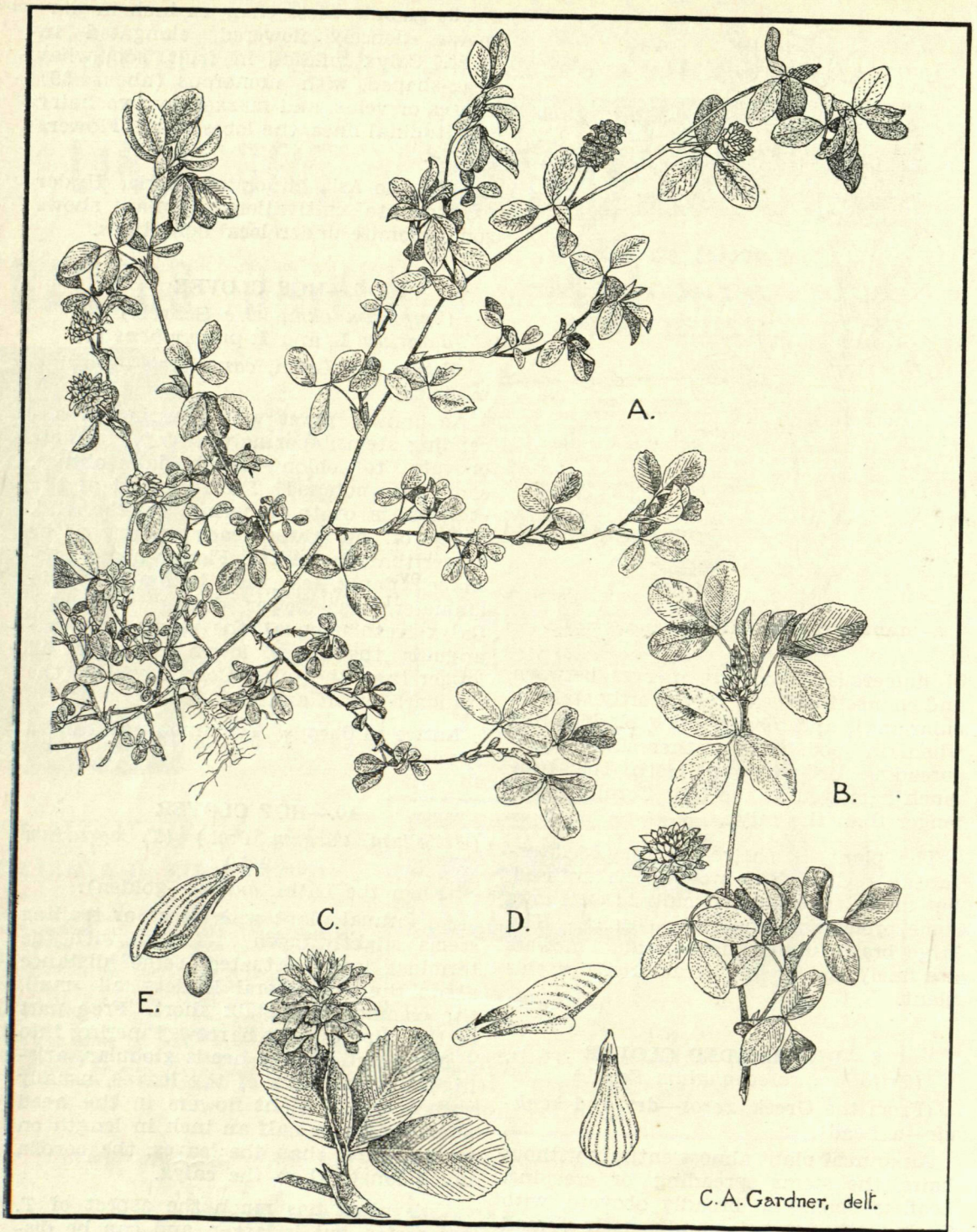
(*Trifolium aureum* Poll.) (*T. agrarium* auct.)

(From the Latin, *aureus*—golden).

An annual plant with erect or trailing stems, slightly downy. Leaves with the terminal leaflet situated some distance above the two lateral leaflets, all small, the common leaf-stalk short. Free part of the stipules very narrow, tapering into a fine point. Flower heads globular, arising from the axils of the leaves, usually with seven or eight flowers in the head which is rarely half an inch in length on stalks longer than the leaves, the corolla much longer than the calyx.

This plant has much the aspect of *T. campestre*, but is larger, and can be distinguished by the longer corolla.

Native to Europe, from Norway to Spain and eastwards to Russia and Asia Minor.



9.—HOP CLOVER (*Trifolium campestre* Schreb.).

A and B—Habit; C—Leaf and flower head; D—Flower; E—Mature flower and seed.

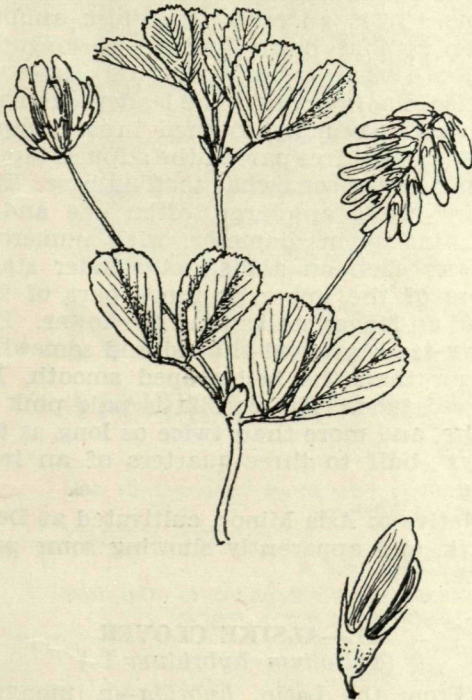
11.—SUCKLING CLOVER

(*Trifolium dubium* Sibth.) (*T. minus* Sm.)

(From the Latin, *dubius*—doubtful, of uncertain affinity).

A slender annual which lies close to the ground, more or less hairy, spreading to a diameter of from 12 to 18 inches. Leaflets small, narrowed at the base, the terminal leaflet situated some distance above the two lateral leaflets; free part of the stipules broadly ovate, tapering into a fine point. Flower heads on stalks arising from the leaf-axils, and longer than the leaves, 4-20-flowered, very small (about a quarter of an inch in diameter), the corolla yellow, turning a dark brown in fruit, the standard narrow. Calyx-lobes triangular.

Native to Europe and the Caucasus, and southwards to Palestine.



11.—SUCKLING CLOVER (*Trifolium dubium* Sibth.)
(*T. minus* Sm.)

12.—SLENDER SUCKLING CLOVER

(*Trifolium micranthum* Viv.) (*T. fliforme* auct.)

(From the Greek, *mikros*—small, and *anthos*—flower).

A small, slender, hairless annual with small leaves on very short stalks, the leaflets all stalkless, almost wedge-shaped and toothed at the apex; the free part of

the stipules oblong and acute. Flower-heads on slender stalks as long as or longer than the leaves, two- to six-flowered, the individual flowers on slender stalks as long as or longer than the calyx-tube, the calyx teeth very narrow, about as long as the tube; corolla yellow, very small, the standard broad and notched.

Native to Europe and the Caucasus.

13.—CLUSTER CLOVER

(*Trifolium glomeratum* L.)

(From the Latin, *glomeratus*—collected into heads).

A small, slender, spreading annual plant totally, or almost quite without hairs, the stems trailing or spreading. Leaflets less than half an inch long; free part of the stipules ovate to lance-shaped, tapering into a long fine point. Flower heads about half an inch in diameter, globular, without a common stalk, mostly in the axils of the leaves. Calyx-tube without hairs, the teeth ovate, rigid, spreading and often reflexed after flowering, becoming rigid and spine-like. Corolla much longer than the calyx, purplish or pink, the standard folded over the other petals.

Native to Europe and the Mediterranean region, extending eastwards to Syria and Palestine.



13.—CLUSTER CLOVER (*Trifolium glomeratum* L.)

14.—SUFFOCATED CLOVER

(*Trifolium suffocatum* L.)

(From the Latin, *suffocatio*—suffocation).

Suffocated clover is typically a small tufted annual with shortly creeping stems seldom more than three or four inches in length, the whole plant without hairs. Leaflets more or less wedge-shaped and notched, with prominent spreading nerves or veins. The small flowers are in dense heads without a common stalk, and at the ends of the branches as well as in the axils of the leaves. The calyx is relatively narrow and thin, with narrow acute teeth about as long as the narrow tube. The corolla is white, and shorter than the calyx-teeth.

Southern Europe and the Caucasus; also naturalised in, or native to, Britain. Fairly common on the western coastal plain in South Western Australia.



14.—SUFFOCATED CLOVER (*Trifolium suffocatum* L.).

15.—DROOPING FLOWERED CLOVER

(*Trifolium cernuum* Brot.)

(From the Latin, *cernuus*—falling with the face downwards).

A prostrate annual, the stems spreading to a diameter of two feet or more, the whole plant devoid of any hairs. Leaves on long stalks, the leaflets obovate-cuneate, toothed, strongly nerved; free

part of the stipules with a broad base tapering into a long fine point. Flower-heads loose, on stalks usually about as long as or shorter than the head, the flowers on distinct slender stalks nearly as long as the calyx, and usually recurved. Calyx-tube rather narrow, the lobes lance-shaped, slightly shorter than the calyx-tube and tapering into fine points. Corolla pink, slightly longer than the calyx. Pod 2-3-seeded, the seeds yellow.

Native to Southern France and Spain, naturalised and cultivated in South-Western Australia, common in moist depressions as far east as Meckering and Pingelly.

16.—TRIFOLIUM BALANSAE BOISS.

(Derivation unknown).

This clover appears to have no common name. It is an erect or diffuse annual, quite without hairs, and with elongated hollow ribbed stems with the leaves at rather long intervals. The leaflets are narrow and distinctly toothed in the upper part, and the free part of the stipules tapers from a broad somewhat toothed base. The flower-heads are large, often one and a half inches in diameter, with numerous flowers each on a distinct slender stalk, those of the upper or inner part of the head on longer stalks than the lower. The calyx-teeth are awl-shaped and somewhat longer than the bell-shaped smooth, 10-nerved tube. The corolla is pale pink or white, and more than twice as long as the calyx—half to three-quarters of an inch long.

Native to Asia Minor, cultivated at Denmark, and apparently showing some promise.

17.—ALSIKE CLOVER

(*Trifolium hybridum* L.)

(From the Latin, *hybrida*—a mongrel, supposedly a hybrid).

An erect or spreading annual, often more than 18 inches tall, with hollow stems. Leaflets large, elliptical in outline, on stalks up to four inches in length; free part of the stipules oblong, terminating in a fine point. Flower-heads in the axils of the leaves, globular, often more than an inch in diameter, on stalks about three inches long. Flowers, especially the upper ones, on slender stalks longer than the calyx-



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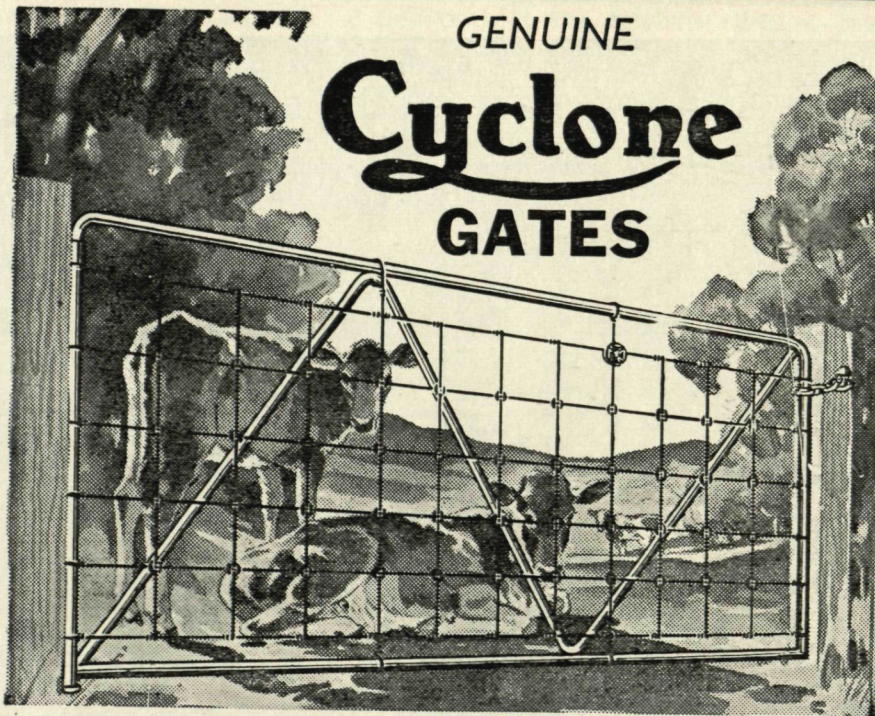
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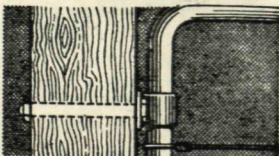
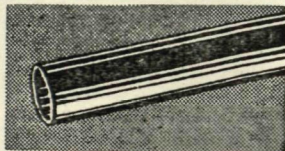


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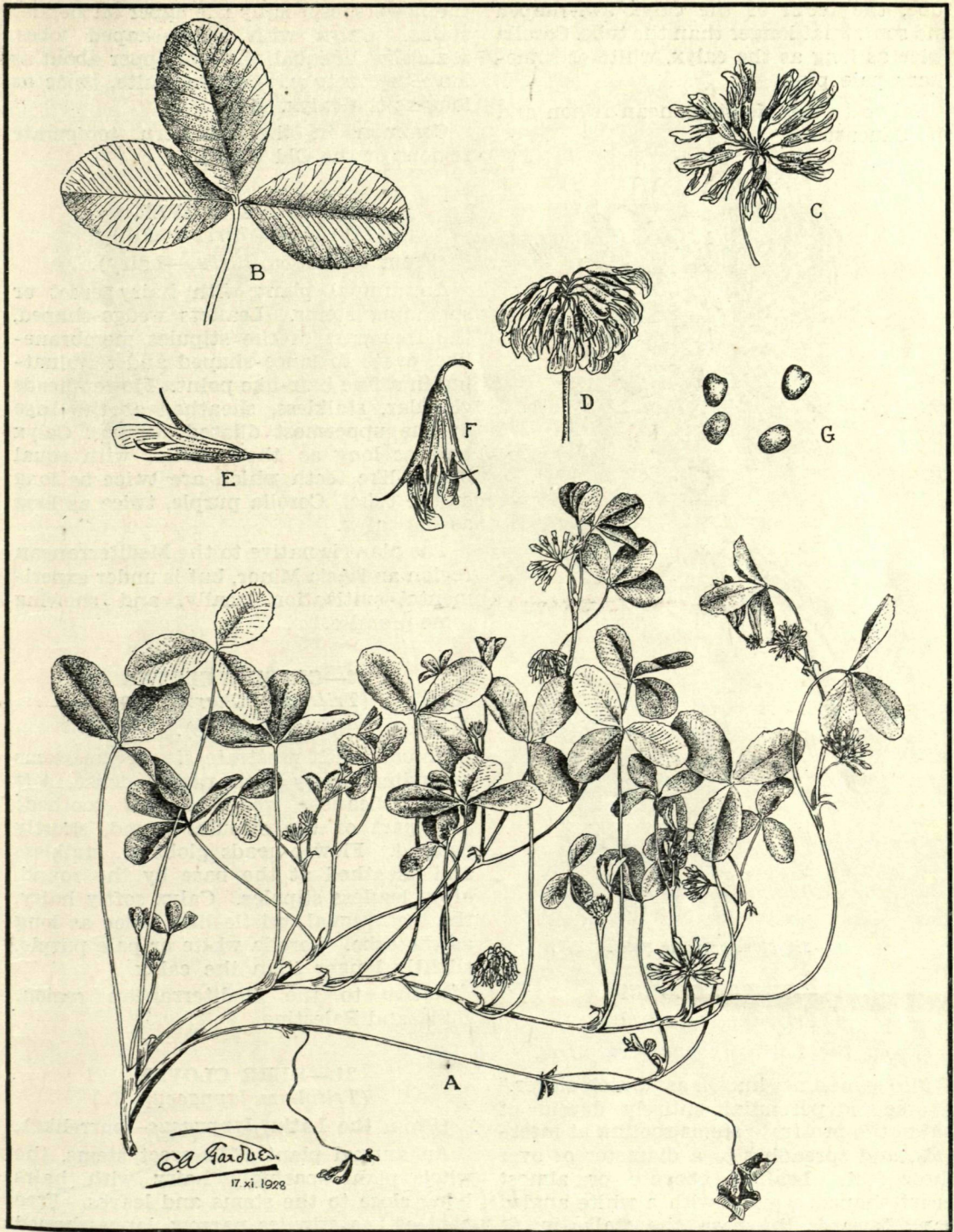


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15.—DROOPING-FLOWERED CLOVER (*Trifolium cernuum* Brot.).

A—Habit; B—Leaf; C and D—Flower heads; E and F—Flowers; G—Seeds.

tube, the teeth of the calyx awl-shaped and somewhat longer than the tube. Corolla twice as long as the calyx, white or sometimes pale pink.

Native to the Mediterranean region and the Caucasus.

the flowers, especially the upper on slender stalks. Calyx with lance-shaped lobes, somewhat unequal, the two upper about as long as the tube. Corolla white, twice as long as the calyx.

Common in the northern temperate regions of the Old World.



16.—*Trifolium balansae* Boiss.

18.—WHITE CLOVER

(*Trifolium repens* L.)

(From the Latin, *repens*—creeping).

Also sometimes known as "Dutch clover." A creeping perennial entirely devoid of hairs, the prostrate stems rooting at intervals, and spreading to a diameter of over three feet. Leaflets obovate or almost heart-shaped, usually with a white angled band towards the base, the stalks up to six inches in length, but sometimes very short; free part of the stipules oblong with a short narrow point. Flower-heads globular, on stalks arising from the leaf axils,

19.—ROSE CLOVER

(*Trifolium hirtum* All.)

(From the Latin, *hirtus*—hairy).

An annual plant with hairy erect or spreading stems. Leaflets wedge-shaped, the free part of the stipules membrane-like, ovate to lance-shaped and terminating in a fine hair-like point. Flower-heads globular, stalkless, sheathed at the base by the uppermost dilated stipules. Calyx half as long as the corolla, with equal bristle-like teeth which are twice as long as the tube. Corolla purple, twice as long as the calyx.

The plant is native to the Mediterranean region and Asia Minor, but is under experimental cultivation locally, and showing some promise.

20.—CUPPED CLOVER

(*Trifolium Cherleri* L.)

(From a personal name).

Annual, with prostrate stems, the stems ascending, hairy with rather dense, soft hairs. Leaflets wedge-shaped, toothed; free part of the stipules round, shortly pointed. Flower-heads globular, stalkless and sheathed at the base by the round, often leafless stipules. Calyx softly hairy, the teeth equal, bristle-like, twice as long as the tube. Corolla white or pale purple, slightly longer than the calyx.

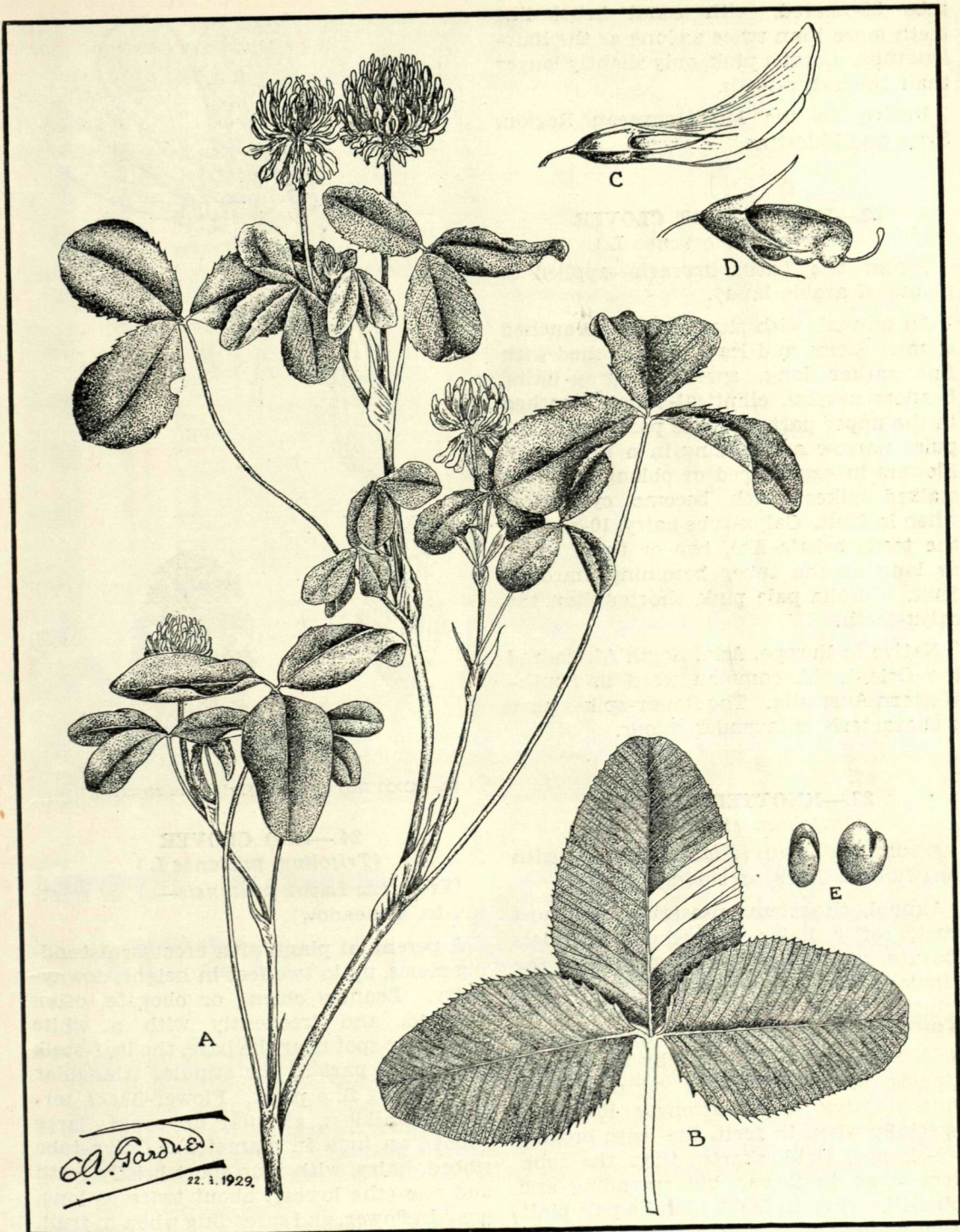
Native to the Mediterranean region, Syria and Palestine.

21.—BURR CLOVER

(*Trifolium lappaceum* L.)

(From the Latin, *lappaceus*—burr-like).

An annual plant with erect stems, the whole plant sparingly hairy with hairs lying close to the stems and leaves. Free part of the stipules narrow, lance-shaped and finely pointed, the leaflets narrow to somewhat heart-shaped. Flower-heads globular, with stalks, or stalkless between the uppermost opposite stipules. Calyx



17.—ALSIKE CLOVER (*Trifolium hybridum* L.).

A—Habit; B—Leaf; C—Flower; D—Pod; E—Seed.

tube 20-nerved, with equal bristle-like teeth more than twice as long as the hairless tube. Corolla pink, only slightly longer than the calyx-teeth.

Native to the Mediterranean Region, Syria and Palestine.

22.—HARE'S FOOT CLOVER

(*Trifolium arvense* L.)

(From the Latin, *arvensis*—applied to plants of arable land).

An annual, with slender erect branched stems. Stems and leaves are clothed with fine, rather long, spreading grey hairs. Leaflets narrow, elliptical-oblong, toothed in the upper part, the free part of the stipules narrow and ending in a fine point. Flowers in egg-shaped or oblong terminal stalked spikes which become cylindrical when in fruit. Calyx-tube hairy, 10-nerved, the teeth bristle-like, two or three times as long as the tube, becoming hard in fruit. Corolla pale pink, shorter than the calyx-teeth.

Native to Europe, Asia, North Africa and the Orient. A common weed in South-Western Australia. The flower-spikes have a characteristic lavender colour.

23.—KNOTTED CLOVER

(*Trifolium striatum* L.)

(From the Latin, *striatus*—marked with longitudinal lines or ridges).

Annual, the stems prostrate to almost erect, softly hairy throughout. Leaflets obovate, slightly toothed. Free part of the stipules ovate to triangular, with long fine points. Flower-heads terminal and in the axils of the leaves, without any common stalk, sheathed at the base by the dilated stipules, becoming oblong or conical in fruit. Calyx hairy, strongly 10-ribbed, especially when in fruit, the teeth broadly awl-shaped, rigid, shorter than the tube, erect when in flower, but spreading and spine-like when in fruit. Corolla pale pink, about as long as the calyx-teeth, the standard folded over the lower petals.

Native to Southern Europe and Asia Minor.



23.—KNOTTED CLOVER (*Trifolium striatum* L.)

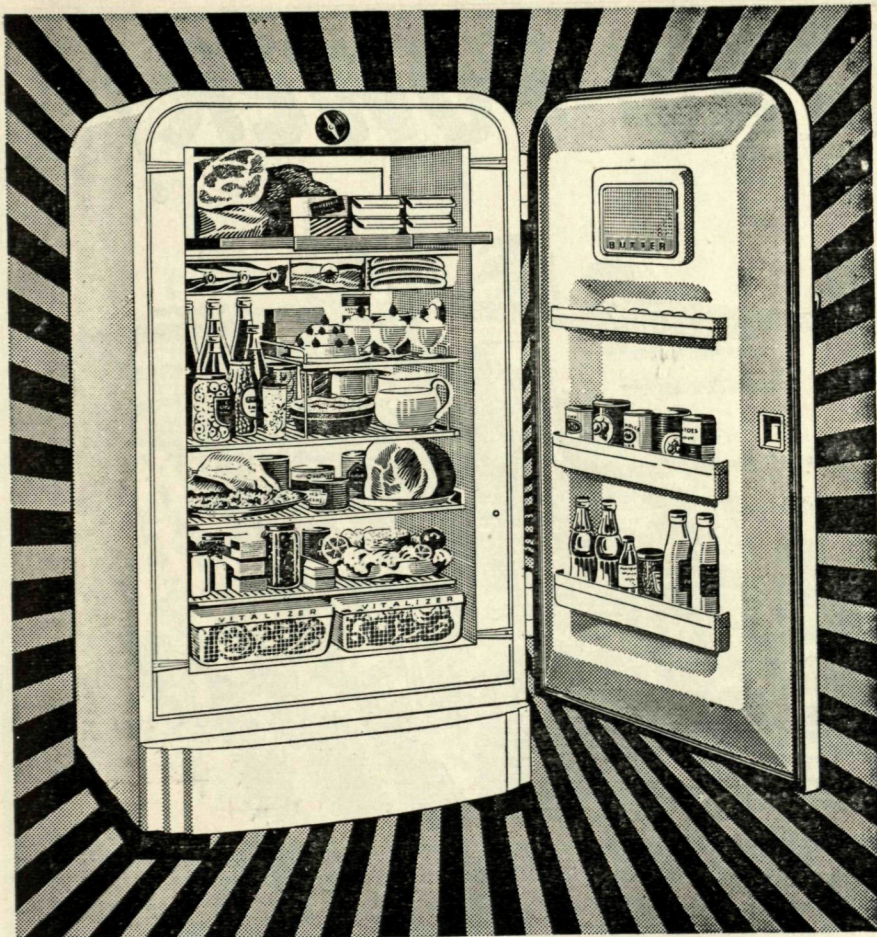
24.—RED CLOVER

(*Trifolium pratense* L.)

(From the Latin, *pratensis*—of, or relating to, a meadow).

A perennial plant with erect or ascending stems, up to two feet in height, downy-hairy. Leaflets oblong or obovate, often notched, and frequently with a white crescentic spot near the base, the leaf-stalk long. Free part of the stipules triangular with a long fine point. Flower-heads terminal, stalkless, globular or ovoid, large (above an inch in diameter). Calyx-tube ribbed, hairy, with four short bristly teeth and one (the lowest) about twice as long, erect in flower, and spreading when in fruit. Corolla pink-purple or rarely whitish, longer than the calyx, the standard notched.

Native to Europe and temperate Asia.



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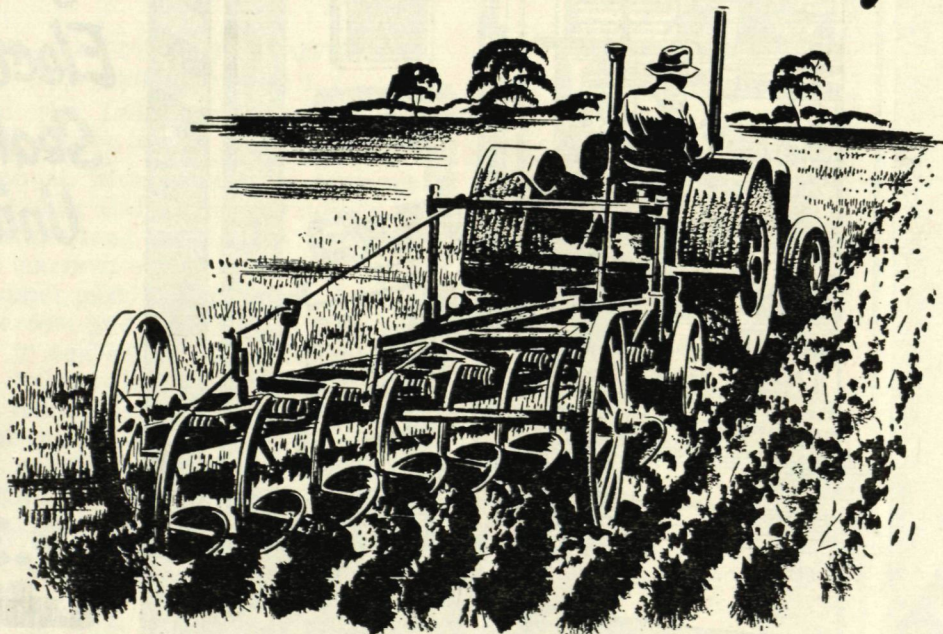
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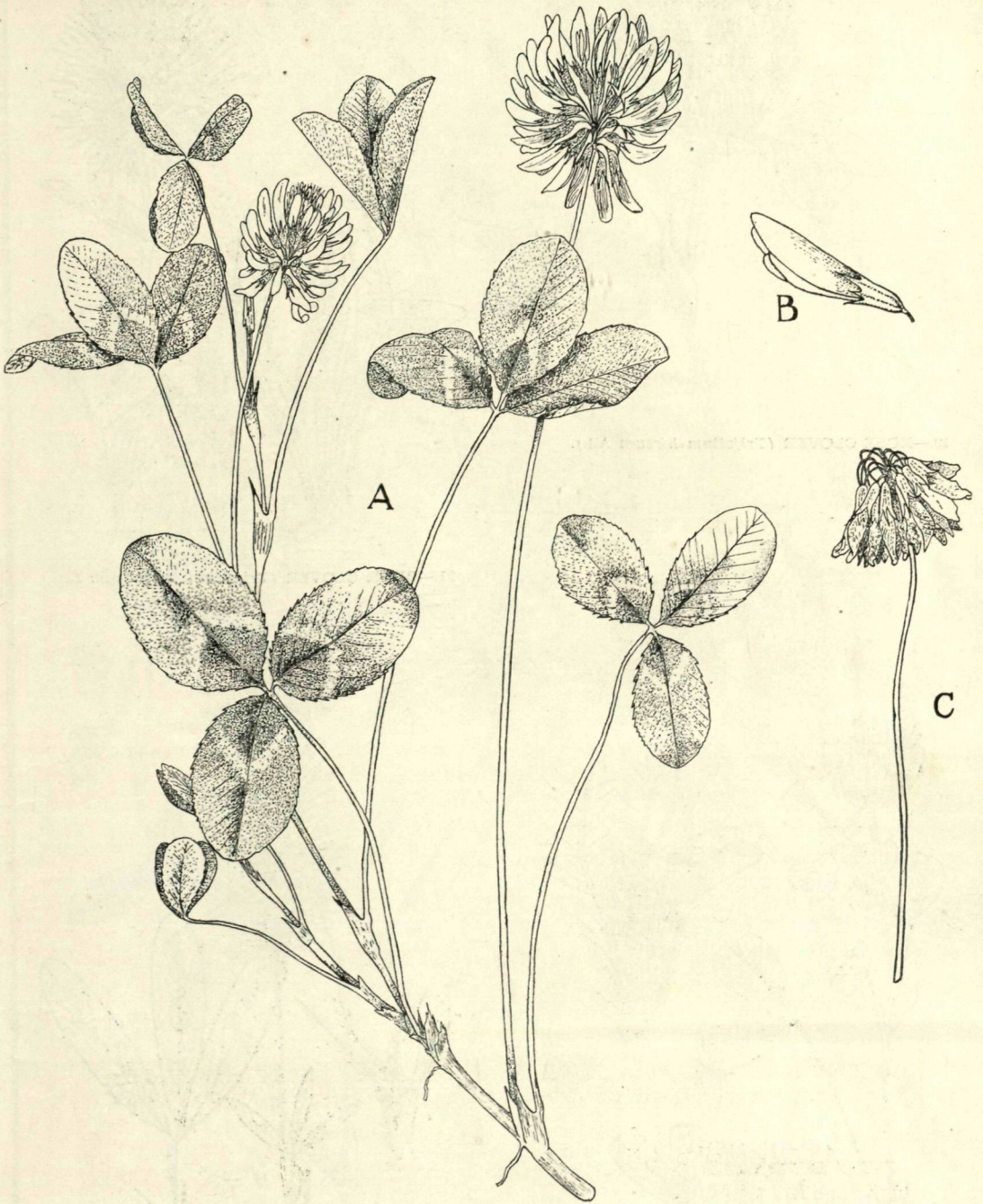
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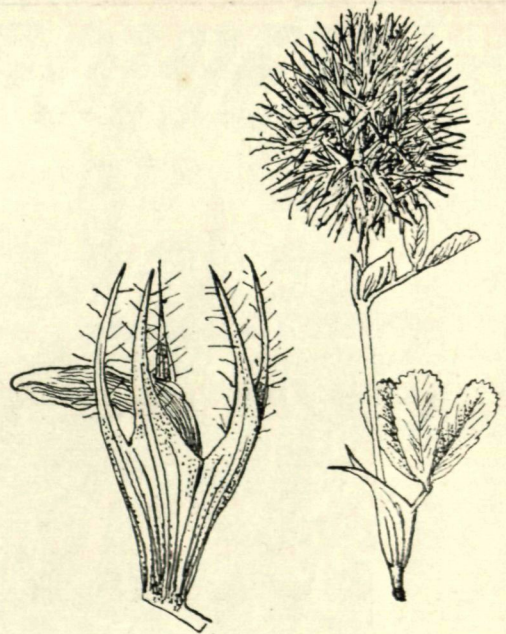


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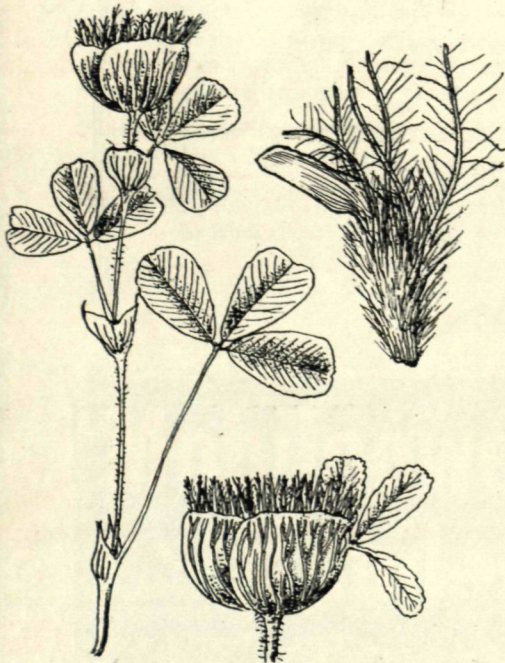
18.—WHITE CLOVER (*Trifolium repens* L.).
A—Habit; B—Flower; C—Flower head.



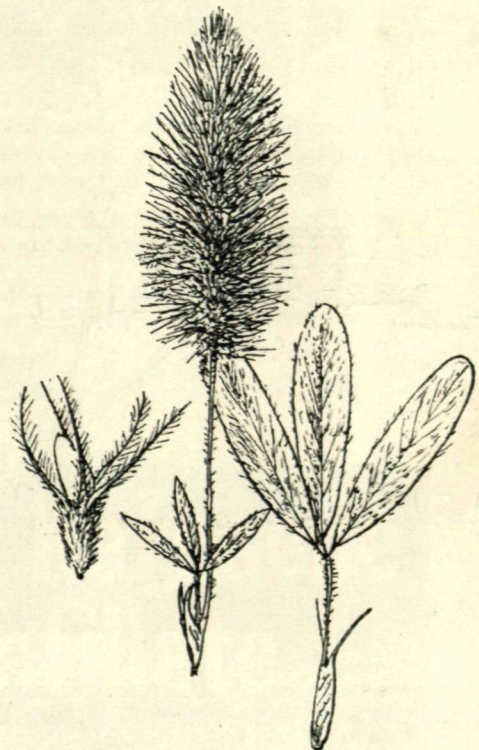
19.—ROSE CLOVER (*Trifolium hirtum* All.).



21.—BURR CLOVER (*Trifolium lappaceum* L.).



20.—CUPPED CLOVER (*Trifolium Cherleri* L.).



22.—HARE'S FOOT (*Trifolium arvense* L.).



24.—RED CLOVER (*Trifolium pratense* L.).

A—Habit; B and C—Flowers; D—Pod; E—Seeds.



25.—LIGURIAN CLOVER (*Trifolium Ligusticum* Balb.).

25.—LIGURIAN CLOVER

(*Trifolium Ligusticum* Balb.)

(From Latin, *Ligusticus*—applied to Liguria, the modern Piedmont).

Annual, the stems erect or loosely spreading, softly hairy. Leaflets obovate. Free part of stipules lance-shaped, tapering into a fine terminal point. Flower-heads egg-shaped or cylindrical, usually two together, one stalked, the other without a stalk. Calyx with equal bristle-like erect teeth from a rather broad triangular base, twice as long as the tube and longer than the pink corolla.

Native to Mediterranean region, Syria and Palestine.

26.—CARMEL CLOVER

(*Trifolium Carmelii* Boiss.)

(From Mt. Carmel in Palestine).

Annual, with hollow ascending forked stem; is clothed throughout with hairs lying close against the surface. Upper leaves opposite. Leaflets elliptical to oblong, the upper ones acute. Free part of the stipules lance-shaped, tapering into a fine point. Flower-heads on long stalks, egg-

shaped when in flower, oblong when in fruit. Calyx-teeth thickened at the base bristle-like, hairy, unequal, the four upper teeth not twice as long as the tube, the lowest one and a half times as long. Corolla creamy-white, twice as long as the calyx.

Native to Syria and Palestine.

27.—BERSEEM CLOVER

(*Trifolium Alexandrinum* L.)

(From Alexandria, the Egyptian City founded by Alexander the Great).

Annual, sparsely hairy with hairs lying close to the surface, the stems erect and branched. Leaflets ovate-elliptical. Free part of the stipules lance-shaped, ending in a fine point. Flower-head terminal, stalked, egg-shaped, becoming conical in fruit. Calyx with lance-shaped teeth produced into bristles, nearly equal, three-nerved at the base, erect in flower, spreading in fruit, about as long as the calyx-tube. Corolla creamy-white, twice as long as the calyx.

Native to Egypt, Asia Minor, Syria and Palestine.

28.—CRIMSON CLOVER

(*Trifolium incarnatum* L.)

(From the Latin; *incarnatus*—flesh-coloured).

Annual, stiffly hairy, the stems erect, 15 to 18 inches tall. Leaflets on long stalks, broadly obovate. Free part of the stipules ovate and obtuse. Flowers in ovoid to cylindrical spikes up to two inches long or more. Calyx-tube densely hairy, the teeth bristle-like, half as long again as the tube, erect when in flower, spreading in fruit. Corolla crimson, longer than the calyx.

Native to the Mediterranean region and France.

29.—STAR CLOVER

(*Trifolium stellatum* L.)

(From the Latin, *stellatus*—set with stars, in allusion to the star-shaped fruiting calyx).

Annual, with softly hairy stems and leaves, the stems erect or ascending. Leaflets small, almost wedge-shaped to heart-

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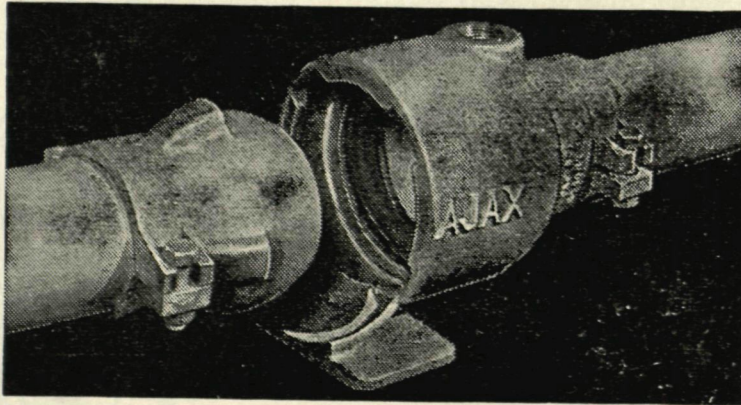
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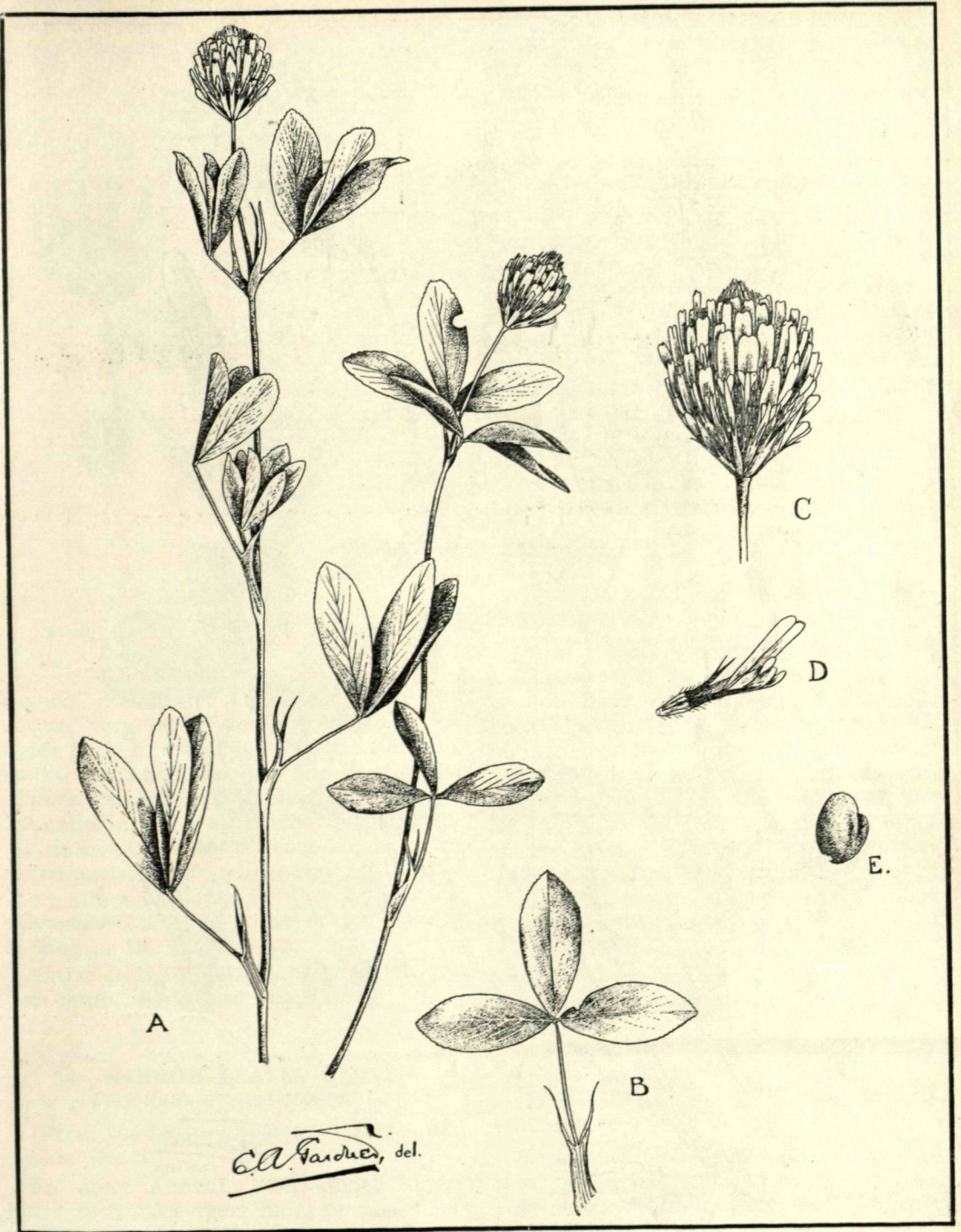
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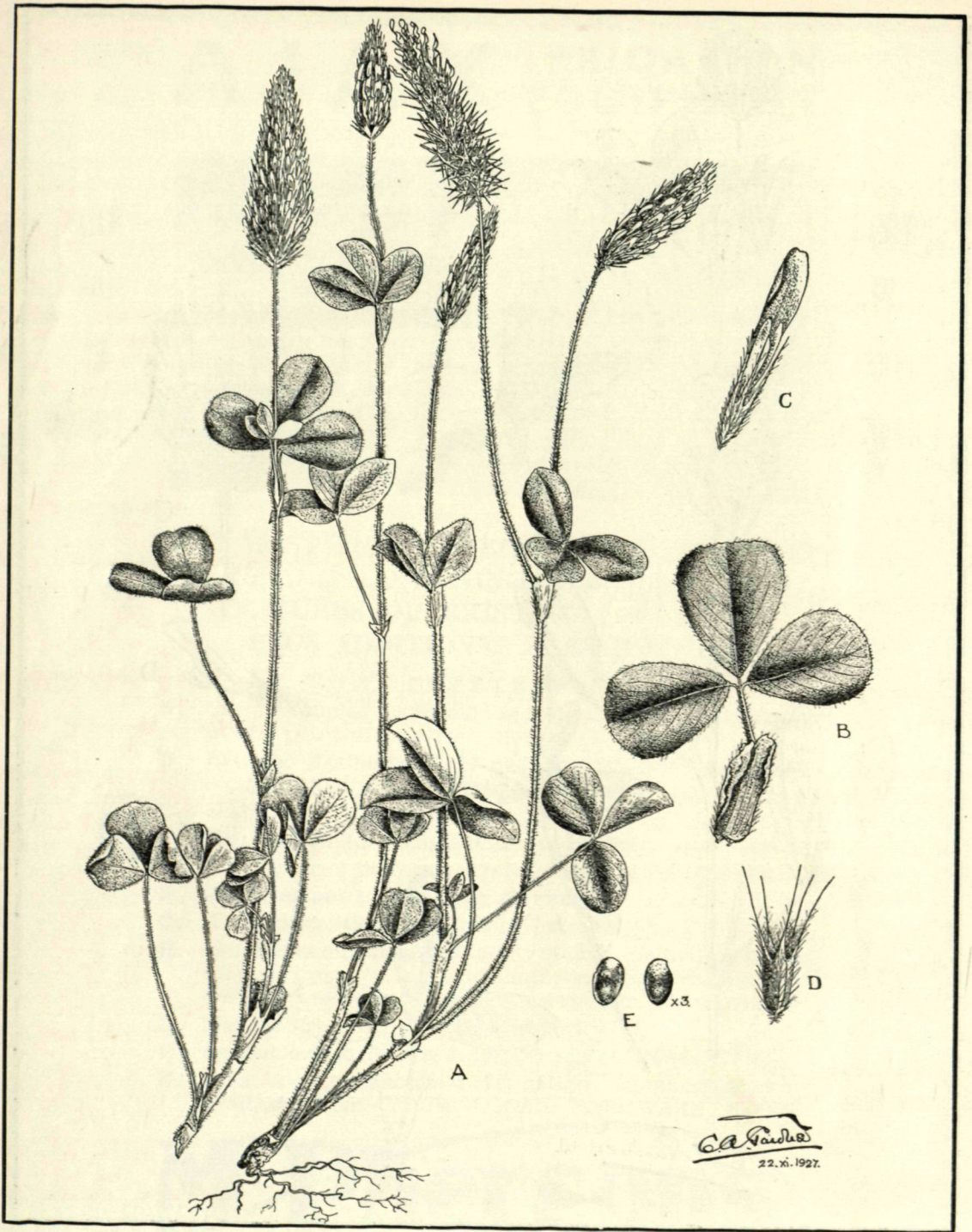
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27.—BERSEEM CLOVER (*Trifolium Alexandrinum* L.).
A—Habit; B—Leaf; C—Flower head; D—Flower; E—Seed.



28.—CRIMSON CLOVER (*Trifolium incarnatum* L.).

A—Habit; B—Leaf; C—Flower; D—Calyx; E—Seeds.



29.—STAR CLOVER (*Trifolium stellatum* L.).

shaped. Free part of stipules ovate and obtuse, very rarely acute, toothed in the upper part. Flower-heads terminal, on long stalks, globular, loose, the flowers on short slender, distinct stalks, and together with the calyx invested with rather long spreading hairs. Calyx-teeth lance-shaped, produced upwards into a long fine point, about three times as long as the bell-shaped calyx-tube. Corolla white or pink, about as long as the calyx-teeth.

Native to the Mediterranean region and Asia Minor, Syria and Palestine.

30.—NARROW-LEAVED CLOVER
(*Trifolium angustifolium* L.)

(From the Latin, *angustus*—narrow, and *folium*—leaf).

An erect annual, with ribbed stems, hairy with close-lying hairs on the stems and leaflets. Leaflets long and narrow, up to two inches long. Free part of the stipules bristle-like. Flowers in oblong to cylindrical terminal spikes up to three and a half inches long. Calyx-tube with some-

what unequal awl-like teeth about as long as the tube, erect in flower, spreading in fruit, shorter than the pink corolla.

Native to the Mediterranean region and the Orient. A weed.

31.—TRIFOLIUM DESVAUXII BOISS.
(A personal name).

An annual plant, with alternate leaves; leaflets narrowly elliptical, or linear, obtuse. Free part of the stipules awl-shaped. Flower-heads stalkless or shortly-stalked, egg-shaped to conical. Calyx-tube 10-nerved, the teeth awl-shaped, hairy, the lowest being the longest. Corolla purplish-pink.

Native to Syria.

32.—HELMET CLOVER or ORIENTAL CLOVER
(*Trifolium clypeatum* L.)

(From the Latin, *clypeus*—a round shield or buckler).

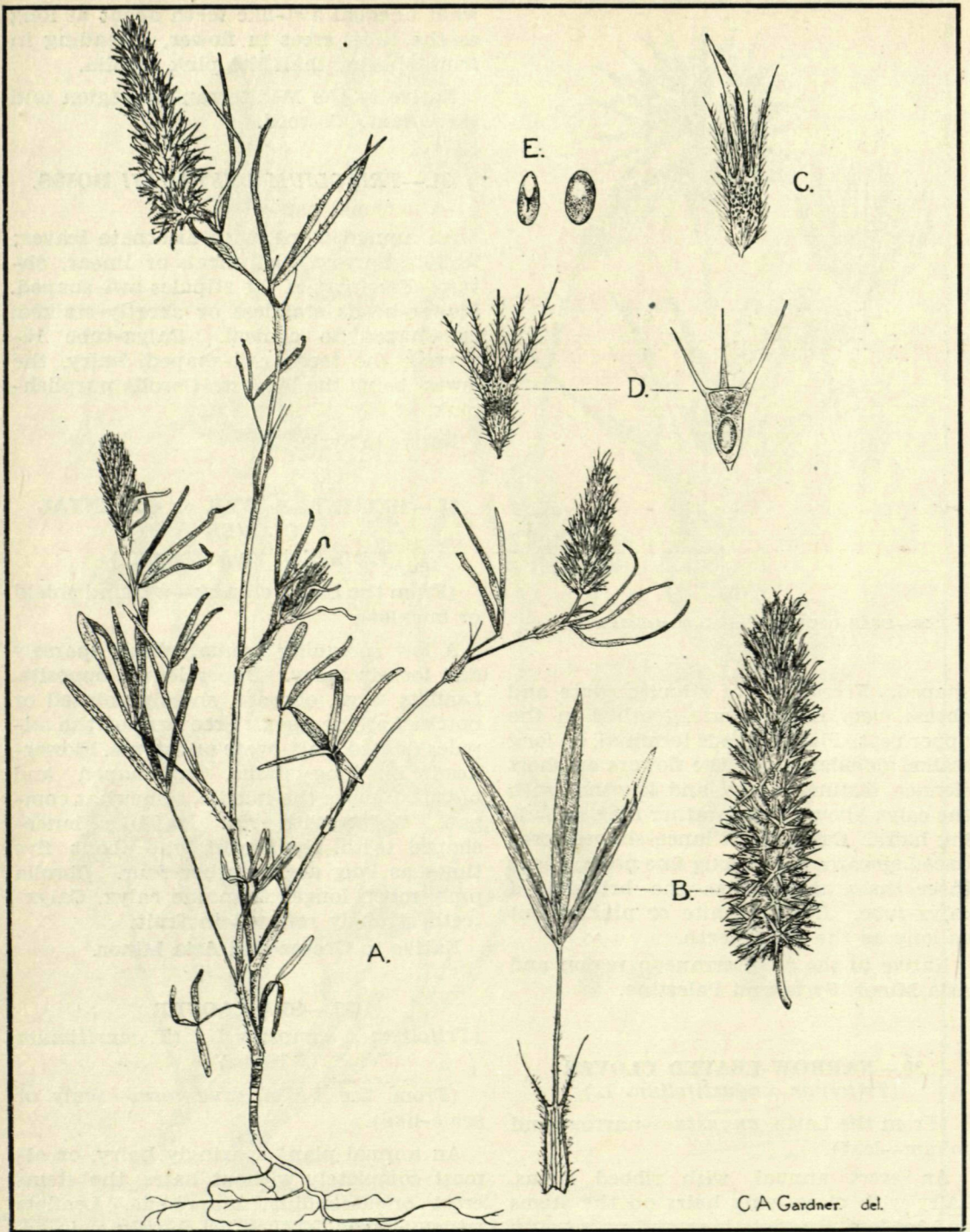
A low spreading annual plant, sparsely and loosely hairy. Upper leaves opposite. Leaflets large, obovate, shortly pointed or notched at the apex. Free part of the stipules dilated, half-ovate and acute. Flower-heads on long stalks, egg-shaped and broadest above the middle, somewhat compact. Calyx with flat leaf-like lance-shaped teeth, the lowest one about five times as long as the other four. Corolla pink, much longer than the calyx. Calyx-teeth strongly reflexed in fruit.

Native to Greece and Asia Minor.

33.—SEA CLOVER
(*Trifolium squamosum* L.) (*T. maritimum* Huds.)

(From the Latin, *squamosus*—scaly or scale-like).

An annual plant sparingly hairy, or almost completely without hairs, the stems erect or ascending, branched. Leaflets wedge-shaped, obtuse or shortly pointed. Free part of the stipules narrow and acute. Flower-heads not stalked, subtended by the uppermost pair of leaves. Calyx-tube bell-shaped, the teeth broadly awl-shaped,



30.—NARROW-LEAVED CLOVER (*Trifolium angustifolium* L.).

A—Habit; B—Leaf and flower head; C—Flower; D—Calyx and section of calyx; E—Seeds.

35.—ZIGZAG CLOVER or MAMMOTH CLOVER

(*Trifolium medium* Huds.)

(From the Latin, *medium*—the middle, intermediate or ordinary).

A perennial plant with flexuous almost zigzag stems up to 16 inches tall, almost devoid of hairs. Leaflets rather large, narrowly oblong to elliptical, fringed with fine hairs, often with a faint whitish spot near the base. Free part of the stipules awl-shaped and spreading. Flower-heads terminating the branches, large, globular, on short stalks, with a pair of leaves below. Calyx-tube bell-shaped, faintly ribbed, hairless, the teeth awl-shaped, spreading in fruit. Corolla reddish-purple, two or three times as long as the calyx.

Native to Europe and Siberia. With the general aspect of red clover, this species can be distinguished by its narrow awl-shaped stipules, shortly stalked flower-heads and the pods which open longitudinally—not transversely.



32.—HELMET CLOVER (*Trifolium clypeatum* L.).

three-nerved, rigid, the lowest triangular and longer than the others which are shorter than the tube, all spine-like and spreading when in fruit. Corolla pale pink, slightly longer than the calyx.

Native to Western and Southern Europe.

34.—ROUGH CLOVER

(*Trifolium scabrum* L.)

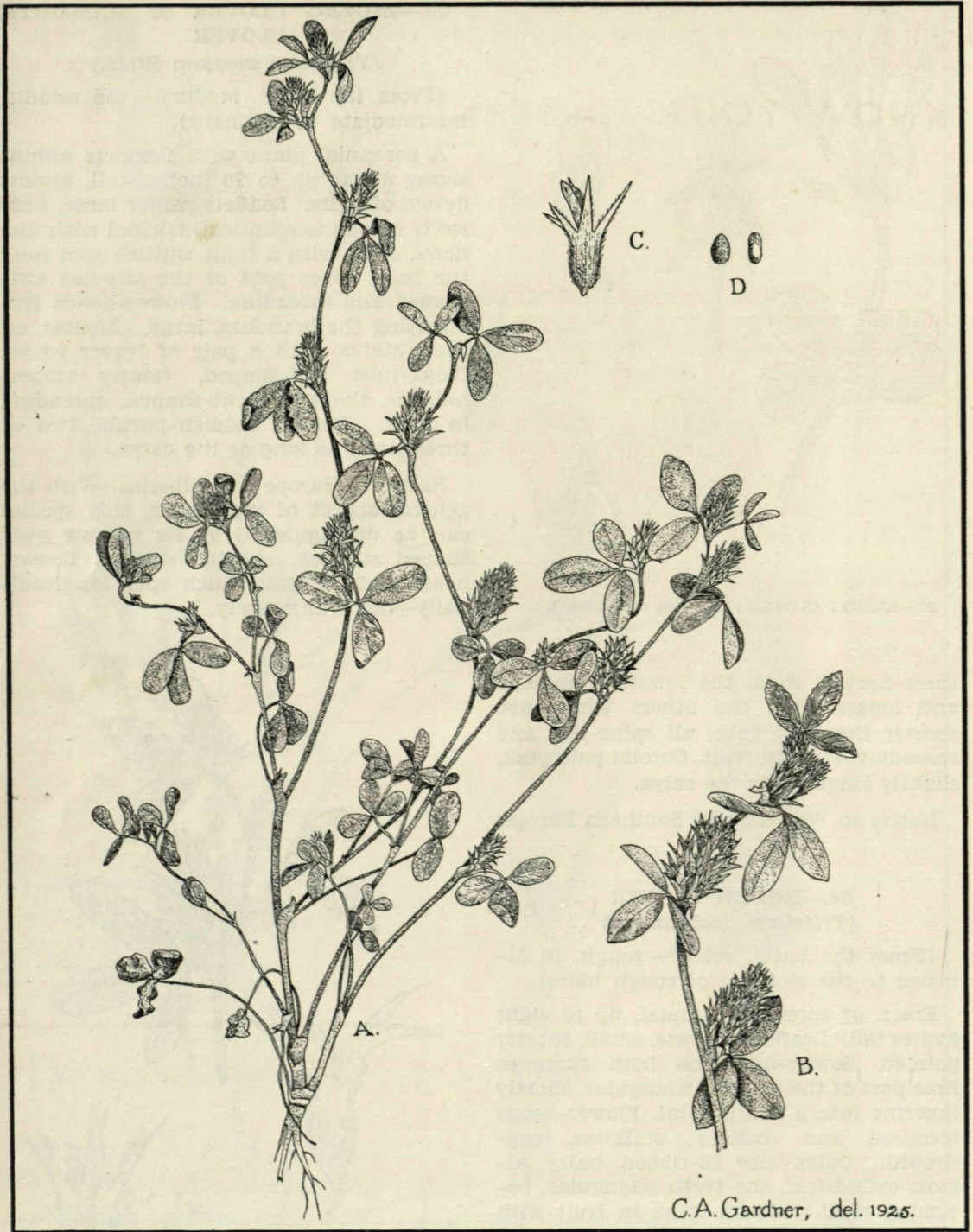
(From the Latin, *scaber*—rough, in allusion to the clothing of rough hairs).

Erect, or spreading annual, up to eight inches tall. Leaflets obovate, small, shortly pointed, downy-hairy on both surfaces. Free part of the stipules triangular, shortly tapering into a sharp point. Flower-heads terminal and axillary, stalkless, egg-shaped. Calyx-tube 10-ribbed, hairy, almost cylindrical, the teeth triangular, becoming rigid and spreading in fruit with sharp points as long as, or longer, than the calyx-tube.) Corolla white, shorter than the calyx.

Native to Europe and Western Asia.



34.—ROUGH CLOVER (*Trifolium scabrum* L.).



34.—ROUGH CLOVER (*Trifolium scabrum* L.).

A—Habit; B—Leaves and flower heads; C—Flower; D—Seeds.

Karri

KNOW YOUR TIMBERS

Habit.

Karri is one of the giant trees of Australia reaching a height of 270 feet with a clean bole of 100-140 feet. The diameter at the butt may exceed 9 feet. The tallest karri measured has a height of 281 feet and is still standing. It is a magnificent tree with a smooth clean gum-type bark carried the full length of its straight, shapely trunk; the very thick bark is of a yellowish-white colour, blotched with pale to dark bluish patches. Karri regenerates readily after milling and the rate of growth is fast. At present 25,000 acres of cut-over forest have been given treatment for regeneration and placed under complete fire protection.

Timber.

The timber of karri is reddish-brown, closely resembling jarrah in appearance, although generally lighter in colour. Growth rings are not well defined and a wavy or striped figure due to interlocked grain is often shown. Karri can be distinguished from jarrah by the burnt splinter test, the former giving a white ash after burning, whereas jarrah burns slowly to a black char.

Karri is moderately heavy in weight, having a green density of 73 lb. per cubic foot, and when dried to 12% moisture content has a range from 49-62 lb. per cubic foot, with a mean density of 57.4 lb. per cubic foot, before reconditioning. In drying from the green condition to 12% moisture content the average shrinkage, before reconditioning of a back-sawn board, is 10% (tangential shrinkage) and average shrinkage before reconditioning of a quartersawn board is 4.9% (radial shrinkage). Reconditioning only reduces these averages to 9.5% and 4.6% respectively, showing that very little collapse takes place.

Seasoning.

Karri requires more care in seasoning than does jarrah, since it dries more slowly and has a much greater tendency to check. Occasionally fine ring checks occur as well as the usual ray checks. Thicknesses up to 2 inches can be kiln-dried from the green condition, but the considerable care required, the strict control of drying conditions, and the fairly long period required for drying would, in most cases, make this practice uneconomical. Good results may be obtained by partially air-drying prior to kiln-drying, particularly if protection and shielding of drying stacks is given during periods of warm and dry weather. The seasoning schedule used for jarrah is applied to karri.

Relatively slight collapse occurs, and reconditioning is not generally practised, but it provides the advantages of making the timber milder for dressing and giving slightly larger sizes. Approximately four weeks are required to kiln-dry 1 inch green stock.

Mechanical Properties.

Karri is both stiffer and tougher than jarrah and has been included in Strength Group "B" together with spotted gum and Sydney blue gum. At 12% moisture content karri has an average modulus of rupture of 20,600 lb./sq. in. compared with 15,900 lb./sq. in. for mountain ash and 14,800 lb./sq. in. for jarrah. In compression parallel to the grain karri has an average value of 10,500 lb./sq. in. compared with 9,700 lb./sq. in. for mountain ash at 12% moisture content. Karri is tougher than jarrah, having a toughness value when dry of 245 in. lb. compared with 110 in. lb. for jarrah.

General.

Karri, together with such timbers as blackbutt, southern blue gum, messmate, stringybark and red mahogany, is classified in durability class 3 and the sapwood is immune to Lyctus attack. It is fairly difficult to work and the grain has a tendency to rise; nevertheless with care it can be finished well and highly polished. It bends well at a radius of 6 inches after a minimum steaming period of one hour per inch thickness. Backsawn and quartersawn material have been found to bend equally well if free from checks, but selection requirements are more stringent with backsawn than with quartersawn stock. The bark of karri has a tannin content which varies from 11 to 22% and gives a leather of a good light colour. There are certain difficulties associated with the extraction process and these have been studied by the Division of Forests Products. The bark, if not dried soon after falling, undergoes a change which is not fully understood, whereby some of the tannins become insoluble. It was, however, found possible to obtain yields of 90-95% of the total tannin present by the use of sodium bisulphite in extraction. There seems to be a definite possibility in this material as a basis for tannin extraction since karri bark could be made available at large mills in sufficient quantities to justify the erection of extraction plants.

Uses.

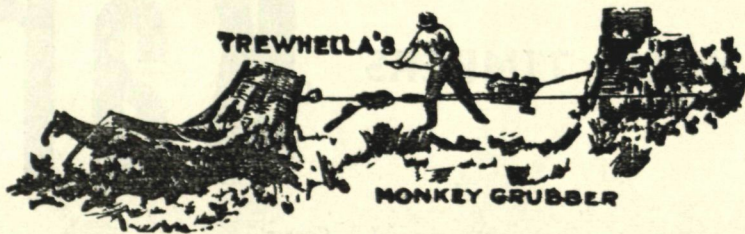
This timber is well known overseas as well as in Australia for its valuable qualities. It is popular for superstructures because of its great strength, its availability in large sizes and long lengths, and its comparative freedom from defects. It is widely used in wharf and bridge structures.

In railway workshops it is used for wagon, van and carriage construction. It is largely used in agricultural implements, especially for bent parts. It is also used in shipbuilding and as mine lift guides in South Africa, and for crossarms in Great Britain. In dwellings it is used for rafters, studs, joists, flooring, interior trim for furniture. It is used largely in Western Australia for export apple cases and when treated, for wooden pipe lines. It can be rotary cut or sliced to provide a very good veneer and plywood, and these products are available commercially. Tests at the Division of Forest Products have shown that karri glues satisfactorily with casein, urea and teco resin film glues. Sleepers treated with preservative, have been found eminently suitable when used in dry climates.

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