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Contributors

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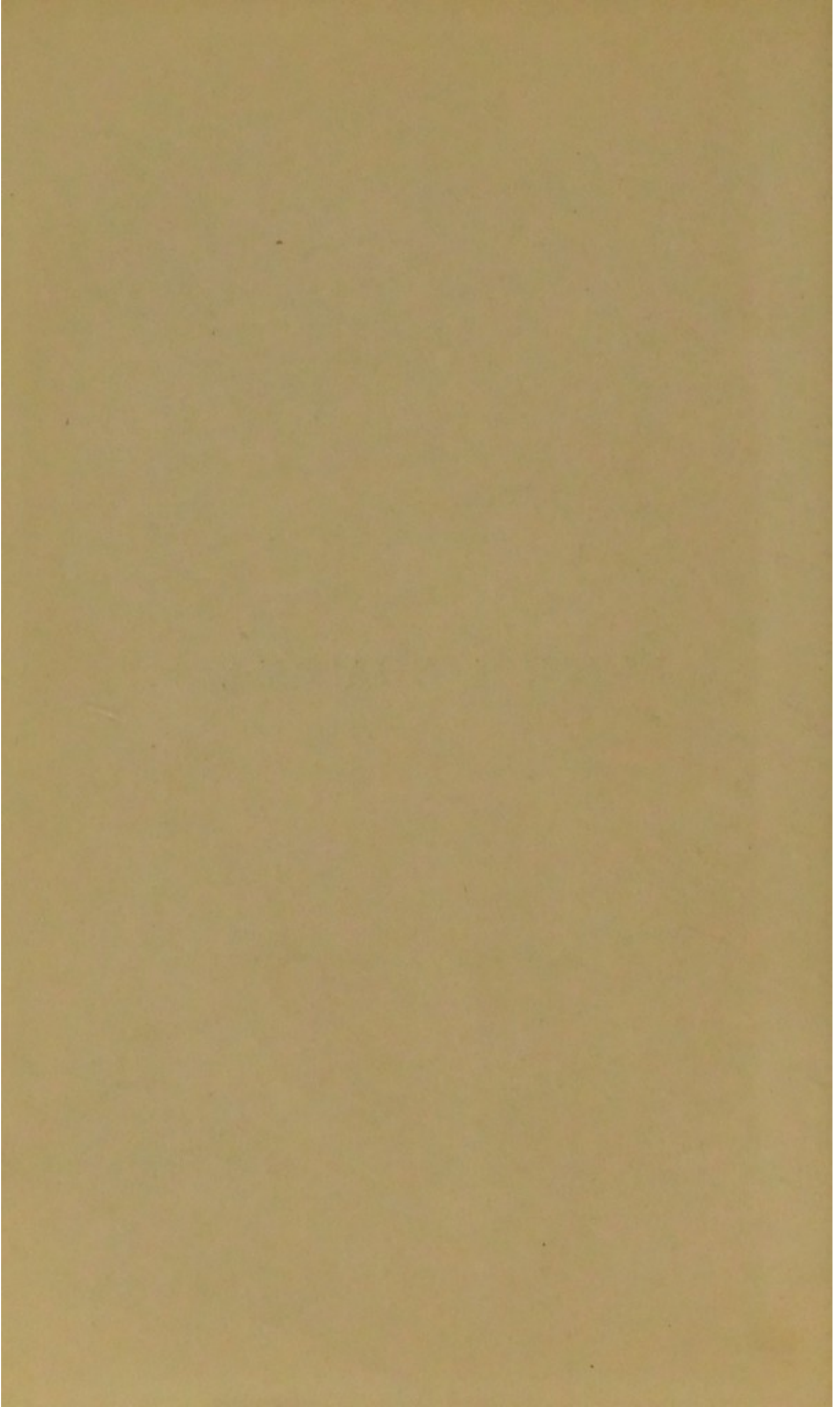


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BRITISH GRASSES.







W. Fitch, del et lith.

Vincent Brooks, Insp

1. *Leersia orizoides* 2. *Milium effusum*
3. *Panicum glabrum*.

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BRITISH GRASSES:

AN INTRODUCTION

TO THE STUDY OF

THE GRAMINEÆ

OF

Great Britain and Ireland.

BY

MARGARET PLUES,

AUTHOR OF 'BRITISH FERNS,' 'RAMBLES IN SEARCH OF WILD
FLOWERS,' ETC.



LONDON:

REEVE & CO., 6, Henrietta Street, COVENT GARDEN.

1867.



W. H. B. del et lit.

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1. *Lycopodium obscurum* 2. *Milium effusum*
3. *Panicum* 4. *Hordeum*

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PREFACE.

WE offer our little work on 'British Grasses' to an indulgent Public, whose genial kindness we have already proved on various occasions. The Grass tribe has many charms and attractions, which only need to be pointed out to secure the attention of all true lovers of nature. The study of them presents some difficulties, but they are not such as, when fairly met, need to deter English ramblers from cultivating their acquaintance. To induce them to do this, we have used every effort and care in collecting information and simplifying the matter culled from greater and more scientific writers; and we confidently hope to accompany many an excursionist on a summer holiday, and to secure the attention of a large proportion of the observant for the elegant grasses now beginning their varied succession in our rich meadows and pastures. Once begun, we have no doubt of the

acquaintance being succeeded by admiration, and ripening into friendship, nor of the cordial satisfaction resulting from the new study. We earnestly entreat our readers to throw themselves without delay into the pursuit of grass-lore, and to begin to collect and to study at once, so that the present season may be fully utilized; for we aim at practical advantage as well as intellectual amusement, and hope to be of use to the agriculturist as well as to the lover of botany.

May, 1867.

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BRITISH GRASSES.

CHAPTER I.

INTRODUCTION.

Of all the plants covering our hills and valleys, Grasses are the most general and the most important. We attach great and deserved importance to utility, and seldom stint our meed of praise to beauty; yet, as we pluck up the grassy weeds in our flower-beds, or sentence the garden walk to a covering of salt to destroy the young grass blades, how little we recognize how beneficent and lordly a family we are making war with: yet, as the term *weed* has been well defined as "a plant growing where it is not wanted," the young grasses, so valuable in the meadows or pasture, are deserving of extermination when they intrude themselves into the parterre.

Linnaeus has computed grasses to constitute a sixth part of all the vegetables of the globe. They prevail especially in open situations, and spread themselves by

long ago, and into which the water trickles when the sunbeams thaw the hoary snows above. There it flings its sweet greenness to the sun, creeps about in the mazes of the solitude, and waves its fairy tassels in the wind. It even beautifies the grave, and spreads over the sightless visage of death and darkness the serene lustre of a summer smile."

In our climate, the idea of grass is always connected with the velvety sward of hill and park, or the quivering plumes of the fragrant meadow; but in tropical countries the character of the grasses is quite different. There you may search in vain for the compact elastic turf over which our childhood's feet have loved to bound; grasses you find indeed, but seldom crowded together and interwoven into a natural carpet. There they grow dispersed or in clusters, attaining a lordly size, and exhibiting gigantic plumes of flowers of surpassing beauty. Nearly all tropical grasses attain a height that may be called gigantic in comparison with our British species, and some of the Bamboos grow to a stature of fifty or sixty feet. Their leaves are broader in proportion, and in most species there are flowers of different sexes on each plant. The flowers are more generally furnished with hairy appendages, or the parts are fringed with silky hairs often of silvery whiteness, which gives them a very elegant appearance. Thus the tropical grasses make up by their size and beauty for the absence of the ever-welcome turf. In subtropical districts the grasses are of an intermediate size and number, or representatives of the two forms are both present. *Arundo Donax* in the south of Europe emulates the Bamboo in its size and elegance, and several species present the characteristic of the combination of

different sexes; the turf, though not absent altogether, is much less compact than in the cooler climates, and meadows are less frequent.

Of the many gifts bestowed by our beneficent Creator in the kingdom of nature, that of the grasses is perhaps the most valuable to the life of man, whether we regard it as "the grass grown for cattle" or "the green herb for the use of man." In the first-named gift we reckon all the agricultural grasses, both natural and artificial, the value of which we only realize when during a drought they are withdrawn. At such a time we are not surprised to hear even of so great and imperious a king as Ahab going forth to see if perchance he can find a little grass anywhere to save some of his cattle alive. And in the "green herb for the service of man" we recognize the rank lines of corn growing up, "first the blade, then the ear, and then the full corn in the ear,"—yielding at last in the rich harvest time the precious "staff of life," "bread to strengthen man's heart."

As food for man and beast it is impossible to over-value this great gift of God, nor should we forget how valuable is the turfy carpet overspreading our hills and valleys, both as regards its comfort to the foot of the weary traveller and its charm to the eye. Who that has any taste for the beautiful can fail to admire the glory of the meadow, whether the trembling panicles of its grasses are laden with the diamonds of the dew or giving out their odour under the influence of the mid-day sun! And when the summer is over and gone, and the rich growth of the meadows stands stoutly in a burly stack, the aftermath is not less profuse in its adornments than was the earlier crop, for as—

"Ilka blade o' grass keps its ain drap o' dew,"

so every blade has its own wreath of jewels bestowed by the breath of the hoar-frost.

Very early in the year, the grass-flowers come forth to courtour regard. The Sweet Vernal Grass leads the first group, and half-a-dozen have shaken forth their tasselled stamens before the April showers have ceased. May, the month of flowers, boasts but three flowering-grasses, one of which is the Holy Grass, so called because dedicated to the Blessed Virgin, and used in Prussia and elsewhere in the decoration of the churches, fitting therefore to flower in the month which, like itself, is dedicated to the mother of our Lord. June is rich in grasses; Mr. Lowe enumerates forty-four which flower in that month, but the numbers only reach their maximum in July, when sixty-six perfect their blossoms according to the computation of the same author. August has but few grasses, and after that the flowers of the family are seen no more, or only in belated individuals.

Nearly every grass is wholesome, all the seeds partaking of the nature of the cereals. *Lolium temulentum* is an exception, its seeds have the character of being narcotic and deleterious, and producing intoxication and even convulsions. There are terrible legends of poisoning by darnel-bread, but authors of the present day doubt the truth of the said legends, and return a verdict of "not proven." The seeds of *Bromus mollis* are accounted doubtfully wholesome, and these of the foreign species *Festuca quadridentata* lie under the same suspicion. There is a curious species in New Zealand, called Spear-grass, which is very injurious to the feet of horses and men, because of its sharp spines, which are a foot long; the spike measures a yard in length, and the strong sharp awns are truly vegetable spears; Dr.

Lauder Lindsay says it is accounted the pest of the province. But these are trifling exceptions where the great numbers of the family are so distinctly wholesome and useful.

Cereals of course take the first place in the grass family, being absolutely necessary to the life of the human race. He who created man in His own image, had already created for him the "green herb" that should form the most important part of his sustenance, and willed that, by using the talents that He had endowed him with, he should improve and extend, by cultivation, those nutritious seeds, so as to provide food co-extensively with the increased need of it. Thus we have in the large variety of cereals a mere handful of species, placed by the hand of Providence so as to attract the special notice of man from time immemorial, and now become the daily bread of the great human family. Only second in importance to the cereals stand the agricultural grasses, without which we could not keep our flocks and herds, and so must forfeit all the support and service we receive from them. In temperate climates the earth is covered by the greensward, which furnishes such abundance of pasturage and meadow for our troops of cattle. In the tropical climates the sward is absent, but the grasses are there in another form, and though of gigantic size, many of them are so tender and delicate that they are as valuable as our own as fodder for cattle. In New Holland, Kangaroo-grass (*Anthistiria australis*) affords excellent food for sheep, and the Dharba or Doob of India (*Cynodon dactylon*) is so valuable as to be the theme of many poems. Mexico rejoices its flocks with the *Gama grass*, and the Tussac grass of the Falklands is noted for its nutritious qualities.

The group of grasses used for economic and industrial purposes is comparatively insignificant, but by no means unimportant when our attention ceases to be dazzled by the greatness of the value of the cereal and fodder grasses. In many rural districts their utility for thatch, fences, building purposes, and domestic articles, is well attested, and neither poor nor rich will despise their employment in the straw-hat manufacture.

Ornamental grasses form a very attractive group as exhibited in our public gardens in the present day, and though not able to lay claim to edible or industrial properties, they well deserve notice as the fine ladies and gentlemen of the tribe.

Thus we see that grasses have a charm for all classes, —for the practical, the industrious, the philanthropist, the man of science, and the man of taste, and to each and all of these classes we commend our little work, in the hope that they will receive it with indulgence, and be induced to carry on the study of the great and good family we invite them to, and by their deeper research add greatly to our scanty stock of information.

CHAPTER II.

STRUCTURE.

A GRASS is the simplest form of a perfect plant. It may be described as a herb with a hollow stem, only solid at the joints; leaves with parallel venation, and entire margins, sheathing at the base and enclosing the stem more or less, attached to it by a small scale or *ligule*; inflorescence of many florets, arranged in spikelets in the form of a *spike*, *raceme*, or *panicle*, and consisting of three or more scales or *glumes* that are empty, one or more flowering glumes containing the fructifying organs, the same number of *paleæ* or still thinner scales, and the *ovaries*, *stamens*, etc., according to the number of florets. Each floret (if fertile) produces one *seed*, the *embryo* being very small.

The *roots* of grasses are generally *fibrous*, that is, composed of threads or suckers, which penetrate the soil to a greater or less extent; the more the fibres are developed, the better the plant can bear drought, and the more it impoverishes the soil. Sometimes the root is creeping, throwing out underground shoots which root themselves, and then throw up stems like independent plants; such species, unless their herbage is very excellent, become

great nuisances. A few species have *bulbous* roots, the base of the stem becoming spherical and sometimes producing other bulbs from its side.

The *stem* is generally cylindrical and hollow in maturity. Lindley explains it to "exist in two different states, that of the rhizome and of the straw,—the rhizome, which is the true trunk, and the straw, which may be considered a ramification." He says, "The rhizome grows slowly, and differs in no respect from the stem of other monocotyledonous plants, as is evident in that of the bamboo. The straw, on the contrary, which grows with great rapidity, is fistular, with a compact impervious diaphragm (the node) at each articulation. In the beginning, when this straw was first developed, it was a solid body like the rhizome, only infinitely smaller; but in consequence of the great rapidity of its development, the cellular tissue forms more slowly than the woody vascular bundles which it connects, and, in consequence, a separation takes place between the latter and the former, except at the articulations, where, by the action of the leaves and their axillary buds, is formed a plexus of vessels, which growing as rapidly as the straw, distends, therefore never separates in the centre." The stem of a grass is hollow as a rule, but there are one or two exceptions, as the Sugar-cane. Generally, the stem is cylindrical, but it is sometimes compressed, as in the case of *Poa compressa*. It has a siliceous coating, more or less developed, and flint is formed in the joints.

Lindley's description of the stem justifies our calling the lower part, occasionally procumbent and rooting, the *rhizome*, the naked ascending part the *stem* proper, and the upper part, to which the spikelets are attached, the *rachis*. The *stem* is simple, any branches that occur

always springing from the lower part or rhizome. It is *erect* or *oblique*, *straight* or *bending*, *ascending* when it gradually assumes an erect direction after being *decumbent* below, *creeping* when it roots at the joints, *naked* when there are no leaves on the upper part, *leafy* when the sheaths clothe it, *round* or *compressed* or *angular*, *two-edged* or *four-cornered*, *knee-jointed* (*geniculate*) when bent suddenly at the joints, *bulbiferous* when enlarged at the joints. The rachis is *simple* or *branched*, *smooth* or *rough*, *round*, *compressed* or *angular*.

The *leaves* of grasses are all linear in form, and have parallel veins, in common with the monocotyledonous group in general. They vary in comparative length and breadth, some being *sword-shaped*, some *strap-shaped*, and some *awl-shaped*. The *apex* in some is *acute* and tapering, in some *blunt*. The sword-shaped leaf grows gradually narrowed till it ends in an acute apex. The strap-shaped leaf has both sides parallel, not beginning to taper till near the apex. The awl-shaped leaf is narrow, generally grooved, and the edges rolled in so as to be like a bristle, and very sharp-pointed.

The *surface* of the leaves is *channelled* when the mid-rib is very strongly developed, causing a ridge on the under part of the leaf and a groove on the inner; it is *nerved* when the side-ribs are strongly marked; and it is characterized as *flat* when there are no furrows, or ribs, or strongly developed markings; some are *smooth* on the *surface*, some *downy*, and some *hairy*.

The *margin* of the leaf is *plane*, *downy*, *hairy*, or *saw-edged* (*serrate*) as in the Pampas grass, where the teeth are so sharp and strong as to inflict painful wounds.

The *sheaths* are continuous with the leaf; they em-

brace the stem, opening on one side, and are provided with a scale or *ligule* ; they have the same varieties of surface as the leaves of which they form a part, and are *narrow* or *inflated* according as they fit tightly to the stem, or encircle it in a loose and swollen manner.

The *ligule* is a small membranous scale-like process, attached to the inner side of the leaf and having its origin at the top of the sheath, just where the leaf diverges from the stem. It is *entire* or *bifid* (cut into two teeth), or *torn* at the margin, or *fringed*, or *truncated* (when cut straight at the top), *pointed* when the apex is abrupt, *acuminate* when it tapers, and *decurrent* when running down the side of the sheath so as to be hardly visible.

The position of the leaf with regard to the stem is *oblique* when it ascends from the sheath, but diverges from the perpendicular ; *perpendicular* when it holds itself quite upright ; *horizontal* when it stands at right angles with the stem ; and *bending* when it arches from the ligule to the apex. The leaves on a stem are equal in number to the joints of the stem, and the sheaths generally cover the joints, especially the lower ones.

The *inflorescence* is arranged in a compact or diffuse form, and is either a *spike*, *raceme*, or *panicle* according as the rachis is *simple*, or endowed with *simple branches*, or with *compound ones*. Its form is *glomerate* or *round*, as in *Sesleria cærulea* ; *verticillate*, with branches arranged in *whorls*, as *Panicum verticillatum* ; *secund* or one-rowed, when all the florets are on one side, as in *Nardus stricta* ; cylindrical, round, long, and equal, as in *Phleum pratense* ; *ventricose* when the head is thicker in the middle and tapering to each end, as in *Alopecurus agrestis* ; *effuse* when the branches of the rachis spread widely, as

in *Milium effusum*; *crowded* when the branches are so short that the florets are close together, as in *Panicum verticillatum*; and *nodding* when the branches droop, as in *Aira cæspitosa*. It is *digitate* when the spikes are collected in a cluster like the fingers of a hand, as in *Panicum sanguinale*.

A *spikelet* is composed of three or more scales or bracts, called *glumes*, the two outer of which are nearly always empty. This, however, cannot be considered as by any means a rule, for it is a characteristic of some genera to have only one empty glume, or the second one so rudimentary as to be scarcely visible. Sometimes, on the other hand, there are more than two empty glumes; but these may be considered as exceptions, and *two empty glumes* to a spikelet as the rule. These glumes occupy the position of the calyx of other flowers. The third glume, when only three are present, is characterized as the *flowering-glume*. Opposite to this, or between it and the axis, is generally placed a smaller and thinner scale, more or less distinctly ribbed, and called a *palea*; the flowering-glume and palea represent the corolla of other blossoms.

The *glumes* are *awned* or *awnless*, *ribbed*, *fringed*, *bifid*, *pointed*, or *blunt*. The *paleæ* are subject to similar varieties of form.

Each *floret*, if perfect, contains its flowering-glume and palea, its ovary, style, and stigma, its three stamens, and often one or two scales attached to the base of the ovary.

The stamens vary in number from two to six, but with the exception of *Anthoxanthum odoratum*, all our British genera have three. The anthers are of cellular structure, linear form, notched at both ends, and coloured with white, yellow, saffron, or purple. The scales at the base

of the ovary are equivalent to the nectaries of other plants.

The styles are generally two, united in many instances for some distance from the base, then diverging; they are situated in most species on the summit of the ovary, but occasionally they take their rise lower down. They are generally curled and feathery, in some foreign species so much so as to give a very striking appearance to the panicle. The ovary varies little in form, being generally round or oval, but sometimes enlarged above, so as to be top-shaped.

In nearly all the British genera the flowers are perfect, having both styles and stamens, or they are rudimentary or barren; but in foreign species the flowers are often distinctly of the different sexes on the same plant, and these are accompanied by a fair proportion of hermaphrodite flowers. In our English grasses the occurrence of a male flower in the same spikelet with a perfect one is very frequent, but we do not find male, female, and perfect ones on the same plant.

In many species the midrib of the glume or of the palea is prolonged beyond the summit; this is called an *awn*. The awn arises either from the summit, the centre or the base, or from any part of the midrib of these glumes or paleæ; it is *straight*, *twisted*, *smooth*, or *bristly*, and of every variety of length.

The *fruit* is one-seeded, called a grain; the husk or pericarp surrounds the seed, and sometimes the palea adheres to it, so that it remains enfolded between the flowering glume and the palea. The grain is *round*, *oval*, *oblong* or *pointed* in form, and *smooth* or *downy* in texture.

CHAPTER III.

CEREAL GRASSES.

ALL grass seeds are wholesome and nutritious with very few exceptions, the only deleterious seed being that of *Lolium temulentum*. Those of the species called cereals are preferred for the larger size of their grains, both their size and their nutritious properties being enhanced by cultivation. In this very important group of grasses wheat stands pre-eminent, affording to multitudes the "staff of life."

Wheat is essentially a native of the temperate zones ; it occupies a vast extent of territory in all the four great divisions or quarters of the earth. In Europe, the middle and south of France, England, part of Scotland, Germany, Hungary, Italy, part of Spain, Southern Poland, Prussia, Austria, and Turkey it is cultivated principally ; while in part of Spain, Portugal, and Greece, it divides the popularity with maize and rice. In Asia, the chief wheat-growing countries are those lying between the Black Sea on the north and the heads of the Persian Gulf and the Red Sea on the south, including Armenia and Palestine. In Africa, Egypt, and the countries bordering on the Mediterranean, are the wheat districts. In America the wheat has a very extended

range, or might have if the hand of man was able to cultivate all the districts that are suitable. The valleys of the Mississippi, Missouri, and Ohio, if brought into cultivation, might furnish granaries for a hemisphere. The same may be said of extensive tracts in South America and Australia. Already it flourishes in North America, in the corresponding climates to those which it favours in Europe.

Scientific men have been sorely puzzled to find the native country of wheat. Its history extends far back into ancient times, yet does not reveal its birthplace. At the time of the Exodus, we read in Holy Writ that "the wheat and the rye were smitten" by the plague of the hail, "because they were grown up." Centuries later, the Royal Psalmist, in lamenting the degeneracy of his people, and depicting the good things which their sin had taken away from them, says, "He should have fed them with the finest of the wheat." In the works of Theophrastus and Pliny, wheat is often mentioned as used by the Greeks and Romans, and it has been found enclosed in the coffins with Egyptian mummies. At one time Asiatic Russia was supposed to be its native country; then a similar plant was discovered by Stuart, the traveller, in the interior of New South Wales, and then the question was raised whether that were or were not its true fatherland.

Within the last few years, the experiments and observations of M. Esprit Fabre, of Agde, in the south of France, seems to prove that our agricultural wheats are cultivated varieties of a set of grasses common in the south of Europe, which botanists have uniformly regarded as belonging to a different genus, named *Ægilops*. That genus is distinguished for the fragility of the

spikes and the numerous awns on the glumes and paleæ. But M. Fabre demonstrates how readily these peculiarities become modified by cultivation, and he practically proves the identity of the plants, wide as seem to the partial observer their apparent differences. Seeds of the *Ægilops* were sown in a garden in 1838, and the produce resown each year until 1846, when as good wheat was produced from the crop as that in any of the fields in the neighbourhood.

All the cultivated wheats must be included, according to Mr. Baker's showing, in his article in the 'Agricultural Cyclopædia,' under the one species *Triticum vulgare*, the characteristics of which are the spiked inflorescence, imbricated spikelets, each containing two or more perfect flowers, and a terminal barren one; outer and flowering glumes ovate, with a blunt notch at the top on each side of the awn, and the grain when ripe separating more or less readily from the chaff.

The varieties of wheat are much more numerous than of any other description of grain,—the result, no doubt, of the greater range of climates in which it has been cultivated. Mr. Lawson, of Edinburgh, enumerates thirty-seven "whitish beardless varieties," twenty "reddish beardless varieties," and six "tinged varieties;" these, with twenty added afterwards as "whitish and reddish bearded varieties," make in all eighty-three kinds of wheat in cultivation in the British Isles.

Triticum vulgare, var. *muticum* (*Common Beardless Wheat*—*T. hypericum* of Linnæus) has a compact ear, no awns, and hollow straw; it may be considered as the head of the family of Whitish Bearded varieties, some of the most highly recommended of which are—

Pearl Wheat, with long, stiff, white straw, medium-

sized very smooth ear, and numerous, closely-packed, small, round, plump white grains ; it weighs very heavy, and produces an abundant quantity of softish flour.

Hunter's Wheat, with medium length of straw and spike, the latter thickened in the middle, tapering to the neck and point, slightly awned ; grain of a brownish colour, a little elongated in form, of a fine, close, hard, flinty texture, and weighing well. It is later in coming to maturity than most white wheats, and if sown in fields bordered by woods it is liable to the attacks of the fly. It was discovered some sixty years ago by the late Mr. Hunter, of Tynefield, near Dunbar, by a roadside in Berwickshire, and is largely cultivated in East Lothian, Fife, and Forfar. It is well suited to inferior and medium soils, being hardy, and flourishing well in the early spring. It is a great favourite in Scotland.

White Irish Wheat, with tall straw, resembling that of rye, and long, loose, pointed spikes ; the chaff white, smooth, and slightly awned ; the grain large, oblong, of a dull brownish colour and hard flinty nature, excellent to mix with softer sorts for bread. This has long been cultivated in Ireland ; it is solely a winter wheat, but is good for light soils.

Red-Chaffed Wheat, with short straw, very square spikes, reddish chaff, and round, white, plump grain. This is well adapted for rich sheltered soils, in consequence of the stoutness of its straw, and liability to scatter its seeds when shaken by the wind.

Chiddam Wheat, with tall straw, square spikes, no awns, and round, fair, starchy grains. The flour is rather soft. It is well suited for soft soils in good condition ; it ripens early, and is not subject to mildew.

Hopetoun Wheat, with long, stiff, bright-coloured

straw; spikes moderately long and pointed, smooth chaff, and no awns; grain bright, plump, and transparent. It is a rather delicate sort, continuing long in flower, and so prolonging the period so liable to injury by wheat-fly, but productive when grown in warm, well-ventilated situations.

T. vulgare, var. *barbatum* (*Common Bearded Wheat*—*T. æstivum* of Linnæus) has a compact ear; the flowering glumes with long awns and hollow straw.

Fern Wheat, or *Awny Wheat*, has tall straw; spike spreading, pointed, with long awns; and long, reddish-brown, heavy grain. It is a very early wheat, can be sown in April, and will ripen sooner than any other kind of spring or winter wheat. It has unfortunately deteriorated of late, through neglect of the means necessary to guard against the disease called "black ball," to which April wheat is especially liable. It is well worthy of cultivation on inferior soils in late districts, but the seeds should be changed every two years.

T. vulgare, var. *turgidum* (*Grey Wheat*—*T. turgidum* of Linnæus). Spike more or less hairy; awns long, especially towards the summit; straw full and hard; grains coarse and thick. The Mummy Wheat (*T. compositum*) is a variety of this.

Fingered Egyptian or *Mummy Wheat* has a broad spike with many offshoots, sometimes six or eight smaller spikes springing from the main one; all awned. Its produce is very large, but the quality of the grain is inferior. The Rev. G. Wilkins, of Wix, states that he has grown, without artificial assistance, four thousand-fold from seed of this sort.

Cone Wheat, or *Rivet Wheat*, has tall, strong straw; long, awned, and well-filled spikes, and coarse grain.

Well suited to strong soils in the south and middle of England. The flour is especially prized by bakers for dusting their tins, but not for any other purpose. The awns often fall off before harvest.

T. vulgare, var. *Polonicum*, has very long, nearly smooth spikes; long awns and leafy chaff; the grains few, hard, and narrow.

Red wheats are accounted more hardy than white ones; they produce better crops, and though they do not fetch so high a price the greater quantity more than equalizes the profit. On good clay or fern loam the white wheats are equally productive, but on poor soils the red are very preferable. The same kind of wheat should not be long sown in succession on the same land, nor should the seed be taken from the same neighbourhood. The north and west of England should be supplied from the south-eastern counties, and the north and west of Scotland from East Lothian or the east of England. It is a very good plan to select a large vigorous ear, and plant the seed in a garden until seed enough is raised from it for field-sowing; in this manner the purity of a sample is secured.

In olden time the reapers were instructed to cut the straw halfway between the root and the ear, that the crop might take up less space in the granary; but in these days every inch of straw is carefully hoarded, being used for fodder, litter, burning, bedding, and for many industrial purposes, as straw-bonnets and hats, the manufacture of paper, mats, baskets, etc.

A single-grained wheat, called by the Swiss "St. Peter's corn," is cultivated occasionally among the mountains of Switzerland, and the ripe ear has so neat a quadrangular form, and is so fair and polished, that

you might suppose it to be carved out of ivory ; its flour makes moderate bread, and its straw is very good for thatching. There are many species of the *Triticum* family characterized by the name of Spelts, which, though inferior to the true wheat, are serviceable as food for man in times of famine, and are useful for cattle.

Various dangers threaten the valuable wheat crop at one or other crisis of its existence. Along the eastern districts of Britain, the harsh chilling east winds in spring, and the bright April sunshine, followed at night by keen frost, destroys the life of many of the young plants, and when the bloom is out, cold easterly rains, mists, and fogs injure it and predispose it to *fly*, *rust*, and *mildew*. Not less dangerous to the crops in the western districts are the heavy Atlantic rains and winds, and the pervading dampness of the air often impairs the quality of the grain. The best districts for wheat are the south-eastern and midland counties of England, and the eastern counties of Scotland.

Wheat crops are sometimes greatly injured by the disease called *bunt* or *black-ball*. This is caused by a very minute fungus which fixes upon the ovary, or occasionally upon the stem. It takes up its position at an early stage in the life of the plant, before the spike has emerged from the enfolding sheath, and far from injuring its growth, it has been observed that the bunted plants are generally taller than the rest of the crop. In former times this disease prevailed to an extent that was quite calamitous, and even in the present day one-third of a crop is sometimes affected by this fungus. Mr. Berkeley relates that on one occasion he saw a very bunt crop on the land of a first-rate farmer. On expressing surprise,

the farmer told him it was entirely his own fault for having neglected to dress the seed. He consoled himself that he might sell his corn at a low price to the bakers of gingerbread, to whom the dark colour of the flour would be no objection, and the treacle would conceal the bunt flavour. Before the dressing of seed became a regular system, it was observed that certain crops which had been raised from seed saved from a wreck were free from bunt, and hence it became a plan to dress seed with salt. A very approved dressing is quicklime mixed with boiling water, poured hot upon the seed-corn, or it is very secure to wet the seed thoroughly with a solution of *Glauber's salts*; but Professor Henslow recommends blue vitriol as the best and most effective dressing.

Mildew often causes great ravages in the wheat crop; there are few fields of wheat which are entirely free from it; the stems and leaves being more or less marked by dark dots or lines, composed of the clusters of microscopic clubs, which have burst through the cuticle of the leaf, beneath which they have long lurked unseen. Lighter soils are more subject to the ravages of this fungus than heavy ones, and crowded crops than thin ones; but occasionally, as in 1850, it seems to fall as a blight on the crops everywhere, and deteriorate both the quality and the quantity of the produce.

Rust is another fungous disease, closely allied to the bunt, and sometimes supposed to be a stage of it. It is often called *red-gum*, *red-rag*, or *red-robin*, and appears in the form of orange spots on the leaves of wheat and other grasses. It sometimes attacks the glumes also, and then it becomes very harmful. There is no remedy discovered as yet either against the rust or the mildew. The

rust is more injurious on the Continent than in our climate.

Flies are great enemies to wheat crops. The striped Wheat-fly (*Chlorops lineata*) lays its eggs in June, when the spikes are just emerging from the sheaths; in about fifteen days the eggs are hatched, then the maggots bore the stem and creep up the spike; then they change to pupæ, and afterwards to flies, yellow in colour with a black triangle on the crown. In September the young flies lay eggs upon the rye and other corn recently sown. The Ribbon-footed fly (*Tæniopus*) are still more harmful to wheat, for they live in the base of the stem and either destroy it altogether or make one side of the ear and most of the grain empty and shrivelled.

Wheat midges (*Cecidomyia tritici*) convey their eggs into the stems whilst the wheat is in flower, and when they are hatched the young larvæ abstract the juices from the grain and cause it to shrivel. The midge itself is an orange insect with splendid black eyes.

Ear-cockles are also virulent enemies to the wheat crop; the eggs hatch in the ovary. These worms are transparent, then yellowish, and somewhat opaque or semi-transparent, composed of many rings and a narrow distinct head; they attain the fourth of an inch in length and after being dried for six years have been reanimated by water. The cavities of the grain, when filled with the Ear-cockle (*Vibrio tritici*), form white balls of silky fibre, which dissolve instantly when plunged in water, liberating hundreds of the worms.

T. Spelta, *Larger Spelt*, differs from true wheat in adhering to the chaff; it is much cultivated in the warmer districts of South-eastern Europe and the African and Asiatic shores of the Mediterranean.

T. repens, our native *Couch-grass*, will be described among the British grasses.

Wheat contains the largest portion of gluten of any of the cereals, a very large quantity of starch, a good amount of albumen, gum, and oil; it is the most nourishing and useful of grains. Its uses are manifold. Bread made of the whole grain, ground together, is most wholesome and nourishing; that of fine flour, the bran being withdrawn, is less wholesome, though fairer to the sight. Bread is an article of such vital importance to rich and poor that hardly any other use to which the grain can be put seems worthy of mention. Yet there are articles of diet of considerable importance and very agreeable, such as maccaroni, vermicelli, semolina, etc., which are not unworthy forms of wheat-flour. Only in the north country is the "creed wheat" valued, which forms the old Saxon dish called "fromenty," so characteristic of old Christmas. Then, though the days of cambric ruffles are gone by, yet even the lords of the creation scarcely rise superior to starched linen, and here again we have to apply to the wheat grain. Even the penny letter owes some of its completeness to the flour of wheat, for the adhesive mixture upon the back of "the Queen's head" is "British gum," and that is made chiefly of wheat flour.

BARLEY counts next in value to wheat. The barley family is distinguished from the wheats by its one-flowered spikelets, which are arranged in clusters of threes.

It is probable that all the kinds of cultivated barley are varieties of one species, *Hordeum distichum*. In the normal type the middle spikelet of the three is alone perfect, and to this group belong all the varieties of two-rowed barley. When the lateral spikelets contain

perfect flowers, and the central an imperfect one, we get four-rowed barley and its allies. When all the spikelets are perfect, it is six-rowed barley (var. *hexastichum*).

Professor Lindley thus describes *H. distichum* :—"This is the only kind of barley that has been found apparently wild. We have now before us specimens gathered in Mesopotamia, during Colonel Chesney's expedition to the Euphrates, with narrow ears, little more than an inch long, exclusive of the awn, or four and a half inches, awns included ; and others, from the ruins of Persepolis, with ears scarcely so large as starved rye. Both are straw-coloured, but that from Mesopotamia has the glumes much more hairy than the other. The plant is also said to inhabit Tartary. To this species belong all the varieties cultivated under various names ; the *H. zeocriton*, *sprat* or *battledore* barley, is an undoubted result of domestication. The *H. vulgare* of Linnæus is a form with the grains in four rows, the naked-eared variety of which is the *H. cæleste* of some authors."

The geographical range of barley is much greater than that of wheat. It can bear great extremes of temperature, enduring the scorching suns of Africa and Central Asia, and the cold of northern Europe and America, even to Siberia and Kamtchatka. It grows rapidly and vigorously, and matures its seed in perfection either in the fervid heat of the south or the short-lived summers of the North.

In times of antiquity it was cultivated for the use of man and domestic animals. In Spain and Barbary two crops of barley are now raised in one season, so when we read in Scripture that, at the time of the Exodus, "the barley was in the ear," we conclude that it was the early crop. In those distant ages barley-bread was the chief

kind known. The faithful and devoted Ruth gleaned, with the maidens of Boaz, until "the end of barley harvest and to the end of wheat harvest," and the "six measures" that Boaz put into her veil were of barley. We read in the Book of the Kings that while the famine desolated Samaria, Elisha prophesied that, on the raising of the siege, "two measures of barley should be sold for a shekel." All these mentions prove that, in those times barley was a very important article of food.

H. distichum (*Early English Barley*) is the kind most usually cultivated in England, Scotland, and Ireland. Its stems are about three feet high, and the spike three and a half inches long, the grains are firmly inserted in the rachis, and the awns are long and adhere tenaciously to the grain. While growing the plant is of a lively light green, and the straw is of a clear glistening yellow when ripe. It is suited to a great variety of soil and climate, but light land and late districts are the best for it. It ripens from thirteen to sixteen weeks after the sowing.

Chevalier Barley has thicker stems, deep orange-yellow when ripe; plump grain, heavy, and well grown, with a husk of pale colour, and white as chalk within. This sort is especially good for malting, and is used for the rich creamy ale for which Edinburgh is famous, and the black porter characterized as London and Dublin porter. Rich sandy loam suits this barley best, and it flourishes well on the red sandstone, mountain limestone, and trap formations.

Annat Barley has more bulky stems, pinky under the spike when ripening; spikes four inches long, and round, plump grains, about twenty-six in each spike; the awns are long, brittle, and easily broken off. This

is a very productive variety, but it is rather capricious. Good black land, or rich sandy loams, suit it best. It is suitable for common malting purposes. It was introduced by Mr. Gorrie, of Carse Gowrie, in Scotland.

Italian Barley has short, broad spikes, and the grains are extraordinarily plump and round; the bright yellow colour of the stem has procured for it the name of Golden Barley; its length is about three feet seven inches. According to Mr. Lawson, it was first cultivated in Ayrshire, having been introduced from the Alps.

Brown's Barley has stems four feet eight inches in height, and elongated, heavy grains. It is early, hardy, and prolific. It flourishes well on clay lands.

Norfolk Short-necked Barley has a strong stem, five feet high, and a great profusion of leaves. The spike is slow in emerging from the sheath, and in wet seasons is liable to choke in the blade. In dry seasons it is very productive.

Two-rowed Black Barley has the characteristics of other two-rowed barleys, but is of a black-blue colour. The kernel is white as chalk. The grains are large and coarse.

Peacock's Barley has short stems, about twenty-seven inches high; spikes short, broad, and tapering to the summit, and grains large and coarse.

Fluck-wheat Barley has a short wide spike, and large, thin-skinned grains of good quality.

There are at least a dozen other varieties of two-rowed barleys.

Common Bere has short thick spikes, and the grains are arranged around the rachis in two single and two double rows. The stem is about three feet three inches high, and the spike two and a half inches. The grains

are smaller and more elongated than those of Two-rowed Barley, and the awns are long, tough, and persistent. The average number of grains in each spike is forty-seven. This is cultivated in the Highlands of Scotland as a spring crop, and in Ireland as a winter crop. In the fertile lands of Perthshire it yields a very heavy crop. It is chiefly employed in making whisky.

Victoria Bere has longer stems, longer spikes, and is more prolific. This is an excellent variety, either for high or low districts.

Six-rowed Barley (*H. hexastichum*) differs from Bere (*H. vulgare*) in having all the rows equidistant. The stem is thirty inches high, the spike short, containing about thirty-two grains; it is hardy and prolific.

Six-rowed Naked Barley. Similar to Bere, but with freer seeds, which separate from the chaff in threshing. Often called Siberian Barley, and introduced from the Himalayan mountains.

Dry soils suit barley best.

Barley-bread is by no means to be despised; not only was it the staple food of great numbers in the olden times, but it is now the regular diet of vast numbers of the Continental poor. With us its chief use is for malt. For this purpose the grain of the finest quality and thinnest rind should be selected. The first process in malting is to plunge the grain in very pure water. All that sinks in the water is fit to be turned into malt, but that which floats should be skimmed off and set aside for feeding poultry and pigs, for it is too light to make good malt. After remaining in water until thoroughly softened, the grain is then laid in heaps large enough to engender a suitable heat for germination, but not enough together to make too great a heap.

It is left thus until the germ is ready to burst the outer skin, and then all further progress of germination is arrested by the grain being spread on the kiln and moved continually while subject to a moderate and increasing heat, until thoroughly dried. If required of a pale colour the process of drying is not very long, but if required of amber colour, the grain is kept longer on the kiln, and subjected to greater heat; and if required dark, both the time and the heat have to be increased.

If the barley be ripe and good it increases in bulk by malting, but if reaped unripe it loses bulk and makes very inferior malt.

Pearl barley forms a not unimportant article of diet. It acquires the form used in commerce by being ground in a mill, which removes the husk and outer part, and leaves the grain about the size of small shot. The utility of pearl barley for making barley-water, is well attested in all hospitals and sick-rooms; it is also good for puddings, and the "cannie Scotch" thicken with it their excellent "barley broth." Fowls lay most eggs and thrive best when fed with barley, and it is very good for fattening pigs.

Barley is subject to the same diseases as wheat, but to a less degree.

The Oat is extensively cultivated in all temperate climates; it grows the most easily in islands, and hence has always succeeded so excellently in the British Isles.

Avena sativa (Common Oat) is described by Professor Lindley as "an annual, with a perfectly smooth herbage, and an open panicle of flowers spreading equally all round. Each spikelet contains two florets, which are quite bald, shorter than the glumes, and ad-

herent to the grain when ripe. Of these florets only one is bearded; even when a third is present, which is sometimes the case. The native country of the common oat is unknown. Its hardness leads to the suggestion, that it must be of northern origin, for it is cultivable even in the Arctic zone, yet no trace of it in a wild state has been found after the most diligent search." The learned Professor considers this plant to be a variety of some wild species, probably *A. strigosa*, which might assume the form of the cereal oat by continued cultivation. He says it is probable that oats may have originated in Mesopotamia or Persia, and describes an oat found in the former country, on the banks of the Euphrates, by the party under command of Colonel Chesney. This plant was about eight inches high, covered with fine soft hairs on the leaves. The panicle contained about six spikelets, and the spikelets had two or three florets each, with long, sharp-pointed, rather membranaceous side lobes to the flowering glumes, and a tuft of brown hairs at the base. Though the Euphrates plant differs in many respects from the cultivated oat, it is quite as probable that it may be developed into the other form, as that the *Ægilops* should develop into wheat.

The practical and experienced Mr. Haxton, of Fife, gives a careful account of the varieties of *Avena sativa* best worthy of cultivation, and from his notes we select some of the most interesting descriptions.

"The different kinds of oats are distinguished from each other by a variety of characteristics, such as colour, size, and form of the seeds, quality of the straw, the period of ripening, liability to shed their seeds in high winds, and adaptation to particular soils and climates. There are three principal groups of oats, easily distinguishable by colour—*white*, *black*, and *dun*.

"*White Oats* are separable into two principal varieties,—the late and the early. Early oats are best adapted for the higher class of soils, as the greater yield per acre more than compensates for the inferiority of the straw. Their earliness renders them very desirable for late districts; but the liability of some to shed their seeds in high winds, renders their cultivation in exposed situations extremely hazardous. Late or common oats ripen later, have thicker husks, and less meal, but of better quality; they are not usually so prolific; they are less liable to shed their seeds in high winds, the straw is superior, and they can be more successfully cultivated on inferior soils. Black oats are of two kinds; the one, the *Tartarean*, having the ear only on one side the straw, and the other, the old or common *black*, with black seeds, but having a spreading ear, similar to the white varieties. Dun oats are to all appearance hybrids between the last-mentioned variety and one or other of the white sorts; they are late and hardy, have superior meal and straw, and are well adapted to clayey and cold-bottomed soils."

Potato Oat has a compact ear, round and very white seeds, a thin husk, easily detached, and short straw. It grows so fast, that it is a common saying that if potato oats are as long as ordinary stubble when the ear makes its appearance, the crop will come to a good bulk at harvest. When fully ripe the seeds are so loose, that however carefully the crop is reaped, great loss is sustained, and in high wind all the upper grain is sure to fall. It is therefore better to cut this kind a little green.

Sandy Oat has taller stiffer stems, smaller grain, and less rich meal than the last variety, but the meal weighs well and is liked by bakers. It is not a good kind for

feeding horses, for, the grain being small, they are liable to swallow it whole. On soft soils it succeeds better than the Potato Oat. It was first discovered in 1824.

Hopetoun Oat has remarkably long thick stems, a large spreading ear, and large brownish seeds with a red spot on the breast. It does not shed its seeds so easily as the Potato Oat, but the stem though coarse is weak, and hence it is very liable to be beaten down by rain and wind. It yields less meal than the Potato Oat. It is often sown in equal parts with the Sandy Oat in order that the firmer character of the latter may hold up the crop; this mixture gives a ragged appearance to the oat-field, as the one kind grows taller than the other until close upon harvest time.

Berlie Oat has a full broad ear, light-coloured seeds not very liable to shake. It is a good variety for rich soils, stands well, and produces a fine sample. There are two kinds, the English Berlie and the Scotch Berlie, the latter being later, less liable to shake, and better adapted to light soils. It is extensively cultivated in Scotland.

Friesland or *Dutch Oat* has tall stout stems, but it ripens unequally, and has fallen into disrepute.

Kildrummy Oat has tall, slender, tough stems, and well-formed, bright coloured seeds with thickish husks. It grows freely and is well adapted for sowing on poor soils in late districts. There are a dozen other varieties of early white oats described by Mr. Lawson, but these are the most highly recommended.

Late Angus Oat has tall strong stems not easily bent, and large, long, awned grain. This is the best of its class for clay land in an early climate, and even for inferior soil. It is unsuited for late districts, because it is from a fortnight to a month later in ripening than the kinds before mentioned.

Blainslie Oat resembles the last, but its grains are more plump and round. It ripens earlier, and so is better adapted for late districts.

Drummond Oat has strong stems not easily bending but shorter; its seeds are rounder and seldom awned; it ripens a week earlier than the *Angus Oat*, and seldom sheds its seeds. It is much cultivated in the central districts of Scotland. There are several other good varieties of *Late White Oats* described in Lawson's 'Manual.'

Black Tartarean Oat has long stems, the ear is placed at one side, and the produce is very abundant. The grain is long, black, and not much awned; the meal is of excellent quality, but seldom fair, because of the difficulty of excluding minute portions of the black husk. Very much appreciated by horses; it is even said, that when accustomed to black oats they refuse the white. The straw is very inferior for fodder.

Common or Old Black Oat has spreading ears, shorter straw, shorter and heavier grain. This old variety is now much neglected, it is well suited for peaty soils.

Common Dun Oat has tall, stiff stems, and seeds shading from black to white, being black at the base, brown in the middle, and white at the summit. The grain is large, long, well-filled, and heavy, and the straw is better for fodder than the *Black Tartarean*. On clay soils it retains its form and colour, and is very prolific, but it deteriorates on light soils.

Winter Dun Oat has a very rigid ear, scant in seeds. It is very hardy, enduring the severest frosts; its seeds are coloured like the last-mentioned variety, but the quantity and quality of the meal is inferior. It is much cultivated in the north-west of France, and also in the south of England as a winter-crop.

Brown Riga or *Archangel Oat* is darker-coloured than the other dun oats; it has long stems, and is very prolific. Taken from some oats imported from Archangel.

Red Essex Oat is very prolific, but of bad quality. It is grown to a considerable extent in the south-east of England for feeding horses.

The best samples of oats are grown on clay lands. Scotch oats fetch a higher price in the market than those from any other country. The cultivation of oats is decided by the kind of land and the taste of the people.

The Celtic race have always been great consumers of oatmeal, hence the prevalence of oat crops in the Highlands and Lowlands of Scotland and the north-west of Ireland. The oat cakes of Scotland and the north of England are excellent, and the *flad brod* of Norway is formed of the same meal and reputed equally pleasant. Oatmeal is still more extensively used in North Britain for porridge than for bread, and it is accounted a mark of the degeneracy of Edinburgh servants that they are no longer contented with porridge for breakfast. Dr. Johnson made the Scotch use of oats a ground for one of his sarcasms. "In England oats are food for horses, and in Scotland food for man." He did not probably know how extensively oatmeal was used in the north of England. In Scotland and Ireland it is still the principal food of the poor. Professor Johnston, of Edinburgh, demonstrates that oatmeal is rich in those protein compounds which constitute the *muscle-forming* principle of the animal frame. Hence it is that this is such desirable food for horses.

Oats freed from the cuticle are called groats; of these a kind of gruel is made, generally accounted superior to that made of oatmeal. In Switzerland they make excel-

lent oatmeal soup by baking the oatmeal first and then boiling it.

Oats are the least subject to diseases of any cereal. The Potato Oat is subject to a thickening of the base of the stem familiarly called *tulip-root*, accompanied by an unhealthy development of the leaf. The cause of the disease is not clearly ascertained, but it prevails most in wet land. Bunt and mildew scarcely ever affect oats, and smut only to a slight extent.

Wireworms torment the roots a little, especially in land recently reclaimed, and this evil is best obviated by paring and shallow ploughing, and any means calculated to destroy the roots of the aboriginal grasses. Some larvæ prey upon the leaves, but do not materially injure the plants.

RYE does not bear such extremes of cold as oats and barley, but it becomes associated with them in the north temperate zone, flourishing well in the south of Sweden and Norway, in Denmark, and in all the lands bordering the Baltic, in the north of Germany, and in part of Siberia. It can be grown in climates that are too cold for the production of wheat; it delights in the sandy soil of Flanders, and grows there in much perfection. It is cultivated to a slight extent for corn in Britain, and its flour made into bread and cakes, but these are used rather as dainties than for general purposes, rye-rolls being sold in the Edinburgh shops in the same way as currant buns and gingerbread. Household bread when made of rye is more adapted for supporting physical strength, and therefore better suited for the classes subject to hard work, than wheaten bread. The Germans account it also more nourishing, but that is because they use the coarsest kind of wheaten bread, and that is in-

ferior in nutrition to rye bread, whilst the English white bread is undoubtedly superior.

Secale cereale, *Common Rye*, is thus described by Professor Lindley :—"It is distinguished from wheat by its narrow glumes, and constantly twin narrow florets, with a membranous abortion between them. Otherwise it is little different in structure, although the quality of its grain is so inferior. According to Karl Koch, it is undoubtedly found wild among the mountains of the Crimea, especially about the village of Dhsimil, on granite, at the elevation of from 5000 to 6000 feet. In such places, its ears are not more than from one to two and a half inches long. Its native country explains the reason why it is so much hardier than wheat, the southern origin of which is now ascertained."

Rye is only partially cultivated as a corn crop in England, it is generally preferred as a green crop. For one or other of these purposes several varieties are in vogue.

Tyrolese or *Giant Rye* is a very early kind ; it is not so productive nor so reliable as the common rye, but it is very useful for early food for sheep.

St. John's Day or *Midsummer Rye* is sown in June, is late in ripening, produces a great deal of root foliage, and is useful for early pasturage for the flocks the following spring. In France it produces a good crop of grain, after being eaten down by sheep till the end of April.

Cooper's Early Broad-leaved Rye is famous for the quantity of early foliage it produces, and on that account is valuable as a green crop.

Rye is grown as a corn crop on the light sandy soils of Suffolk and Norfolk, being sown on clover or saintfoin, and treated in every way like wheat. It used to be grown mixed with wheat, and the mingled grain was called *mes-*

lin. Rye is very easy of cultivation, from being so little subject to disease. No dressing with salt or vitriol is required for the seed. Rye as a green crop is sown on stubble land after the wheat is reaped; and after it has been consumed by the ewes and lambs, turnips are sown.

We have already remarked on the good qualities of rye bread. Meslin bread used to be common in the north of England, and was universally esteemed exceedingly wholesome and palatable. Rye is used to feed pigs and horses and also in making malt and ardent spirits, but it is only second-rate for any of these purposes. Rye is extensively cultivated in Holland, where it forms the chief ingredient in the spirit called *Hollands* or *Geneva*, the latter name being Dutch for Juniper, the berries of which give the flavour to the spirit. The straw may be made palatable to cattle, if chopped, steamed, and mixed with linseed. Its toughness renders it desirable for thatching, and for stuffing horse-collars, etc., and its applicability to straw-hat-making is well known, being celebrated by the great poet of England:—

“Sun-burnt sicklemen of August weary,
Come hither from the furrow and be merry;
Make holiday—your rye-straw hats put on.”

The principal disease to which rye is subject is the ergot, which is a fungus that attacks the seed and shoots out a long black horn from the grain. During a period of famine in France, the poor were driven to use bread made of ergoted rye. All who ate it became ill, suffering more or less from dry gangrene, which in the worse cases caused the limbs to rot off before death. In the ‘*Journal of the Royal Society of Agriculture*’ there is an account of similar effects produced upon a family at Waltisham, in Suffolk, in 1762. When the French

poor were dying from the effects of this poison the disease was attributed to witchcraft, and many fell victims to it before its cause was ascertained. The otherwise poisonous ergot is found useful as a medicine in the hands of the faculty. It is collected on the Continent by women and children, who wade among the standing rye for the purpose: they sell it at from ten to twenty shillings the ounce.

In Sweden some little flies torment and injure the rye crops. They lay their eggs beneath the cuticle of the stem, and the larvæ make their abode in the heart of the culms and stunt their growth, robbing the spikes of all nourishment, and rendering them almost barren. The rye moth (*Pyralis secalis*) deposits its eggs within the sheaths, and the young caterpillars pasture on the ears.

The MILLET grasses are cereals of some importance in the tropical and subtropical countries. The *Sorghum Dora*, or *Durra*, or common Indian Millet, is a very handsome grass, allied to our *Holcus* family. It is a native of the East Indies, and is cultivated in the south of France. The culm is as thick as a man's finger, and attains a height of from six to ten feet, bearing a spreading panicle a foot long, the light and much-branched rachis trembling with innumerable downy flowers. The seeds are nearly round, yellow or orange.

The Two-coloured Millet (*S. bicolor*) presents a curious appearance when in seed, the glumes being black and the seeds almost snow-white: it is said to be a native of Persia.

There are many other species, the seeds of which are variously cooked in India, as well as members of other genera, affording grain more or less adapted for edible purposes, as the Ragee or Mand, the Menya, the *Setaria*

Germanica, or German Millet, and the Abyssinian corn plants Teff and Toccusso. Mr. Gorrie thus describes the *Poa Abyssinica* in the 'Cyclopædia of Agriculture':—
"Several varieties of Teff, or Abyssian Millet, the only cereal species of *Poa*, are much cultivated in Abyssinia, for their small, millet-like seeds, which are highly esteemed in the domestic cookery of the Abyssinians, and from the flour of which they prepare a soft, spongy, and sourish, though not disagreeable, kind of bread. These varieties are classified into white- and brown-seeded, the former of which are deemed the finest. The *P. Abyssinica* has been known to British botanists for nearly a century, but only as a botanical or horticultural rarity; nor has its introduction into the more suitable climates of southern Europe been attended with much success, chiefly in consequence of the preference given to the true Millets, and partly from an existing opinion that, to Europeans at least, it is by no means so wholesome as those." Even the *Stipa pinnata* is said to produce flour like that of rice.

MAIZE (*Zea Mays*) is as much cultivated as wheat in Portugal, Spain, south of France, Italy, Greece, Persia, Arabia, Egypt, Nubia, Barbary, the Canary Islands, and India, increasing continually as you proceed southwards. Maize predominates in the torrid zone of America, and shares the empire with rice in Africa, which is natural, America being the native country of maize as Asia is of rice; so that we are not surprised at finding it even at an altitude of 7200 feet!

This is one of the handsomest of the cereals; it rears its elegant plumes of flowers from the summit of a culm eight or ten feet high. Beneath this plume, situated in the axils of the broad flag-like leaves, appear generally

two ears, at first small and downy, and tipped with long lax silky styles, which form a drooping tassel, but enlarging to the length of a foot, and then presenting a densely-packed head of seed, as many as 800 large grains being sometimes found in one head. The plant is monœcious: in the terminal plume all the flowers are male, and the axillary spikes contain only female flowers. The flour from this Indian corn is extremely nourishing, and, though not well adapted for forming light bread alone, it is very successful when mixed with an equal portion of wheat or rye flour. American *mush* and Italian *polenta* are made by strewing Indian meal into boiling water with one hand, and stirring vigorously with a spoon held in the other, until the mixture becomes solid enough to turn into a platter; it may then be eaten with butter and salt or with milk and treacle, or it may be left to become cold, and then cut in slices and fried. A great variety of cakes and puddings may be made from the Indian-corn flour: many receipts are given in print outside the packets as sold in the grocers' shops, and in this instance the merits can hardly be overrated.

RICE (*Oryza sativa*) begins to prevail in nearly the same latitudes as those which encourage the maize, as Spain, Portugal, Italy, Greece, Egypt, Nubia, Barbary, and India. But rice flourishes pre-eminently in the eastern parts of the Old Continent, and in China and Japan. In the southern provinces of the United States it prevails almost exclusively, and also in the torrid zone of Asia. In Africa it flourishes about equally with the maize. Asia is the natural home of the Rice family, as America is that of the Maize.

The history of rice, could it be written, would not be

lacking in tragic and painful scenes. Longfellow's 'Slave's Dream' shadows forth some of the sad associations of the rice fields:—

“Beside the ungathered rice he lay,
His sickle in his hand;
His breast was bare, his matted hair
Was buried in the sand;
Again, in the mist and shadow of sleep,
He saw his native land.”

But though the rice-field has been sometimes a “dismal swamp” to the slave longing for freedom, it has far oftener been the scene of easy labour and abundant food. The best ground for rice is low land by the side of rivers, and, wherever it is possible to do so, they prepare the ground for the reception of the seed by inundating it, and they steep the seed in water in the meanwhile. Having broken up the muddy ground, and raked it with a sharp-toothed hurdle, they sow the rice by hand, and the sprouts appear within a day or two of sowing. The Chinese take the plants up again and plant them in tufts, and then overflow the land again. When mature the plant is about two feet and a half high, and its leaves resemble those of the leek. It has a diffuse panicle, the florets are bearded, and the glumes yellow. When the grain is ripe, which is known by the general yellow appearance, it is cut down with a sickle, made into sheaths, and carried to a barn to be threshed.*

Rice is one of the most important of cereals, affording wholesome and nutritious sustenance to vast numbers of the human family in Asia and Africa, a valuable

* In India, according to Duchesne, this is the only grain from which beer can be made. By fermentation, a spirit called *rack* or *arrack* is extracted from it.

and cheap article of diet to the poor in Europe, and a welcome addition to the tables of the rich. Alone, or with curry or milk, it forms good food ; ground into flour, it is available for puddings, cakes, etc., and starch is formed of it as well as of wheat.

The family of the Sugar-cane (*Saccharum*) includes a great number of stately plants attaining a considerable height, some being twenty feet in stature.

The Common Sugar-cane (*Saccharum officinarum*) is a native both of the East and West Indies, or was very early introduced there from Africa. The inhabitants of the West India Islands assert that the sugar-cane never blossoms, because they are accustomed to plants cultivated to the highest pitch of luxuriance for the sake of the sap, and cut before the blossoming time. The inflorescence of the sugar-cane is an object of remarkable beauty ; the rachis diverges into innumerable branchlets, bearing a crowd of delicate florets, the weight of which bends the slender branch. The leaves are flat and smooth, and soon fade. There are a good number of species known to botanists, but the only one in extensive cultivation is the Common Sugar-cane. This is propagated by cuttings. When the ground is prepared, holes are made in rows three feet apart, leaving two feet between each pair of holes ; two or three cuttings are then placed in each hole, and covered two inches deep with earth. In about a fortnight green sprouts begin to arise from the ground, and according to the season and climate, the canes are fit for cutting from August to November. The cuttings are planted in March in the West Indies, and several crops may be raised from the same set of roots, so that new cuttings only need be planted once in several years. As the canes are cut

and carried from the plantations, they are thrown into a mill, and there crushed, and the juice expressed, and received into troughs. It next runs into a pan called a clarifier, where it is kept at a certain heat, but not allowed to boil. During this process it is tempered with lime and skimmed, and then it is drawn off as a clear yellow liquid; it is then exposed to the air in open vessels, and poured from one to another. It is left to percolate slowly through the spongy stem of a Water Plantain, thus it forms into crystals; after this, it is ready to be packed in casks for exportation.

The Chinese Sugar-cane also abounds in sap; it is very valuable, because the canes are hard enough to resist the attacks of the white ants, which make such depredations upon other species. Canes are applied to various industrial purposes.

We have thus before us the most important uses of the edible grasses or cereals. As furnishing the staff of life in every part of the globe, and affording many articles of luxurious diet, their family becomes the most valuable in all the vegetable kingdom. Art and civilization have developed the utility of a great number of species, but these are few in comparison with those which have not yet been searched into. Mr. Loudon, in his 'Practice of Agriculture,' recommends very earnestly the cultivation of an American grass, the *Zizania aquatica*, the seeds of which, he says, resemble those of Polish Millet. He thus describes the plant:—"It is exceedingly prolific, and produces abundance of bland farinaceous seeds in all the shallow streams of the dreary wildernesses of North-west America, between the Canadian lakes and the hilly range which divides Canada from the country on the Northern Pacific

Ocean. Its seeds contribute essentially to the support of the wandering tribes of Indians, and feed immense flocks of swans, geese, and other wildfowl, which resort there for the purpose of breeding. Productive as is this excellent plant, and habituated to an ungenial climate, and to situations which refuse all culture, it is surprising, says Pinkerton, that the European settlers in the more northern part of America have as yet taken no pains to cultivate and improve a vegetable production which seems intended by nature to become, at some future period, the bread-corn of the North."

And if such a plant continue thus unknown and disregarded, why may not such be the case with many others? We rejoice and are thankful for our wheat and oats and barley, our Indian corn and maize, our sugar-cane and our rich stores of rice, but as man increases and multiplies on earth, and carries his increased intelligence and enterprise into every corner of the globe, who shall say that new species of cereals shall not be discovered, to pour, as from added tributaries, fresh streams of life-giving power into the granaries of the world?

Let our thankfulness be deep and true to Him who giveth us fruitful seasons, filling our hearts with joy and gladness, who, despite the unbelieving fears of men, controls the elements, and checks the ravages of insect and of blight, so that our harvests fail not and our poor perish not for lack of bread! Vain indeed would be the glory of the ancestral oaks, the pride of English park and forest; vain even the wooden walls of old England, if the humble grasses should fail to produce their bread for the use of man, and their green herbage for the sustenance of the herds and flocks.

CHAPTER IV.

AGRICULTURAL GRASSES.

THE importance of grasses as food for cattle is only second to their importance as food for man, and agriculturists have been awakened at length to the necessity of intelligent care in their cultivation. Mr. Lawson, of Edinburgh, was one of the first of the distinguished seedsmen who gave earnest study to the subject. He asserts that grasses were first cultivated in England in the seventeenth century, but that Scotland and Ireland were a century later in turning attention to the subject. In the first stage of this science the plan adopted was to collect the seeds shaken out of the best hay crops, and sow the new pastures with that; and Stillingfleet has the credit of being the first to select approved species for seed. As soon as this plan of selection came into operation, agricultural grasses were considered under two heads:—1st, Natural grasses, or those which were planted by nature; and 2nd, Artificial grasses, or those introduced into the pastures by the agency of man.

The value of natural pastures has been acknowledged as long as agriculture, even in its humblest forms, has been practised. Poets sing their praises, statesmen

yield their testimony to their merit. Gay borrows their charms for his description :—

“ When the fresh grass in all her state is crowned,
And high luxuriant grass o’erspreads the ground,
And labourer, with bending scythe is seen
Shaving the surface of the weaving green.”

Nor does the antique Spenser neglect the theme :—

“ Ne did he leave the mountains bare unseen,
Nor the rank grassy fens’ delights untryed.”

Here we have two different kinds of natural pastures described by poets, and agriculturists would multiply the varieties sevenfold. Early in the eighteenth century men began to distinguish grasses by their qualities, and to prefer one to another. But agriculturists were wanting in intelligence and enterprise, and continued to regard all the green covering of meadow and pasture as “grass” in general, except in the rare instances of intelligence where observation was awakened. In 1766 a stimulus was given towards the observation and cultivation of the natural British grasses by the London Society for the Encouragement of Arts, Manufactures, and Commerce, who advertised a prize or prizes for “gathering by the hand the seeds of Meadow Foxtail, Meadow Fescue, and Sweet Vernal-grass.” This wise measure was followed by a due portion of success, in the awakened interest of agriculturists; and the same beneficent Society followed up its first effort by a second in 1769, which offered a gold medal to the person who should give the most satisfactory account of the various properties and comparative value of any two or more natural grasses. In 1822 a new and important era set in for the grass family. The Duke of Bedford turned

his full attention to their study, and, assisted by his highly intelligent gardener, proceeded to test the qualities of all our British species, and of many foreign ones. The better to succeed in this attempt, they procured directions from Sir Humphry Davy for a simple test, which, though less exact than the elaborate chemical experiments now in vogue, answered their purpose sufficiently.

“Submit the grass, in a green or dry state, to the action of hot water, till all the soluble parts are taken up. Then separate the liquor from the woody fibre of the grass by means of blotting paper, and evaporate it to dryness. The remaining solid matter is the nutritive product of the grass.”

Thus the great nobleman and his gardener, Sinclair, began their course of observations and experiments, first collecting all the natural grasses, then putting their qualities to the test, and then proceeding to study the cultivation of such as were recommended by their early growth, abundant aftermath, or nutritive qualities.

Mr. Sinclair writes of these grasses, and does so with authority, for he had the honour of being the first to design a grass garden. He formed one at Woburn, by desire of the Duke of Bedford, and another at New Cross for himself; and in these gardens they tried all kinds of experiments with the various grasses then known, the merits and qualities of which they tested patiently and thoroughly.

His plan was first to analyse the turf from various pastures most highly approved by intelligent farmers, and then to try to reproduce such turf by artificial means in localities where the natural turf was inferior. He soon arrived at the conviction that any failures to

renew sward on lands that had been ploughed up arose, not from the length of time that the grass plants require to arrive at perfection, nor from any injury inflicted on the land by a course of grain crops, but from neglect in employing the seeds of grasses natural to the soil, and which constituted the turf before it was broken up. After much observation and reflection, he was confirmed in his original conviction, that the aim of human art in agriculture is to assist nature, and, carefully observing her operations, to work in furtherance of them. Therefore, he devoted himself to the constant watching of the habits of the grasses, and he found that from the beginning of spring until winter set in, there was no time when one or other species of grass was not in its most perfect state,—some containing more nutriment before the production of the flowers, some being of most value in the flowering season, some when in seed, and many owing their chief excellence to their aftermath. Also, he found that dry weather favoured the growth of some, and moisture that of others; and hence he learned to adapt different species to different soils, and to combine what may be called a succession of grasses to form permanent pasture. In this style of pasture he eschewed any admixture of annual grasses, or of leaved clover, and particularly warned his followers against turning sheep in upon the young grass before it had got well rooted. Messrs. Wheeler, of Gloucester, following faithfully in the estimable steps of Mr. Sinclair, have, with the aid of Professor Ramsay, prepared lists of grasses suitable to the various geological formations of Great Britain. They say, in their book on grasses:—"In old pastures nature is a true index for us to the grasses indigenous to the soil; and, by careful examination, we find the grasses,

clovers, and other plants varying on each geological formation in a very remarkable degree. Thus, the herbage of the South Downs, so well adapted for short-woolled sheep, differs entirely from the herbage on the Cotswolds, or Oolitic series, the home of our fine long-woolled sheep. The herbage in the fine pastures of the Old Red Sandstone of Herefordshire, where the beautiful Hereford herds are seen in such great perfection, differs also materially from that in the fine grazing pastures on the Kimmeridge Clay."

Moreover there is the taste of the cattle to be considered. Sheep have strong likes and dislikes. They will hasten to a kind of grass which is a favourite with them, trampling down all the other grasses as unfit to taste. The *Dactylis glomerata* they are very greedy about; while there is a grass growing freely in first-rate pastures in Kent which they dislike so much, that they stop before it and utter cries of despair. Horses, again, have their preferences, and cows theirs; and we have even seen swine exercise considerable cunning to secure a feed of a favourite grass. So the agriculturist has as much to consider as a master of ceremonies; he must consult the capabilities of situation, the qualities of his provision, and the various taste of his company.

We give a selection of Mr. Sinclair's analyses of different turfs, upon which he founded his advice on the selection of grasses for permanent pasture:—

TURF, FROM HARDWICKE.

Anthoxanthum odoratum. *Lolium perenne*. *Dactylis glomerata*.
Cynosurus cristatus. *Poa pratensis*. *Poa trivialis*. *Holcus lanatus*.
Festuca pratensis. *Achillea Millefolium*. *Trifolium repens*. *Trifolium*
pratense. *Rumex acetosa*. *Plantago lanceolata*. *Hieracium Pilosella*.
Prunella vulgaris.

TURF, FROM ENDLEIGH.

Festuca pratensis and duriuscula. Alopecurus pratensis. Dactylus glomerata. Bromus mollis. Poa trivialis. Cynosurus cristatus. Festuca rubra. Agrostis stolonifera. Lolium perenne and var. compositum. Holcus lanatus. Agrostis vulgaris. Trifolium pratense and repens. Plantago lanceolata. Hieracium Pilosella. Rumex Acetosa. Stellaria graminea. Bellis perennis. Anthoxanthum odoratum.

After much study, and careful examination and comparison of meadow and pasture lands, he came to the conclusion that, for spring grass, the following admixture of natural grasses was the best, and for other seasons as described afterwards:—

SPRING GRASS.

Alopecurus pratensis. Dactylis glomerata. Festuca pratensis. Phleum pratense. Anthoxanthum odoratum. Arrhenatherum avenaceum. Lolium perenne. Bromus arvensis. Poa annua. Avena pratensis. Vicia sepium.

SUMMER AND EARLY AUTUMN GRASS.

Avena flavescens. Hordeum pratense. Cynosurus cristatus. Festuca duriuscula. Poa trivialis and pratensis. Holcus lanatus. Trifolium pratense and repens. Lathyrus pratensis. Festuca glabra.

AUTUMN GRASS.

Agrostis stolonifera (Fiorin grass). Agrostis palustris. Triticum repens. Achillea Millefolium.

On dry sandy or chalky soils, the grasses you find planted by nature are—

Festuca ovina and vars. vivipara and rubra. Hordeum murinum. Agrostis canina and lobata. Aira præcox, cæspitosa, and flexuosa. Alopecurus agrestis. Avena pubescens. Melica cærulea. Nardus stricta. Bromus sterilis. Poa alpina. Aira cristata. Poa compressa. Hordeum pratense. Lotus corniculatus and major. Medicago lupulina. Hedysarum Onobrychis.

It was long after Stillingfleet had introduced the plan

of selecting seeds, and Sinclair of studying varieties of land, that either practice came into vogue; and it is but the smaller portion of farmers who give intelligent care to the subject even at the present day, though few would confess to neglecting it altogether. For those whose lands bear first-rate natural pasturage, we have only to recommend gratitude to the Author of all nature's benefits, but to the rest we beg to recall the well-known proverb, "God helps those that help themselves."

Every part of the plant of a grass affords food for animals, but grasses vary greatly in the quantity of foliage they produce, and in the quality of that foliage. Where the leaves are thick and succulent, there is generally a predominance of sugar and mucilage; if the tint be glaucous, it is a still greater sign of the prevalence of the sugar. On the other hand, the grasses with thin leaves, rough, and of a light tint, contain a greater portion of extractive matter. According to Sinclair's analysis, the grasses with the inflorescence in a spike or close panicle and succulent leaves, contain a good deal of gluten; those with very tall culms, spreading panicles, and leaves flat and rough, have a great quantity of saline matter and bitter extractive; whilst those with strong creeping roots, few culms, leaves flat and rough, and spike of few flowers, excel in the bitter extract combined with mucilage.

In forming artificial pastures, the first care should be to improve the land and get it into the best possible state, dressing with lime or clay or manure, according to the elements most needed.

The dry sandy or chalky land, which by nature would bear the grasses described above, if treated with large

quantities of clay, would be capable of producing a superior class of herbage.

The following grasses are recommended by Sinclair for such land :—

<i>Festuca ovina</i> , <i>var. hordeiformis</i> , 3 pecks.	<i>Poa compressa</i> , 1 peck.
<i>Dactylis glomerata</i> , 3 pecks.	<i>Festuca rubra</i> , 1½ peck.
<i>Cynosurus cristatus</i> , 1 peck.	<i>Festuca duriuscula</i> , 2 pecks.
<i>Avena flavescens</i> , 2 pecks.	<i>Lotus corniculata</i> , 1 lb.
<i>Lolium perenne</i> , 1 peck.	White Clover, 3 lbs.

For moist meadows subject to inundation or water meadows, he recommends :—

Agrostis palustris, *canina*, *alba*, and *stolonifera*. *Glyceria fluitans*. *Festuca elatior*. *Aira cæspitosa* and *aquatica*. *Alopecurus geniculatus*. *Poa aquatica*. *Eriophorum polystachyum* and *vaginatum*.

In all cases, he advises agriculturists to sow many kinds of grasses in a pasture, as this makes fuller and more rank herbage, and for every kind of land there is a large number of grasses, either indigenous or introduced, which especially suit it. In ancient turf you find six or seven different species upon one square inch of land.

Different grasses are required, according to the length of time the land is to continue as pasture. If for one year only, annual grasses are as good as any, but if permanent pasture is required, annual grasses should be avoided. Sinclair recommends September for sowing, in preference to any other season. He directs that the larger seeds be sown first, the ground then lightly raked, the smaller seeds then added, and the ground rolled.

For an early crop of hay, the same experienced grass-grower recommends as follows :—

Dactylis glomerata. *Festuca pratensis*. *Arrhenatherum avenaceum*. *Lolium perenne*. *Bromus erectus* and *arvensis*.

Or—

Phleum pratense. *Avena flavescens*. *Cynosurus cristatus*. *Holcus lanatus*. *Poa nemoralis*. *Hordeum pratense*. *Bromus multiflorus*. *Lathyrus pratensis*.

For permanent pasture, he recommends seeds in the following proportion:—

<i>Dactylis glomerata</i> , 2 bushels.	<i>Poa angustifolia</i> , $\frac{1}{4}$ bushel.
<i>Festuca pratensis</i> , 2 bushels.	<i>Agrostis stolonifera</i> , <i>var. latifolia</i> , $\frac{1}{4}$ bushel.
<i>Alopecurus pratensis</i> , 2 bushels.	White Clover, 15 lbs.
<i>Poa trivialis</i> , 2 bushels.	Rye Grass, $\frac{1}{2}$ bushel.
<i>Arrhenatherum avenaceum</i> , $\frac{1}{4}$ bsh.	Bush Vetch, $\frac{1}{4}$ bushel.
<i>Phleum pratense</i> , 15 lbs.	<i>Anthoxanthum odoratum</i> , $\frac{1}{4}$ bush.
<i>Festuca duriuscula</i> , 2 bushels.	Red Clover, 12 lbs.
<i>Cynosurus cristatus</i> , 1 bushel.	<i>Achillea Millefolium</i> , 4 bushels.
<i>Poa nervata</i> , $\frac{1}{2}$ bushel.	
<i>Poa nemoralis</i> , 1 bushel.	

Mr. Wheeler, of Gloucester, proposes the following admixtures, which he keeps ready for sale:—

FOR RICH LOAMS IN BEST GRASS POSITIONS.

<i>Lolium perenne</i> 10 lbs.	<i>Alopecurus pratensis</i> . . . 2 lbs.
<i>Poa pratensis</i> 2 "	<i>Anthoxanthum odoratum</i> . 8 oz.
<i>Dactylis glomerata</i> . . . 5 "	<i>Phleum pratense</i> 2 lbs.
<i>Festuca pratensis</i> 3 "	<i>Trifolium pratense</i> 4 "
<i>Festuca duriuscula</i> . . . 3 "	<i>Trifolium repens</i> 5 "

FOR A POOR STIFF SOIL ON CLAY.

<i>Lolium perenne</i> 12 lbs.	<i>Phleum pratense</i> 2 lbs.
<i>Poa pratensis</i> 3 "	<i>Dactylis glomerata</i> 6 "
<i>Poa trivialis</i> 2 "	<i>Anthoxanthum odoratum</i> . 8 oz.
<i>Festuca loliacea</i> 2 "	<i>Trifolium pratense</i> 6 lbs.
<i>Festuca duriuscula</i> . . . 2 "	<i>Trifolium repens</i> 3 "

FOR LIGHT SOILS ON SANDS.

<i>Lolium perenne</i> 14 lbs.	<i>Trifolium medium</i> 4 lbs.
<i>Poa pratensis</i> 3 "	<i>Trifolium pratense</i> 2 "
<i>Festuca duriuscula</i> . . . 3 "	<i>Trifolium repens</i> 5 "
<i>Avena pubescens</i> 1 "	<i>Lotus corniculatus</i> 8 oz.
<i>Anthoxanthum odoratum</i> . 8 oz.	<i>Achillea Millefolium</i> . . . 8 "

The first grass extensively used for artificial pasturage was the Rye Grass (*Lolium perenne*) ; it grows readily in almost any kind of soil, and ripens an abundance of good seed, and, for these qualities, it early became popular. It was introduced into England before the year 1677, and both the normal form and its varieties, known as Dixon's Rye Grass, Russell's Rye Grass, and Ruck's Rye Grass, soon won for themselves the good opinion of agriculturists. The Rye Grasses produce great abundance of seed, which vegetates easily, and the plants soon arrive at perfection. It is held in much esteem for early herbage. Cattle eat the foliage eagerly, but they reject the stems, and when these are allowed to stand for seed the crop impoverishes the land to a great extent. Then the Meadow Cat's-tail began to be appreciated (*Phleum pratense*). Very early in the present century Dr. Richardson, of Portrush, in Ireland, introduced the Fiorin grass (*Agrostis stolonifera*), and attracted general attention by his success with it. Individual agriculturists had tried experiments with some species at an earlier date, as for instance, in Yorkshire, it is asserted by Marshall that *Holcus lanatus*, called in the district "Yorkshire Fog," was cultivated alone, and its seeds threshed like corn. This is another instance of seed-bearing properties procuring favour for a grass, that being the principal recommendation of *Holcus lanatus*. It was not till the time of Sinclair that the superior qualities of *Alopecurus pratensis*, *Dactylis glomerata*, and *Phleum pratense*, were fully declared. The first requires more than two years to arrive at perfection, but is a most valuable grass when once established, both for meadow and aftermath ; the last is remarkable for its large produce of culms, which are more nutritious than those of

any other grass, but its aftermath is inconsiderable, so it is principally to be cultivated for the hay crop. *Dactylis glomerata* is excellent for its large produce of foliage, which is good for hay, and still better for aftermath, but its culms have very little nourishment in them.

The qualities of the indigenous artificial grasses will be treated in their proper place, among the British species; the following introduced ones are recommended by Sinclair and others:—

Lolium Italicum—*Italian Rye Grass*.—This is imported annually in seed; it grows freely, and is an excellent meadow grass. Like the allied species, *L. perenne* and its varieties, it is better for hay than for aftermath. Pacey's Rye Grass (*L. Paceydnium*), Russell's Rye Grass (*L. Russellianum*), and the Evergreen Rye Grass *L. sempervirens*, are varieties of *L. perenne*, which are most approved. All these will be described in treating of *L. perenne*. Dixon's Rye Grass and Ruck's Rye Grass found most favour with that eminent agriculturist Francis Blackie, Esq.

Poa fertilis—*Fertile Meadow Grass*.—This is a native of Germany, introduced by Mr. Sinclair, and greatly approved by him. He considers it next in value to *Alopecurus pratensis* and *Dactylis glomerata*, as it produces nearly as much foliage as they, and its substance is of a still more nutritious character, especially its aftermath. According to the botanist Host, this grass is indigenous in moist pastures, and about the banks of rivers and ponds in Germany. It somewhat resembles our *Poa nemoralis*, but has a larger and more spreading panicle, and the spikelets are more oval. Hares and rabbits are very fond of it; it grows about a foot and a half high, and perfects abundance of seed.

Poa nervata—*Nerved Meadow Grass*.—This is another of Sinclair's introductions, being valued by him for its hardy habit, being green and succulent in severe weather, which had nipped the leaves of three hundred other species. The drawback to its desirability is that it vegetates slowly and is long in reaching maturity. This does not prevent it being a valuable ingredient in permanent pasturage. The panicle is large with slender branches, the spikelets are small, green, and smooth, with five florets in each spikelet. The leaves are in two rows, spreading like a fan, and the culm is compressed. It is a native of North America.

Attempts have been made, during recent years, to introduce the Chinese Sugar-cane (*Holcus saccharatus*) as a fodder grass. It is very valuable as food for horses, sheep, pigs, and cows. The land should be dug or forked deep, and the seed sown in the middle of May. If the season be favourable, three crops may be reaped during the summer, so rapid is its growth. It should be sown in rows eighteen inches apart, half as much space being left between each plant. Four pounds of seed will plant half an acre, and yield three good crops. A dressing of guano and sand should be given at the sowing time. Cattle eat the plants greedily when green. When dried, the culms are found to be full of crystalline sugar. Any good loamy land is adapted for growing it, and the seed is kept by Messrs. Sutton, of Reading. The first notice we saw of it was in the 'Gardener's Weekly Magazine.'

In the Orkney Islands, the *Tussac Grass* of the Falklands, *Dactylis cæspitosa*, has been successfully introduced. It is a noble grass, putting up many culms, which are often branched, and attain a height of from

three to four feet. Its foliage is abundant and contains much sugar; its colour is pale and yellowish. It would be a very desirable grass if it would endure our climate, but sea-spray being necessary to its well-being, restricts its utility to island and coast culture. A peaty soil and saline atmosphere are its conditions for luxuriance and fertility.

Although lawns scarcely form a branch of agriculture, but belong more to the department of horticulture, yet there seems much more affinity between the turf of permanent pasture and that required for the lawn, than between the latter and the dainty grasses cultivated in the flower borders; on this account we treat of lawn-grasses among the agricultural series.

The 'Gardener's Weekly Magazine' says with much truth, "many of our grass-lawns ought to be called weederies;" and truly they often consist of daisies and dandelions, plantain and ranunculus. A good grass-lawn is a great acquisition, and it requires art and patience to form one. We have seen lawns which were formed at the expense of peeling the best permanent pasture on the estate; but, thanks to the experience now offered by careful observers to the public, a good lawn may be had at a far cheaper rate. First, then, in preparing a lawn, the soil must be considered. The fine-leaved grasses best suited for close herbage prefer a light, dry, poor soil; and if the natural soil to be treated be of this description, one point is already gained. But there is to be a moderation in the poverty: the grasses will not bear too poor a soil, and if this be its character the poverty must be corrected by occasional manuring; superphosphate being the best of all dressings for preparing the new lawn, or putting life into an exhausted

old one. If the situation is not naturally dry, the ground must be trenched and drained, and a new surface of fine fresh soil laid. The seed for sowing lawns must be carefully selected. The following mixture is highly recommended :—

Agrostis vulgaris, *var. tenuifolium*. *Festuca duriuscula*. *Festuca ovina*. *Cynosurus cristatus*. *Poa pratensis*. *Avena flavescens*. *Trifolium repens and minus*.

In the article of the ‘Gardener’s Weekly Magazine’ already quoted, the “stuff” generally sold as “Lawn seed” is denounced as “only fit to feed sparrows with.” But really good clean seed may be had from Messrs. Wheeler at 1s. per lb. All the first-class seedsmen are doubtless reliable in this respect. Upon land prepared as described, this seed should be thickly sown in the proportion of 50 lbs. to an acre.

Mr. Wheeler says, “Lawns, if becoming patchy, may be sown with an admixture of grass seeds in their bald places; but as baldness usually proceeds from damp or wearing out, or both, a little draining should be done for the one, and some manure be employed for the other.” He considers moss in lawns to be a sign of poverty, and prescribes a top-dressing of guano and soot as a remedy against the moss. The presence of moss is so delightful to the foot, that one cannot but regret that it is not approved of in lawns. Mr. Wheeler gives one piece of advice regarding the keeping of a lawn which is exactly to our taste; he advises that, to avoid the annoyance of worms, larvæ, insects, and ants, blackbirds, starlings, and thrushes should be encouraged, for they destroy the pests above-mentioned, and there are rarely to be seen bald patches on a lawn

where the birds are made welcome. This is truly a good testimonial for our favourite songsters, and makes us doubly glad to see the orange bill darting in and out among the grass-blades, as the sooty bird hops freely to and fro. It is ever a pleasant sight to see the speckled breast of the thrush as he raises his head to take a good look at us in the window, and then hops on to secure his own meal. If the blackbirds and thrushes sing to us and keep our lawns in order, we surely cannot have the face to grumble at their depredations amongst the fruit another year.

CHAPTER V.

INDUSTRIAL AND ECONOMIC GRASSES.

THE Bamboo may be called the king of grasses, yet his family, unlike most descendants of royalty, are remarkable for utility. The strong stems of the bamboo are employed for timber and cordage, and the juice of one furnishes the sweet liquor called arrack. Entire houses are built of bamboo in South America, the large old plants being used for the walls, the young and slender ones for the thatch; various kinds of furniture are made from bamboo, as well as carriages, pipes, arrows, vases, and instruments. The Chinese make their *jalousies* of bamboo, and they form a very simple pouch for powder and shot of a cane with a knot in the middle and a plug at each end. The negroes make boxes, baskets, nets, and bags of bamboo. It will scarcely be considered as an additional recommendation to the bamboo that the bastinado is administered with it.

A near ally of the bamboo, the Brazilian Reed, performs a most useful office in the economy of nature. These tall grasses imbibe so much moisture from the springy earth that their hollow stems are always full of liquid, and thus form living fountains thirty or forty feet high, each stem measuring five or six inches in

diameter. The parched traveller has only to cut one of these stems below a knot, and he has a cup of water at once. These reeds are used for thatching, and the natives propel arrows from them instead of using bows. Bamboo tissue makes good coarse paper in India. The young shoots are good cooked as asparagus.

The *Arundo variegata*, Royal Reed, or Canne Royale, is much used for thatch; the peasants make flutes and fishing-lines of it, and use its root for medicine, according to Duchesne. The same author states that a yellow dye is drawn from the leaves and flowers of *Arundo Phragmites*.

The *Elymus arenarius* affords the nearest approach to a corn crop attainable by the Icelanders, and this only can be cultivated in very favourable localities. They highly appreciate the seeds, call them Melur, and eat them raw or made into cakes. Forbes, in his book on Iceland, narrates that he found much of this grass springing from the white volcanic sand at the foot of Mount Hekla, and was told that it had been planted there for warmth and shelter. This grass, and *Psamma arundinacea*, are very valuable on sandy shores, binding the sand together, and thus forming a natural sea-wall; indeed, so universally has their utility in this respect been recognized, that they are protected by Act of Parliament. Sinclair thus speaks of them:—"So far back as the reign of William the Third the important value of the *Elymus arenaria* and the *Arundo arenaria* was so well appreciated as to induce the Scottish Parliament of that period to pass an Act for their preservation on the sea-coasts of Scotland. And these provisions were by the British Parliament, in the reign of George the Second, followed up by further enactments, extending

the operation of the Scottish law to the coasts of England, and imposing further penalties for its violation, so that it was rendered penal not only for any individual (the Lord of the Manor not excepted) to cut the bent, but for any one to be in possession of any within eight miles from the coast." Excellent fences are formed of reeds with the addition of posts and rails; these together form a kind of panel, which can either be used singly as a screen for fruit or other trees, or be united with others, and so form a vegetable wall. The reeds should be cut and dried, and then bound in bundles; so prepared, they fetch a good price in the market. They are also used for laying plaster floors, and very extensively for thatching. They are not, of course, worth growing where a corn crop could be raised, but they bring a good profit for waste ground.

Various grasses have chemical properties of some importance. Mr. Holland, in a very able lecture, demonstrated the presence of a chemical substance called Conmarine in Sweet Vernal Grass, to which it owes its perfume, which substance is also present in the Tonquin Bean, Woodruff, and Melilot, and imparts to them a similar odour; from any of these plants this conmarine, or essence of hay, may be extracted in the form of needle-shaped crystals by dissolving in spirits of wine and then evaporating the spirit. The conmarine has a very pleasant perfume, but when heated it acts powerfully and painfully on the brain. Mr. Holland suggests that the peculiar affection called hay-fever is, in all probability, really caused by this conmarine, which is given off in great quantities by the drying hay, and, though dispersed in the air, may still float in sufficient quantities to act painfully on the brain of those susceptible of its

influence. Grasses are possessed of some chemical property which enables them to dissolve and secrete flint.

An Indian species of *Andropogon* affords a stimulating oil very useful with friction in rheumatism. It also yields Indian Vetiver, used in fevers. Another grass, with fragrant roots, obtains the name of Vetiver in France and Rhus in India. The Lemon Grass, which yields so sweet a perfume, called the Oil of Verbena, is allied to these. These grass perfumes are very useful to put with linen, to prevent the entrance of insects. The stems of the plants made into fans are accounted very efficacious in driving away flies.

Duchesne tells us that the flowers of *Agrostis Spicaverenti* give a good yellow-green tint to woollen goods, and that the peasants make nice little brooms of the panicles.

We have already seen that sugar, beer, and spirits are extracted from various grasses, either their sap or their seed furnishing the quality desired, so we need not revert to those uses. Their application to thatching, their use in packing, in stuffing mattresses and horse-collars, and their employment in the manufacture of mats and matting, and of brooms and brushes, may be mentioned in general without descending to the particulars of the way in which the article is employed.

The use of the Holy Grass (*Hierochloa borealis*) in decorating churches and being revered as an article of devotion in Prussia, Sweden, and Lapland, is rather interesting than industrial, though even this affords employment to the poor, who gather the grass and sell it in the markets.

A Spanish grass (*Lygeum Spartum*) is a plant of almost

classical antiquity. A stock of it was included among the naval stores laid in by the Carthaginians, and good cordage and matting is still made of it in Spain; they also use it for bedding in that country. A very nice collection of useful and fancy articles manufactured from this grass is to be seen in the Kew Museum.

Stems of grasses, especially of the cereal ones, are much used in the manufacture of paper. The Chinese were the first to employ them extensively for this purpose: they use many plants thus, but principally cotton, bamboo, and wheat and rice-straw. In preparing the bamboo for paper they use the whole substance for commoner sorts, but for superior paper they select only young stems. Ure thus describes the process of making paper from bamboo:—"The canes, being first cut into pieces of four or five feet in length, are made into parcels, and thrown into a reservoir of mud and water for about a fortnight, to soften them; they are then taken out and carefully washed, every one of the pieces being again cut into filaments, which are exposed to the rays of the sun to dry and to bleach. After this they are boiled in large kettles, and then reduced to pulp in mortars, by means of a hammer with a long handle, or, as is more commonly the case, by submitting the mass to the action of stampers, raised in the usual way by cogs on a revolving axis. The pulp being thus far prepared, a glutinous substance extracted from the shoots of a certain plant is next mixed with it in stated quantities, and upon this admixture chiefly depends the quality of the paper. As soon as this has taken place the whole is then beaten together till it becomes a thick viscous liquor, which, after being reduced to an essential state of consistency by a further admixture of water, is then transferred to a

large reservoir or vat, having on each side of it a drying-stove, consisting of two sloping sides touching at the top. The workman dips his mould into the vat, and then raises it out again, the water passing off through the perforations in the bottom, and the pulpy paper-stuff remaining on the surface. The frame of the mould is then removed, and the bottom is pressed against the sides of one of the stoves so as to make the sheet of paper adhere to its surface, and allow the sieve to be withdrawn. The moisture, of course, speedily evaporates by the warmth of the stove, but before the paper is quite dry it is brushed over on its outer surface with a size made of rice, which soon dries, and the paper is then stripped off in a finished state, having one surface exquisitely smooth, it being seldom the practice of the Chinese to write or print on both sides of the paper."

In our own country the fear of a failure in the supply of rags for the manufacture of paper has prompted every effort of human ingenuity to seek for other material for an article of such extensive utility. Fibre from the roots of trees, from their bark, from their wood, the bines of hops, the tendrils of vines, the cottony down from the catkins of the poplar, the stems of nettles and hollyhocks, cabbage-stalks, thistles, sugar-cane, hay, and straw have all been tried in their turn. Straw is now extensively used, alone, or in connection with rags; it makes good common paper. Like the bamboos of China, the straw has to be chopped into minute pieces and steeped in water mixed with alkali to destroy the silica; if this process be negligently performed and part of the silica allowed to remain, the paper becomes so brittle as to be hardly of any use. Then the straw has to be boiled in a caldron, for a greater or less number of hours, accord-

ing to the strength of the fibre and the presence or absence of the hard joints; the joints require thrice the time of boiling that the rest of the stem requires. The straw of wheat requires the smallest amount of boiling. It is very difficult and tedious to bleach straw paper, and the paper made partly of straw is seldom of so fair a whiteness as that made of rags entirely. Reeds make good paper, and bleach more easily than straw. Straw is a much cheaper material than rags, the same quantity costing £2 which of rags would cost £17; but a far greater amount of waste occurs in preparing the straw for manufacture than in preparing the rags, and this added to the extra labour required in boiling and bleaching, almost equalizes the cost. Straw pulp forms a very good auxiliary to rag pulp when mixed in the proportion of from half to three-quarters. A good, thick, coarse brown-paper is successfully prepared from straw alone, but the so-called "straw-papers" contain a considerable admixture of rags. Perhaps the very best use of straw in this manufacture is to impart stiffness to common newspaper.

An equally if not more extensive use of the stems of grasses, is in basket and straw-plait work.

In the Museum before mentioned, we find a large variety of grasses used for this purpose. There are good coarse baskets and slippers made of the *Arundo Donax* and *Ammophila arundinacea*, and we understand that the Welsh make mats for their houses of the latter species, in daring defiance of the Act of Parliament. The careful and industrious student and cultivator of grasses, Sinclair, has taken great pains to bring several English grasses into vogue for straw-plait. He cites the example of an American lady who made a beautiful straw bonnet

from the culms of *Poa pratensis*, and received a prize for it from the London Society of Arts. Then a Buckinghamshire lady made one of the culms of the *Cynosurus cristatus*, and it obtained the Society's medal. Mr. Sinclair sowed the seeds of the Leghorn straw-plant (*Triticum Spelta*), but he could not get straw from them as fine as the imported kind. Mr. Cobbett made the same essay, but his straw was too coarse for Leghorn plait. Afterwards they ascertained that the quality of the straw depended on a culture not attainable in this climate.

In Italy the wheat cultivated for this purpose is not allowed to perfect its first culms; these are eaten down by cattle, and then the second culms spring in great numbers but are of a much weaker and more slender growth. Of course in our northern clime if well-grown culms were eaten down there would be no chance of perfecting a second crop. Mr. Cobbett tried the same experiment with oat straw, but that, like the wheat, was too coarse for superior work.

There are many of our British grasses which are demonstrated by Mr. Sinclair to be much better fitted for this purpose than the straw of cereals. The culms of the *Cynosurus cristatus* are very fine and tough. They should be gathered before the seed is ripe or earlier, though never before the flower is fully opened, then put into boiling water for ten minutes, afterwards bleached for eight days, or placed in boiling water for an hour, then spread and kept moist for two days and finally put into a close vessel, and subjected to the fumes of sulphur for half an hour. A shorter way of preparation also prescribed by Mr. Sinclair, is to immerse them in a strong solution of acetic acid and then to subject them

to sulphuric acid gas. The immersion need only occupy ten minutes, and the whole process may be achieved so as entirely to bleach them in half an hour.

Thus prepared, they make first-rate plait. The culms of *Festuca ovina*, *duriuscula* and *heterophylla*, of *Agrostis Spica-venti*, *vulgaris*, *canina*, and *stolonifera*, of *Avena flavescens* and *pubescens*, and of *Nardus stricta*, *Anthoxanthum odoratum*, and *Poa angustifolia* are very good for the purpose; and these, being perennial grasses, if once sown would yield an annual harvest to meet the annual demand for the hats and bonnets of the season.

In the Transactions of the Highland Society, an establishment for straw-plait making is described. It was originated by Messrs. Muir, of Greenock, and placed in the Orkney Islands. Rye was cultivated in the adjacent fields, the seaweed washed up by the tides served for manure; and the straw of the rye was chemically prepared, and then woven into straw-plait, the beauty of which was declared to be equal to the famous Leghorn fabric.

The Couch-grass (*Triticum repens*), though not recommended for industrial purposes, is not without its use, especially on the Continent. At Naples its abundant creeping roots are collected in great quantities, and sold in the markets as food for horses; when boiled, they make good food for pigs. Boerhaave recommends a decoction of the root as a good remedy for jaundice; and dogs seem to hold a similar faith concerning the properties of the leaf, for we often notice them eating the grass, as if for medicine.

The large grains of the *Coix lachryma* form beautiful beads of a delicate grey colour and satiny texture; their drop-like form has procured for them the name of "Job's-

tears." The largest and most delicately tinted that we have seen were brought from Jamaica. In the Museum at Kew, the dress of a Fijian girl is exhibited which is composed entirely of these grains; it consists of a band of many rows of the beads, and a deep fringe hanging from it,—certainly a very simple style of costume! The Fijians manufacture many articles of ornament from these natural beads, and set fringes of them round the mats of their chiefs. They are much liked for bracelets by British ladies, especially those who prefer quiet tints to gaudy ones.

This beneficent family of herbs has remarkably few harmful or deleterious members. The seeds of *Lolium temulentum* and of *Festuca quadridentata* are accounted unwholesome, but all others are excellent and nutritious. The long twisted awns of *Stipa spartea* are destructive to the sheep in the Red River colony, for they fix themselves in the wool, and from thence penetrate the flesh, causing sores which occasionally prove fatal. The Spear-grass of New Zealand lacerates the feet of horses and cattle with its sharp spines, and inflicts painful wounds on the hands and legs of settlers, so that it is accounted the special pest of the province. But for these offensive species we have hundreds that are nutritious in every part for cattle, and serviceable for many uses, industrious, medicinal, or ornamental.

CHAPTER VI.

ORNAMENTAL GRASSES.

OF late years public taste has been turned to the advantageous effect of grasses in landscape gardening. Ferns had the credit of first winning attention from colour to form, and grasses next stepped in to confirm the preference for grace and elegance over gaudy colouring. We seldom now find a velvet lawn without its suitable contrast of a clump of Pampas-grass, either standing as an object of solitary beauty, or grouped with shrubs in a verdant background.

This beautiful plant is now so thoroughly established as a general favourite, that we offer remarks on its culture, culled from the 'Gardeners' Magazine,' with a full confidence in their general acceptability.

The seeds must be sown in pots, and covered very lightly with sandy loam and peat. Then the pots must be placed in a slight heat till the blades are well developed. The young plants must next be separated, and only a few put into each pot; a cool frame is best adapted to them in this stage, and they require to be well watered. On being finally planted out, the place must be prepared for them with plenty of mellow loam, and must be in a

moist situation. This grass has the male and female flowers on different plants. The latter is the one generally preferred, as best suited to our climate. It soon develops a large circular tuft of leaves, which attain a length of several feet, and bend outwards in the style so much admired in the coronal ferns, until the abundance of arching foliage resembles the graceful streams of a fountain. From the centre of this arching group arise a number of perpendicular culms, the apices at first seeming only thickened, but shortly developing a folded sheath, within which reposes the close-packed flower-buds; these culms shoot upwards with such rapidity, that they have been known to grow an inch in twenty-four hours, and they attain their full height of from five to seven feet in September. Then the sheath opens gradually, and the inflorescence emerges by degrees, at first as a closely-packed head, then exhibiting its complex structure of branches and buds, and by the end of October developing its full glory of spreading panicle a foot long, and numerous feathery flowers, so white and glossy as to shine like silver, and so lightly mounted on the slender branches that they wave and tremble in every zephyr. The male plant differs in the foliage being less graceful and the inflorescence later in opening. The latter habit unfits the plant for out-door culture in Britain, for it leaves little chance of the flowers being perfected before the early frosts; and the culms, being then full of sap, are unable to stand the cold, and so perish before the flowers can expand. The best way of utilizing the beauty of the male plant is to cut the unopened panicles before the coming of the frost. The heads should then be dried, and the sheaths carefully stripped off; the young florets lying snug within seem

made of frosted silver, but so closely packed that they present the appearance of a solid body. But when this compressed crowd of silver blossoms is shaken gently and repeatedly, they separate, and the true form of branching rachis soon becomes developed. Thus treated, the heads which would have perished in a night, leaving their latent beauty undeveloped and almost unsuspected, become the most lovely objects for drawing-room decoration possible. Mr. Johns recommends this treatment most highly.

In the 'Cottage Gardener's Magazine,' the botanical name of the Pampas-grass, *Gynerium argenteum*, is said to be derived from two Greek words, *gyne*, female, and *erion*, wool, because of the woolly stigma. The writer of the article takes great umbrage at the popular name Pampas-grass, for he says it is found in no part of the Pampas, but only upon the banks of the Paraná and other rivers in South America.

The roots of this grass are wide-spreading, fibrous, and very numerous. The leaves are hard and spiny at the edges; they are about half an inch broad, and from six to eight feet long. So sharp are the spines, and the leaves of such strong texture, that they inflict severe cuts upon any hand rash enough to attempt to gather them.

Mr. Moore introduced the Pampas-grass into Britain, and Messrs. Henderson were among its first cultivators. It is quite hardy, but these experienced nurserymen find it advantageous to tie the leaves together at the end of autumn, so as to enclose the heart of the plant, and to wrap a mat around. This they open on favourable occasions, and remove it entirely in March. By this means the plant is able to produce its culms earlier, and

the grower has the advantage of the beautiful panicles for a longer period.

Clumps of the Sugar-grass (*Holcus saccharatus*) form desirable objects in a landscape garden. This grass was introduced into Belgium from Shanghai, and thence into England a few years ago. It is extensively cultivated in the United States, attaining there a height of from eight to sixteen feet, but in Europe it seldom exceeds eight feet, and a dull or cold season dwarfs it greatly. The culm is straight, the leaves flag-like, flexuous, drooping and bending most gracefully in the manner of those of the *Zea Mays*. The panicle is cone-shaped, the flowers densely crowded; the flowers are green at first but soon become tinged with purple, and very elegant. It can bear the frost very well after the flowers are expanded, but if the frost come before, the sap is still flowing, and the culms perish as certainly as those of the male Pampas grass. But with care in early sowing there is no danger of this, as it attains its growth quickly, and in a favourable season two crops may be obtained.

The Maize is well worth cultivation for its beauty and unique habit of growth; its more sterling qualities are enumerated in the chapter on Cereals.

The Panick-grasses include a number of very beautiful species, some of considerable size and fitted for distant grouping, and many of smaller stature, well adapted for flower-borders, pots in the conservatory, and bouquets.

Panicum miliaceum resembles a *Zea* in its stout culms and broad overlapping leaves, each sheath enfolding the base of the next; it is a very rich-looking grass, and stands out well in contrast with the light feathery ones.

Panicum Italicum has also broad leaves, but its culms are slender; it attains a height of from two to three feet, and its panicle is so crowded and compact as almost to assume the form of a regular cylinder; it curves slightly, causing the culm to bend outwards, which gives an elegant form to the clump. Mühlenberg describes its leaves as "lanceolate with bearded ligules; sheath downy at margin, terminal spikes cylindrical, basal ones interrupted."

Panicum Crus-galli. Here the culm is erect, glossy, with enlarged nodes, and compressed above them. The leaves are lanceolate, as in the last species, but, according to Mühlenberg, the ligule is always absent. The reddish pistil gives an agreeable variety of colour to the numerous light-green florets, and the panicle is alternately branched, the florets crowded on the branches. It is a native of Pennsylvania, and flowers in August. It forms a verdant and very rich group, and tells well in a border among gay flowers. Its height is about two feet.

In strong contrast with the solid appearance of these members of the *Panick* family stands the Bulbous Panick, five feet in height, and as light and airy in form as our native Millet-grass. The leaves are very narrow, stiff, and pointed, and seem to occupy scarcely any space, so that the whole cluster looks half transparent, and as if it might be blown away bodily by the lightest breeze.

Panicum colonum is allied to *P. bulbosum*, by the lightness of its panicle, but it is of short stature, only about one foot high, and very leafy. It is a native of both the East and West Indies; its spikelets are described by Persoon as "alternate, secund, awnless, ovate, and nearly

sessile." It is very attractive for borders, pots, and bouquets.

Panicum capillare resembles *P. colonum*, but its panicle is still more airy and elegant, the branches of the rachis truly deserving the denomination *capillary*. It grows from one to two feet high, and its sheaths are large and very downy, the last one extending so high as to envelope the base of the panicle, and seem like a cornucopia holding the delicate bouquet of flowering branches which throng the rachis in whorls.

This Panick group is a very extensive one, and contains species of a great diversity of habit, the panicles of some being so diffuse and their branches so slender as to resemble a crowd of green flies, while in others the branches are so short and thick, and the florets so crowded, as to give the panicle the form of a more or less interrupted spike or cone. The foliage is equally variable, now almost as broad as the *Zea* leaf, and then so narrow as to be quite linear.

Some members of the *Elymus* family group well in grass plantation or shrubbery.

Elymus giganteus grows from seven to eight feet high, raising a large compact spike on the summit of the almost perpendicular culm. It is a grand simple plant, but the foliage is rigid and does not droop, so as to carry off the stiffness of the very erect spikes. It is a perennial grass, and flowers in June and July.

Elymus glaucifolius is more graceful in habit, the culms bending outwards and the spikes arching slightly. The leaves spread widely, and their glaucous hue is very pleasing. The height of the plant is about three feet, it is a native of North America, and flourished well in Kew Gardens this year.

Elymus Caput-Medusæ is a species of smaller growth, seldom exceeding a foot in height. Mr. Loudon describes it as a desirable grass for ornamental purposes, and as compared with the stiff growth of its tall compeer *E. giganteus*, it is very graceful. It is a native of Portugal, growing there on the seacoast, as our species does on those of Britain.

The true reeds have many noble species well suited for grouping with shrubs, or other grasses, or for solitary clumps in lawns.

Arundo Donax is a native of the south of Europe, where it is cultivated for economic purposes. The French call it "*Le grand Roseau*," or "*Canne de Provence*." It is worthy the former name, for it grows to an immense height, so as to form a link between European and tropical grasses. Its panicle of feathery flowers is a very beautiful object. There is a variegated species with leaves striped like those of the common Ribbon-grass, but it is sickly and soon dies out.

Arundo Mauritania, a native of Mauritius, is of lower and more slender growth than *A. Donax*, and equally beautiful both as to flag-like leaves and feathery flowers. *Arundo Pliniana*, Pliny's Reed, is also very stately and elegant, and is a great favourite in the gardens of Languedoc. All these require heat, so are not fitted for outdoor cultivation in Britain. There is a species of hardier growth called by seedsmen *Arundo festucoides*, which is very handsome. It grows four feet high, and has large feathery panicles.

Somewhat resembling the Pampas-grass, especially in its silvery whiteness, but not exceeding six feet in height, is the *Erianthus Ravennæ*, much recommended by Decaisne for planting on lawns. He describes it as "large

and beautiful as a sugar-cane," but it probably attained a higher growth in France than with our British cultivators.

The *Coix lachryma*, or Job's-tears, is a handsome grass, growing to a height of three feet; it has lanceolate leaves, and, according to Mühlenberg, has both male and female spikelets on one plant, but they are easily distinguished, for while the male spikelets are many-flowered, the female spikelets only contain one flower. In gardens it blossoms in July.

The *Chloris* family contains many species, either curious or elegant. The inflorescence is digitate, the spikes situated in a bundle on the apex of the culm, or placed alternately on either side of the culm near the apex. The spikelets are unilateral, from two- to eight-flowered, either with or without awns. The leaves are flat. They are all exotic grasses, but bear our climate during the summer very well.

Chloris truncata attains a height of from two to three feet, and flourished well in the Kew Gardens last summer. There were from twelve to eighteen slender spikes on each culm, and the extreme lightness of the culms and foliage made the clump look exceedingly elegant. The glumes assumed a brownish tinge as the florets opened, and this increased the beauty of the spikes. The leaves are short, broad, and somewhat glaucous. *Chloris barbata*, *fimbriata*, and *polydactyla* are pretty species of lower growth, and well adapted for flower-beds and bouquets.

Chloris foliosa has spikes from four to six inches long, it is a native of St. Thomas's Island.

Trypsacum dactyloides was very luxuriant in Kew Gardens last summer. In the seedsmen's lists it is

called two feet high, but the plots at Kew were much taller, measuring from three to four feet. It is rather curious than beautiful. The spikes grow in threes, and are unilateral. The foliage is very attractive, the leaves are very broad and of a full green, very soon becoming beautifully tinged with red and brown, while the midrib remains white, the sheaths receive the coloured tints as well as the points of the leaves. This species is a native of New Holland, but those described by Mühlenberg were from Pennsylvania, Virginia, and Carolina. These have the joints coloured with red. The family is allied to that of *Zea*; the male flowers are situated on the upper, and the female on the lower part of the spikes. The anthers are blood-red, and the pistils brown.

Not inferior in beauty to any of the tall grasses is the *Pennisetum longistylum*, one of the most charming ornaments of the Kew grass-garden. The heads are cylindrical in form, and their weight bends down the slender culms into every variety of the line of beauty; the glumes and paleæ are of delicate whiteness, and the styles so long and feathery that they resemble tassels of white chenille. The leaves are very narrow and somewhat stiff. It grows from one and a half to two feet, or a little higher, and forms a very handsome spreading clump.

The family of *Eleusine* are curious grasses, with digitate spikes resembling horns; the florets are awnless, and the spikelets many-flowered. Mühlenberg describes a species from India, *E. Indica*, called familiarly Crab-grass or Yard-grass. The culm is ascending, the leaves alternate, lanceolate, the midribs downy; ligulæ white, shortened, serrated, sheaths glossy. The spikes are terminal, two or four together, spikelets containing from two

to six flowers, the seeds triangular and black. There is a dwarf species, a native of China, called by the seedsmen *E. oligostachya*, but Mühlenberg does not describe it. It is very graceful and well suited for cultivation in flower-beds.

The *Stipa pennata* is a familiar garden-plant, commonly called Feather-grass. A writer in the 'Cottage Gardener's Magazine' very aptly observes that "this plant is among grasses what the Bird of Paradise is among birds." The awns are prolonged to an immense length, and are delicately feathered. There are few flowers in the panicle, and each spikelet contains but one. The awns are twisted at the base, then slightly arched, and are so prominent from their great length and beauty that all the plant seems composed of these awn-feathers. The root is perennial, and fibrous; the leaves are long, very narrow, sharp at the point, very dark green in colour, and growing in thick tufts. It is said to have been found wild in Britain, but it is so no more. In Germany it is not unfrequent, and Desfontaines describes it as frequenting sandy hills in France. It is easily propagated in gardens by dividing the root in the spring, or it may be sown in pots and transplanted when an inch high.

Stipa juncea is less beautiful, its panicle is very lax, and the awns are twisted like a corkscrew for two-thirds of their length, the remaining third is downy. The leaves also are twisted and rigid. It grows in similar situations in Algeria to those affected by the *Stipa pennata* on the continent of Europe. It is less desirable as a border plant, though sufficiently elegant, but thrown into shade by the true Feather-grass. Both these species flourish best on a chalky or limestone soil. They

have the most striking effect when placed on a raised border, so as to bring the plant nearly to a level with the eye.

The *Spartina cynosuroides* is a tall, slender grass, with a panicle a foot long, bearing spikes two inches in length, placed alternately along the rachis, the spikelets unilateral. The leaves are very long and linear, terminating in a slender point; the highest sheath is also very long. It is a native of North America, and very hardy. In the Kew Gardens it attains a height of from four to five feet.

Setaria macrochaeta is a native of the south of Europe. It has a compound, erect spike or panicle, the spikelets arranged in remote groups. It grows two feet high, and flowers in July and August.

The *Festuca* group contains species as desirable for ornamental as for agricultural purposes. *F. glauca* is a perennial grass, a native of the south of Europe, where it grows as a weed on the seacoast. The panicle is one-sided, spikelets contain five florets, and are slightly awned. The leaves are glaucous, rigid, and oval-shaped. It grows from one to two feet high, and from the glaucous colour of its foliage is very popular for edgings, and is also highly recommended for pot culture.

Our familiar native, *Festuca ovina*, is much valued for horticultural purposes. It may compete with dwarf Box as an edging, with every hope of success. The seeds should be sown in a bed, and the young plants placed three inches apart along the line required. Soon the leaves become tufted, and the tufts join together. The border is very easily kept tidy by cutting off the culms as they rise; the foliage is so short by nature as not to require cutting.

The *Isolepis gracilis* has somewhat the same habit, but is more beautiful. But it is too delicate to endure the winter, and can only be reared in heat, and then planted out, for it can bear no frost.

There is a fine genus of grasses described by Mühlenberg as natives of Ohio and Susquehanna, called *Uniola*. One of them is now cultivated in our gardens (*U. latifolia*), and resembles a large *Bromus*. According to Mr. Lowe, the name is given on account of the union of the glumes. The rachis is branched, and the branches erect. The leaves are plain, glossy, and lanceolate, downy at the base; the sheaths are glossy and striated; the ligules shortened, and obscurely notched. Panicle branched, branches triangular, and situated in pairs. The anthers are yellow, three in number, the pistils two, bright red. It flowers in August, and grows four feet high.

The Giant Quaking Grass (*Briza maxima*) is as familiar in old-fashioned gardens as the Feather-grass and Ribbon-grass. It is an annual, but very easily raised from seed, and very effective either as a border-plant or in a bouquet. The leaves spring in a cluster from the crown of the root, they are half an inch broad, but soon begin to taper, and seldom exceed three or four inches in length. They are smooth in texture, and of a milky-green colour; their edges turn in. The culm is very slender, from one and a half to two feet high, round, and slightly furrowed, with four or five joints. The panicle is large and loose, the spikelets large, and so heavy that they weigh down the slender branches of the rachis. When ripe they are of a very pale straw-colour with silvery lustre, generally tipped with purple. Old Gerard calls it "Pearl-grass," or "Garden Quakers." It is a native of the South of Europe.

The common Meadow Quaking Grass is sometimes cultivated as a garden plant, and forms a very pretty object. We give the description of it among the British grasses.

The Love-grasses (*Eragrostis*) are elegant plants, resembling the *Briza* family in habit and dancing charm, and like them they never fail to attract the notice of children. They are especially adapted for pots and bouquets.

They are more nearly allied to *Poa* in general character than to *Briza*, and in former days were included in the *Poa* group. The larger species has an erect panicle, much branched and spreading, and numerous tumid florets with three well-developed keels. It is free-growing, bears many stems, and is perfectly smooth. Its foliage is of a rich, fresh green, and spreading widely; the spikelets vary in number from ten to thirty-six, they are narrow, and hung on very slender footstalks, are glossy as satin, and variegated with green and purple. It is a native of Greece and Barbary.

Eragrostis elegantissima is smaller; its panicles are erect, branched, and spreading, and its spikelets tapering, numerous, and of a rich purple colour. It is found in Switzerland, France, and Italy.

The golden-spiked Dog's-tail grass (*Chrysurus cynosuroides*) is a very charming variety for the sake of its golden colour. The culm grows about nine inches high, is much jointed, and often produces a branch from one of the lowest joints. Leaves narrow, short, tapering; the sheaths smooth and channeled. The panicle is two or three inches long, and somewhat dense; the spikelets grow in threes, they are barren, and contain two florets; one of the glumes has a long awn proceeding from a little below its apex,—this gives the spikelets a downy

character. The golden colour of the whole panicle is its greatest charm. It is a native of the south of Europe. When sown in March, and planted out into a light soil, it flourishes well, and seldom fails to produce abundance of golden panicles.

The *Sporobolus tenacissimus* is a dainty little grass well deserving notice. It is a native of the East Indies, and in our climate flowers in August. The panicle is lengthened and contracted; the spikelets are awnless; the paleæ longer than the glumes. Loudon derives the name from Greek words signifying "seed" and "cast forth," because of the looseness of the grains, and the ease with which they fall out when shaken by the wind. Its height is about half a foot, it is perennial.

Lamarckia aurea, golden-spiked Lamarckia, has spikes as golden as the panicles of the golden-spiked Dog's-tail. Like it, it is a grass of minute stature,—from six to nine inches being its average height. The leaves are broad, from three to five inches long, tapering, and often turning round at the points. The whole plant is of a light fresh green. The spikelets are from one and a half to two and a half inches long, unilateral, and arranged in bundles of three or four on a branch of the rachis; they either stand at right angles with the rachis or are somewhat pendulous. Each head is furnished with four or five of these clusters of spikes. The paleæ are awned. It should be sown in March or April, and is much appreciated for pots or small bouquets.

For a similar purpose we can recommend the *Achnodonton Bellardii* for cultivation. This grass has a bulbous root, is perennial, and grows about half a foot high. It is a native of the seacoast of Mesopotamia, and flowers in June and July.

The *Ceratochloe pendula* is another of these grasses suited for bouquets; it is larger than those last mentioned, attaining a height of one and a half feet, but it is very graceful and well deserving of a place in the border.

Ceratochloe uniloides is about the same height, has large spikes proceeding from a branched rachis. The panicle is nodding, and the spikelets contain six to eight florets. The seed has three little horns, hence the generic name. It flowers in July, and is a native of North America.

Diplachne fascicularis is another North American grass of considerable beauty. Mr. Loudon derives the name of the genus from words signifying "divided" and "chaff," because the paleæ are bifid at the apex. It is an annual, and inhabits the seacoast. The panicle is erect, contracted, and oblong. Most of the branches are simple, but a few of the lower are occasionally branched, they are very numerous and extremely slender. The spikelets are oblong and narrow, the leaves very long and smooth. It flowers in June and July.

We must not close our chapter on ornamental grasses without a kind word to the familiar favourite of our childhood the Ribbon-grass (*Digraphis arundinacea*). Old-fashioned garden lovers still call this by quaint old names as "Gardener's Garters," "Ladies' Laces," "Windle straw," etc., and we have seen many an amateur of horticulture scorn it as a vulgar weed; but those who look upon it with an unprejudiced eye will value it still, even if they feel none of the prestige of old association. We say nothing about its pale panicles, we never suffered them to expand in our dear old garden, the striped flag-like leaves were the objects of our admiration, and we love the parti-coloured streamers

as much as ever. Place two or three of them among violet or rose-coloured blossoms, once notice the effect, and you will never scorn the Ribbon-grass again, nor grudge it the quiet nook in the shrubbery which your gay half-hardy plants would decline to expand their blossoms in.

CHAPTER VII.

CLASSIFICATION.

GRASSES have been studied and arranged by many eminent botanists, but the generic distinctions are far from clearly defined in many instances, and much scope yet remains for fuller examination of this interesting family of plants. We adopt the arrangement of Mr. Bentham, as being the most simple of any, and sufficiently clear on all the British grasses. According to his decision, eight tribes of grasses are represented in the British Flora, the characters of which are defined as follows:—

GROUP I. PANICACEÆ.

Spikelets with one perfect terminal flower, with or without a male or imperfect flower below it.

Tribe 1. *Oryzææ*. Stamens more than three, except in two or three *Leersias*. Genus:—1. *LEERSIA*.

Tribe 2. *Paniceææ*. Flowering glumes of a firmer texture than the empty ones below them. Genera:—2. *MILIUM*; 3. *PANICUM*.

Tribe 3. *Phalarideææ*. Two male or imperfect flowers, or minute rudimentary glumes below the perfect flower,

besides the outer empty glumes. Genera:—4. *HIEROCHLOE*; 5. *ANTHOXANTHUM*; 6. *PHALARIS*; 7. *DIGRAPHIS*.

GROUP II. POÆACEÆ.

Spikelets with one or more perfect flowers, the male or rudimentary flowers, if any, terminal.

Tribe 4. *Agrostideæ*. Spikelets one-flowered, usually pedicellate. Genera:—8. *PHLEUM*; 9. *ALOPECURUS*; 10. *CHAMAGROSTIS*; 11. *LAGURUS*; 12. *POLYPOGON*; 13. *AGROSTIS*; 14. *GASTRIDIMUM*; 15. *PSAMMA*; 16. *CALAMAGROSTIS*.

Tribe 5. *Aveneæ*. Spikelets two- or few-flowered, pedicellate. Flowering glumes usually longer than the outer ones, their awns often bent or twisted. Genera:—17. *AIRA*; 18. *AVENA*; 19. *ARRHENATHERUM*; 20. *HOLCUS*.

Tribe 6. *Chlorideæ*. Spikelets one- or several-flowered, sessile along one side of the simple linear branches of the panicle. Genera:—21. *CYNODON*; 22. *SPARTINA*.

Tribe 7. *Hordeineæ*. Spikelets one- or several-flowered, sessile in the notches of a simple spike. Genera:—23. *LEPTURUS*; 24. *NARDUS*; 25. *ELYMUS*; 26. *HORDEUM*; 27. *TRITICUM*; 28. *LOLIUM*; 29. *BRACHYPODIUM*.

Tribe 8. *Festuceæ*. Spikelets several-flowered, pedicellate. Awns, if any, straight. Genera:—30. *BROMUS*; 31. *FESTUCA*; 32. *DACTYLIS*; 33. *CYNOSURUS*; 34. *BRIZA*; 35. *POA*; 36. *CATABROSA*; 37. *MOLINEA*; 38. *MELICA*; 39. *TRIODIA*; 40. *KÆLERIA*; 41. *SESLERIA*; 42. *ARUNDO*.

GENERA AND SPECIES.

Genus 1. *LEERSIA*. Glumes two, concave, boat-

shaped, keeled, nearly closed, generally fringed, the outer broader and the same length as the inner; palea absent; scales lanceolate, acute; stamens two, three, or six, short; anthers oblong; germen ovate, compressed; styles two, capillary, short, stigmas feathery; panicles loose; spikelets one-flowered; seed obovate, compressed. Species 1:—*oryzoides*.

Genus 2. MILIUM. Spikelets single-flowered; empty glumes two, nearly equal, tumid, ovate, pointed; flowering glume smaller, ovate, permanent, finally cartilaginous and glassy, enclosing the seed; scales two, ovate, obtuse; stamens three, thread-shaped, short; ovary roundish; styles two, capillary; stigmas tufted. Species 1:—*effusum*.

Genus 3. PANICUM. Inflorescence panicle; panicle compact or spike-like, or more or less spreading; spikelets small, naked or awned, one-flowered, or at any rate containing only one perfect flower; outer glumes generally three, the first minute, the second larger and empty, the third either empty or containing a male or neuter floret; flowering glume concave, embracing with its margins the palea, which like itself is cartilaginous and glossy, and of similar shape but rather flatter, and with two slight ribs; scales minute, inflated; ovary roundish; seed invested with the flowering glume and palea, flattened on one side. Species 6:—1. *sanguinale*; 2. *glabrum*; 3. *verticillatum*; 4. *glaucum*; 5. *viride*; 6. *Crus-galli*.

Genus 4. HIEROCHLOE. Panicle more or less spreading; spikelets three-flowered, only one of three being perfect; outer glumes ovate, acute, membranous, keeled; inner and flowering ones ovate and coriaceous; stamens three in the male florets, and two only in the perfect

one; anthers linear, pendulous, notched at both ends; ovary present only in the central floret, small, ovate; styles short, near together; stigmas long, linear, downy; seed ovate, pointed, small, not attached to the flowering glume. Species 1:—*borealis*.

Genus 5. *ANTHOXANTHUM*. Outer glumes two, unequal, one-flowered, the next two glumes empty and narrower, awned, the awns of different lengths, one arising from the back of the one glume, the other from the base of the opposite one; palea like a scale; stamens two; seed pointed at both ends, the flowering glume adhering to it. Species 1:—*odoratum*.

Genus 6. *PHALARIS*. Spikelets containing one floret; outer glumes two, nearly equal, boat-like, the keel winged, the two pressed closely together; flowering glumes smaller, concealed within the closed outer glumes, lanceolate, acute; palea oblong, concave, acute; scales lanceolate, pellucid, pointed, tumid at the base; stamens three, filaments capillary, anthers oblong, notched at each end; styles two, slender; stigmas hairy; ovary ovate. Species 1:—*canariensis*.

Genus 7. *DIGRAPHIS*. Scales or rudimentary glumes at base of florets minute, narrow, hairy: outer glumes keeled, but the keels not winged; panicle branched, somewhat spreading. Species 1:—*arundinacea*.

Genus 8. *PHLEUM*. Panicle spike-like; spikelets one-flowered; outer glumes oblong, linear-lanceolate, compressed, nearly equal, pointed or awned; flowering glume and palea shorter, and concealed within the outer glumes, awnless, and very thin; sometimes there is a minute awn on the back of the flowering glume, or a bristle at the base of the palea; ovary roundish; filaments capillary, longer than the glumes, anthers oblong;

styles two, capillary, reflexed; stigmas feathery; scales ovate, concave, acute; seed roundish, enveloped by the flowering glume and palea, but not united to them. Species 6:—1. *pratense*; 2. *alpinum*; 3. *Boehmeri*; 4. *asperum*; 5. *arenarium*; 6. *Michelii*.

Genus 9. *ALOPECURUS*. Spikelets one-flowered; outer glumes equal, ovate-lanceolate, concave, compressed, connate at base; flowering glume ovate, lanceolate, concave, with a slight awn on its back; no palea; filaments three, flattened at the base; anthers forked at each end; ovary roundish; styles capillary, united at the base; seed ovate, folded in the flowering glume. Species 6:—1. *agrestis*; 2. *pratensis*; 3. *geniculatus*; 4. *alpinus*; 5. *bulbosus*; 6. *fulvus*.

Genus 10. *CHAMAGROSTIS*. Spike simple; spikelets one-flowered; outer glumes equal, or nearly so, erect, oblong, abrupt, keeled, awnless; flowering glume a little shorter, very thin, white, hairy; palea so small as to seem but a tuft of hairs, or altogether absent; ovary ovate, smooth; filaments three, hair-like, twice as long as the flowering glume; stigmas long, slender, downy; seed elliptical, enfolded in the glumes but not united to them. Species 1:—*minima*.

Genus 11. *LAGURUS*. Spikelets single-flowered; outer glumes long, narrow, spreading, hairy; flowering glume of firmer texture, shorter, with two awns springing fork-like from its apex, and a very long one on its back; palea shorter than the flowering glume, and with a pair of awns on its apex, but smaller than those on the flowering glume; scales lanceolate, blunt, tumid at the base; ovary oblong; styles short; stigmas long; filaments hair-like; anthers oblong, pendulous, notched at each end. Species 1:—*ovatus*.

Genus 12. POLYPOGON. Inflorescence a spike-like panicle; spikelets single-flowered; outer glumes nearly equal, narrow, straight, concave, with cloven points, and awns attached to the keels; flowering glume about half the length of the outer ones, broadish, notched at the summit, awned; palea also notched at the summit, thin, transparent, narrow, and awnless; scales oblong; ovary ovate; filaments capillary, as long as the flowering glume; anthers oblong; styles two, far separated; stigmas with long feathery hairs; seed ovate, enveloped by the flowering glume and palea, but not fastened to them. Species 2:—1. *Monspeliensis*; 2. *littoralis*.

Genus 13. AGROSTIS. Inflorescence a more or less spreading panicle; spikelets one-flowered; outer glumes equal, narrow, pointed, awnless; flowering glume smaller, acuminate, generally awned; palea smaller still, or absent. Species 4:—1. *alba*; 2. *canina*; 3. *setacea*; 4. *Spica-venti*.

Genus 14. GASTRIDIMUM. Outer glumes unequal, acute, their base swollen, smooth, and shining. Species 1:—*lendigerum*.

Genus 15. PSAMMA. Panicle spike-like, cylindrical; glumes stiff like chaff, flowering glumes awnless. Species 1:—*arenaria*.

Genus 16. CALAMAGROSTIS. Inflorescence paniced; spikelets one-flowered; outer glumes nearly equal, keeled; flowering glume thin, short, and narrow, awned, a tuft of hairs at the base. Species 4:—1. *Epigejos*; 2. *lanceolata*; 3. *stricta*; 4. *Lapponica*.

Genus 17. AIRA. Spikelets two-flowered; outer glumes two, equal, ovate-lanceolate, acute; flowering glumes like the outer ones in form, but thinner; palea resembling the flowering glumes in height and texture;

awns short; styles bristle-shaped, spreading; stigmas downy; filaments long, hair-like; anthers oblong, forked at each end; seed ovate. Species 5:—1. *cæspitosa*; 2. *flexuosa*; 3. *canescens*; 4. *præcox*; 5. *carophylleæ*.

Genus 18. AVENA. Spikelets many-flowered, loosely collecting the florets; outer glumes lanceolate, acute, ventricose, loose, awnless; flowering-glumes slightly smaller, two-cleft at the top, awned; scales two; ovary blunt; styles two, reflex, hairy; stigmas simple; filaments thin, capillary; seed oblong, slender, pointed, marked with a longitudinal furrow, clothed with the flowering glume and palea. Species 3:—1. *fatua*; 2. *pratensis*; 3. *flavescens*.

Genus 19. ARRHENATHERUM. Spikelets several-flowered, the lower floret in each spikelet male; the lowest flowering glume awned. Species 1:—*avenaceum*.

Genus 20. HOLCUS. Spikelets two-flowered, one floret male, the other perfect; outer glumes erect, beardless, ovate, compressed, enclosing the florets, one of which is elevated on a footstalk; flowering glumes pointed, that of the male flower bearing an awn upon its back; palea smaller, awnless; scales single, cloven, membranous; ovary ovate; styles two, hair-like; stigmas oblong, feathery; seed ovate, attached to the hardened palea and flowering glumes; axis of the spikelet smooth. Species 2:—1. *lanatus*; 2. *mollis*.

Genus 21. CYNODON. Spikelets single-flowered; outer glumes nearly equal, florets awnless, placed on one side of the spike. Species 1:—*dactylon*.

Genus 22. SPARTINA. Spikelets single-flowered, sessile; outer glumes boat-like, compressed, converging, very unequal, pointed, the broader one striated; flowering glume longer than the smaller outer glume, but shorter

than the long one, linear, compressed, narrowing to a point at the summit; palea, like the flowering glume, intermediate in length between it and the longer outer glume; scales none; ligules very short; ovary narrow, pointed; filaments slender; anthers long; styles thread-shaped, erect, longer than the filaments; stigmas short, feathery; seed oblong, compressed. Species 1:—*stricta*.

Genus 23. *LEPTURUS*. Spikelets one- or two-flowered, placed on alternate sides of a simple erect spike. Species 1:—*incurvatus*.

Genus 24. *NARDUS*. Spikelets simple, of one floret only; no outer glumes; flowering glume narrow, pointed, enclosing the palea, which is smaller, narrow and pointed; no scales; filaments three, slender, shorter than the glume; anthers oblong, very slightly notched; ovary oblong; style single, slender, long, downy; stigma simple. Species 1:—*stricta*.

Genus 25. *ELYMUS*. Inflorescence spiked; spikelets containing more than one floret, sessile, not solitary; outer glumes lanceolate; flowering glumes pointed and awned; palea fringed; scales two, oblong, pointed, fringed; filaments three, slender, very short; anthers oblong, more notched at the base than at the apex; ovary turbinate; styles two, short; stigmas feathery. Species 1:—*arenarius*.

Genus 26. *HORDEUM*. Spikelets in clusters of three on each tooth of the rhachis; rhachis jointed and breaking easily at each tooth; outer glumes narrow, pointed, and terminating in bristly awns; ovary turbinate; styles two, villous, reflexed; stigmas feathery; seed oblong, swelling, angular, and pointed at each end, marked above with a longitudinal furrow. Species 4:—1. *sylvaticum*; 2. *pratense*; 3. *murinum*; 4. *maritimum*.

Genus 27. TRITICUM. Inflorescence spiked; rhachis zigzag, toothed, elongated; outer glumes ovate, bluntish, concave; scales two, swollen at the base; filaments hair-like; anthers pendulous, oblong, cloven at each end; ovary turbinate; styles two, slender, reflexed; stigmas feathery; seed ovate, oblong, blunt at both ends, convex on the outer side and a longitudinal furrow on the inner. Species 3:—1. *repens*; 2. *caninum*; 3. *cristatum*.

Genus 28. LOLIUM. Inflorescence spiked; spikelets several-flowered, placed singly on each tooth of the rhachis, and pressed close into the angle; only one empty glume, awl-shaped, permanent, fixed, opposite to the rhachis; flowering glumes lanceolate, narrow, pointed, as long as the empty one; scales ovate, obtuse, swollen at the base; filaments short; flowering glumes enfolding the seed, which can only fall when they open; seed oblong, convex beneath, and a broad shallow furrow above. Species 2:—1. *perenne*; 2. *temulentum*.

Genus 29. BRACHYPODIUM. Inflorescence spiked; spikelets several-flowered, slightly stalked. Species 2:—1. *sylvaticum*; 2. *pinnatum*.

Genus 30. BROMUS. Spikelets many-flowered; outer glumes spreading, collecting the florets into an oblong two-lobed spikelet, ovate-oblong, pointed, awnless, the lower the smallest, flowering glumes the size and form of the outer or longer, concave, obtuse, cleft at the summit, with a straight awn rising just below the apex; palea lanceolate, small, awnless, nerved, the nerves hairy; scales ovate, acute, swollen at the base; ovary hairy; styles two, short, reflex, hairy, placed on the side of the summit of the ovary; stigmas simple; seed oblong, convex on one side, furrowed on the other. Species 11:—1. *erectus*; 2. *asper*; 3. *sterilis*; 4. *maximus*;

5. *Madritensis*; 6. *arvensis*; 7. *giganteus*; 8. *secalinus*; 9. *mollis*; 10. *racemosus*; 11. *squarrosus*.

Genus 31. *FESTUCA*. Spikelets slender, roughish, two-ranked; outer glumes erect, unequal, keeled; flowering glumes lanceolate, somewhat cylindrical, pointed, awned; scales either two, ovate-lanceolate, acute, or one concave, notched, and horizontal; filaments hair-like, shorter than the flowering glume; anthers oblong; ovary turbinate, glabrous, sometimes a little downy; styles two, short, reflexed; stigmas downy; seeds oblong, slender, sharply pointed at both ends. Species 5:—1. *ovina*; 2. *elatior*; 3. *sylvatica*; 4. *Myurus*; 5. *uniglumis*.

Genus 32. *DACTYLUS*. Inflorescence in a slightly-branched panicle; spikelets several-flowered, crowded into dense clusters; outer glumes unequal, pointed, keeled, convex; scales lanceolate, jointed, swollen at the base; filaments three, slender, longer than the flowering glumes; styles spreading; stigmas feathery; seed oblong, naked, furrowed. Species 1:—*glomerata*.

Genus 33. *CYNOSURUS*. Involucre pectinated; spikelets unilateral, many-flowered, sessile; outer glumes two; flowering glumes long, concave; palea flat, awnless; scales ovate, acute, swollen at the base; filaments three, hair-shaped; anthers oblong, pointed; styles reflexed, hairy; stigmas simple; seed oblong, pointed. Species 2:—1. *cristatus*; 2. *echinatus*.

Genus 34. *BRIZA*. Spikelets several-flowered, pendulous; panicle loose; outer glumes spreading, blunt; flowering glumes the same shape as the outer ones; palea very small, flat, and roundish; scales two, narrow and notched; filaments capillary; anthers oblong; ovaries roundish; styles two; stigmas feathery; seed com-

pressed, adhering to the flowering glume and palea. Species 2 :—1. *media* ; 2. *minor*.

Genus 35. POA. Inflorescence a simple or compound panicle ; spikelets many-flowered, awnless, ovate, oblong, two-ranked ; outer glumes rather unequal, ovate, pointed, mostly keeled ; flowering glumes ovate, pointed, concave, more or less keeled, compressed, rather longer than the outer ones, membranaceous at the margins ; scales acute or torn, swollen at the base ; ovary roundish ; styles two, reflexed, hairy ; stigmas feathery ; seed oblong, pointed, compressed on each side. Species 15 :—1. *aquatica* ; 2. *fluitans* ; 3. *maritima* ; 4. *distans* ; 5. *procumbens* ; 6. *rigida* ; 7. *loliacea* ; 8. *annua* ; 9. *compressa* ; 10. *pratensis* ; 11. *trivialis* ; 12. *nemoralis* ; 13. *laxa* ; 14. *alpina* ; 15. *bulbosa*.

Genus 36. CATABROSA. Spikelets containing only two florets ; outer glumes broad, blunt at the summit, or indented. Species 1 :—*aquatica*.

Genus 37. *Molinea*. Spikelets small, flattened ; outer glumes pointed ; palea small, with a bristle at its base. Species 1 :—*cærulea*.

Genus 38. MELICA. Panicle simple or compound, containing a few large spikelets ; spikelets containing one or more flowers, and a wedge-shaped glume enclosing one or two rudimentary florets ; outer glumes ovate, concave, thin, nearly equal ; flowering glumes ovate, concave ; palea ovate, flat ; scale single, fleshy, and horizontal ; ovary top-shaped ; styles two, bristle-shaped, spreading ; stigmas long, feathery ; filaments hair-like, thickened at the base ; anthers oblong ; seed ovate, with a longitudinal furrow on the upper side. Species 2 :—1. *nutans* ; 2. *uniflora*.

Genus 39. TRIADIA. Spikelets several-flowered ; outer

glumes nearly equal; flowering glume with three nearly equal teeth at the top. Species 1 :—*decumbens*.

Genus 40. KÆLERIA. Spikelets few-flowered, disposed in dense clusters, nearly sessile; panicle spike-like; outer glumes keeled, pointed, and scale-like at the edges. Species 1 :—*cristata*.

Genus 41. SESLERIA. Inflorescence spike-like, cylindrical; spikelets few-flowered; outer glumes nearly equal, ovate-lanceolate, concave, acute; flowering glumes erect, acute, nearly equal, toothed at the top; palea folded, two-ribbed, cloven; filaments hair-like, long; anthers pendulous, oblong; ovary ovate; styles two, varying in length, sometimes combined; stigmas long, cylindrical, feathery; seed ovate, smooth. Species 1 :—*cærulea*.

Genus 42. ARUNDO. Inflorescence paniced; spikelets several-flowered; outer glume unequal, oblong, pointed; flowering glumes as long as the outer ones; palea the same length; from the base of the floret arise a number of long hairs. Species 1 :—*phragmites*.

TRIBE I. ORYZEÆ.

Genus I. LEERSIA. CUT-GRASS.

Gen. Char. Glumes two, concave, boat-shaped, keeled, nearly closed, generally fringed, the outer broader and the same length as the inner; palea absent; scales lanceolate, acute; stamens two, three, or six, short; anthers oblong; germen ovate, compressed; styles two, capillary, short; stigmas feathery; panicles loose; spikelets one-flowered; seed obovate, compressed.

This genus of grasses is chiefly American, but individual species are found both in Asia and Australia, and one at any rate is common in Europe, and has even effected a settlement in England. The generic name was bestowed by Swartz in honour of the botanist Leers, a native of Nassau, who wrote and illustrated a very elaborate work on grasses. The original work is both rare and valuable, but the second edition is very inferior.

Leersia oryzoides, Eng. Bot. **European Cut-grass.**

Root perennial, with long runners; stem erect, smooth, from three to five feet high in the south of Europe, but only about two feet high in England; joints hairy; leaves linear-lanceolate, pointed, striated, very rough at the edges, glaucous; sheaths roughish; ligules short and notched; panicles spreading, the branches light and wavy; spikelets numerous, unilateral, containing one floret; glumes unequal in breadth but equal in length, opening but a little way, fringed at the

keel; no palea; stamens short; anthers long; ovary narrow, acute; stigmas feathery.

We are indebted to Mr. Borrer for the admission of this elegant grass to our British flora. He found it in ditches, slow streams, and boggy situations, in Sussex and Hampshire. It is a common species in North America, also in Asia, and is a well-known weed among rice in Italy. Sequier says that it is easily detected by its glaucous hue by those engaged in weeding, even before the bristles on its leaves are developed; this roughness procures for it the name of *Asperella* in Italian. In Germany, France, Italy, Austria, Switzerland, and Persia, it is a frequent inhabitant of watery places. Up to the time of the florets opening, the panicle is much enveloped in the upper sheath, and the delicate zigzag branches of the rachis only spread fully at the flowering time. The florets are pale green, and greatly resemble those of its very important relative the Rice-plant, only they are smaller. Its flowering time is from August to October.



Miss Pratt mentions an exotic species of Cut-grass, the flowers of which are so constructed as to form a vegetable fly-trap for small insects.

TRIBE II. PANICEÆ.

A tribe of grasses, containing several genera, the members of which are important in warm climates. The name is derived from the characteristic form of the inflorescence. The panicle varies extremely in form throughout the tribe, often being light and spreading, but occasionally so dense as to resemble a spike. The spikelets are dorsally compressed, the glumes two, unequal.

Genus II. MILIUM.

Gen. Char. Spikelets single-flowered; empty glumes two, nearly equal, tumid, ovate, pointed; flowering glume smaller, ovate, permanent, finally cartilaginous and glossy, enclosing the seed; scales two, ovate, obtuse; stamens three, thread-shaped, roundish; styles two, capillary; stigmas tufted.

The generic name is given because of the resemblance of the grasses to the sort of corn used in ancient times, and remarkable for the number of its seeds, called *Milium*; hence Festus derives the name from *mille*, a thousand. The Roman plant in question probably belonged to the next genus, *Panicum*.

Milium effusum. Spreading Millet.

Root perennial, fibrous, with creeping shoots; stem erect, tall, often attaining a height of from four to five feet, slender and glossy; leaves short, flat, smooth, four or five in number; sheaths small and striated; ligules oblong; panicle widely spreading, hence the specific name, erect, the branches long and slender, placed in bundles at intervals along the rachis; spikelets numerous, small, ovate, one-flowered; empty glumes equal, broad, membranaceous, concave but not keeled, nearly smooth; flowering glume slightly

smaller, smooth and glossy; palea a little smaller again, of similar texture, faintly two-nerved, and along with the flowering glume enveloping the seed.

This grass is familiar to every one who observes grasses at all. Its great height, widely spreading panicle, and multitude of small florets, generally of a pale green tint, but sometimes in exposed situations turning purple, ensure it attention; but the situations it selects, and the plants which frequently occupy its neighbourhood, are a further guarantee for the Millet-grass receiving its due meed of praise. While writing this, a dozen woody nooks come before the memory, where the atmosphere for five feet from the ground seems



crowded with dancing green motes, the quivering florets of the Spreading Millet; while from amidst this vegetable swarm the stately spires of the crimson Foxglove rise, or the pale bells of the giant Campanula swing to and fro, ringing their mute chimes; or, again, the lithe branches of the Dog-rose stoop down to the quivering grass florets, and shake their rosy petals among them, so as to create a fresh commotion throughout the dancing crowd. Even in woods so dense that only the Helleborine can endure their shadowy depths, the Spreading Millet lifts its airy panicles, and here it grows very high, overtop-

ping its five feet. No Foxglove bells, nor purple and white Campanula, nor gay Hedge Roses, coquette with its trembling beauty here; its leaves and florets are very pale, indeed, but they dance as gaily as in the sunshine, though they have no more exhilarating music to inspirit them than that made by the quivering of the Poplar leaves. As long as the trees stand in close ranks, the Spreading Millet has it all its own way; and during all the summer months, its panicles either quiver with green blossoms, or grow staid and calm under the burden of numerous grains of seed, wrapped in their glossy coverings. But cut the trees down, and see the change which next summer makes in the Millet! On the low ground, where there is moisture enough to nourish its strength, it grows tall and stately as before, and many an unlooked-for plant springs up amongst it to keep it in countenance, as it were, now that the shelter of the clustering trees is gone; but, as the sun looks down upon the opening florets, they blush under his beams, and are soon green no longer, but glow with every tint of violet. On the high ground, the delicate grass fares worse; there the Foxglove rises, and one or two other plants that can stand exposure and a rocky soil, but the Millet faints for shade and moisture, and not only loses its fresh hue, but becomes so stunted in its growth that you would hardly recognize your luxuriant friend of last summer.

This grass is of little or no value in agriculture; its slender culms, airy panicles, and scant foliage contain little nutriment; but the feathered people of the woods do not take things at our valuation, and the Millet is a plant much respected by them. Its seeds are a little harvest to them, all the more enjoyable for the pleasant

toil they have to take in freeing them from the husks. Even game do not despise the seed, and it may be well worth the care of gamekeepers to have it collected by children for winter food when corn is dear.

The Spreading Millet grows abundantly in moist shady woods in Great Britain, Lapland, Norway, Sweden, the United States, and North America. Its culms remain standing through the following winter, unless broken down by storms; and they form as beautiful objects glittering with the starry gems of the hoar-frost, as when trembling in the summer breeze, and shaking the dewdrops from their delicate florets.

The foreign grasses usually known as Millets belong to the next genus.

Genus III. PANICUM.

Gen. Char. Inflorescence paniced, panicle compact or spike-like, or more or less spreading; spikelets small, naked or awned, one-flowered, or at any rate only containing one perfect flower; outer glumes generally three, the first minute, the second larger and empty, the third containing a male or neuter floret, or else empty; flowering glume concave, embracing with its margins the palea, which like itself is cartilaginous and glossy, and of similar shape, but rather flatter and with two slight ribs; scales minute, inflated; ovary roundish; seed solitary, invested with the flowering glume and palea, flattened at one side.

1. **Panicum sanguinale**, Linn. **Fingered Panicum.**

(*Digitaria*, Brit. Fl.)

Root annual, fibrous; stems numerous, ascending, branched, slender, hollow, ribbed, glossy; leaves flat, somewhat hairy; sheaths hairy; ligula prominent, especially in the upper sheath, rounded, and with hairs at the base:

joints near the base of the stem and hidden by the sheaths panicle digitate, spikes long, situated very near together, simple, from three to seven in number, spreading to the right and left like the open fingers of a hand; rachis somewhat angular, the blunt angles minutely toothed; spikelets in pairs, dull violet in colour, leaning one way, one spikelet on a footstalk, the other sessile, that with the stalk fertile, the other barren (according to Dr. Parnell), both oblong lanceolate and without awns; the outermost glume is very minute, sometimes abortive, the second is larger, concave, acute, downy, and three-ribbed, the third is double the size of the second, flat, oblong, lanceolate, and five-ribbed, it is downy at the edges; the flowering glume is the same length as the third empty one, it is very smooth, generally tinged with purple, and has folded margins, like the empty glumes it is awnless; the stamens are three, long and slender; the anthers short, and cloven at both ends, violet in colour; stigmas also violet, and feathery; seed glossy.

This is an attractive grass because of its peculiar digitate form of inflorescence.



Its habit is somewhat creeping; the stems somewhat procumbent at first, then ascending; owing to this habit it spreads rapidly, even where it is not indigenous, especially when it finds itself in a rich sandy soil. It is only found in England where the seeds have been sown accidentally. Its true home is in the warmer climates of Europe, in North Africa, America, and the

West Indies. In August the florets open, and the seed is ripe in September. It is a hard, coarse grass, of no agricultural use; but Mr. Sinclair retails some good properties possessed by the seed which secures its cultivation in Germany. It ripens seed in abundance, but the birds are so fond of it, that it is necessary to protect it with nets when grown for commercial purposes. The seed, when ripe, is collected in a hair-sieve, at sunrise, then spread on a sheet, and dried in the sun for a fortnight; then it is put into a large vessel with layers of straw between the layers of seed, and beaten with a pestle until the chaff is detached from the seed. After this it is poured into a wooden trough, with dried Marigold flowers, Apple, and Hazel leaves, and again beaten till it becomes bright and glossy; it is finally winnowed, and thus cleansed from all chaff and rubbish. Mr. Sinclair tells us that the Marigold flowers are added to impart a golden tint. A bushel of seed with the chaff attached yields only an eighth part of clean seed. The grain thus prepared, when boiled in milk, makes a dish resembling sago.

This grass is generally stigmatized as a useless weed, but Mr. Sinclair, ever intent on developing the good qualities of the grass family, wins our respect for it by making known its possible utility. Mr. Loudon follows his lead, and claims the same honour for it in Poland. He adds a less attractive use to which it is applied by those ingenious misapppliers of nature's gifts, boys. In some parts of Germany, according to his account, boys prick each other's noses with its sharp spikes until they bleed; to this use or rather abuse, he traces its specific name, *sanguinale*.

The hairiness of the plant is very variable. Dr. Par-

nell describes it as very hairy in the West Indies, New Orleans, and on the banks of the Mississippi, but very smooth in Germany, especially in the neighbourhood of the hot springs. It is distinguished from the next species (*P. glabrum*) by the unequal size of the second and third glumes.

2. ***Panicum glabrum*, Gaud. Glabrous Panicum.**

(*Digitaria humifusa*, Eng. Bot.)

Root annual, fibrous; stems decumbent at first and then ascending, branched, smooth, striated, glossy, having about three joints all situated near to the root and hidden by the sheaths; leaves short and rather broad, hairy at the edges; ligule of upper sheath obtuse, and sometimes hairy at the base; panicle digitate; spikes long and narrow, few in number; spikelets in twos or threes, all stalked and flattened at the back, but the stalks of unequal length; the outermost glume is minute and scale-like, as in the last species, but the next two are of equal size, downy, five-ribbed, and of a full violet colour; the flowering glume is of the same size and form as the second and third empty glumes, both it and the palea are finely ribbed and shining, and invest the seed in the same manner as those of the last species; the stamens are three in number, a little longer than the flowering glume; the anthers short, violet, cloven at each end; the styles are very slender, the stigmas feathery, and violet.

This grass is less attractive than the last, being of lower growth, and having fewer spikes in its panicle, never more than four, and sometimes only two. It has established itself in the south of England, but is really a native of France, Holland, Belgium, Prussia, and as far north as southern Scandinavia. It is distinguished

from the *Cynodon Dactylon*, which it greatly resembles, by its spikelets being flattened at the *back*, and placed on the rachis in twos and threes, whilst in the *Cynodon* they are placed singly on the rachis, and are flattened at the *side* only. From the *Panicum sanguinale* it is distinguished, as we have already seen, by the equality of the second and third empty glume.



Like the last species, this is a mere weed; it affects cooler climates than *P. sanguinale*, but no use is ascribed to it. It flowers from July to the end of August.

3. *Panicum verticillatum*. Rough Panicum.

(*Setaria*, Brit. Fl.)

Root annual, fibrous; stems numerous, straight, but spreading, often branched at the base, smooth on the lower part but rough above, leafy; leaves harsh, straight, pointed, lanceolate, very rough at the edges; sheaths smooth, striated, the uppermost one shorter than the leaf; ligules fringed, short, and blunt; panicle simple, the branches short, and placed in whorls, rough; the spikelets are flattened at the back, stalkless, and placed in clusters generally of four, amongst these numerous bristles arise, which are called by Mr. Curtis the involucre of the spikelet; the bristles are long and closely beset with teeth pointing downwards; the first empty glume is very small, broad, and

pointed, the second larger, oblong, smooth, and five-ribbed; the flowering glume like the second empty one; floret of two paleæ, the outer large, concave, three-ribbed, the inner flattish and folded. Dr. Parnell describes the spikelets as containing two florets, one barren and one fertile, but other authors doubt the presence of the barren floret. The stamens are three, the anthers dark purple in colour, and notched at each end; the ovary is small and oval; the stigmas feathery; the seed glossy.

This Panick-grass is a native of the warmer parts of Europe, spreading into Russian Asia; it is a frequent weed in cultivated and waste ground, but does not grow in sufficient abundance to be accounted noxious, though its harshness would make it so if it became prevalent. It is occasionally met with in England in sandy fallow ground about London and Norwich. Its spike-like panicle is not destitute of



beauty, and the numerous bristles interspersed among its crowded spikelets give it a very distinctive appearance, while their reversed teeth form a reliable specific distinction. It grows from one to two feet high. The general colour of the plant is a full green, but the spikelets are liable to receive a tinge of purple. Sometimes the whorls of the panicle are rendered obvious by a distinct interruption between the lower whorls, in which case the grass is easily distinguished at sight, but when the whorls are crowded together it is necessary to draw

the panicle through the hand, when the clinging of the reflexed teeth betrays the species.

4. **Panicum glaucum**, Linn. **Glaucous Panicum.**

(*Setaria*, Brit. Fl.)

Root annual, fibrous; stems erect, taller than in the last species, furrowed; leaves linear-lanceolate, somewhat glaucous; sheaths shorter than the leaves; panicle spike-like, cylindrical; spikelets crowded, rather larger than in the Rough Panicum; the bristles numerous, rough, with erect teeth; the first empty glume very small, the second about twice the size, the third larger again; the flowering glume investing the seed as it ripens and becoming scored with transverse wrinkles. In this species most authors consider the glumes to contain a barren as well as a fertile floret.

The Glaucous Panicum is a native of the south of Europe, America, the East Indies, and New Holland, in all which countries it is a common weed in cultivated ground. In England it is not indigenous, but is occasionally found in the south, introduced accidentally among other seeds. It is a taller grass than the Rough Panicum, and the glaucous hue of the herbage is agreeable, the numerous bristles are beset with ascending teeth, and have a tawny or golden tinge, not inclinin to purple. Some seedsmen



recommend this as an ornamental grass ; it grows freely, and its glaucous foliage and sunny panicles contrast very well with the rich tints of Geraniums and Verbenas, in summer bouquets. It flowers during the later summer season and the early autumn. The erect teeth of the bristles distinguish it from the Rough Panicum, and the disparity of length between the second and third glumes distinguish it from the Green Panicum, which in other respects it resembles very closely.

5. **Panicum viride**, Linn. **Green Panicum.**

(*Setaria*, Brit. Fl.)

Root annual, fibrous ; stems erect, often branched at the base, rough in the upper part ; joints about four ; sheaths smooth, ribbed, the upper one shorter than its leaf ; ligule short, blunt, hairy at the edge ; leaves lanceolate, rather rough on both surfaces, very rough at the margins ; panicle simple, spike-like ; branches hairy ; spikelets flattened at the back, crowded, sessile or nearly so ; involucre of rough bristles, their teeth pointing upwards ; spikelets crowded, green ; first glume very small, second and third larger and equal, the third considered by some authors to contain a barren floret ; flowering glume of fertile floret as large as the second and third glumes, and with three ribs ; palea flattish and folded at the edges ; stamens three ; anthers dark-violet, notched at both ends ; styles two, long, and smooth, stigmas short and feathery ; seeds glossy.

The Green Panicum is more frequent in England than the two allied species, but even it has no claim to being indigenous. It affects dry sandy ground principally in waste places. It is a harsh grass, undesirable for agricultural purposes, and only valued by the small birds,

who feast upon its seeds. It has been found in Surrey, Suffolk, and Norfolk. It is indigenous in nearly all the countries of Europe, and also in North Africa and the United States. It flowers during the latter part of the summer and the early autumn, and its polished seeds are ripe in September.

It is distinguished from the Rough Panicum by the erect teeth of its bristles, and from the Glaucous Panicum by the equal length of the second and third glumes.



6. **Panicum Crus-galli**, Linn. **Cockspur Panicum.**

(*Echinochloa*, Bab. Man.)

Root annual, fibrous; stems erect, smooth, furrowed; leaves broad, harsh, pointed, rough beneath, central rib very clearly marked; sheaths tumid, the panicle arising closely from the uppermost one; ligule either absent or only supplied by a white mark or a few hairs; panicle compound, dense, the main branches distant below, crowded above, rough, from six to ten in number, with a few very short branchlets bearing clusters of sessile spikelets with long smooth hairs springing from their base; spikelets crowded, all turned to one side; first empty glume broad and short, the second as long as the floret, rough with short hairs and three-ribbed, the third of equal length, and terminating in a short or long bristly awn; flowering glume very thin and transparent, smooth, glossy, and awnless; the palea of the barren

floret is small and polished; ovary ovate; styles long and slender; stigmas feathery; stamens three, long and thread-shaped; anthers cloven at both ends.

This is a coarse grass, undesirable for agricultural purposes, but showy in appearance, and well calculated for the landscape-garden, especially when the ripening seed weighs down the panicles, and thus causes the culms to arch outwards. It is hardly indigenous in Britain, and only found as a weed in cornfields; it flowers all the summer and autumn, and this long flowering-season makes it the more suitable as a garden plant. It is a native of Europe, North America, the East Indies,



and New Holland, in cultivated or waste land, which is either moist or occasionally inundated.

The Cockspur Panicum is easily distinguished, for it and the *Triodia decumbens* are the only British grasses destitute of a ligule. Its crowded panicle, with its few dense spike-like branches, and the long, smooth, fine, transparent bristles situated in tufts about the spikelets, are specific distinctions patent to every observer.

This family contains many grasses of importance, as affording food for man. The *Panicum Italicum* is called the "True Panick-grass," and is the one cultivated extensively in Italy and elsewhere for its abundant seeds; its culms are slender, and the almost cylindrical panicles

very heavy and immensely productive. *Panicum milia-
ceum* is the Millet-seed, the well-known native of the
East Indies. It is a historical plant, cultivated from
time immemorial in the South of Europe for its seed, so
much valued for culinary purposes. Pliny gives the pre-
ference to the seed of the Italian *Panicum*, as weighing
more and being more nutritious, but he acknowledges
that those of the Millet *Panicum* are more generally
used for making bread. Of this plant and its allies,
Professor Lindley says:—"All these produce small
grains far inferior to those of the cereal grasses, and
chiefly useful as food for poultry, or for making the
Italian dish called *polenta*. They are unable to bear
fruit and will not ripen in this country with much cer-
tainty. Where they are cultivated, as in Germany,
Hungary, France, and Italy, they are sown broadcast
after all danger of spring frost is over." Little birds
devour the seeds of either with great eagerness, and we
cannot dissociate the dense head of the Italian Millet
from that of a costly piping bullfinch, the idol of a doating
mistress, which found its death in overcramming with the
Millet seed. The little *gourmand* ate until his crop was
so large that his head was forced back by it, and shortly
afterwards he took a fit and expired. The beauty of the
Millet-grass quite equals its utility. Its large, light,
drooping panicle, the crowd of pale green spikelets trem-
bling on their slender footstalks, the broad undulated
leaves, the highest waving as a pennon over the expanded
panicle, and the tall growth of the plant, recommend it
highly to the landscape gardener; and if he continued in
doubt regarding its appropriateness for ornamental cul-
ture, he would only need to wait till the delicate florets
opened their valves, when the tassels of scarlet anthers,

protruding from every spikelet, would take his fancy captive at a glance. Host gives a charming illustration of this grass in his work on 'Austrian Grasses.' Another very attractive species for garden culture is the *Panicum nervosum*. It is tall and reed-like in its habit, its panicle light and spreading, in the style of the British Millet-grass; it is not introduced among those recommended by seedsmen. In strong contrast to these giants of the family, the Juniper *Panicum* appears. Almost mossy in its habit, creeping low on the ground, and extending its procumbent branches far, it might be very suitable for bordering if it could be acclimatized. It is a native of the Isle of Bourbon. Many species cultivated in the Kew Gardens, and by nurserymen for ornamental purposes, are mentioned in the chapter on "Ornamental Grasses."

P. arborescens grows to the height of a forest tree in the East Indies, according to Linnæus.

The family is most probably named from the form assumed by the inflorescence, but some derive it from *panis*, bread.

TRIBE III. PHALARIDÆ.

Spikelets of one perfect floret and two imperfect florets or rudimentary glumes.

Genus IV. **HIEROCHLOE. HOLYGRASS.**

Gen. Char. Panicle more or less spreading; spikelets three-flowered, only one of the three being perfect; outer glumes ovate, acute, membranous, keeled, inner and flowering ones ovate and coriaceous; stamens three in the male florets, and two only in the perfect one; anthers linear, pendulous, notched at both ends; ovary present only in the central floret, small, ovate; styles short, near together;

stigmas long, linear, downy; seed ovate, pointed, small, not attached to the flowering glume.

Hierochloe borealis, Rœm. and Sch. **Northern Holygrass.**

Root perennial, creeping; stem erect, round, smooth, from twelve to eighteen inches high; leaves short, flat, broad, lanceolate, rough on the upper surface; sheaths somewhat short; panicle spreading, drooping in the upper part; branches smooth, slender, tinged with purple; spikelets ovate, brown, glossy; outer glumes nearly equal, broad, acute, smooth; lower flowering glumes as long as the outer ones, five-ribbed, hairy, rough at the keel; palea two-nerved; flowering glume of fertile flowers shorter, glossy; palea very small, two-nerved like its fellows; stamens three in the barren and two in the fertile florets, the filaments as long as the flowering glumes, the anthers extending beyond them; ovary long, narrow, pointed; scales long, narrow, and pointed.

This is a very rare grass, founding its claim to be considered a native of Britain on its discovery by Mr. Don in the valley of Kella, Forfarshire, and more recently in Caithness by Mr. Dick. It is to be seen in great luxuriance in the Botanic Gardens of Edinburgh; and its light, spreading panicles, brown-tinted florets, and fresh green foliage, recommend it highly as a border plant, and a graceful addition to drawing-room



bouquets. Its flowers appear early in May; and its panicles form a charming contrast with the solid grandeur of the Tulip and Narcissus tribe. Its fragrance is an additional recommendation to it as a cultivated plant; it partakes the odour of the Sweet Vernal-grass, with a delicate hint of the scent of the Bitter Almond in addition.

Though a rare grass in Britain, it is common in mountain pastures and rocky places in northern climates, being frequent in Lapland, Norway, Sweden, Kamtchatka, Russia, North America, Northern Germany and the mountains of South-eastern Germany, parts of Asia, and New Zealand. In some of these countries it is much valued by the Catholic population, as being dedicated to the Virgin Mary; and on this account it is called by Loesel, *Gramen Mariæ*, Mary's Grass. Its generic name is derived from two Greek words bearing reference to the same usage, and meaning *sacred* and *grass*. Gmelin gave the name, having been accustomed to see it strewn before church doors, and in the churches on festival days. In Sweden it is sold in bundles to be placed over or near the beds, from an idea that it induces sleep, because of its sacred influence.

There is a handsome species of *Hierochloe*, indigenous in Tierra del Fuego, of larger growth, awned, and with flowering glumes large and of rich brown colour, while the outer glumes are nearly white, and the florets bearded at the base. It has the same pleasant odour as our northern species, and is therefore called *redolens*.

Genus V. ANTHOXANTHUM.

Gen. Char. Outer glumes two, unequal, one-flowered, the next two glumes empty and narrower, awned, the awns

of different length, one arising from the back of the one glume, the other from the base of the opposite one; palea like a scale; stamens two; seed pointed at both ends, the flowering glume continuing attached to it.

***Anthoxanthum odoratum*, Linn. Sweet Vernal-grass.**

Root perennial, fibrous; stem slender, one to two feet high, smooth, joints long and wide apart, the stem bending at the joints; sheath somewhat hairy, ribbed; leaves flat, narrowing to a sharp point, hairy both above and below and rough at the edges, of a light green colour; ligule hairy at the base; panicle simple, compact in flower but expanding as far as the very short footstalks permit when in seed, ovate in form, the branches short, beset with minute hairs, and placed alternately on the rachis; spikelets broadly lanceolate, clustering; first glume much pointed, small, second glume double the length and also pointed, both hairy on the keels; flowering glumes shorter, equal in length, hiding within the empty glumes, of oblong form and brownish tint, hairy, and with awns of unequal length; ovary oblong; filaments long; anthers large, and cloven at each end, purple; styles two, long and bearing long feathery stigmas; base of the leaves hairy.

This is a welcome grass, alike to the eye of the agriculturist and the botanist. Its early appearance seems like a herald of coming summer. In April its panicles begin to develop their long tassels of bright stamens, and, though there are only two to each floret, the anthers being large, the panicle seems well furnished with them. The flowering-heads are very prominent, for the meadow grasses are still very short when the culms of the Sweet Vernal-grass have attained their full growth, and the only flowers that compete with it are

the bronze and golden stars of the little *Luzula præcox*, the brilliancy of which heightens the rich effect of the quivering purple anthers.



The fragrance of the grass is an additional attraction; it vies with Woodruffe in its pleasant odour, and is generally allowed to be the plant that gives the scent so much appreciated in new-made hay. This is hardly a recommendation to those subject to that very trying disorder known as hay fever, and which, even where only of mild order, is so very depressing in its effects.

The agriculturist looks with favour on the Sweet Vernal-grass, because it is perennial, and thrives very well amongst permanent mixed grasses. When in flower, it is not a favourite with cattle. Sinclair tells us that its latter math is much more valuable than its spring produce. It begins to vegetate and throw up culms early in spring, and continues doing so till the end of autumn, when it is most prized. Its seed begins to ripen in June. It is said to be very advantageous in sheep pastures, improving the flavour of the mutton. Not only is it the earliest of grasses, but it is one of the most enduring. It produces but a small quantity of herbage, but that little first appears when grass of any kind is at the scarcest, and it continues to spring, increasing its produce, till the autumn. All authorities recommend it highly, in moderate quantity, for perma-

ment pastures, where it may be considered as the flavouring of the hay crop. It is not particular in its choice of soil or situation, but may easily be introduced into any moderate land. This grass is frequent throughout Europe and North America.

Genus VI. PHALARIS.

Gen. Char. Spikelets containing one floret; outer glumes two, nearly equal, boat-like, the keel winged, the two pressed closely together; flowing glumes smaller, concealed within the closed outer ones, lanceolate, acute; paleæ oblong, concave, acute; scales lanceolate, pellucid, pointed, tumid at the base; stamens three, filaments capillary, anthers oblong, notched at each end; styles two, slender; stigmas hairy; ovary ovate.

Phalaris canariensis, Linn. Canary-grass.

Root annual, fibrous, the fibres very white; stems erect, round, leafy, smooth, numerous, eighteen inches to two feet high, bent at the lower joints, the joints naked; leaves spreading, lanceolate, taper-pointed, rather glaucous, rough beneath, five or six on each stem; sheaths roughish and inflated; ligule blunt, white, membranous, often torn; panicle ovate, spike-shaped, thick, very handsome; spikelets oval, flat, lying one over another like tiles, large, beautifully striped with green and white, each containing one awnless floret; outer glumes very flat, pointed, striped with green and white; flowering glume shorter, ovate, acute, hairy; palea a little shorter and toothed at the apex, rather hairy; the floret with two acute lanceolate scales at the base, which by some botanists are accounted as supplementary glumes.

The Canary-grass is a native of the Canary Isles, South Europe, and North Africa, and has become natu-

ralized in Britain through being cultivated for bird-seed. The chief localities of its cultivation are central and



northern Europe; and in Britain the county of Kent, and *par excellence* the Isle of Thanet, are its best homes. It is also grown to a considerable extent in the deep strong clay lands of Essex. Mr. Loudon recommends a rich loamy soil for it, well cleaned and in good tilth. The grain is sown in February, in drills, six inches between the rows, and the plants thinned out so as to leave no

two nearer than two inches. The young plants grow slowly, and if neglected are soon overtopped by weeds, which the good soil readily produces, so constant and careful weeding is required to ensure the grass fair play. It is a very profitable crop when diligently tended. In its early growth it resembles young wheat or oats, when under good cultivation each head will contain upwards of a hundred seeds, and the empty husks form good food for horses, especially when mixed with other kinds of chaff. The straw is too hard and woody to be of value either as fodder or bedding for cattle. It is often introduced in certain districts in the place of the barley crop, after a summer's fallow of the previous year. It is reaped like wheat, and bound in sheaves. It seldom requires harvesting till after the various kinds of corn are housed, for it should be allowed to stand on the ground till the seeds in the topmost heads are ripe.

As an ornamental grass it is also worthy of attention. There are few who have not had an opportunity of noticing its tall slender culms and globular heads, the overlapping spikelets so prettily variegated with white and green, for wherever a pet canary or other bird favouring canary-seed is hung near an open window, seeds are thrown out into the garden below, and thus many a thriving plant of *Phalaris canariensis* rears its striped head unexpectedly, to the surprise and pleasure of the floral amateur. Its only wild habitat is in cornfields, where it appears in consequence of some accidental admixture of seed. We have found it in Wiltshire and Cornwall in such situations. It is also a frequent plant on dunghills.

Genus VII. DIGRAPHIS.

Gen. Char. Scales or rudimentary glumes at base of florets minute, narrow, hairy; outer glumes keeled, but the keels not winged; panicle branched and somewhat spreading.

Digraphis arundinacea, Trin. Reed Canary-grass.

(*Phalaris*, Eng. Bot.)

Root perennial, creeping widely, tufted; stems from two to five feet high, erect, strong, smooth, reedy, with several purple joints bearing five or six leaves which are also reed-like, lanceolate, striated, pointed, rather glaucous, roughish on both sides, and toothed at the margins; sheaths scarcely at all inflated; ligules short, bluntish; panicle branched, spreading; branches numerous, compound, rough, angular, turning one way; spikelets numerous, crowded, purplish or roseous; outer glumes lanceolate, nearly equal, keeled, ribbed, sawnless, roughish; flowering glumes smooth, glossy, bearing the two scales at the base, fringed with long hairs.

On the banks of rivers and ponds this very handsome pictorial grass may be constantly seen. It forms a fea-



ture in every landscape where the painter wishes to introduce graceful natural objects with their reflection in limpid water. Its reed-like stems and broad bending leaves are of themselves sufficiently attractive, but their charm is heightened when the spreading panicle emerges from the upper sheath, and gradually unfolds its spikelets, richly tinted with violet or rose, unless the absence of sunshine leave the whole plant of the same delicate

green. These welcome panicles appear in July, and the seed ripens in August.

But it is not only in its wild state that the Red Canary-grass is an object of admiration. The variety with striped leaves, common in old-fashioned gardens, was well appreciated by our grandmothers, and public taste is returning to good sense on this point, and Ribbon-grass coming anew into fashion. The quaint old florist Parkinson, writing in the reign of Charles II., expends much notice on this variety. "The French," he says, "call it 'Aiguillettes d'armes,' it being the fashion of their ensign's pennons used in war, that is, like unto a parti-coloured ribbon. In England they call it Ladies' Laces." In Yorkshire, Warwickshire, and other counties, it used to bear the homely name of

"Gardeners' Garters;" and Miss Pratt states that other country people called it "Windle Straw." It has once been found wild in Scotland.

This is a very productive grass, and may be cut down several times during the summer. Unfortunately its foliage is too coarse to be pleasing to cattle, and they will only eat it when very hungry. In tenacious soils, however, and by the side of ponds and ditches, and in marshes, it is worth cultivating. It forms good shelter for waterfowl.

In Britain, Germany, and throughout the south of Europe it is frequent, but it has not been found in Norway, Sweden, or Lapland, nor yet in America.

TRIBE IV. AGROSTIDEÆ.

Panicles more or less spreading; spikelets one-flowered, situated on footstalks.

Genus VIII. PHLEUM.

Gen. Char. Panicle spike-like; spikelets one-flowered; outer glumes oblong, linear-lanceolate, compressed, nearly equal, pointed or awned; flowering glume and palea shorter and concealed within the outer glume, awnless, and very thin, sometimes there is a minute awn on the back of the flowering glume or a bristle at the base of the palea; ovary roundish, filaments three, capillary, longer than the glumes; anthers oblong, notched at each end; styles two, capillary, reflexed; stigmas feathery; scales ovate, concave, acute; seed roundish, enveloped by the flowering glume and palea, but not united to them.

1. **Phleum pratense**, Linn. **Timothy-grass.**

Root perennial, creeping; stems upright, smooth, round, from eighteen to twenty-four inches high, joints smooth; leaves four or five on the stem, flat, rather broad, acute, roughish; sheaths nearly smooth; ligule oblong; panicle cylindrical, compact, two to five inches long; spikelets small, numerous, compressed, situated in pairs on short footstalks; outer glumes about a line long, abrupt, with scarious edges and fringed at the keel, each glume terminating in a short, stout, rough awn; flowering glume ovate, five-ribbed, jagged on the upper part, covered by the outer glumes and closely covering the palea, which is shorter, pointed, and has its margins delicately fringed; ovary roundish; filaments long and slender; anthers rather long, notched at both ends; styles long; stigmas feathery.

The Timothy, or Common Cat's-tail-grass is conspicuous in meadows and pastures everywhere, flowering in June, and exhibiting its cylindrical spike-like panicles to all observers. It is called Timothy-grass, because it was first extensively cultivated by Mr. Timothy Hanson, in North America, and introduced into British artificial pastures on his recommendation, and has been held in good esteem, particularly for moist tenacious soils, where it flourishes best. Sinclair found it very good for early pasture, but inferior



in its after-math; it is hard and coarse in texture, and therefore not a favourite with cattle, but the stems contain more than the average proportion of nutritive matter, and it is therefore cultivated for hay. In a dry or fluctuating soil the lowest joints of the stem become bulbous, and the whole plant dwarfed in size. It is easily influenced by varieties of soil, and is therefore very variable in its height and the size of its panicle, and on this account some botanists have considered that it had several varieties, but these are seldom permanent, and may generally be ascribed to the nature of the soil. When first it was introduced into agriculture it was highly extolled, but many of its virtues proved to be fallacious when thoroughly tested. It is a native of Northern Asia and North America, and when first cultivated was called Herd-grass, which name was afterwards exchanged for that of its patron, Mr. Timothy Hanson. Professor Lindley thus speaks of it:—"Like the Rye-grasses, the Timothy, when sown with a corn crop, attains to its full vigour of growth in the second year of its existence; and being both an agreeable and nutritious food for cattle, as well as capable of withstanding great extremes of temperature, it early recommended itself to the notice of agriculturists in those districts where the winters are so severe as to preclude the culture of *Lolium perenne* and its varieties. Unlike the Rye-grasses, its vitality is so great as not to be overcome by the ordinary ploughing up of grass-land, hence its abundant presence in the succeeding corn crop is by no means consistent with the correct farming notions of the uninitiated; but any prejudice on this score is generally set aside on its being found not only harmless to the corn crop, but highly beneficial in improving its straw

or fodder." The panicle has a purplish tinge, and when the stamens are put forth they hang around it like tawny pendants. Messrs. Wheeler and Sons recommend this grass for moist clay lands and "improved moorish soils."

Timothy Grass is very common in meadows and pastures throughout Britain, Lapland, Sweden and Norway, the United States, and North America. It flowers both in the summer and in the autumn, if the weather is favourable.

This species is distinguished from *P. alpinum* by its outer glumes being more than twice the length of their awns; from *P. arenarium* by the presence of awns on the glumes; and from *P. Michelii* by the flowering glume having a minute awn.

P. pratense, var. *longiaristatum*. *Long-awned Timothy-grass*.—This is a variety found occasionally in the neighbourhood of Edinburgh, in damp sandy places; its distinctive feature is the long awns upon the glumes; the form of the panicle is liable to great variation, being sometimes as long as that of the typical form, and sometimes so short as to be nearly globular. Dr. Parnell has given excellent drawings of this plant. Root swelling into a bulb.

Phleum pratense, var. *longiciliatum*.—In this variety the awns are short, but the hairs on the keels are largely developed. It has bulbous or knotted roots, and is, like the former, a Scotch variety, frequenting sandy places on the west coast.

2. *Phleum alpinum*, Linn. **Alpine Cat's-tail-grass.**

Root perennial, creeping, rather tuberous; stem erect, round, smooth, twelve to sixteen inches high; leaves flat,

acute, smooth on the surfaces, but rough at the edges; sheaths smooth, striated, the uppermost long and much inflated; ligule obtuse; panicle spike-shaped, ovate-oblong, bristly, brownish, about one inch long; spikelets small, on short footstalks; outer glume abrupt, fringed at the keel, which is prolonged into an awn more than half the length of the glume itself, and very stout and rough; flowering glume ovate, fine-ribbed, jagged at the summit, keel hairy, with a very short awn; palea shorter, its margins fringed; anthers shorter and broader in proportion than in the last species.

This grass varies from the last in its shorter and more bristly panicle and lower growth. It is an unimportant species, frequenting alpine pastures in Lapland, Germany, Switzerland, Sweden, Norway, Scotland, North America, and the United States. Its British habitats are in the higher Scotch mountains, and it is generally found there below the average stature. It flowers in July and August.



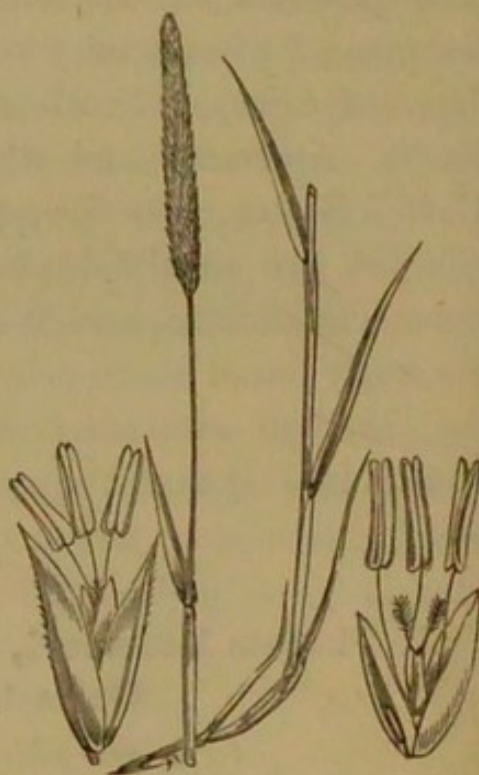
3. *Phleum Boehmeri*, Schrad. **Purple-stalked Cat's-tail-grass.**

(*Phalaris phleoides*, Eng. Bot.)

Root perennial, of numerous smooth fibres; stems simple, crowded, erect, leafy below, twelve to eighteen inches high, naked above, polished, and generally beautifully tinted with

purple; joints usually four; leaves linear, rough, acute, rather glaucous, the upper ones short, upper leaves much shorter than the others, the upper sheaths very long and close; ligules short, abrupt; panicle about two inches long, dense, a little contracted at each end, cylindrical, glaucous-green with a tinge of purple; spikelets small, flattened, crowded; outer glumes equal, narrow-lanceolate, tapering and terminating in a sharp point or minute awn, the midrib hairy but not on the lower part; flowering glume smaller, elliptical, fine-ribbed; palea entire at margin, elliptical, smaller than the flowering glume, with a minute bristle at the base; ovary hairy above; filaments long, capillary; anthers long, purple; styles rather short, feathery nearly to base; scales long and narrow.

This pretty species is rare in our islands, favouring the dry sandy or chalky fields of Norfolk and Cambridgeshire almost exclusively. The violet colour of the upper part of the culm is very pleasing, and is also a good distinctive feature; it is to be regretted that this is not used as a foundation for the specific name. It is indigenous in Norway, Sweden, France, Germany, Switzerland, Italy, and Russia. As an agricultural grass, it has no desirable qualities.



It is distinguished from *P. pratense* by the absence of awns on the outer glumes, and of teeth on the flowering

glumes; from *P. arenarium* in the absence of fringe on the margins of the glumes; from *P. asperum* in the bristles of the outer glumes; and *P. Michellii* by the bristles of the keels and the narrower form of the glumes.

Bœhmer's Cat's-tail-grass flowers in July, and ripens its seed in August.

4. *Phleum asperum*, Jacq. **Rough Phleum.**

(*P. paniculatum*, Eng. Bot.)

Root perennial, of many branched fibres; stems several, branched, leafy, smooth, about a foot high, with four joints covered by the sheaths; leaves ribbed, roughish, bright grass-green, not at all glaucous, flat, acute, the long sheath of the uppermost leaf often reaching above the base of the panicle; ligule prominent, tapering to a point; panicle cylindrical, very rough, two or three inches long, the branches mostly arranged in threes, grass-green; spikelets numerous, compressed; outer glumes equal, wedge-shaped, rough, ribbed, variegated with green and white, obtuse at the summit though tapering to a narrow end and remarkably tumid in the upper part; flowering glume a third part shorter, elliptical, roughish, obscurely fine-ribbed, obtuse at the summit; palea smaller, folded at the margins; ovary oval; filaments long, hair-like; anthers short and pale, cloven at each end; styles two; stigmas feathery.

In dry open fields, this grass is occasionally found, but it is rare in Britain; Cambridgeshire, Oxfordshire, Gloucestershire, and Bedfordshire are cited as its especial counties, but it is a scarce plant in any of them. It is found in France, Holland, Belgium, and Switzerland. Its scarcity is not a matter of distress to the

agriculturist, for it produces so little foliage that it could never be an important meadow grass; its numerous culms would not atone for the absence of leaves.



The most remarkable feature in the Rough Cat's-tail is the roughness of the panicle, which in former days procured for the plant the name of File Cat's-tail, and which is very perceptible to the touch; the long filaments are very ornamental, relieving the solid and harsh appearance of the cylindrical panicle. They come out

in abundance, feathering all the lower part of the spike at once, and trembling incessantly under the weight of their short pale anthers.

Dr. Parnell notes carefully the distinctive features of the different species; the wedge-shaped glumes of *P. asperum* distinguish it from *P. pratense* and *P. Micheli* and *P. arenaria* and *P. Bæhmeri*, while the lanceolate ligule and rough keel form extra points of distinction from the last-named species. It flowers in July, and seeds in September.

5. *Phleum arenarium*, Linn. **Sand Cat's-tail-grass.**

(*Phalaris*, Eng. Bot.)

Root annual, fibrous; stem erect, branched, smooth, glossy, from six to eight inches high; leaves broadish, lanceolate, short, roughish; sheaths long, ribbed, smooth, and

somewhat tumid; panicle simple, oval, narrowing to the base, blunt at the apex; spikelets numerous, oval; outer glumes rough in various degrees, fringed on upper part of keel, equal, lanceolate, tipped with short awns; flowering glume membranous, fine-ribbed, notched at summit, broad and short; palea the same height, smooth, and ribbed; filaments long; anthers short; styles short; stigmas feathered.

The Sand Cat's-tail, also called the Sea Cat's-tail, is a neat minute plant, varying in size according to soil and situation, and sometimes very dwarf in stature. It generally fixes itself on the loose sand of the seashore. In such a situation, it is not unfrequently found along the coasts of England and Ireland, but it is very seldom seen in Scotland. Dr. Parnell cites the counties of Northumberland, Durham, Cheshire, Derbyshire, Norfolk, Suffolk, Kent, Sussex, Somerset, and Devon as its homes. It is not found in Lapland, Sweden, or Norway. It flowers in the middle of July, and ripens its seed in August.



33. **Phleum Michelii**, Schrad. **Michelian Cat's-tail-grass.**

(*Phalaris alpina*, Host.)

Root perennial, tufted, scarcely creeping; stems erect, a foot or more in height, simple, smooth, leafy halfway up;

joints smooth ; leaves broadish, flat, pointed, rough-edged, the radical ones rough on the surface ; ligule short, blunt panicle cylindrical, from one and a half to three inches long, erect, purplish, except when it grows in very shady situations, where it becomes pale green or nearly white ; spikelets compressed ; outer glumes with long dense fringe on their keels, taper-pointed ; flowering glume more obtuse, but in height and hairiness resembling the outer ones ; palea shorter, membranous, entire at the summit and hairy at the edges.

This rare alpine grass is found only on the Clova mountains in the British Isles. Mr. Don discovered it in one locality, but it is not on record that any botanist has found it since. On this account, some writers of the present day omit it from the list of British *Phleums*. The fringes of the keels on the outer glumes are so conspicuous as to give the whole spike a hairy aspect ; while the tapering figure of the said glumes distinguishes the species from all the rest of the family ; it resembles *P. arenarium* most, but its larger growth, fuller tint of green, and simple culms, are sufficient distinctions, to which is added the universal hairiness of the keels.

It is a native of lofty mountains in Germany, Switzerland, and Savoy ; in these countries it flowers in July. In Scotland it is rather later, not opening its blossoms till the end of that month or the beginning of August.

Genus IX. ALOPECURUS.

Gen. Char. Spikelet one-flowered ; outer glumes equal, ovate-lanceolate, concave, compressed, connate at base ; the flowering glume ovate, lanceolate, concave, with a slight awn on its back ; no palea ; filaments three, flattened at the base ; anthers forked at each end ; ovary roundish ; styles

capillary, united at the base; the flowering glume enfolds the seed, which is ovate.

1. ***Alopecurus agrestis*, Linn. Slender Foxtail.**

Root fibrous, small, annual; stem from one to two feet high, erect, leafy, naked in the upper part, and roughish; leaves rough above, flat, acute, striated; sheaths more or less swollen, the upper one longer than its leaf; ligules lanceolate and downy; panicle simple, spike-like, about three inches long, erect, slender, tapering, many-flowered, and tinted with purple; outer glumes nearly equal, acute, membranaceous, united below the keels, varied with white and green, the nerves prominent and hairy at the base, the keel downy and awnless; flowering glume smooth, ovate, oblong, with two green ribs, awned, the awn twice as long as the glume, rough, bent, and recurved when dry. Filaments three, slender; anthers cloven at each end; styles short, united; stigmas long and downy.

This grass is accounted by farmers a troublesome weed; it springs up amongst wheat and other cereal crops, and goes by the name of "Black Bent." It is often to be seen on waysides and in waste ground, though undoubtedly the best specimens are to be found in arable land. In the Isle of Wight it grows among the pasture grasses. The great length and tapering form of the panicle has procured for it the name of "Mouse-tail"



in English, and *myosuroides* in Latin. It is a frequent grass in the situations already mentioned, but is comparatively rare in Scotland, and not recorded at all in Ireland; it is found in most parts of Central and Southern Europe, and as far north as Scandinavia.

As an agricultural grass it is of no importance, for cattle do not like it, so there is no hope of it exchanging its descriptive title of weed for a more dignified appellation. Birds eat its seeds with avidity. It flowers in July, and ripens its seeds in October.

2. *Alopecurus pratensis*, Linn. **Meadow Foxtail.**

Root fibrous, perennial; stem erect, smooth, round, striated; joints smooth; leaves smooth and somewhat glaucous, the stem-leaves roughish, acute, flat; sheaths smooth, inflated; ligules short, rather downy; panicle erect, one to two inches long, cylindrical, blunt at the ends; spikelets stalked, numerous, overlapping one another, flat; outer glumes equal, acute, scarcely united at the base, keeled, the keels fringed with silky hairs; awn hair-like, thrice the length of floret, geniculated; flowering glume ovate-oblong, with two green ribs on each side, and the long awn rising from near its base, smooth except towards the apex of the keel; filaments slender; anthers long, yellow, slightly notched at each end; seeds ovate.

This is a familiar grass to all who wander in the meadows in spring. We have only just done congratulating ourselves on the arrival of the Sweet Vernal-grass, with its fragrant promise of summer and summer joys, when the tall culms and club-like panicles of the Meadow Foxtail begin to claim a share of our attention; they are soft downy objects, these simple green clubs,

and we pass them many a time with little notice, until one sunny morning we miss the uniform greenness of the clubs, and behold instead a dense fringe of quivering orange anthers. A few hours, and the sleek glumes are seen no more for the crowd of tassels that quiver all round the spike; no one need overlook the Meadow Foxtail now, for its blossoms are as charming in their way as the purple tassels of the Vernal-grass, and the tall culms are so in advance of the surrounding grasses that they stand out in striking clusters over the young May meadow. Flower



lovers gather these grasses for their collections, and hope to preserve them in all their beauty; but alas! though the form and often the tint of the foliage may be admirably preserved, the myriad dancing anthers are evanescent decorations, for, when the filaments are dry, their strength fails them, and the gay orange anthers are left behind between the pressing sheets.

The Meadow Foxtail is a very valuable agricultural grass. It is, as we have seen, one of the earliest in developing its treasures of leaf and flower. It does not add very materially to the weight of the hay crop, because it produces but few culms. There are few good natural pastures where it is absent, and in many famous for their richness it is the principal grass; it occurs abundantly, according to Sinclair, in the pastures of

Devon, Lincolnshire, and Aylesbury. Its excelling value is its aftermath, which is very abundant and highly nutritious. Professor Martyn tells us that it possesses the three great requisites of quality, quantity, and earliness, in a degree superior to any other grass, and is therefore highly deserving of cultivation in lands that are proper for it. Clayey loam, we are informed by Mr. Sinclair, is best suited for it; it will flourish in a sandy soil, but is more productive in a loamy one. It thrives well under irrigation. Sheep are very fond of it, as are also horses and goats; but cows and swine do not prefer it. It is easy to collect the seed; it does not quit the chaff, and the panicles are very prolific. It is the lightest of all grass seeds, and was one of the first that agriculturists began to collect, a prize for doing so having been offered by the London Society for the Encouragement of Arts, Manufactures, and Commerce. The first year of its life it produces little; the second year there is an increase, but the plants do not come to perfection till the third or fourth year, and on this account it should be cultivated in all permanent pastures. The breadth of its leaves and their light colour make it an undesirable grass for lawns, where uniformity of tint is a desideratum, and fineness of foliage an indispensable requirement.

This grass is easy to distinguish from others of the same family. It is taller than any other, except the Slender Foxtail, when growing amongst wheat, and its panicle is thicker. But all comparisons of size are unreliable, on account of the variations of soil, climate, etc.; so we must recur to more unfailing marks of distinction. The uppermost sheath being twice as long as its leaf, and the awn projecting from the floret, distin-

guishes this species from *A. geniculatus* and *A. fulvus*; the smooth stem and sheaths separate it from *A. agrestis*; the length of the panicle precludes the possibility of confusing it with *A. alpinus*; and it cannot be confounded with any *Phleum* because of the absence of paleæ.

It is a native of most parts of Europe, from Italy, through France, Germany, Holland, Great Britain, to Denmark, Norway, Sweden, Russia, and even Siberia. It is also indigenous in America.

There is a kind of larvæ which prey upon the seed, and often make such ravages as to tithe the seed in every panicle in a meadow. It flowers in May or the beginning of June, sometimes even earlier; the seeds are ripe in June and July.

3. *Alopecurus geniculatus*, Linn. Marsh Foxtail.

Root perennial, of long simple fibres; stems ascending and geniculated, or knee-jointed, smooth, striated, often branched near the base; joints smooth; leaves flat, acute, roughish, striated; sheaths loose; ligules oblong; panicle cylindrical, short, rather obtuse, many-flowered, purplish; spikelets numerous, flattened, ovate; outer glumes equal, membranous, ovate, pointed, united at the base, keels fringed; flowering glume shorter, with two green ribs, and a slender awn from near its base; filaments slender; anthers large, thick, orange; styles short, united; stigmas feathery; awn long, slender, geniculated.

The Marsh Foxtail is a frequent ornament of shallow ponds and swampy places. It roots itself in the spongy earth, and throws up its stems in a procumbent or ascending position, as the case may be. If there be much water on the spot it has selected as its home, the

stems soon float, and the first joints repose on or in the water; then the culm arises in an erect position, at a blunt angle from one of the bending joints, and proceeds



to develop first leaves and then the panicle. The anthers are of so rich an orange colour that the flowering spikes form no mean ornament to the margin of the pond, mingling and contrasting with other water-weeds. This is never a tall grass, and yet its stems often measure a great length. For some distance it is always procumbent, and when it begins to affect an ascending habit, it only alters its

position by slow degrees, and many bends of the knee-like joints.

This grass is not useful for cattle, nor are we able to cite any edible or industrial uses to which it may be applied.

It is common in every part of Britain. We have found it floating at the edges of peat bogs on the lofty moorlands, and in swamps in the low country, on inundated ground in the Lizard district of Cornwall, and in similar positions in the Western Isles of Scotland. It prevails also in Lapland, Norway, Sweden, Denmark, Germany, France, and Italy; but Dr. Parnell says it is rare in the United States. It flowers in June, and seeds in July.

4. *Alopecurus alpinus*, Sm. **Alpine Foxtail.**

Root creeping, fibrous; stems erect, ten to fifteen inches high; leaves flat, acute, rather broad, somewhat rough at the edges; sheaths loose; ligules obtuse; panicle erect, short, oblong, silky; spikelets erect, numerous, closely imbricated; outer glumes equal, acute, three-ribbed, hairy; flowering glume ribbed, awned; awn often wanting, but when present slender and extending one-third of its length beyond the glume; filaments hair-like, notched at each end; styles united, short; stigmas long and feathered.

The short panicle, scarcely measuring one inch in length, distinguishes this Mountain Foxtail from all others of its family. Its stems partake, in a slight degree, the habit of the Marsh Foxtail; that is, they incline to the decumbent style of growth at first, and then bend upwards at the joints. But this species attains the erect form much more quickly than the other, and the stems are never prolonged to any considerable extent.



Dr. Parnell observed, when noticing this grass in its hillside homes, that the root-leaves were often cropped by the mountain sheep, but the culms were left standing; and from this he naturally inferred that the foliage pleased the taste of those animals much more than the stems.

It flowers in July, and ripens its seed the following

month. The Highlands of Scotland are the only British home of this alpine grass. It is essentially a northern plant, and is indigenous in Greenland and all across Arctic Asia and America. According to Mr. Bentham, it reappears in the Antarctic regions, but is unknown in Scandinavia.

5. *Alopecurus bulbosus*, Sm. Bulbous Foxtail.

Root perennial, tuberous; stem solitary, scarcely a foot long, very simple, erect, a little decumbent at the base, smooth, striated; joints four, wide apart; leaves smooth, the radical ones few and short, the stem-leaves narrow, the uppermost rather longer than its sheath, the others about equal to the sheaths; ligule short and striated, that of upper sheath twice as long as broad; panicle erect, cylindrical, an inch to an inch and a half long; spikelets numerous, flattened; outer glumes equal, acute, awnless, separated at the base, hairy on the keels and lateral ribs; flowering glume shorter, emarginated and awned at the base, abrupt at summit; awn rough on the upper part, smooth and tortuous below; filaments hair-like, short; anthers cloven; ovary oval; styles two, united; stigmas two, feathery.

The bulbous root of this grass affords a distinctive feature, patent even to the casual observer; the bulb emits fibres from its lower part, and has a brown striated membrane. The culm is solitary, at first inclining to the decumbent habit like the last two species, and then ascending. But it differs from *A. geniculatus* in its longer, narrower, and less hairy florets; from *A. agrestis* in the smoothness of its stem and sheaths, and the bluntness of its flowering glumes; and from *A. pratensis*

in the shortness of the flowering glume in comparison with the outer glumes.

The Bulbous Foxtail is a rare inhabitant of salt-marshes; it favours those near Yarmouth, those in the neighbourhood of Cardiff, and some in the vicinity of Northfleet, Kent. Also, it has been found in similar situations in Somersetshire and Gloucestershire, and along the eastern coast of England. In Scotland or Ireland it has not been found.

Its foreign homes are France, Germany, Spain, Portugal, Italy, Turkey, Greece, and the islands of the Mediterranean. It is of no agricultural value.

6. *Alopecurus fulvus*, Sm. Orange-spiked Foxtail.

Root perennial, fibrous; stem ascending, geniculated, procumbent at the base, smooth, from twelve to eighteen inches high; joints smooth; leaves flat, acute, rough above, smooth below; sheaths smooth, striated, upper one swollen; panicle erect, cylindrical, compact, from one to two inches long; spikelets numerous, oval, minute, erect; outer glumes equal, pointed, united at the base, ribbed, hairy on the keels and ribs; flowering glume having a small awn arising near its base, but not extending beyond its summit; filaments three, hair-like; anthers short, roundish, orange, notched at each end; stigmas slender.

This grass is of no use for agricultural purposes; it inhabits marshy ground, and is found in Essex, Norfolk, Cambridgeshire, Worcestershire, and Denbighshire. It is rare in Scotland, and not known at all in Ireland. Dr. Parnell gives all known particulars concerning it.

Genus X. CHAMAGROSTIS.

Gen. Char. Spikes simple; spikelet one-flowered; outer glumes equal, or nearly so, erect, oblong, abrupt, keeled, awnless; flowering glume a little shorter, very thin, white, very hairy; palea so small as to seem but a tuft of hairs, or altogether absent; ovary ovate, smooth; filaments three, hair-like, twice as long as the flowering glume; stigmas long, slender, downy; seed elliptical, enfolded in the glumes but not united to them.

Chamagrostis minima, Borkh. **Dwarf Chama-**
grostis.

(*Knappia agrostidea*, Eng. Bot.)

Root annual, consisting of a few long simple fibres; stems simple, slender, erect, smooth, bearing only one or two leaves near the base; leaves short, linear, channelled, blunt, springing chiefly from the root; sheaths smooth, compressed, membranous, uppermost one longer than its leaf; ligule obtuse, notched, clasping the stem; inflorescence racemed; spikelets minute, one-flowered, ranged on alternate sides of the rachis, on very minute footstalks; outer glumes equal, smooth, blunt, green on the back and tinted with violet at the sides; flowering glume shorter, obtuse, jagged at the top and covered with long hairs; palea very small and hairy, or absent altogether; ovary delicately marked with minute short stripes; styles two, separate; anthers three, broader near the filament than at the apex, notched at each end.

Mr. Bentham, whose arrangement we follow, has called this grass by the name given to it by Schrader, and rejected by the author of 'English Botany,' on the authority of Linnæus, whose dictum he quotes:—"A generic name with one or two syllables prefixed, so as

to make it apply to a totally different genus from what it originally designated, is to be rejected." In the 'English Botany' this grass is called "*Knappia agrostidea*," in honour of Mr. Knapp, the author of 'Gramina Britannica,' a standard work published in 1804. Certainly it is much better to call a plant by a name that expresses its own characteristics, than by the name of its describer or even its discoverer, and the meaning of the one chosen by Mr. Bentham, "Humble Field-grass," is remarkably appropriate.



This very neat little grass favours sandy pastures near the sea, in which situations it is occasionally found in Anglesea and Jersey. It is a small delicate annual; it develops its minute culm very early, and opens its little florets in April, in May the seeds are ripe, and after that the minute stems and leaves dry up, and are quite withered by Midsummer. It has no recommendation, agricultural or otherwise, nor any attraction but its delicate and evanescent beauty.

In Germany, the South of France, and Greece, it is frequent in maritime pastures or sandy waste places.

Genus XI. LAGURUS.

Gen. Char. Spikelets single-flowered; outer glumes long, narrow, spreading, hairy; flowering glume of firmer texture, shorter, with two awns springing fork-like from its apex

and a very long one on its back; palea shorter than the flowering glume and with a pair of awns on its apex, but smaller than those on the flowering glume; scales lanceolate, blunt, tumid at the base; ovary oblong; styles short; stigmas long; filaments hair-like; anthers oblong, pendulous, notched at each end.

Lagurus ovatus, Linn. Ovate Hare's-tail.

Root annual, fibrous, fibres downy; stem solitary, erect, downy; leaves short, broadish, tapering, very downy; sheaths long and somewhat swollen; inflorescence spiked; spikelets crowded, one-flowered, outer glumes narrow, pointed, very hairy; flowering glume shorter, thin, terminating in two long points or awns, and bearing a long awn on its back; palea resembling the flowering glume, and like it, terminating in two teeth or awns, but in every way smaller; anthers long, notched at each end; seed obovate, enveloped in the glumes.

The Hare's-tail grass is, like the last, a native of sandy ground in maritime situations; it raises its short, woolly spike, fitly likened to a hare's tail, early in the summer; its stem varies in height, we have seen specimens from the coast of France above a foot high, the spikes more than an inch long, but it is more usual to find them of a smaller size. The head is erect at first, but soon bends to one side, from the action of the wind and its own



weight. It is a very favourite grass; the white silky awns and the abundant hairiness of the outer glumes form a delicate glossy fringe, investing the whole head and giving a very attractive effect. On this account it is now extensively cultivated as an ornamental grass for flower-beds and rockeries, and is easy of cultivation and effective in its assumed position.

Genus XII. POLYPOGON.

Gen. Char. Inflorescence a spike-like panicle; spikelets single-flowered; outer glumes nearly equal, narrow, straight, concave, with cloven points, and awns attached to the keels; flowering glume about half the length of outer glume, broadish, notched at the summit, awned; palea also notched at the summit, thin, transparent, narrow, and awnless; scales oblong; ovary ovate; filaments capillary, as long as the flowering glume; anthers oblong, cloven at each end; styles two, far separated, stigmas with long feathery hairs; seed ovate, enveloped by the flowering glume and palea but not fastened to them.

1. *Polypogon monspeliensis*, Desf. **Annual Beard Grass.**

(*Agrostis panicea*, Eng. Bot.)

Root annual, fibrous, small; stems numerous, simple, ascending, from nine to fifteen inches in height; joints smooth; leaves flat, broad, acute, rough-edged, pale, and rather glaucous; sheaths long, smooth, striated, the upper one longer than its leaf; ligule long, acute; panicle compound, erect, dense, lobed and branched, silky, pale green, from one and a half to two inches long; spikelets one-flowered, numerous, crowded; outer glumes linear, hairy, obtuse, the lower part of the keel toothed, not ribbed,

awned from the keel; awns long, slender, rough with erect bristles; flowering glume half as long as the outer ones, ovate, tipped with a small awn, reaching about as far as the point of the outer glumes; palea slightly shorter, thin, transparent, and awnless.

The great length of the awns on the outer glumes, and their delicate green tint gives a marked appearance



to this grass. The stems are sometimes bent at the lower joints, and their height is variable, but the spike-like panicle, with its short, crowded branches of florets amid their crowd of rough green awns, is an unvarying feature.

The Annual Beard-Grass is an inhabitant of moist maritime situations, it is found along the coast of Durham, and occurs again along the south-eastern

coast, in Norfolk and in Essex, also on the southern shore both of Hants and Kent.

On the shores of the Mediterranean it occurs frequently and in abundance, and its verdant spikes produce the ripe seed in August. It is not found at all in Ireland or America, and is a rare plant in Scotland.

The name is composed from two Greek words, signifying *many* and *beard*, and refers to its abundant awns.

In its foreign habitat it is by no means restricted to the seacoast, though its preference is for maritime situations.

2. *Polypogon littoralis*, Sw. Perennial Beard-Grass.

Root perennial, creeping extensively; stems decumbent at the base, thin, bent, and finally ascending, a little branched, round, smooth, hollow, from six to twelve inches high; joints smooth; leaves flat, acute, roughish on both surfaces, slightly glaucous; sheaths smooth, striated, seven or eight on each stem, the uppermost one longer than its leaf; ligule of upper leaf much longer than broad, acute, prominent; panicle compound, purplish, much resembling that of *P. monspeliensis*, except that the branches are rather further removed and form interruptions in the spike-like form; rachis and its branches rough; spikelets small, numerous, flattened at the side; outer glumes narrow, equal, hairy, blunt, toothed at the keels, but not ribbed, having a long rough awn rising from near the apex of the keel; awns not nearly so long as in the last species, nor so rough; flowering glume rather more than half the length of the outer ones, cloven at the summit and bearing a long awn between the teeth of the apex, which extends beyond the points of the outer glumes; palea shorter, thin, transparent, cloven at the summit, entire at the margins, awnless; styles distinct; scales pointed.

Mr. Bentham considers this plant intermediate between *Agrostis* and *Polypogon*; it is distinguished from the last species by the awns being the same length as the outer glumes, while that of the flowering glume is longer; in *P. monspeliensis* this order is reversed, the awns of the flowering glumes being shorter than those of the outer ones.

The author of 'English Botany' tells us that this grass was first discovered in August, 1777, by the Rev. H. Bryant, in salt-marshes on the north coast of Norfolk,

and that it has since been found in Essex and Kent, but not elsewhere. We have seen a specimen gathered near Clevedon, in Somersetshire,—a wonderful locality for rare plants certainly; Mr. Bentham also records its presence in Hampshire, and Dr. Parnell at Woolwich. Along the seacoasts of western Europe it occurs frequently, and on the coasts of the Mediterranean, and those of North America.



Genus XIII. AGROSTIS.

Gen. Char. Inflorescence a more or less spreading panicle; spikelets one-flowered; outer glumes equal, narrow, pointed, awnless; flowering glume smaller, and also acuminate, generally awned; palea smaller still or absent.

1. *Agrostis alba*, Linn. **Common Agrostis.**

Root perennial, tufted, creeping; stem decumbent at first in some situations, then erect, or erect from the first, smooth, striated; joints smooth; leaves flat, short, narrow, numerous, four or five generally on one stem, rather rough all over; sheaths striated, roughish; ligule long and acute; panicle spreading, more or less densely branched; spikelets small, numerous, erect; outer glumes nearly equal, narrow, acute, without ribs, minutely bristled along the keel; flowering glume thin, ovate, minutely notched at summit,

not ribbed, and having a small tuft of hairs at the base, awnless, or with a very minute awn; palea half the length of the flowering glume, cloven at the summit, and transparent.

The normal form of this grass has a light spreading panicle; the branches compound, slender, rough, and purplish; the cloud of minute florets are of a green tint, and as the branches are arranged in groups of five, the clusters of florets do not mingle in an equal mass, but stand in groups at different stages of the rachis. It is a very variable grass, assuming a tufted form in dry situations, and a creeping habit in moist ground. The latter is its favourite habitat, as it flourishes best in marshes, ditches, and moist meadows, where it grows from one to two feet high, and with plentiful foliage. While in bud the branches of the panicle approach closely to the rachis, but when the spikelets open, the branches spread widely and allow abundant space to the numerous florets.



Dr. Parnell gives descriptions of several varieties of this grass, and Sir J. E. Smith describes some as discerned by himself or by Dr. Withering; Mr. Bentham doubts the permanency of the varieties, but they are interesting as easily recognizable forms whether permanent or changing.

Var. stolonifera. The branches of the panicle densely

tufted, free from hairs or bristles, spreading; stem decumbent and rooting, throwing out long procumbent stolons, which take root at their joints. Outer glumes downy. This variety prevails much in moist meadows and pastures, and more especially in stiff clayey lands, where it becomes a great nuisance to the farmer, for when the land is broken up and fallowed, the roots hold the stiff clods together and materially increase the difficulty of breaking them up. Sir J. E. Smith records this evil habit of the variety *stolonifera*, but the Rev. W. Richardson has since come to its rescue, and claimed good agricultural qualities for it. Mr. Richardson took great pains in cultivating this "Fiorin grass" and recommended it especially for damp clay soils, where its creeping habits secure it quickly covering the land. Mixed with other grasses, Mr. Sinclair recommends it as valuable for late pasture, the other grasses shelter it in spring, and as their flowering-time passes and they decline in quantity, it fills their vacated space. But its greatest productive powers are developed when cultivated alone, and kept clear of weeds. Some have supposed this to be the famous Orcheston grass. *A. alba*, var. *stolonifera*, is called Black Squitch in some counties.

Var. *palustris* has fewer branches, but larger spikelets. Its flowering glume is its most distinctive feature, being adorned with a short horn-like awn springing from the keel not far from the apex, and scarcely reaching beyond it. It grows in damp stagnant places.

Var. *pumila*. This is a minute plant, only two or three inches high; stems procumbent at first, then ascending; the ligule short and blunt; and panicle leaning to one side. This variety is always found in stony alpine situations, and it is highly probable that its

distinctive features are owing to the nature of the ground.

Var. *aristata*. Larger in its growth; its leaves rough, their sheaths smooth; ligule more prominent than in the normal form; flowering glume awned from a little above the base, and extending beyond the spikelet, hence the distinctive name. The length of this awn upon which the claim of the plant to rank as a variety is founded, is extremely unreliable. Dr. Parnell, to whom we are indebted for the notes on most of the varieties, has taken immense pains to ascertain the limits of their variability, and he says that this awn is sometimes so short as to be hardly perceptible. The other distinctions which he records are:—the palea thin, half as long as the flowering glume, furnished with a tuft of short hairs.

Var. *vulgaris*. This is often considered the typical form, and either distinct altogether from *A. alba*, or the more normal species, in which case *A. alba* is treated as a variety of it. The careful Dr. Parnell treats them as quite distinct. The smoothness of the sheaths, the short, blunt ligule, and the lower outer glume being toothed only on the upper part of the keel, are the principal differences which he cites in the features of *A. vulgaris*. This form of *A. alba* grows in dry situations, over the same tracts of country as the normal form. Cattle are said to dislike it.

The *A. alba* is found in one or other of its forms throughout Europe, and in Central Asia, North Africa, and America. It flowers in July and August, and ripens its seeds soon after the withering of the latest flowers. Doubts are entertained by botanists as to the permanency of any of the varieties, as they seem to de-

pend so much on the nature of the land where the plant is established.

The large full panicle of delicately tinted florets and the verdant colour of the foliage, make this a very pictorial grass, inferior only to the Silky Bent in charm.

2. ***Agrostis canina*, Linn. Brown Agrostis.**

Root creeping, perennial; stem at first prostrate, then ascending, a little branching, round, smooth, glossy, from one to two feet high; joints smooth; leaves narrow and tapering when springing from the stem, bristle-shaped when springing from the root, rough above and below, and toothed on the margins; sheaths smooth; ligule long; panicle compound, often tinted with yellow-brown, erect, spreading in flower, but closing as the seed ripens; branches of rachis rough, very slender, and quivering under the trifling weight of the light florets; spikelets numerous, pointed, situated on footstalks about their own length; outer glumes long and pointed, the keels toothed; flowering glume ovate, five-ribbed, serrated at the apex, and a little hairy at the base, awned; the awn taking its rise at the middle of the keel rather nearer the apex than the base, about the same length as the glume, but liable to variation; the filaments are about half the length of the outer glumes, the long anthers reaching to the apex of the same glumes.

This Bent-grass is very frequent in mountain districts, and prevails in the same countries as the Common Bent. It is to be found all over Britain, and also in Sweden, Norway, Denmark, Germany, France, Italy, and America. Dr. Parnell suggests that in the last named country it has been introduced.

It is a very elegant grass; the brown colour of the outer glumes and the silky glossy appearance of the

whole panicle, together with the delicate minuteness of floret and branches, makes it a very elegant object, as it flourishes on the borders of fields, or in waste places in alpine heights.

There is a dwarf variety, differing only in size from the normal form, but named by Koch *A. alpina*; it has been found among the Clova mountains, on Ben Lomond, and in the Isle of Arran.

The *A. canina* flowers from the end of June to August.



3. *Agrostis setacea*, Curt. **Bristle Agrostis.**

Root perennial, fibrous, tufted; stems filiform, erect, roughish, one to two feet high; leaves filiform, four or five on the stem, and dense tufts at the root, rough, the root ones long; sheaths rough, striated, the uppermost one greatly longer than its leaf; ligule long and pointed; panicle approximate, only spreading while the florets are open, compound, erect; branches very slender, short, rough, placed in clusters of three or five; spikelets small pointed; outer glumes nearly, but not quite, equal, the lowest longest, not ribbed, and toothed the whole length of the keel; both sharply pointed; flowering glume toothed at the apex, a little shorter than the outer ones, with four ribs and hairs at the base, awned; awn rising from the base of the flowering glume, long, fine, roughish, protruding a little beyond the apices of the outer glumes; palea very minute, scale-

like, pointed; ovary ovate; filaments slender; anthers notched at both ends.

This is a delicate and pretty ornament of our southern heath-lands, very attractive when the panicle is spread,



but little remarkable in its usual contracted state. Its dense tufts of bristly leaves would make it valuable as a permanent lawn-grass, but for agricultural purposes it would have no recommendation except as food for sheep; those feeding on Dartmoor show great preference for it, and the excellence of the mutton is a good testimonial to its wholesomeness.

It is distinguished from *A. vulgaris* by the roughness of the stems and sheaths, and the minuteness of the palea. It varies from *A. alba* in the long awn situated on the back of the flowering glume and the smallness of the palea. The roughness of the stem and leaves also distinguishes it from *A. canina*.

In western Europe it prevails extensively, being frequent in France, Germany, Switzerland, Italy, Spain, Portugal, Turkey, and Greece.

It flowers in July and August, and the seed ripens in September.

4. Agrostis Spica-venti, Linn. Silky Agrostis.

(*Apera*, Babington.)

Root annual, fibrous; stems erect, slender, from one to two feet, leafy; joints smooth; leaves narrow, pointed, spreading, rough, striated; sheaths roughish; ligule long, tapering, jagged; panicle compound, loose, spreading, leaning to one side, silky; branches compound, delicately slender, frequently subdivided, rough, placed in clusters on alternate sides of the rachis, which is smooth and glossy; spikelets numerous, minute, glittering; outer glumes narrow, acute, the upper one largest; flowering glume ovate, lanceolate, rather rough, three-ribbed, but the ribs somewhat indistinct, with a tuft of hairs at the base, awned; awns rising from near the apex of the flowering glume, hair-like, rough, slender, three or four times as long as the whole spikelet; palea narrow, rather shorter than the flowering glume, and like it, bifid at the summit, awnless, and with a minute appendage at the base, so small as to be almost microscopic; filaments long; anthers long, extending beyond the glumes; seeds smooth.

This is one of our most elegant native grasses, and is deservedly sought after as an ornament to the flower-garden. Its widely spreading panicles contain a crowd of glittering spikelets so lightly hung on hair-like foot-stalks that they quiver in the lightest breeze, and present ever-changing surfaces of glittering straw or brown to the sunlight. The habit of bending to one side adds to the grace of the panicle, giving it a feathery expression, and the narrow foliage with its full green tint heightens by contrast the sparkling beauty of the florets.

In sandy ground, along field-borders or in pastures, this beautiful grass is by no means uncommon. We find it throughout the northern and eastern counties of

England, and in some of the midland ones. It flowers in June and July, and is readily distinguished from



others of the family by the great length of the awns, and also by the inequality of the outer glumes. These grasses are generally known in English as Bent-grasses, but Mr. Bentham prefers retaining the botanical name, and as we follow his arrangement we accept his nomenclature.

Sir J. E. Smith tells us that this grass is liable to fungus disease, called *smut*; it is a favourite herbage with horses and goats, but not liked by sheep. There is a variety, called *interrupta*,

common in France, Italy, Switzerland, and Germany, with an attenuated and contracted panicle, the branches being erect, and the anthers shorter; but the permanence of the distinctions is dubious.

Genus XIV. GASTRIDIDIUM.

Gen. Char. Outer glumes unequal, acute, base swollen, smooth, and shining.

Gastridium lendigerum, Beauv. **Awned Nitgrass.**

(*Milium*, Eng. Bot.)

Root annual, tufted, fibrous; stems numerous, erect, round, smooth, glossy; joints three, enveloped by the

sheaths; leaves rough, flat, acute; sheaths slightly swelling, generally smooth, uppermost one longer than its leaf; ligule long, white, torn; panicle compound, close, spike-shaped, pale green, from one to four inches long; branches arranged in clusters of three or four; spikelets numerous, erect, crowded; outer glumes unequal in length, pointed, the base tumid, smooth, and polished, the keels green, strongly toothed on the upper part; flowering glume only one-third the length of the outer ones, broad, five-ribbed, thin, often hairy, jagged at the summit, sometimes furnished with an awn arising from near its apex, but as often without it; awn slender, rough, twice as long as its glume; palea a little shorter, notched at the summit; styles two, distinct; stigmas feathery; anthers notched at each end; the two scales are acute; seed invested by the hardened flowering glume and palea.

An erect annual grass, growing from half to three-fourths of a foot high; the panicle, though spike-like, is not stiff in form, and its pale green colour and silvery lustre makes it very attractive. This lustre is owing to the polished swollen bases of the outer glumes which catch the rays of light as so many green glass beads might do. It grows in fields and waste places, preferring such as have been inundated, and being especially partial to the neighbourhood of the sea. All along the south coast of England, and part of the coast of Wales, the Awned Nitgrass is pretty



frequent. It is found throughout France, Germany, Italy, Switzerland, Portugal, Spain, Turkey, Greece, North Africa, and the islands of the Mediterranean. Not discovered in Scotland or Ireland.

Sir J. E. Smith and many authors of note place this grass in the *Milium* group, because of "the seed being invested by the permanent hardened corolla," that is, by the flowering glume and palea; but more recent writers form it into a separate genus on account of the peculiar swollen bases of the outer glumes. It has no agricultural value.

Genus XV. **PSAMMA.**

Gen. Char. Panicle spike-like, cylindrical; glumes stiff like chaff; flowering glume awnless.

Psamma arenaria, Beauv. **Sea Maram.**

(*Arundo arenaria*, Eng. Bot.; *Ammophila arundinacea*, Brit. Fl.) (Maram, or Sea Matweed.)

Root perennial, creeping, jointed, spreading itself to a great extent; stems stiff, round, smooth, articulated, shining, hard, leafy, about three feet high; joints smooth; leaves rigid, turning inwards, sharply pointed, glaucous, smooth on the under side, furrowed on the upper; sheaths nervose, smooth; ligules long, lanceolate; panicle erect, spike-like, with short, erect, rough branches, three to five inches long; spikelets densely crowded, lanceolate, acute, containing one floret; outer glumes unequal, acute, narrow, not ribbed, roughish on the upper part of the keels, the outer broadest, eroded at the apex, and clasping the other; flowering glume five-ribbed, dorsal rib minutely toothed, terminating in a short scaly point, several hairs at the base; palea the same

length as the flowering glume, narrow, minutely fringed at the margins.

Although this grass is too hard and coarse to be eaten by any kind of cattle, it is not without its utility.

Common on seacoasts, establishing itself among the loose drifting sand; its extensive creeping roots have an amazing power in binding together the loose material of its home, and thus forming out of useless drifting sand a firm bank against the encroachments of the sea. So well was its value appreciated in the olden time that Acts of Parliament were issued, first in Scotland and then in England also, forbidding any to molest or injure the Sea Matweed on pain of



heavy fines and penalties. It was forbidden even to gather the spikes or leaves of the plant or to have any part of it in one's possession. These laws have not been disannulled, but they have long fallen into disuse, for we find in the Kew Museum and elsewhere articles of domestic use made from the stems of Sea Matweed; mats, baskets, and ropes are occasionally manufactured from this plant, and every stem thus used is a distinct infraction of the law.

The Sea Matgrass is common in the Orkney Islands and all along the coast of Scotland, it is equally common along the coasts of England. In Lapland, Sweden,

Norway, and the shores of the Mediterranean, it fulfils the same beneficent office as on the shores of England, and in America and the United States it is equally useful.

The flowers appear in July, the seed is ripe at the end of August or beginning of September.

Its appearance is too stiff to be attractive, but where utility is so well attested, beauty can be dispensed with. The inhabitants of Southport should have a special affection for this plant,—the sand there is most trying from its drifting propensities, and there is no doubt that many of the sandbanks now stationary are only held together by the powers of the Sea Matweed. The extensive tracts of land about the Frith of Forth, now so beautifully adorned by a large variety of maritime plants, owe their first productive power to the interlacing roots of this grass, and we could name similar effects arising from the same cause of every shore around our islands.

Still more must it be held in veneration on the low Dutch coasts, where the high tides are wont to make such terrible havoc with the adjacent cultivated land. It is said that the Dutch have been most industrious in sowing the seed of the Matweed and its coadjutor the Lyme-grass, and have by this means materially strengthened their sea-fences. The knowledge of the great utility of these plants is a better protection to them than even Acts of Parliament.

Genus XVI. CALAMAGROSTIS.

Gen. Char. Inflorescence paniced; spikelets one-flowered; outer glumes nearly equal, keeled; flowering glume thin, short, and narrow, awned, a tuft of hairs at base.

1. Calamagrostis Epigejos, Roth. Wood Smallreed.

Root perennial, creeping; stem erect, slender, but firm, three to four feet high, rough with small ascending bristles, often branched at the base; joints smooth; leaves long, narrow, acuminate, nerved, underneath glaucous, and rough at the edges; sheaths smooth, striated; ligule lanceolate, many times divided, naked on both sides; panicle erect, rough, spreading, close before and after flowering; spikelets brownish, pointed, in clusters all on the same side, nodding; branches rough, situated in clusters at certain distances along the rachis; outer glumes nearly equal, lanceolate, acute, nerved, rough on the keel, without lateral ribs, roughish towards the point; flowering glume much shorter than the outer ones, white, membranaceous, inserted in a woolly tuft longer than itself, awned on the back; awn long, jointed, reaching as far as the woolly hairs; palea narrow, membranaceous, acute, very short.

When in flower the panicles of this reed are very elegant; growing on tall stems, above a yard in height, the panicle itself is generally a span long, the florets are brown and glossy, and so numerous as to form dense masses upon the alternate compound branches; the stems are leafy to the very foot of the panicle, and the leaves, being long and ribbon-like, arch and droop in every variety of curve. The awn is scarcely distinguishable from the long



bright delicate hairs surrounding the floret, and scarcely reaches as far as their points.

Moist woods and shady ditches are the situations selected by this reed; it is not a common species, but is pretty frequent among bushes in damp places in the south of England and in Ireland, also in some of the northern counties in sheltered situations, and in Anglesea and Shropshire. Very rare in Scotland. Its foreign homes are Lapland, Norway, Sweden, Denmark, and Germany.

It flowers in July or very early in August, seeds at the end of August or beginning of September.

2. **Calamagrostis lanceolata**, Roth. **Purple Small-reed.**

(*Arundo calamagrostis*, Eng. Bot.)

Root perennial, fibrous, scarcely creeping; stem erect, round, very smooth, three or four feet high, leafy, slenderer than the Wood Smallreed, sometimes branched; joints wide apart; leaves linear, acute, narrow, somewhat involute, pale green underneath, rough above, sometimes hairy; sheaths long, close, striated, smooth, or nearly so, uppermost one longer than its leaf; ligule lanceolate, often lacerated, decurrent; panicle compound, seven or eight inches long, spreading when in flower, and contracted before and after; spikelets scattered, erect, numerous, on compound, slender, rough branches; outer glumes of a chestnut or purple colour, nearly equal, lanceolate, acute, keeled, rough on the back, without lateral ribs, toothed the whole length of the keel; flowering glume much shorter than the outer ones, white, torn at the apex, five-ribbed, awned from a little below the summit, and surrounded by a number of long white, silky hairs; awn small, rough, slender, extending

very little beyond the apex of its glume; palea one-third shorter, very thin and transparent, cloven at the summit; scales acute; anthers large and pendulous; filaments slender.

This species affects groves, hedges, and brushwood, in wet situations; its favourite counties are Devon, Dorset, Sussex, Suffolk, Northampton, Hants, Lincoln, Leicestershire, Yorkshire, and Cumberland. It is also found in various parts of Ireland. Its foreign habitats are Lapland, Norway, Sweden, France, Germany, Switzerland, Italy, Spain, Portugal, Turkey, Greece, North Africa, Siberia, and British America.



The Purple Smallreed is distinguished from the Lapland Smallreed in the hairs being longer than the flowering glume, which itself is one-third shorter than the outer glumes. It differs from the Wood Smallreed in its short awn, and from the Narrow Smallreed in the position of the awn, which in that species rises from beneath the centre of the flowering glume, while in the Purple Smallreed it rises near the apex.

It flowers from the end of June to the beginning of August.

3. *Calamagrostis stricta*, Nutt. **Narrow Smallreed.**

Root perennial, creeping; stem erect, round, roughish,

leafy, eighteen to twenty-four inches high; joints smooth; leaves narrow, acute, roughish, two or three on each stem; sheaths smooth, striated; ligule minute; panicle compound, narrow, compact, from three to five inches long; branches of the rachis compound, rough; spikelets smaller than those of the Purple Smallreed, numerous, crowding; outer glumes broadish, nearly equal, membranaceous, not ribbed, roughish on the back; flowering glume as long as the other glumes, ovate, jagged at the summit, and surrounded by long silky white hairs, all shorter than itself, awned; awn arising from below the centre of the flowering glume, thin, straight, not longer than the floret; palea much shorter than the flowering glume, thin and transparent, at the base there is an appendage like a minute bristle, accompanied by a tuft of long hairs, about two-thirds the length of the flowering glume.

The foliage of this species is stiffer and less elegant than that of either of the preceding species; it is altogether a smaller plant than they, and requires moister situations, affecting bogs and marshes. It has recently been found (according to Mr. Bentham) on moors in Cheshire, but it is very rare in England. Mr. Don found it near Forfar.

Its foreign homes are North Europe and North

America. It flowers late in June, and ripens its seed in July.

This Smallreed grows freely in the Botanic Gardens of Edinburgh, though scarcely attaining its average



height for want of its coveted excess of moisture. The other species are also carefully cultivated there, and seem as if naturalized.

4. *Calamagrostis Lapponica*. Lapland Smallreed.

Root creeping, perennial; the stem cylindrical, smooth, ribbed, about three feet high; joints wide apart, smooth; leaves long, narrow, acute, rough all over except the back, generally rolled in; sheaths smooth, striated, upper one longer than its leaf; ligule prominent, pointed; panicle compound, erect, compact, three to four inches long, purplish-brown in colour; spikelets numerous, situated on rough branches, which are placed in clusters at certain distances along the rachis; outer glumes equal, narrow, pointed, purple or brownish, toothed along the keels; flowering glume as long as the outer glumes, five-ribbed, rough, bifid at the summit, awned; awn arising below the centre of the keel, reaching a little beyond the apex of the glume, rough, bent, slender; palea shorter than the flowering glume, smooth; scales pointed.

Very nearly allied to the last species, if not a variety of it. Dr. Parnell treats the two as quite distinct, while Mr. Bentham and others regard them as "identical or very nearly allied." The former gives the distinctive features thus:—

"*Calamagrostis Lapponica*. Ligule acute. Hairs shorter than floret. Awn arising from below the centre of the flowering glume."

"*Calamagrostis stricta*. Awn arising from below the centre of the flowering glume. Hairs not longer than the floret."

This species was found near Loch Neagh and else-

where in Antrim, according to Dr. Parnell. A native of Lapland.

It flowers in June and July, and its seed is ripe in August.

TRIBE V. AVENEÆ.

Inflorescence panicked or recurved; spikelets containing more than one floret; flowering glume shorter than the outer ones.

Genus XVII. AIRA.

Gen. Char. Spikelets two-flowered; outer glumes two, equal, ovate-lanceolate, acute; flowering glumes like the outer ones in form, but thinner; palea resembling the flowering glume in height and texture; awns short; styles bristle-shaped, spreading; stigmas downy; filaments long, hair-like; anthers oblong, forked at each end; seed ovate.

1. *Aira cæspitosa*, Linn. **Tufted Aira.**

Root perennial, fibrous, tufted; stems ascending, cylindrical, rough, one and a half to two feet high, leafy; joints smooth, the stems sometimes lying on the ground to the first joint, and then assuming the erect habit; leaves linear, pointed, harsh, rough, strongly ribbed, very numerous, tufted, the radical ones sometimes folded; sheaths rough, ribbed; ligule long, pointed; panicle compound, large, spreading, drooping before the florets open and erect after, silver-grey or brownish in colour, and very glossy; the slender rachis and branches rough; spikelets small, numerous, each containing two or three florets; outer glumes nearly equal, pointed, the keel roughish, the two lateral ribs of the upper glume smooth, the lower glume without lateral ribs; flowering glumes slightly shorter than the outer ones, the summit cut into four teeth, the base

hairy, furnished with a little awn taking its rise near the base and extending slightly beyond the summit; palea narrow, membranaceous, the margins entire, a little shorter than the flowering glume and much narrower; the first floret is situated just within the outer glumes and reaches nearly to their apex, the second stands on a short hairy footstalk and its tip extends beyond the summit of the outer glume, it is generally rather smaller than the first floret.

The panicles of the Tufted Hair-grass are most beautiful objects, large, diffuse, the stems more delicate than the finest wire, and the innumerable florets dancing and quivering in the breeze, flashing back the rays of light from their glossy silvery glumes, and giving grace and charm to the river-side plants, or the woodland shrubs among which they may chance to be situated. A village *fête* on the borders of Somersetshire, which was considered a great success, owed half its charm to this Tufted Hair-grass. The village schoolmaster had but few ornaments at his disposal, but



he was able to borrow a dozen soup-plates; these he suspended by wires, covering the now picturesque willow pattern with moss, and round each he wove an airy wreath of the glittering panicles of this showy grass. The rustic baskets were filled with simple flowers, and

the candles which lighted the assembly when nature's light was withdrawn shone from tin sconces, but, whatever the light was, it flashed on silvery crowds of insect-like florets, which quivered from their pendent position, and displayed a beauty which would have done honour to Belgravia.

The Tufted Hair-grass is a treasure in a bouquet of wild flowers. It is often found growing side by side with the Purple Lythrum and the Orange and Lemon Toadflax; add to these a fern frond or two, or even some of the sword-shaped leaves of the Water Iris or Reed, and you have a group of exquisite beauty.

But in praising the pictorial charm of this giant *Aira* we have exhausted the list of its good qualities. We can judge by the dense tufts of coarse grass remaining in pastures that are otherwise bare of herbage, that the cattle disdain to feed on that species; these unsightly tufts, which are called by farmers "hassocks," or "rough caps," or "bulls' faces," are neither more nor less than dense masses of *Aira cæspitosa*. Cows, goats, and swine can be compelled to eat it, but only by sheer hunger; and horses invariably refuse it. It is the roughest and coarsest grass that grows in meadows and pastures. It is very fond of moist situations, and the farmer who wishes to be rid of its unprofitable presence should drain the land well, and pare off the tufts of hassock, the ashes of which make good manure, though in life it was worse than useless. It grows in such masses that it must both exhaust the soil, and cover an amount of land which would be much more profitably employed to rearing a useful crop; so, much as we love its beauty, we cannot plead for its toleration in meadow and pasture lands. We would petition for its home on the river-bank, and

in the damp grove, to be spared; and there we would feast our taste on its glittering beauty. It forms a good cover for game and waterfowl, so we shall have the goodwill of the sportsman on our side in retaining it on waste lands. It will grow in any kind of soil. The panicles, when gathered and hung in bunches by their stems to dry, retain all their grace, the side branches continuing to droop under the weight of the dry florets. These, mixed with everlasting flowers, and some crimson branches of *Humea*, which retain their colour all winter when dried in the way prescribed for the *Aira*, make charming winter bouquets for the drawing-room.

There is a variety called *vivipara*, found in the Clova Mountains, in which the seeds germinate without falling from the panicle; the stem is comparatively short, but what it loses in height it adds in bulk, being more than twice the thickness of the slender stem of the normal form; its sheaths are destitute of rough bristles, as are also the rachis and branches; the backs of the leaves are smooth. This is the same as the variety called *lævigata* by Sir J. E. Smith, only his plant was not viviparous. It grows on Ben Lawers and other of the higher Scotch mountains.

A. cæspitosa, var. *lutescens* (*Yellowish Hair-grass*), is a variety introduced by Messrs. Lawson. It is free from the objectionable tendency to form dense tufts which we have noticed in the normal type, and does not grow nearly so tall. It yields a good soft herbage early in the season, which is readily eaten by the cattle. On this account it is considered a good ingredient of permanent pastures.

A. cæspitosa, var. *longiaristata* (*Long-awned Tufted Aira*), is a variety principally distinguished by the awn

extending a quarter of its length beyond the summit of the floret, and by the remarkably beautiful colour of the spikelets, which are of a rich chocolate hue tipped with white. In this form of the plant, the sheaths and the backs of the leaves are smooth, and the second floret is placed on a long hairy footstalk. Dr. Parnell records it as gathered on Ben Lawers.

A. cæspitosa, var. *brevifolia* (*Short-leaved Tufted Aira*), is also an alpine variety, only found on the highest of the Scotch mountains, never descending lower than three thousand feet above sea-level. Its short root-leaves and smooth sheaths and stem are distinctive features. The panicle is small when compared with that of the normal form, and the spikelets are coloured as in the last variety. The foliage is abundant though short, but the plant is shy in producing stems, only one arising from the centre of a dense tuft of leaves, all of which are harsh in texture and folded. The beautifully-tinted spikelets are large in comparison to the size of the panicle. Both these varieties flower in August.

The Tufted Hair-grass is distinguished from the Alpine Hair-grass by the situation of the awn near the base of the flowering glume, and from the Wavy Hair-grass by the awn of the lower floret not reaching beyond the summit of the outer glumes.

This grass is abundant in every part of England, Scotland, and Ireland, producing its panicles in great numbers in July, when they nod while in bud, and become erect and diffuse in flower; the seeds ripen in September. But when the seeds are ripe, the panicles do not necessarily come to an end; they lose their silvery brightness, and change their delicate hue for a universal straw tint, and in sheltered situations they

stand thus far into the autumn, and even through the winter.

Its foreign homes are Lapland, Norway, Sweden, Germany, France, and Italy, North America, and the United States.

2. *Aira flexuosa*, Linn. **Wavy Aira.**

Root perennial, fibrous; stems almost naked, erect, slender, flattish, ribbed, often tinged with purple; joints three, smooth; leaves bristle-shaped, fleshy, the upper ones rough, but those of the root smooth except near the summits; sheaths ribbed, rather rough, the uppermost much longer than its leaf; ligule blunt; panicle forked, compound, spreading; the branches slender, the branchlets wavy, often placed in threes; rachis rough on the upper part; spikelets not nearly so numerous as in the last species, containing two perfect florets and a rudimentary one, of brownish tint and very glossy; outer glumes unequal, not ribbed, with roughish keels, membranaceous, lanceolate, pointed; florets nestling within the outer glumes and partly concealed by them; flowering glume toothed at the summit, hairy at the base, awned; awn geniculated, rising below the centre of the keel, and extending beyond the summit of the flowering glume to the apex of the larger outer glume; palea the same length as the flowering glume, thin, pointed, sometimes with two slightly developed teeth at the summit, fringed at the edges.

This grass is quite as ornamental an object as the last-mentioned one, though its panicles contain fewer florets, and it is therefore less calculated for extensive decoration. Its fibrous roots are liable to become woolly in sandy ground, like those of the *Lagurus ovatus*; the stems grow in loose tufts, not many together;

the root-leaves vary much according to situation, being short and curved in dry situations, but long and of a



dark green in shady ones; the brown hue of the florets is also much deeper in shady places, and the whole grass more elegant.

It is a familiar inhabitant of grassy places on moors, mingling its airy panicles with globular heads of the blue Devil's-bit Scabicus, or raising them among the seas of purple Heather so loved by the grouse. Still more

attractive does it seem in the rocky woodland, where the dwarfed Birch-trees contest the possession of the ground with the crimson Heath, and the grey rocks are fringed with blue Hair-bells and glittering brown florets of the *Aira flexuosa*.

The *A. flexuosa* is distinguished from the *A. cæspitosa* by the bluntness of the ligule, the longer awn, and the footstalk of the second floret being so short as not to raise it as high as the larger outer glume; it differs from *A. caryophyllea* also in the bluntness of the ligule, and in the flowering glume being toothed at the summit.

There is a variety called *montana*, the panicle of which is narrowed, the florets hairy at the base, the awn very long and twisted, the general habit more slender, and the lower floret extending prominently beyond the smaller outer glume.

Both the normal form of *A. flexuosa* and the variety

montana are eaten with avidity by sheep, and are also relished by horses and cows.

This grass is generally distributed throughout the British Isles, and is common all over Europe, and in parts of Asia, North America, and in Antarctic South America.

3. *Aira canescens*, Linn. **Grey Aira.**

(*Corynephorus*, Bab.)

Root perennial, tufted; stems very leafy, erect, round, smooth, cylindrical; joints three; leaves bristle-shaped, short, rough, glaucous, tufted; sheaths ribbed, rough, the uppermost one so long as to embrace the base of the spreading panicle; ligule prominent, acute; panicle compound, close before and after flowering, spreading in flower, dense, and narrow, tinged with purple; rachis smooth, branches rough; spikelets numerous, crowding, each containing two florets; outer glumes lanceolate, pointed, unequal, minutely toothed on the keels; flowering glume shorter than the outer ones, acute, not ribbed at the sides, hairy at the base, awned; awn long, rising from a little above the base of the flowering glume, club-shaped at the apex, not reaching as far as the point of the outer glume, it is jointed, has a circular fringe around the joint about midway between the base and apex; palea slightly shorter than the flowering glume, membranaceous, notched at the summit; styles short; stigmas long and feathery; filaments slender; anthers short, dark purple.

The peculiar structure of the awn distinguishes this from every other British grass. It is a very rare species, its only British habitats on record being the sandy coasts of Dorset, Norfolk, and Suffolk, and the Channel Islands. It is a small plant, seldom attaining a greater

height than six inches, its foliage minute in proportion.



Sir J. E. Smith describes it as growing on the walls of Basle, and in the sandy fields of Germany and Piedmont. Other authors have gathered it in Norway and Sweden, France, Holland, Belgium, Spain, Portugal, Turkey, Greece, and the Islands of the Mediterranean. No agricultural use is attributed to it. It flowers in July and ripens its seed in August.

4. ***Aira præcox*, Linn. Early Aira.**

Root annual, fibrous; stems leafy, erect, three to six inches high; leaves bristle-shaped, short; sheaths angular, pale; panicle compound, narrow, almost spike-like; spikelets minute, crowded; outer glumes equal, embracing the florets; flowering glumes small, cleft at the top, sessile, naked at the base, and awned at the back; awn arising a little above the base, and extending considerably beyond the outer glumes; palea shorter than the flowering glume, with two blunt teeth at its summit; anthers short, cloven at both ends.

The Early Hair-grass is often overlooked from its minute size and early appearance. Sandy and hilly pastures, dry commons, and the banks of brooks and ditches, are its favourite habitats. Early in May its folded sheaths become conspicuous to any who examine the sandy banks in search of mosses and lichens; at that

time it might be taken for a miniature Iris, its pale sheaths so envelope the buds of leaf and flower. By degrees the leaves become developed, but in full growth they are mere bristles, and the minute, closely packed panicle rises from the last sheath. On steep hedgebanks in the Wealden districts of Kent, this tiny grass grows in abundance, even in April, overtopping the adjacent miniature forest of Cup-lichen, and in its turn overtopped by the slender fruit-stalks of the Hair-moss. In May its spikelets open and let in the sweet sunshine upon the twin florets cradled between their valves; a few days more and the bloom is gone; the glumes close again upon swelling seed, which the next month ripens, and then the minute plants have done their work. The sun of the dog-days beats fiercely on the sandy hedgebank or sloping hill-side, and the poor clusters of *Aira præcox* wither under its influence, and yield up their evanescent life. It is a frequent inhabitant of Scotch dykes along with *Poa rigida*. Sheep and cows are fond of this grass, when it grows in sufficient quantity to furnish them with a good mouthful. Common throughout Europe and western Asia; generally distributed in Britain.



5. *Aira caryophyllea*, Linn. **Silvery Aira.**

Root annual, fibrous; stems erect, round, smooth, ribbed,

from six to twelve inches high; joints smooth; leaves bristle-shaped, short, roughish; sheaths small, panicle spreading, compound, erect, loose, the branches hair-like, placed in clusters of three along the rachis, then forked and branched again, rather zigzag in form, roughish, tinted with purple; spikelets small, silver-grey, tumid, and rounded at the base; outer glumes equal, membranaceous, the keels somewhat toothed, not ribbed at the sides; flowering glumes sessile, with two long slender teeth at the summit, hairy at the base, awned; awn very long, slender, arising from the keel, about halfway between the base and the centre, bent or geniculated where it comes on a level with the points of the apex teeth, and protruding to a considerable distance beyond the outer glumes; palea also membranaceous, thin, the same length as the flowering glume without its teeth, also toothed at the summit, but the teeth broad and short, minutely haired at the edges; the second floret is a little smaller than the first, and is placed on a very minute foot-stalk, and sometimes sessile.

The Silvery Hair-grass resembles the Early Hair-grass in many particulars, but it is of rather larger growth, and its panicle is spreading when in flower, and does not contract when in seed. Nearly all its leaves are upon the stem, it bears scarcely any from the root, and the little foliage it has withers away like that of the Early Hair-grass, under the united influence of sun and drought. It grows in the same kind of



situations as the *A. præcox*, but does not produce its flowers till a month later. It is found in sandy pastures and heaths throughout England, Germany, France, and Italy.

The *Aira* family is very widely diffused in various climates and at different altitudes. The South Sea Hair-grass (*A. Antarctica*) is found in the South Shetland Isles, 62° S. latitude, at an elevation of 7046 feet above sea-level. It is frequent in New Zealand. It resembles our native species in its spreading panicle, but has flat leaves and three florets in the spikelets.

Genus XVIII. AVENA.

Gen. Char. Spikelets many-flowered, loosely collecting the florets; outer glumes lanceolate, acute, ventricose, loose, awnless; flowering glumes slightly smaller, two-cleft at the top, awned; scales two; ovary blunt; styles two, reflex, hairy; stigmas simple; filaments three, capillary; seed oblong, slender, pointed, marked with a longitudinal furrow, clothed with the flowering glume and palea.

1. *Avena fatua*, Linn. . Wild Oat.

Root annual, fibrous, thickened at the base; stem erect, simple, striated, very smooth, three feet high, polished, a little leafy; leaves linear, flat, nervose, scabrous, rough; sheaths thin, nervose, smooth; panicle erect, much branched, spreading; rachis smooth; branches alternate, hair-like, thickened toward the apex, nodding; outer glumes equal, lanceolate, acute, narrow, smooth, longer than the floret; florets generally three, remote, gradually diminishing, with tufts of hair at the base; flowering glumes ovate, acute, eight-ribbed, awned; awn twice the length of the outer glumes, jointed, twisted at the lower end, arising a little

below the centre of the glume; palea shorter than flowering glume, ribbed along the margin, ribs green, fringed at the edges, concave, naked; the seed has a soft hairy covering.

A common weed in fields and hedges, particularly objectionable amongst barley, though accounted troublesome



by the farmers among any kind of corn. Village fishermen sometimes use the florets as artificial flies. The awns make very good hygrometers. No member of the grass family is more desirable in the field-flower bouquet; the delicate glaucous-green tint, shading to white, of the large glumes; the nodding habit of the showy spikelets, and the pennon-like graceful leaf recommend the Wild Oat to the lover of the beautiful. So destitute of any utility is this plant

and so deleterious is its presence, that its name has got to be used for all youthful follies.

Var. *strigosa* has longer florets, the flowering glume is six-ribbed, while that of the normal species is eight-ribbed; the leaves of *A. fatua*, var. *strigosa*, are broad, acute, rough on both surfaces, the central rib polished on the under surface, the panicle is turned to one side; the outer glumes are not quite equal, the lower being smaller and seven-ribbed, the upper nine-ribbed, the ribs of a full green colour; the flowering glume is as

long as the largest outer glume, and terminates in two short bristles; the awn is long, jointed and stout, it is rougher than in the normal species. Altogether this variety considerably resembles the cultivated oat, and is by many botanists regarded as a distinct species. Sir J. E. Smith considers it a foreign oat introduced accidentally with *A. sativa*. It is not uncommon in Scotland; Dr. Parnell has had it from Inverness, Aberdeen, Forfar, and Perth. In England it is found in Durham, Yorkshire, Denbighshire, Nottinghamshire, Anglesea, Sussex, and Cornwall. Abroad it is distributed through central Europe.

A. fatua in its normal form is found more freely in England and Ireland than in Scotland. Its foreign homes are Lapland, Norway, Sweden, Germany, France, Italy, Asia, and North Africa.

It flowers in July and seeds in August.

2. *Avena pratensis*, Linn. **Perennial Oat.**

(*Trisetum*, Parnell.)

Root perennial, fibrous; stems many, one foot or a foot and a half high, erect, simple, with two or three joints near the base, above naked, striated, roughish; leaves of stem broadish, ribbed, radical ones linear, acute, rigid, incurved, smooth on both sides; sheaths long, ribbed, smooth; the uppermost longest, and somewhat rough; ligule lanceolate, acute; panicle simple, erect, spike-like, long, compact; rachis and branches rough; spikelets large, oval, containing four or five florets, the upper spikelets nearly sessile, the lower ones on stalks; outer glumes somewhat unequal, acute, three-nerved, slightly keeled, tinged with purple in the lower part; flowering glume acute, often with two

minute teeth on the apex, five-nerved, roughish on the keel, and with hairs on the base, awned; awn situated above the centre of the keel, stout and twisted in the lower part, thin and stiff above, rough on the upper part, and bent when dry.

Dry pastures, heaths, rocky places, and, above all, chalk meadows are the natural habitats of the Perennial



or Narrow-leaved Oat. No one can traverse the thinly covered meadows bordering the stretch of downs famous as Salisbury Plain, without being attracted by the broad loose spikes of this grass, the somewhat dishevelled appearance of which claims the notice of botanists at once. Few Wiltshire meadows are without this grass. It flowers in June, and is of most value for agricultural purposes at that time, as it then contains most nutritive

matter. Sheep and cows relish the early foliage best. It is frequent in the situations already indicated throughout Britain, and also in Lapland, Norway, Sweden, Germany, France, Spain, Portugal, and Italy.

Var. *pubescens* has a perennial root, somewhat creeping; an erect, simple, roundish, smooth, striated, leafy stem, one or two feet high; leaves spreading, sharp, acute, flat, covered with soft down, those of the root most downy; sheaths finely ribbed, downy, upper one thrice the length of its leaf; ligule acute, prominent;

panicle almost simple, spike-like, erect; rachis nearly smooth; branches rough; spikelets smaller than in the normal form; outer glumes very unequal, keeled, scabrous, pointed, interior one largest, both membranaceous, naked; florets three, the third often abortive; flowering glume roughish on the keel, tinged with reddish-purple; palea thin, transparent, flat, shorter.

This variety is more popular than the normal form for agricultural purposes. Messrs. Wheeler, of Gloucester, who have taken immense pains in the study and cultivation of artificial grasses, recommended the downy variety of the Perennial Oat-grass for chalk lands and for light soil on sands.

A. pratensis, var. *planiculmis*, is a luxuriant variety; in cultivation it grows three feet high, and has its sheaths somewhat flattened. It was found wild in 1826, in Glen Sannox, on the ascent of Goatfell, in the Isle of Arran, by Mr. Stuart Murray. This variety and the *pubescens* are accounted distinct species by several botanists of high repute. Sir J. E. Smith and Dr. Parnell both consider the latter an independent species.

A. pratensis, var. *longifolia*, has long, narrow, flat leaves, upper one rough above and below, the second rough above but smooth below; radical leaves quite smooth behind, glaucous, and as long as the stem, which is rough with ascending bristles. This variety is recorded by Dr. Parnell as indigenous in moist shady woods about Edinburgh.

A. pratensis, var. *latifolia*, of Dr. Parnell, agrees with the description already given of var. *planiculmis*, and is doubtless identical with it.

A. pratensis differs from *A. flavescens* in the spikelets being larger and fewer.

3. *Avena flavescens*, Linn. **Yellow Oat.**

Root perennial, creeping; stem erect, but curved at the base, a foot and a half high, striated, jointed, smooth, polished; leaves flat, acute, striated, more or less pubescent; joints several, smooth, often with a circle of drooping hairs beneath; sheaths very hairy; panicle compound, erect, or somewhat nodding, spreading; rachis and branches scaly, the lower branches placed in clusters of fives; spikelets numerous, of a shining gold colour, small; outer glumes acute, keeled, roughish, very unequal; flowering glumes four or five in number, tinged with green, toothed at the summit, hairy at the base, awned; awn rising from above the centre of the glume, slender, shorter than in the other species, bent; palea narrow, acute, shorter, blunt, and jagged at the summit.

The Yellow Oat-grass is one of the prettiest of the species, its panicle is sufficiently diffused to have a claim to elegance, and the brilliantly sparkling gold of the spikelets gives it a very characteristic charm. It abounds in rich natural meadows; we have noticed it in especial luxuriance in those on the carboniferous limestone formation, mingling with *Poas* and *Festucas*. Mr. Sinclair ascertained that it would not thrive if cultivated alone. He recom-



mends it to be mixed with *Hordeum pratense*, *Cynosurus cristatus*, and *Anthoxanthum odoratum*. It prefers a

calcareous soil, but it will grow in any soil from limestone rock to irrigated meadows. Sheep like it much, and it is strongly recommended as an ingredient in chalk meadows. Messrs. Wheeler give it among their seeds for chalk, London clay, oolite, lias, and Wenlock shale lands.

It is frequent in Britain, and equally so in Norway, Sweden, Germany, France, Spain, Portugal, Italy, Russia, and North Africa. It flowers in July and the seeds ripen in August.

Genus XIX. **ARRHENATHERUM.**

Gen. Char. Spikelets several-flowered, the lower floret in each spikelet male; the lowest flowering glume awned.

Arrhenatherum avenaceum, Beauv. Common False Oat.

Root perennial, of two knots or swollen joints, one above the other, one of them often enlarging so as to resemble a bulb; stem erect, round, polished, brittle, three feet high; joints generally smooth; leaves rough, rather harsh, flat, narrow, acute, of a darkish-green tint; ligule short, obtuse, jagged; panicle half-whorled, the branches all leaning one way; branches simple, rough; spikelets large, showy, erect or nodding, two-flowered; outer glumes very unequal, large, smooth, thin, pointed, the outer one shorter than the florets, the inner about their length, the smaller awned slightly; flowering glumes acute, roughish, seven-ribbed, the central rib roughish, and bearing an awn; awn arising from a little above the base of the glume, long, slender, bent opposite the apex of the floret, twice as long as the spikelet; palea narrow, acute, hairy on the edges; upper floret perfect, but with a very small awn or no awn at all; male floret with

only the rudiment of an ovary and a very long awn; filaments long; anthers large, pendulous, purple.

The great height of this grass, its large lanceolate panicles bending gracefully to one side, and the great beauty of its large spikelets, make it an object of admiration to all grass-lovers. The outer glumes are pale green shading to straw-colour, they gape widely apart and are very glossy; the flowering glumes and palea are thus thrown open to view, and being large and richly tinted with violet, the contrast with the outer glumes



is perfect; add to this the grace of the long pendulous purple anthers and the flag-like leaves arching beneath the panicle, and those who are not familiar with the False Oat can imagine its rare beauty. It grows freely in meadows, especially near the hedges or in thickets throughout Britain; flowering in June or July, later than most summer grasses; its large, tapering, gaily coloured panicle never failing to attract notice and admiration.

It is only of recent years that the value of the False Oat as an agricultural grass has become generally known. Mr. Sinclair notices it thus—"A valuable grass if cut when it is in flower, producing numerous culms again for the aftermath. Subject to *rust*, which does not appear till after the flowering season."

It produces a plentiful early supply of foliage, which

is suitable either for pasturage or for hay. Dr. Parnell deposes that it is highly prized on the Continent, and eaten with avidity by all cattle except horses. Its produce is much greater in a clay than in a heathy soil. It is a troublesome and frequent weed in cornfields.

In a light, dry, richly cultivated soil, this grass is apt to become thoroughly bulbous, and is then called var. *bulbosum*, and the joints of the stem become downy.

Abroad this grass is found in Germany, France, Italy, and the United States.

Genus XX. HOLCUS.

Gen. Char. Spikelets two-flowered, one floret male, the other perfect; outer glumes erect, beardless, ovate, compressed, enclosing the florets, one of which is elevated on a footstalk; flowering glumes pointed, that of the male flower bearing an awn upon its back; palea smaller, awnless; scale single, cloven, membranous; ovary ovate; styles two, hair-like; stigmas oblong, feathery; seed ovate, attached to the hardened palea and flowering glumes; axis of the spikelet smooth.

1. *Holcus lanatus*, Linn. Common *Holcus*.

(*Meadow Soft-grass*, Sir J. E. Smith.)

Roots perennial, fibrous, tufted, not creeping; stems several, one or two feet high, simple, erect, leafy, jointed, clothed with soft, deflexed, dense hairs; joints four, generally covered with down; leaves flat, acute, greyish, covered on both sides, but more thickly beneath, with the same kind of down; sheaths swollen and woolly, the upper one longer than its leaf, the lower ones much shorter; ligule short and blunt; panicle erect, compound, dense, downy, hoary, mostly with a purple or rosy tinge; branches hairy

placed in pairs of unequal length ; branchlets very slender, hairy ; spikelets pedulous, two-flowered ; outer glumes nearly equal, the innermost broadest, both hairy, membranaceous, the upper one awned slightly ; the second floret on a short stalk ; flowering glumes oval, shorter than the outer ones, faintly five-ribbed, blunt at the summit, hairy at the base ; palea about equal in length to the flowering glume, membranaceous, obtuse, hairy at the edges ; stalk of upper floret long, smooth ; awn of flowering glume short, bent near the base and then straight until the seed ripens, when the awn curves like a fish-hook and conceals itself under the outer glumes, it is rough at the summit and smooth below.

A very common and familiar grass, well answering to its old English name Meadow Soft-grass ; its universal downiness gives it a grey tint, its stems are generally about a foot high, and the panicles are very compact until the spikelets open, then it spreads. It is not remarkable for grace or brightness.



Various opinions have been set forth regarding the agricultural value of this grass. At the latter part of the eighteenth century it was cultivated in Yorkshire

for its seeds, and threshed like corn ; it was then known by the name of "Yorkshire fog." It is undoubtedly very productive, and has also the advantage of being

easy of cultivation. It contains a great deal of mucilage and sugar, and is not liked by cattle, who prefer saline or acid qualities; they would probably like it better if sprinkled with salt.

Mr. Curtis tells us that the "appearance of the red panicle of the Meadow Soft-grass was a sign to the farmer that the crop was ready for the scythe." Like the *Bromus mollis* it has had its day of popularity and is now thrown into the shade, but the reaction is much less severe in its case than in that of the Brome-grass.

Moist shady banks, woods, groves, and moist meadows suit this grass the best. It is least attractive when growing in the shade, for then it lacks the purple or rosy tint which generally forms the principal charm of its modest panicle.

Common throughout Britain, and in Germany, France, and Italy. It flowers early in June and ripens its abundant crop of seed in July.

2. *Holcus mollis*, Linn. Soft Holcus.

Root perennial, creeping widely; stems slender, erect, cylindrical, smooth, one to two feet high; joints four, covered with fine deflexed hairs; leaves pale, flat, broadish, pointed, downy on both surfaces; panicle compound, erect; branches spreading, hairy, placed in pairs on the rachis; branchlets hairy; spikelets mostly ascending, two-flowered; outer glumes unequal, acute, hairy, upper one broader and a little longer, three-ribbed, lower without ribs; flowering glumes half the length of the larger outer glume, obtuse, that of the lower floret with three long slender hairs at the base, upper one on a long smooth footstalk, and with at least double the number of hairs at the base; awn arising from a little below the summit of the flowering glume of the

upper floret, long, slender, extending far beyond the outer glumes, rough its whole length; palea nearly equal in length to the flowering glume, membranaceous, blunt at the summit, fringed on the edges; the upper floret is rather smaller than the lower, and the awn, though bent when dry, is never curved as in the last species.

This species resembles the last, but is distinguished by its smaller panicle, more pointed spikelets, paler hue, and more slender habit to the general observer. The most distinctive feature is the awn, which in this species



is rough for its whole length, and only bent when dry, while that of *Holcus lanatus* is only rough on the upper half, and is curved like a fish-hook when the seed is ripe.

The Soft Holcus or Creeping Soft-grass is common in such situations as are selected by the Meadow Soft-grass, but it is seldom so abundant. It prefers light soils and open pastures, and

flowers a week or two earlier than the sister species. It possesses more nutritive qualities than *Holcus lanatus*, but these are more than overbalanced by its troublesome propensity of striking its roots deep into the soil and extending them to a great distance, so as to impoverish the land extensively; on this account farmers regard it as a vexatious weed; its roots extend five feet deep sometimes; pigs are fond of them, for they are said to have the flavour of new meal, and to be very nourishing. On

account of these deep roots the grass bears drought wonderfully well. It flourishes particularly well in the sub-alpine woods in the north of Yorkshire, lifting its small downy panicle from sandy nooks among the rough grey rocks, and especially delighting in the dry almost barren ground where the rains have deposited sand and earth, and from whence the young trees have been cut for props in the adjacent lead-mines. In these miniature plains both the Soft-grasses luxuriate, but the *Holcus mollis* reigns there supreme.

It is common throughout Britain, and also in Sweden, Denmark, Germany, France, and Italy.

Var. *bi-aristatus*, described by Dr. Parnell, has fewer and longer spikelets, the flowering glumes as long as the smaller outer one, and the palea as well as the flowering glume is furnished with a long awn.

Var. *parviflorus* has the spikelets as much smaller than those of the normal form as those of the variety *bi-aristatus* are larger; it grows in sandy ground, under shade, and is of a dwarfed size. Both these varieties flower early in July.

TRIBE VI. CHLORIDEÆ.

Genus XXI. CYNODON.

Gen. Char. Spikelets single-flowered; outer glumes nearly equal; florets awnless, placed on one side of the spike.

1. *Cynodon dactylon*, Pers. **Creeping Cynodon.**

Roots perennial, strong, fibrous, widely creeping; stems a span high, cylindrical, smooth, at first prostrate, then ascending; joints all near the base, covered by the sheaths;

leaves flat, pointed, rigid, pungent, glaucous, hairy; sheaths smooth, ribbed; ligule absent, a tuft of hairs in its place; inflorescence digitate; spikes short, from three to five in number; rachis zigzag and angular; spikelets solitary, alternate, close-pressed, on one side of the rachis only; outer glumes nearly equal, lanceolate, acute, without lateral ribs, toothed on the upper part of the keel; flowering glume compressed, polished, beardless, longer than the outer glumes, without lateral ribs; palea long but narrower, rough at the edges; stamens three, pendulous; styles long; stigmas feathery.

Mr. Brown describes the rudiment of a second floret at the base of the palea, situated on a long hair-like footstalk, the end of which is thickened.



The clustering spikes of this Creeping Cynodon, and the purple tint of its orderly rows of spikelets, gives it both a marked and a pleasing appearance; its foliage is not graceful, the stem-leaves standing at an angle of 45° from the stem, stiff and regular, never deviating into curves or drooping. The

slender spikes vary from an inch to an inch and a half in length, and the height of the plant is from three to six inches. The foliage is of a glaucous green, which contrasts agreeably with the purple spikes. It is found only on the sandy shores of Cornwall.

But although a rare and little-known plant in Britain

it is one of considerable importance in Asia. Sir William Jones, in the fourth volume of his 'Asiatic Researches,' celebrates its praises. He says:—"Its flowers in their perfect state are among the loveliest objects in the vegetable world, and appear through a lens like minute emeralds and rubies in constant motion from the least breath of air. It is the sweetest and most nutritious grass for cattle, and its usefulness added to its beauty induced the Hindoos in their earliest ages to believe that it was the mansion of a beautiful nymph; even the Veda celebrates it, as in the following texts:— 'May Durva, which rose from the water of life, which has a hundred roots and a hundred stems, efface a hundred of my sins, and prolong my existence a hundred years.' " The same learned author goes on to demonstrate that every law-book and almost every poem in Sanskrit contains frequent allusions to the sacredness of this plant, and he quotes from the fourth Veda the following conclusion to a fearful incantation:—"Thee, O Darbha, the learned proclaim a Divinity not subject to age or death; thee they call the armour of India, the preserver of regions, the destroyer of enemies, a gem that gives increase to the fields; at the time when the ocean resounded, when the clouds murmured, and the lightnings flashed, then was Darbha produced, pure as a drop of fine gold."

Although called Darbha in this mystic poem, this plant is more generally known in India by the name of Doob. Low-growing grasses are so scarce there, and the European settlers have such a strong partiality for grass lawns, that they are inclined to praise the Doob almost as much as the Hindoos. It is the only grass which can be relied on for making close verdant turf,

and the Europeans send their servants into the plains to collect plants of Doob, which they carefully plant in the situation chosen for the lawn, and have a fair chance of seeing their efforts ultimately crowned with success.

In the north of Italy it is very common, springing up in quiet streets, and flowering at many seasons like *Poa annua*.

This grass is mentioned by Dioscorides, who describes it as "having jointed creeping shoots, throwing out sweet roots from their joints, and pointed, hard, broad leaves, like a small kind of reed, which are the food of cattle." It abounds in Greece.

Genus XXII. SPARTINA.

Gen. Char. Spikelets single-flowered, sessile; outer glumes boat-like, compressed, converging, very unequal, pointed, the broader one striated; flowering glume longer than the small outer glume, but shorter than the long one, linear, compressed, narrowing to a point at the summit; palea like the flowering glume, intermediate in length between it and the longer outer glume; scales none; ligules very short, ovary narrow, pointed; filaments slender; anthers long, forked at both ends; styles thread-shaped, erect, longer than the filaments; stigmas short, feathery; seed oblong, compressed.

1. *Spartina stricta*, Smith. **Cord Spartina.**

(*Dactylis*, Eng. Bot. *Cord-grass*.)

Root strong, creeping, perennial; stems smooth, cylindrical, ribbed, stiff, erect, invested with the sheaths to the base of the spikes; joints several, all covered; leaves rigid, erect, flat, excepting at the end, when fresh, rolled in when dry, and easily separable from their sheaths; sheaths smooth,

ribbed, numerous on the stem, the uppermost longer than its leaf; ligule short, blunt, torn; inflorescence twin spikes, both linear, erect, and stiff; spikelets long and narrow, flattened at one side, and arranged in order along the outer side of each rachis; rachis rough; outer glumes unequal, hairy, the outer one the smaller; flowering glume shorter than the palea, hairy, and without lateral ribs; the palea with two delicate ribs.

The name *Spartina* is formed from *Spartum*, a hard kind of Spanish grass which is used to make cordage; hence this, which resembles it in toughness, is called both by the botanical and English name.

This is a low-growing grass, seldom exceeding a foot in height; it is too stiff to be attractive, and has the added disadvantage of a disagreeable odour. It grows in muddy salt-marshes, and flourishes in many such localities about Clevedon and Weston-super-Mare, though its principal habitat is the east coast of England; the muddy ground about the mouths of rivers suits it well. It is not known in Scotland or Ireland, but is indigenous in France and Italy.

It flowers in August and ripens its seed in September.

Var. *alterniflora* is of larger growth than the normal form, and Dr. Parnell and others, after much careful examination, erect it into a separate species. It has a



creeping root and long runners, a stem all covered with sheaths, from eighteen inches to two feet high, many withered old leaves mingling with those of this year's growth; numerous joints, the uppermost leaf overtopping the spikes, root-leaves a foot long; spikes several, never less than four, and sometimes amounting to a dozen on one stem; many spikelets on each of these spikes arranged alternately on the rachis, but all facing one way; smooth, angular rachis, terminating in a horn-like point; outer glumes very unequal, the inner the largest, the keel fringed with bristly hairs; flowering glume three-ribbed, acute, smooth; palea longer than glume, thin, acute; styles partly united. It differs mainly from the normal form in the outer glumes being smooth except on the keel.

Its especial British habitat is on the mud-banks about the Southampton rivers. It is a coarse strong grass, reed-like, and with foetid odour. Horses and pigs like it. It is very abundant in North America, and is used for thatching. Mr. Bentham asserts, from his experience of American specimens, that it passes gradually into the normal form. It flowers in August.

TRIBE VII. HORDEINEÆ.

Genus XXIII. LEPTURUS.

Gen. Char. Spikelets one- or two-flowered, placed on alternate sides of a simple erect spikes; inflorescence spiked.

1. **Lepturus incurvatus**, Trin. **Curved Lepturus.**

(*Rottboellia*, Eng. Bot.)

Root annual, fibrous; stems cylindrical, smooth, glossy,

and ribbed, decumbent at the base, then ascending; joints smooth, basal one often throwing out branches; leaves narrow, acute, rolled in, smooth; spike long, narrow, slightly curved or erect, spikelets placed alternately on either side of the rachis, containing one or two florets; outer glumes flattish, lanceolate, equal, pointed, stiff with four strong green ribs, closed except when in flower; flowering glume shorter than outer ones; both it and the palea are narrow, delicate, and transparent; scales pointed; filaments slender; anthers pendulous, notched at both ends; when two florets are in one spikelet one of them is male and the other perfect; the seed is elliptical; the spikelets are not merely sessile, they are partially imbedded in hollows of the rachis, and the seeds grow closely into this natural cradle, shut in securely by the clasping outer glumes.

This unattractive grass lifts its humble and slightly curving spikes from salt-marshes and muddy shores unattractive as themselves; you may chance to gather it on firm reliable ground, within hearing of the advancing tide, but out of the reach of the rushing waves; but it is just as likely that the ground where you seek it was overflowed by the last spring-tide, and is all washed into holes and dangerous with half-hardened mud.



In such places, both near river-mouths in Cornwall and on the Somersetshire shore, we have gathered the Curved Lepturus, or Sea Hard-grass. It is abundant

on the Irish coast, and that of England and Wales, and also on the shores of the Mediterranean.

The flowers appear in July, the seeds five or six weeks later.

There is a slender variety, called *filiformis*, found in salt-marshes in the neighbourhood of Aberlady; its stem is compressed, and all its parts more delicate than in the normal form.

Genus XXIV. **NARDUS.**

Gen. Char. Spikelets simple, of one floret; no outer glumes; flowering glume narrow, pointed, enclosing the palea, which is smaller, narrow, and pointed; no scales; filaments three, slender, shorter than the glume; anthers oblong, very slightly notched; ovary oblong; style single, slender, long, downy; stigma simple.

Nardus stricta, Linn. **Common Nard.**

(*Matgrass*, Eng. Bot.)

Root perennial, composed of thick downy fibres; stems erect, rigid, slightly angular, smooth, naked, five to eight inches high; joints chiefly on the lower part; leaves radical, thickly tufted, linear, harsh, rigid, divaricating, their base enveloped with scales externally, and crowned at the divarication with the usual ligule; inflorescence spiked; spikes slightly curving, close, except when in flower; spikelets all pointing one way, lanceolate, acute, bright purple, of one floret in two rows on one side of the rachis; outer glumes absent; flowering glume minute, toothed on keels and margin, and tipped with a slight awn; palea membranaceous, narrow, lanceolate, entire, shorter than glume; filaments slender; anthers oblong, large, russet; stigma feathery; seed pointed at each end.

The Matgrass is a pretty enough grass in its native haunts, the wild moor and the steep hill-side, where no shadow falls but that of sailing clouds. The numerous tufts of leaves are of a dark colour, and harsh, and the tall slender violet spikes rise from among them, forming a grave enough contrast, till some sunny morning when the sorrows of the grouse are about to begin, the August heat compels the shy purple florets to open, and out burst the orange anthers hanging like a gay fringe upon the now expanded spikelet.



The foliage is too harsh to please the taste of cattle, and grass-lovers are at a loss to find recommendations for it. Linnæus discovered that crows often busied themselves about it, but he ascertained that it was for the sake of some larvæ which infested it, and he also asserts that horses and goats like it.

The name was first given by classical writers; it is supposed to be derived from the Hebrew.

Its foreign homes are Lapland, Norway, Sweden, Germany, North America, and the United States.

Its flowering time is August; it is common in all hilly districts.

Genus XXV. **ELYMUS.**

Gen. Char. Inflorescence spiked; spikelets with more than one floret, sessile, not solitary; outer glumes lanceolate; flowering glume pointed and awned; palea fringed; scales two, oblong, pointed, fringed; filaments slender, very short; anthers oblong, more notched at the base than the apex; ovary turbinate; styles two, short; stigmas feathery; seed narrow, convex at the back.

Elymus arenarius, Linn. Sand Lyme-grass.

Root perennial, strong, creeping extensively; stems erect, stiff, cylindrical, smooth, delicately ribbed, two to five feet high; leaves long, narrow, rigid, glaucous, pointed, spinous, furrowed, rough within, smooth behind, rolled inwards on the edges; sheaths rather loose, smooth; ligule short, blunt; spike erect, rather dense, three or four inches long, and occasionally much longer; rachis smooth, toothed alternately on each side; spikelets in pairs upon the teeth of the rachis, containing three or four florets; outer glumes narrow lanceolate, nearly equal, stiff, downy, or sometimes smooth, three-ribbed; flowering glume shorter, broader, less pointed, five-ribbed, hairy; palea ornamented by two green marginal ribs; footstalk of the florets hairy.

The Lyme-grasses are of no agricultural value, but they have other excellencies. Mr. Sinclair calls this species "the Sugar-cane of Britain," because it contains so much saccharine matter. If used for hay it would be very nutritious, but probably too hard to please the taste of the cattle. Its great excellence, which it shares with the Sea Reed and the Sea Sedge, is as a fence against the encroachments of the waves. Its strong roots, with their long creeping shoots and interlacing

fibres, hold fast the drifting sand-banks, and the stiff stems and leaves collect the sand which every breeze carries along in clouds, thus forming an ever heightening embankment. This grass is included with the Sea Reed under the popular term Mar-ram, and along with it protected by Act of Parliament. The Dutch understand their utility well, and use every effort to promote their growth, gaining ground by their means which without them would have been desolated or entirely washed away by the spring-tides.

The Sand Lyme-grass is frequent on all the sandy shores of Britain, Holland, Lapland, Norway, Germany, France, Portugal, Italy, Iceland, and British America.

It flowers in July and ripens its seed in August.

In Iceland, we are informed by Mr. Forbes, the traveller, that this grass is the nearest approach to a corn crop; its seeds are very wholesome, as indeed are those of all the grasses with very rare exceptions, and they are produced in good quantity, so that doubtless the bread made from their flour is by no means despicable.

Elymus arenarius, var. *geniculatus*, has usually been treated as a distinct species, but Mr. Benthham prefers regarding it as a variety only. It has the strong creep-



ing roots, stiff, noble growth, and spinous leaves of the normal form, but its inflorescence is very different. The long massive spike is jointed near the base, and bends downwards at an acute angle; the rachis is winged and the spikelets placed in pairs on the teeth. The great length of the spike and its curious bend about the second or third pair of spikelets are its distinguishing features. Like the normal form, its natural habitat is on sandy shores; Dr. Parnell says it will grow in any kind of soil, and forms a good cover for game. Its grain is probably as well suited for edible purposes as that of the normal form. It is very rare in England, its only recorded home being Gravesend.

There is a species common on the seacoast of Portugal, and fulfilling there the same beneficent office which our British species fulfils here, which is furnished with long hair-like awns, by means of which the seeds are wafted in every direction by the wind, and the industrious labour of the Dutch performed by the kindly hand of nature,—*Elymus Caput-Medusæ*. This arrangement is more requisite in the Portuguese species than in ours, it being an annual grass, and consequently its utility dependent on its constant reproduction.

Genus XXVI. HORDEUM.

Gen. Char. Spikelets in clusters of three on each tooth of the rachis; rachis jointed and breaking easily at each tooth; outer glumes narrow, pointed, terminating in bristly awns; ovary turbinate; styles two, villose, reflexed; stigmas feathery; seed oblong, swelling, angular, pointed at each end, marked above with a longitudinal furrow.

In some species each of the three spikelets contain a perfect floret; in others the lateral ones are male, and only the central one perfect.

1. **Hordeum sylvaticum**, Huds. **Wood Barley.**

(*Elymus Europæus*, Eng. Bot.)

Root perennial, fibrous, tufted; stems erect, cylindrical, nearly smooth, two feet high; joints minutely hairy; leaves lanceolate, flat, pointed, rough; sheaths ribbed, roughish; ligule short; spike cylindrical, dense, two or three inches long, uniform; rachis rough, angular, toothed alternately, from fourteen to twenty-one teeth in the spike; spikelets in clusters on each tooth, the central one consisting only of two very narrow glumes, not fringed, often empty, but sometimes containing a male flower or the rudiment of one; the two lateral spikelets have a perfect floret each, and sometimes a rudimentary one also; outer glumes of perfect florets broader and longer, equal, parallel, three-ribbed, roughish, awned, and fringed; the flowering glume is shorter, five-ribbed, hairy at the base, and furnished with a very long, rough awn; the palea has two delicately fringed ribs, and a bristle at the base; the ovary is hairy; the styles short; the stamens long and feathery; the two scales long and pointed.

The Wood Barley is, as its name indicates, an inhabitant of woods and thickets. In such situations it is found in the midland and northern counties of England, and in Oxfordshire, Wiltshire, and Denbighshire. It is not found in Scotland or Ireland.

It has no agricultural value, nor is it particularly ornamental. The stem, leaves, and spike are of a uniform moderate greenness, and even when the florets first open, and the anthers are obtruded, a time when



most grasses have a claim to beauty, the shortness of the filaments prevents the anthers being conspicuous, and their pale lemon tint offers no strong contrast to the greenness of the spike. The shorter awns on the middle spikelets distinguishes this species from *H. murinum*, the mid-spikelet of which is endowed with long awns, and its outer glumes conspicuously fringed.

2. *Hordeum pratense*, Huds. **Meadow Barley.**

Root perennial, fibrous; stem upright, cylindrical, smooth, polished, eighteen inches to two feet high, leafy; leaves narrow, flat, acute, glabrous, edges minutely toothed; four or five upon the stem; spike one and a half to two inches, cylindrical, dense, uniform; rachis jointed, brittle, toothed on alternate sides; to each tooth there are three spikelets, the central containing a lanceolate flowering glume enfolding the floret, and furnished with an awn as long as itself; the lateral spikelets are smaller, their outer glumes are bristle-shaped and rough, and their florets imperfect and with long awns; the palea of the central floret is acute and small, and has a minute bristle at the base; the outer glumes of all the spikelets are bristle-like, but the base of those of the central one is more expanded, and its keel fringed with minute bristles.

In appearance this is not a more attractive grass than

the last, which it resembles very much ; it is a frequent inhabitant of moist meadows and pastures ; in barren ground its root becomes bulbous and its habit tufted ; sometimes its stems assume a decumbent style of growth. Moist rich ground suits it the best, and it grows readily in chalk lands. It produces a fair crop of herbage in spring, yet is not recommended for hay ; its nutritive qualities are considerable. The numerous rough bristles of the spike must be very unpleasant to the mouths of cattle, and it is possibly on this account that the Meadow Barley procures so little favour as a pasture grass. It is often found in rich natural pastures, as in Norfolk, etc. It is rare in Scotland, and not found in Devon and Cornwall. Its foreign habitats extend all over the middle of Europe.



The flowers open in July, and the seeds are ripe in August.

3. *Hordeum murinum*, Linn. **Wall Barley.**

Root annual, fibrous ; stem cylindrical, smooth, leafy, upright, one to two feet high ; joints smooth ; leaves narrow, pointed, rough and hairy in a slight degree on both surfaces, margins toothed ; sheaths without hairs, ribbed, inflated ; ligule short, torn ; spike dense, cylindrical, uniform, narrow ; rachis jointed, brittle, toothed, winged, and flattened be-

tween the teeth; spikelets in clusters of three on each tooth, one-flowered; outer glumes all bristle-like; central spikelet with two equal glumes, spreading a little at the base, fringed, terminating in a straight rough awn; central floret with a flowering glume ovate, three-ribbed, furnished with a long rough awn, exceeding the length of those on the outer glumes, and a membranaceous, transparent, fringed palea, bearing a bristle at its base; the lateral spikelets situated on footstalks, their outer glumes mere bristles, the inner one a little spreading at the base; the flowering glumes three-ribbed, with awns longer than those of the outer glumes, but not so long as that of the flowering glume of the central floret; the palea minute, membranaceous, with a slender bristle at the base; the central floret has its proper complement of ovary, pistils, and stamens, but the lateral florets have stamens alone.

No one in search of plants can have failed to note this very common grass. It is generally about a foot high, and grows in considerable quantities, its green compact spikes bending and swaying in the breeze after the manner of ripe corn. There is scarcely an unpromising bit of ground where four roads meet, or below high brick walls which hinder the sunshine from ever touching the earth, or about building ground in London



and other great towns, or in neglected streets, but there the Wall Barley effects a settlement. Especially about

London, in the many districts where fields and market gardens are being so rapidly converted into streets and squares, the Wall Barley abounds; the transition state seems to suit it, the fences are thrown down, the turf broken up between the new houses and the site for the next row of buildings; heaps of earth and brickdust and indescribable rubbish lie, and the Wall Barley greens it all over, and tempts the unwary passenger to tread boldly as if on even ground. It does not disdain a place on wall-tops provided a little earth has settled there, but it grows in a dwarfed form in that position. It is rare in Scotland, but very common in England and Ireland, also in Germany, and throughout the south of Europe. In Lapland, Sweden, Norway, and America it is unknown.

According to Sir J. E. Smith, its botanical name is not taken from *murus*, a wall, but from *mus*, *muris*, a mouse, in allusion to the hair-like awns lying over one another like the hairs of fur.

It is distinguished from the succeeding species by the glumes of the central spikelet being spread at the base and fringed.

Its nutritive properties are not worthy of mention.

It flowers at the end of June and beginning of July. Like the other *Hordeums*, it is destitute of any claim to beauty, as its anthers are pale and little protruded.

4. *Hordeum maritimum*, With. **Sea Barley.**

Root annual, fibrous; stems decumbent at the base, then ascending, cylindrical, smooth, glossy, leafy; joints smooth; leaves narrow, short, pointed, rather rough, hairy above and below, somewhat glaucous; sheaths smooth, ribbed, only

the upper one inflated and longer than its leaf; ligule blunt; spikes rather short, dense, cylindrical, uniform; rachis jointed, toothed; spikelets in clusters of three; outer glumes of central spikelet bristle-shaped, rough, awned; flowering glume terminating in a long rough awn, that of the central floret longest; palea also bristle-shaped; lateral spikelets on footstalks; outermost glumes bristle-shaped, inner ones spreading at the base; flowering glumes also dilated, all awned, the tops of the awns of equal height; florets barren except central one.



This is a maritime grass, smoother and more glaucous than the *Hordeum murinum*, and only attaining a height of from three to six inches. It grows in sandy pastures near the sea, but is not welcomed by farmers, because when the spikes become dry the awns pierce and irritate the mouths of the horses who graze upon the herbage. On this account it is an undesirable ingredient in meadow grass. It is abundant enough on the coasts of

England, but is doubtfully indigenous in Scotland or Ireland. Curtis calls it Squirrel-tail grass, which is a good descriptive title for it. He speaks of it as growing in the Isle of Thanet, where it had become noticeable from its pernicious effect on the mouths of the horses. He does not make the difference between this and the last species very clear; and indeed this might easily be taken for a stunted form of *H. murinum*, but for Dr.

Parnell's careful observations on the inner glumes of the lateral spikelets, which so materially differ from the outer ones, while in the Wall Barley the inner and outer glumes of the lateral spikelets are alike.

Abroad it does not extend further north than the Baltic; it abounds along the shores of the Mediterranean, and is unknown in America.

It flowers in June and July.

Genus XXVII. TRITICUM.

Gen. Char. Inflorescence spiked; rachis zigzag, toothed, elongated; spikelets single, sessile, several-flowered; outer glumes two, ovate, bluntish, concave; flowering glumes similar to the outer ones; palea resembling the flowering glume, but not concave; scales two, swollen at the base; filaments three, hair-like; anthers pendulous, oblong, cloven at each end; ovary turbinate; styles two, slender, reflexed; stigmas feathery; seed ovate, oblong, blunt at the ends, convex at the outer side, with a longitudinal furrow on the inner.

1. *Triticum repens*, Linn. Couch Triticum.

(*Couch-grass*, Eng. Bot.)

Root perennial, creeping extensively; stems slender, stiff, erect or ascending, two feet high; leaves spreading horizontally, often all to one side, dark green, pointed, roughish, upper ones broader than those springing from the root; sheaths shorter than the leaves; spike two or three inches high; rachis rough on the margins, zigzag; spikelets oval, containing four or five florets; outer glumes narrow, stiff, acute, or slightly awned, with four or five ribs; flowering glumes gradually shorter, with fainter ribs, the terminal one very small; paleæ with two green marginal ribs.

The Couch-grass is common in waste places and far too frequent in cultivated fields. Its roots penetrate so



deeply into the ground and spread so extensively that they are very difficult to extirpate. When collected in sufficient quantity these roots form good food for pigs, and in times of famine have been made into bread. But food both for man and beast is too easy to get to render it worth while to spend labour in getting Couch-grass roots for edible purposes, so their nutritious qualities do not atone to the farmer for their manner of exhausting the soil.

This grass is variable in form and tint. Sometimes it is only a foot in height, but when it grows close to a hedge or bush, and supports itself by the branches, it attains a height of three feet. Generally the tint is a full deep green, but occasionally the tint becomes glaucous; the leaves turning to one side gives the grass a marked appearance, and makes it easy of recognition. The leaves are smooth on the lower half of outer surface. Cattle eat the Couch-grass in spring, and we often observe cats and dogs eating its leaves; Dr. Parnell is of opinion that they take it as an emetic.

It is common throughout Britain, and is indigenous in Norway, Sweden, Germany, France, Italy, Spain, Portugal, Switzerland, Russia, and Iceland, also in the United States.

T. repens, var. *junceum*. This form of Couch-grass is found in the neighbourhood of the sea. Its height is from fifteen to twenty-four inches; it is of stiffer growth; its leaves much more glaucous, smooth, and polished; the upper ones broader, the radical ones hairy beneath, rigid, narrow, and involute; spike very long, rachis smooth, zigzag.

This variety appears on the seacoast, just as the normal form does inland; it is of some use in binding together the loose sand, after the manner of the Sea-reed and Lyme-grass, but has no other useful qualification. The stems are often tinged with violet on the lower part; the spikelets are quite smooth and without awns, and the outer glumes many-ribbed; the spine-pointed leaves are strongly furrowed on their upper side. Sir J. E. Smith calls this *Triticum junceum*, Sea Rushy Wheat-grass, and Dr. Parnell also treats it as a distinct species.

T. repens, var. *aristatum*, is distinguished by having awns on the florets half the length of the paleæ.

Both the normal form and its varieties flower in July.

T. repens differs from *T. caninum* in the length of its creeping roots, the ribs of its outer glumes, and the absence of awn on the flowering glume.

2. *Triticum caninum*, Huds. **Fibrous Triticum.**

(*Bearded Wheat-grass*, Parnell.)

Root fibrous; stems tufted, erect, straight, finely ribbed, leafy, two to three feet high, slender; joints numerous, small, of a dark tint; leaves rather broad, upper ones rough on both sides, sometimes hairy, radical ones often polished, dark green; sheaths shorter than their leaves; ligule minute; spikes solitary, pale, two to four inches long, a little

drooping when ripe ; spikelets oval, sessile, in two rows, each containing four or five florets ; rachis zigzag ; outer glumes roughish, nearly equal, thin, somewhat hairy, awned ; flowering glumes roughish, rather hairy, larger than the outer ones, furnished with a long slender rough awn on its summit ; paleæ the same length, with two green marginal ribs.



The Fibrous Wheat-grass is a denizen of bushy places and damp shady situations ; it will live in open ground, but it prefers shelter. It is a tall, slender, elegant grass, the spike generally arching a little, and the stem-leaves drooping in a flag-like manner ; the leaves all being smooth on the under surface is a good mark of distinction, and the awns on the flowering glumes is a still more valuable one.

Cattle eat this grass with avidity, and it produces a good quantity of early herbage ; these points qualify it for a good position among agricultural grasses. Its latter math is inferior.

Frequent in every part of Britain.

Its foreign homes are Lapland, Norway, Sweden, Germany, France, Italy, Spain, Portugal, Switzerland, Iceland, and Siberia.

It flowers early in July, and ripens its seed in August.

3. **Triticum cristatum**, Sir J. E. Smith. **Crested Wheat-grass.**

Root perennial, with very long, strong, woolly fibres; stems ascending, slender, rigid, leafy, hairy at the top, nine to eighteen inches high; leaves narrow, shortish, hairy, pointed; sheaths long and tight; ligule short, blunt; spike elliptic-oblong, very close, pale, one inch long; rachis rough; spikelets sessile, containing four or five florets; outer glumes lanceolate, equal, with six faint ribs; flowering glumes awned, longer than the outer ones; paleæ as long as the flowering glumes, and delicately fringed.

This rare grass was discovered on the Scotch coast, near Montrose, by Mr. George Don, where it grew in a small quantity, bearing but a few spikes. There is no record of it being found elsewhere, and on this account Mr. Bentham has omitted it from his list of British grasses. It is readily distinguished from the other species by its short spikes.

In Siberia and Tartary it is common, and it also is indigenous in Germany, France, and Switzerland.

Its flowers appear in July and its seeds in August.

Such are our native representatives of the important family to which our cereal wheat belongs. All the true wheats are annual grasses, and are said by some to be indigenous in unknown regions of western Asia, but by others to be altered forms of the south European and west Asiatic genus called *Ægilops*. Our British species are perennials, and can only be considered as allies of the *Ægilops*, not as sister-species.

Genus XXVIII. **LOLIUM.**

Gen. Char. Inflorescence spiked; spikelets several-flow-

ered, placed singly on each tooth of the rachis, and pressed close into the angle; only one empty glume, awl-shaped, permanent, fixed, opposite to the rachis; flowering glumes lanceolate, narrow, pointed, as long as the empty one; scales ovate, obtuse, swollen at the base; filaments short; flowering glumes enfolding the seed, which only falls when they open; seed oblong, convex beneath, with a broad shallow furrow above.

1. **Lolium perenne**, Linn. **Rye-grass Lolium.**

(*L. linicola*, Eng. Bot.; *L. multiflorum*, Brit. Fl.)

Root fibrous, downy, perennial; stem erect or ascending, bent at the base, leafy, cylindrical, ribbed, smooth, a foot high, jointed; joints several; leaves narrow, keeled, smooth, dark green, pointed, flat, sometimes rough on the under surface, especially the four or five which grow on the stem; sheaths smooth, striated, upper one longer than its leaf; ligule short, blunt; spike nearly erect, very flat, often a little twisted, a third the length of the stem; rachis smooth, toothed; spikelets sessile, placed in two rows alternately on the rachis, distant from one another; outer glume oblong, lanceolate, smooth, five-ribbed, on the outer side very stiff, shorter than the spikelet; flowering glumes several, sometimes obtuse, sometimes pointed, and sometimes furnished with a little awn; the terminal spikelet has generally two empty glumes; filaments slender, shorter than the glumes; anthers cloven at each end; ovary obtuse; styles short; stigmas feathery.

A common grass in meadows and pastures, on roadsides, and in waste places. Not very attractive in appearance, the stem being stiff, and the flattened spike affording no relief to the straight line of the stem; the pervading full green tint is the only beauty of the plant. As an agricultural grass it is much prized and exten-

sively cultivated. It is called by farmers Ray-grass. The perennial roots put up several stems, which grow prostrate at the base, but ascend from one of the lower joints and then grow upright, smooth, and tall, measuring from six to twenty-four inches when mature; the stem is often tinged with brown at the joints; the pointed leaves are four or five inches long, the upper ones much broader than those which spring from the root, these are quite smooth; the spike varies in length from four to seven or even nine inches, and supports from ten to eighteen spikelets; the rachis is zigzag in its growth, and the spikelets are lodged in the hollows; the seed is easily separated from the chaff. The Rye-grass continues to flower for some time. Both the normal form and the varieties are extensively cultivated; their seed is easily collected and they produce a good crop the first year. But there are drawbacks to their excellence: the seed is very liable to be mixed with that of Couch-grass, which gives unreasoning farmers an idea that Lolium seed produces Couch; it is necessary to be very careful in cleaning the seed, to avoid this admixture. Messrs. Wheeler explain that this is easily done, the seed of the Couch-grass being longer and thinner than that of the Rye-grass, and readily detected by careful examination.



Lolium perenne, var. *Italicum*, is one of the most sought after for cultivation. The Italian Rye-grass is biennial, has roughish stems from two to five feet in height; leaves lanceolate, flat, rough on the inner surface and smooth behind; a spike from five to eight inches long, bearing from fourteen to twenty spikelets; the spikelets have only one outer glume, and several florets, with rough awns, rising from a little below the summit of the flowering glume.

This variety is a native of Italy, and was first introduced into England by Mr. Lawson of Edinburgh, who continues to import a quantity of seed annually. It is a very valuable grass, arriving very quickly at maturity, and producing a great quantity of foliage and numerous tall stems, and being eaten with avidity by cattle. If cut before flowering it becomes almost perennial, at any rate it lasts longer than two years. It is the best of all grasses for a single year's crop, and is good for grazing if the land be in a state of good fertility.

Mr. Lawson says, in writing of this grass, "An experience of ten years since our first introduction of the Italian Rye-grass into Britain, enables us now to give a more decided description of its habits than formerly. In respect to duration it may be called sub-perennial, beyond which title even the most permanent varieties have no claim. In most instances two seasons of Italian Rye-grass are all that can, with any degree of certainty, be depended upon, and in very wet, cold, spongy soils it will often exhibit a thin stock the second season. Instances have, however, occurred, in which as many as five or even six successive years' produce have been reaped from the same field; but this has arisen more from the ground having been re-sown in course of reap-

ing the crop, than from the actual duration of the original plants, the seeds being remarkably easily separated from the hay, even though not perfectly ripe. Although the tendency of Italian Rye-grass is to produce many stalks from the same root, yet, from its upright habit of growth, it by no means forms a close turf; hence the propriety of sowing it with a mixture of other grasses of a different habit, which, by filling up the interstices, will add considerably to the weight of the produce."

The same writer continues, stating how great the produce of Italian Rye-grass is under favourable circumstances. "If the seed be sown in October, it may be cut for soiling in December, and be ready for cutting again in April; but such produce can only be gained when plenty of manure is applied, and first-rate management used. The spring herbage produced by this variety is much valued by farmers, coming at a time when grass is scarce. In rich or irrigated land three crops may be reaped during the season."

L. perenne, var. *multiflorum*, is an annual variety, and is distinguished by the greater number of florets in each spikelet, sometimes amounting to twenty! The awns of the flowering glumes are longer than in the Italian Rye-grass. It is a stout strong variety, attaining a height of four or five feet, and is like the variety *Italicum* introduced from Italy.

L. perenne ramosum. The Branched Italian Rye-grass would be very valuable if constant. It bears branches from its stem, these again producing spikes, and thus it affords a great quantity of seed. But it is apt to run into the normal form.

L. perenne, var. *Paceyianum*. Pacey's Rye-grass is a variety in great favour with agriculturists; it produces

an abundance of foliage, both from the roots and stems ; it is perennial, and so is well suited for permanent pasture as well as for meadows. Messrs. Wheeler recommend it for lands on chalk, London clay, oolite, lias, red sandstone, and carboniferous formations.

L. perenne sempervirens does not yield so heavy a crop as the last-named variety, nor is it so durable. But its foliage is good and plentiful, it grows speedily, and is very hardy. Its popular names are Evergreen Rye-grass or Devon Eaver.

L. perenne, var. *submuticum*, Short-awned Rye-grass, has very large spikelets, the awns of the flowering glumes being short ; thick strong stems, and heavy seeds.

The foreign homes of the normal form of *L. perenne* are Lapland, Norway, Sweden, Germany, France, Spain, Portugal, Switzerland, Italy, Russia, North Africa, and western Asia.

2. *Lolium temulentum*, Linn. **Darnel Lolium.**

Root annual, of a few downy fibres ; stem smooth below and rough on the upper part, two feet high ; joints four, smooth ; leaves lanceolate, spreading, ribbed, rough, of a lighter green than those of the former species ; sheaths slightly roughish, ribbed ; ligule short, notched ; spike erect, large ; spikelets sessile, arranged in two rows on the zigzag rough rachis, containing four or five florets ; outer glume single, or with a very rudimentary second one ; flowering glumes numerous, ovate, swelling, ribbed, rough, each tipped with an awl-shaped, whitish, erect awn, twice its own length, arising from a little below the summit.

This grass is pretty frequent both in hedgerows and in arable land ; it is a noxious weed, and is the one evil

species in the wholesome grass tribe. The seeds are said to be intoxicating to men, beasts, and birds, and even to cause convulsions and death. A farmer at Poitiers is said to have killed himself by persisting in eating Darnel bread. He also made his wife and servant eat of it, but they escaped with severe sickness. Old Gerarde says, "The new bread wherein Darnel is causeth drunkenness. Darnel hurteth the eies and maketh them dim, if it happen in corn either for bread or drink; which thing Ovid, in his third book, hath mentioned, and hereupon it seemeth that the old proverbe came, that such as are dim sighted should be saide to eat of Darnel." These assertions sound very dreadful, but they are chiefly "hear-say," and we feel more sympathy with Sir J. E. Smith's opinion, "We know of no mischief from it in this country." This is always supposed to be the Darnel of the ancients, but that also is far from certain.



It is distinguished from *L. perenne* by the length of the outer glume, and by the long awns on the flowering glumes. It flowers in July and seeds in August.

L. temulentum, var. *longiaristatum*, Long-awned Darnel, is a stout variety with still longer awns. Dr. Parnell tells us of a case of poisoning recorded against this variety, which, if true, is much to its discredit. The symptoms were somnolency, convulsive tremor, and

coldness of the extremities. The Doctor says that its presence in flour may be detected by digesting in alcohol, when the *L. temulentum* flour turns a green tint. In Scotland this grass is familiarly called "Doits," but whether their expression "doited," meaning "drunken or besotted," is derived from the Doits-grass, or the grass is called Doits because it causes the drunkenness, we are not able to decide. It certainly bears a very bad character among the Scotch, for the old farm-labourers tell sad stories of the terrible effects resulting from the admixture of the Doits-seed with wheat in the scarce times during the war.

The countries where *L. temulentum* is indigenous are Norway, Sweden, Germany, France, Italy, North Africa, Japan, South America, and the United States.

Genus XXIX. BRACHYPODIUM. FALSE
BROME.

Gen. Char. Inflorescence spiked; spikelets several-flowered, slightly stalked.

Brachypodium sylvaticum, Beauv. Slender False-Brome.

Root fibrous, tufted, perennial; stems simple, round, leafy, tapering, very slender, and a little drooping in the upper part; joints four, hairy; leaves spreading, flat, pointed, a little rigid, rough, more or less hairy, ribbed, bright green, polished; sheaths hairy and ribbed, especially the lower ones, uppermost sheath shorter than its leaf; ligule short, blunt, hairy; spike simple, loose, drooping, zigzag; spikelets long and narrow, six or seven in number, cylindrical when young, but flattened in seed, alternate, slightly stalked, downy; outer glumes acute, unequal, downy or glossy;

flowering glumes awned from the summit; awn rough, generally much longer than the glume; palea short, obtuse at the summit, and fringed with a few hairs on the edges.

The slender False Brome merely consists of stem, leaves, and spike, and so it might have no greater claim to beauty than the Wheat-grasses or the Rye-grass, yet none can refuse it a title to the term *graceful*. Its tapering stem, lax drooping leaves, and bending spike, give it an attractive character, besides which the looseness of the spike, and the distance of the long tapering spikelets take away all possibility of stiffness from its form. It grows principally in moist alpine woods, and is often to be seen overtopping the low Hawthorn and Sloe bushes, or peering forth from among the changing foliage of the wild Guelder-Rose; but it does not invariably cling thus for support, but will flourish under the thick shade of interlacing branches, covering the ground beneath them with its foliage, and lifting its spikes unsupported in the shade. It is also found in stony places, in alpine situations, or even near the sea-coast, though it flourishes less luxuriantly in such situations than in its favourite sylvan shade.



This grass is not accounted of any use in agriculture, because oxen, sheep, and horses refuse to eat it; but in the winter months deer eat it with relish, and, as it will grow in situations unsuitable for most grasses, and is so hardy that it remains green throughout the winter

months, it might be well worth the care of deer-keepers to sow it beneath the shade of the spreading beeches, and in the waste rocky places, to secure food for the game.

The long cylindrical spikelets distinguish this grass from all of similar inflorescence.

It grows in moist woods and stony places all over Britain, and also in Germany, Switzerland, Italy, and Russia.

It flowers early in July.

2. **Brachypodium pinnatum**, Beauv. **Heath False-Brome.**

Root perennial, a little creeping; stem a foot and a half or two feet high, erect, simple, round, leafy, very smooth, rigid, scarcely tapering; joints four, hairy; leaves somewhat erect, lanceolate, pointed, rather rigid, and ribbed, rough, with prominent centre rib; sheaths smooth, polished, lower ones with drooping hairs; ligule short, blunt, hairy; spike simple, erect, two-rowed; spikelets very slightly stalked, containing ten florets; rachis roughish, grooved, smooth on the groove; outer glumes unequal, somewhat elliptical, ribbed, awned; flowering glumes longer than outer one, roughish, five-ribbed, awned; awns rough, half the length of glumes; palea shorter, blunt, having two green ribs fringed with white hairs on the upper half; anthers yellow.

This handsome species loves a dry calcareous soil, and is found in stony places in hilly countries. It is much more scarce than the slender False-Brome, but is indigenous in most chalk districts. Dr. Parnell mentions many counties as its habitats,—Devonshire, Oxfordshire, Bedfordshire, Cambridgeshire, Dorset, Somerset, Sussex, Kent, Suffolk, Norfolk, Gloucestershire, Worcestershire, Leicestershire,

Yorkshire, and Cumberland. It is also a native of Norway, Sweden, France, Germany, Italy, Spain, Portugal.

It flowers in July.

Dr. Parnell describes five varieties of this grass:—

Brachypodium pinnatum var. *gracile*. Slender Upright Wheat-grass. Very slender in form, with shorter spikelets, branching root, and long awns. It is found in Kent.

Brachypodium pinnatum var. *cæspitosum*. Clustered Upright Wheat-grass. This has narrower leaves and short awns. It loves chalky soil, and is found near Bath.

Brachypodium pinnatum, var. *compositum*. Spikelets clustered, in groups of three. It is a monstrosity found in Yorkshire.

Brachypodium pinnatum, var. *hispidum*. Bristly Upright Wheat-grass. This has the florets covered with bristly hairs, and the root nearly simple. It is also a Yorkshire variety.

Brachypodium pinnatum, var. *hispidum*, Hairy Wheat-grass, has the glumes and florets covered with hairs, and the awns short. The spike is very upright.



TRIBE VIII. FESTUCACEÆ.

Inflorescence paniced or racemed; spiklets several-flowered, stalked; florets mostly awned.

Genus XXX. **BROMUS. BROME-GRASS.**

Gen. Char. Spikelets many-flowered; outer glumes two, spreading, collecting the florets into an oblong two-rowed spikelet, ovate-oblong, pointed, awnless, the lower the smallest; flowering glumes the size and form of the outer, or longer, concave, obtuse, and cleft at the summit with a straight awn rising just below the apex; paleæ lanceolate, small, awnless, nerved, the nerves hairy; scales ovate, acute, swollen at the base; ovary hairy; styles two, short, reflex, hairy, placed on the side of the summit of the ovary; stigmas simple; seed oblong, convex on one side, furrowed on the other.

1. **Bromus erectus**, Huds. **Upright Brome-Grass.**

Root perennial, black, fibrous, downy; stem erect, stiff and straight, simple, rarely downy, three feet high; joint somewhat downy; leaves linear-lanceolate, ribbed, rough, acute, nearly erect, with long slender hairs pointing upwards, the upper ones broader than those of the root; sheaths striated, smooth, or slightly hairy, the hairs ascending; ligule short, blunt, ragged; inflorescence paniced; panicle nearly simple, or a little branched, erect; branches and rachis rough, the lower branches placed in clusters of three together; spikelets linear-oblong, compressed, erect, often of a purple hue, either smooth or downy, containing eight or nine florets; outer glumes lanceolate, acute, keeled, the inner one the larger and three-nerved, glossy; dorsal rib toothed all along lower part, without lateral ribs; flowering glume lanceolate, with closely appressed hairs on the back, bifid at the summit, seven-ribbed, four of the ribs being very faint, the midrib toothed all its length, and terminating in a straight, rough awn, situated below the bifid summit; palea the same length as the flowering glume, awnless; anthers oblong, cloven at both ends, delicately fringed, saffron-colour.

Either sandy or chalky soil suits the erect Bromegrass; we are accustomed to see it in sandy corn-fields in Kent, where it grows as a weed among the rich crops. Mr. Sinclair describes it as inhabiting similar situations, but Mr. Curtis has always found it in chalky land, so he gives that as its only congenial soil.



It is a grass of not unpleasing appearance: there is a certain stateliness about its upright stem and small panicle, and a quiet sobriety of colouring in the contrast between the purple tinge of the spikelets and the grey green of the rachis, stem, and foliage. Pheasants like the seed, but cattle reject the herbage. It is rare in Scotland and Ireland, but pretty frequent in the eastern and south-eastern counties of England.

Its foreign homes are Norway, Sweden, Germany, France, and Italy. It is not found in America.

It flowers late in June, and ripens its seeds in a month.

Dr. Parnell mentions a hairy variety, the glumes and paleæ of which are very hirsute; it grows only on sandy soil.

2. *Bromus asper*, Linn. **Hairy Brome.**

Root annual or biennial, fibrous; stem often six feet high, erect, smooth in the upper part, cylindrical; joints several, small, slightly hairy; leaves spreading, broad, of a full green, ribbed, rough, clothed with long, spreading hairs, all

nearly of equal breadth, the radical ones slightly broadest; sheaths rough, with deflexed hairs; panicle simple, drooping, branched; rachis and branches very rough, branches in pairs; spikelets lanceolate, almost cylindrical, an inch long, tinted with purple, containing about nine florets; outer glumes very unequal, acute, the upper the longest, three-ribbed; dorsal rib toothed nearly its whole length; flowering glumes longer than outer ones, nearly cylindrical, glabrous, or slightly hairy, bifid at the summit, a long awn arising from a little below the apex; palea closely fringed on the keel, its membranaceous edges bent in.

This lordly grass is a frequent denizen of our thickets and hedgerows, especially in rather moist situations.



The tall stature, large panicle bending gracefully, and long branches drooping slightly in flower, and arching more and more as the ripening seed adds weight to the long spikelets; its ribbon-like leaves, the highest standing almost erect, its apex not seldom overtopping the panicle, and the lower ones arching and bending with varied grace, and the beautiful form is complete. It is impossible even in the greenhouse or stovehouse to find a more graceful adjunct to a drawing-room bouquet

than this grass, and its effect is perfect among gay flowers. The faint purple tinge often cast upon the spikelets does

not bestow the charm of contrast, not being a clear or full tint; as regards colour, the Rough Brome-grass can only boast its own full green. It is a common plant throughout Britain, its bearded spikelets drooping from nearly every hedgerow, especially such as border woods and shady lanes.

Abroad, it is found in Norway, Sweden, Germany, Switzerland, France, Italy, and Russia. It has no agricultural value.

It flowers in July, or the first week in August, and, like the last species, produces ripe seeds in a month.

3. *Bromus sterilis*, Linn. **Barren Brome.**

Root annual, small, creeping, fibres capillary; stem one to two feet high, slender, striated, rough, leafy to the top; leaves spreading, flat, rather flaccid, narrow, acute, ribbed, rough at the edges, and furnished with a few straggling white hairs; ligule blunt, ragged; sheath cylindrical, ribbed, with soft deflexed hairs, upper one equal in length to its leaf; panicle mostly simple, drooping, spreading, light green, or tinged with purple, branches long, slender, rough, occasionally divided, the lower ones generally in pairs; spikelets lanceolate, pendulous, brownish-green, afterwards dark purple, containing from six to eight florets; outer glumes unequal, acute; the larger one angular, three-ribbed; the lower one without lateral ribs, and sharply toothed on the upper half of the keel; flowering glumes longer than the outer ones, seven-ribbed, rough on the back, with a straight awn much longer than the glume itself; palea linear-lanceolate, two-thirds the length of the flowering glume, with two green marginal ribs delicately fringed; ovary egg-shaped, styles growing laterally out of it.

A frequent ornament of waste places, especially dry,

sandy hedgebanks on roadsides. The sandy Kentish soil, which nourished the *B. erectus*, bore whole crops



of *B. sterilis*, on the steep hedgebanks on the sunny side of the lane or highway. There is no county in England where it is scarce, and its frequency may cause it to be despised. But notwithstanding its unpromising name, and the absence of nutritious qualities to recommend it to agriculturists, the Barren Brome-grass is a very handsome species. The drooping panicle, arching branches, large bearded spikelets, at first compact, but spreading when the flower

is past, and exchanging their light green tint for a full ruddy purple, and plentiful foliage, makes a truly elegant spray for ornamental purposes. It flowers in June, and ripens its seed in July.

Its foreign homes are Lapland, Norway, Sweden, Germany, France, Italy, and North Africa.

4. *Bromus maximus*, Desh. Great Brome-grass.

Root annual, fibrous; stem upright, cylindrical, rather downy, leafy, one to two feet high; joints four; sheaths small, upper ones ribbed, lower ones pubescent; ligule large, ragged; leaves flat, pointed, downy on both sides, rather rough on the margins; inflorescence racemed, upright; rachis and branches downy; spikelets longer than their

footstalks, often measuring three and a half inches, the awns inclusive, containing eight florets; empty glumes unequal, smooth, minutely toothed on the keels; the outer one only two-thirds the length of the inner, both lanceolate, pointed; flowering glumes larger and broader, acutely lanceolate, very rough to the touch, with deflexed bristles, bifid at summit, with shining edges, and seven ribs, awned; awns rough, straight, not exceeding double the length of the florets; palea very thin, membranaceous, linear-lanceolate, fringed on the folds, one-third shorter than the flowering glume; ovary ovate, styles arising from its summit, stigmas feathery; filaments slender; anthers notched at each end; scales pointed.

This rare species has a considerable resemblance to the Barren Brome-grass, but its spikelets are longer and much broader, the awns of the lower florets exceeding in length those of the upper ones, so that the points of all are nearly equal, and the footstalks are shorter, undeserving the name of branches.

There is a peculiar acute, conical point at the base of the florets, which will distinguish this from every other species; the downiness of the rachis and branches distinguish it from *B. sterilis*, and also the awn of the flowering glume, which is at least half as long again as itself.



Mr. Babington found this handsome grass at St. Aubyn's Bay, Jersey, and it has been discovered in other parts of that island, but not elsewhere in Britain. Its

rarity is not a subject of regret, for it is not only useless for agricultural purposes, like most of its family, but, according to Dr. Parnell, it has some bad qualities; the florets, when ripe, have the property of insinuating themselves under the wool of sheep, and thrusting their sharp awns into the flesh to some depth. No cattle care to eat it.

It flowers in June.

It is frequently to be found on the shores of France, Spain, Italy, and Africa, affecting all the coasts of the Mediterranean.

5. **Bromus madritensis**, Linn. **Compact Brome-grass.**

(*B. diandrus*, Eng. Bot.)

Root annual, fibrous; stem about a foot high, erect, stiff, slender, striated, smooth, polished; leaves often entirely smooth, flat, linear, acute, hairy on both sides; sheaths ribbed, a little keeled, generally smooth, but sometimes with hairs pointing downwards, the upper one downy; ligule short, blunt; panicle or raceme upright, spreading, scarcely subdivided, nearly three inches long; spikelets linear-lanceolate, erect, rough, often tinged with brown, their stalks seldom so long as themselves, the lower ones in pairs, containing each about eight florets, not exceeding two inches in length; empty glumes unequal, acute, upper one longest, three-ribbed, the middle rib minutely toothed on the upper part; flowering glume longer than the empty ones, bifid at summit, and with white hairs on the margin, seven-ribbed, the ribs on either side of the central one very faint, central one minutely toothed its whole length; palea linear-lanceolate, shorter than the flowering glume.

Although a foot is given as the height of this grass, it is much oftener of lower growth. It delights in dry

banks, rocks, and walls, and in the latter two situations it is only about six inches high. Its spikelets resemble those of the Barren Brome-grass, but they are upright instead of nodding, and they stand on short, firm footstalks, instead of long drooping ones; besides these differences, the erect growth, and close panicle, and the smoothness of the stem and footstalk are sufficiently distinct characteristics. It is a pretty compact little grass, its beard seeming wonderfully long for so small a herb. About Clifton it grows freely, and in rocky places in Gloucestershire, Surrey, Kent, Hampshire, and Devon.



It is not found in Ireland, except in county Tipperary. Its foreign homes are Germany, Italy, France, and Switzerland.

It flowers late in June, and its seeds are ripe at the end of July.

6. *Bromus arvensis*, Linn. **Field Brome.**

(*B. pratensis*, *B. commutatus*, Eng. Bot.; *B. patulus*, Brit. Fl.; *Serrafalcus*, Bab. Man.)

Root annual, fibrous, small; stems two or three feet, numerous, leafy, striated, smooth, hard, nearly solid, a little hairy just beneath the panicle; joints several, hairy, mostly covered by the sheaths; leaves a little downy on both sides, rough at the edges, striated, narrow, flat, pointed; sheaths thickly clothed with soft hairs, pointing downwards, shorter

than their leaves, the uppermost one very small; ligules prominent and jagged; panicle spreading, especially when in fruit, at first erect, then drooping, many-flowered; rachis rough, branches whorled, spreading, rough; spikelets linear-lanceolate, acute, containing seven florets, remarkable for a glossy appearance which none other of the family has, frequently tinged with reddish-brown; empty glumes very unequal, acute, ribbed, membranaceous at the edge; lower glume five-ribbed, upper three-ribbed, the larger slightly awned sometimes; flowering glumes short, oblong, turgid, bifid at the summit, awned; awns slender, about the length of the glumes, seven-ribbed, glossy at the margin; paleæ thin, white, membranaceous, smaller than the flowering glume.

This species is much less striking in appearance than the Barren Brome or the Hairy Brome, the spikelets



are fewer and shorter, and of a broader and fuller shape, the branches are shorter and more erect, and the panicle altogether more compact. Dr. Parnell gives, as a distinctive feature, the length of the larger outer glume being just half that of the spikelet, but surely the spikelets on his specimens must have been unusually short, or the outer glumes unusually long.

The Field Brome is an abundant grass, found frequently in cornfields in England but not at all in Scotland or Ireland. It is a native of colder countries, as Lapland, Norway, Sweden, France, Germany, etc.

Bromus arvensis, var. *commutatus*. Grows to the same height, is more jointed in the stem, having generally five joints, while the normal form has but four; its panicle is more drooping, the lower branches in clusters of three, the spikelets contain as many as ten florets, and are more narrowed to the point than in the typical *arvensis*. It is found where the soil is rich, and affords good herbage for sheep and lambs. Dr. Parnell describes it as more frequent than *B. arvensis*, favouring Scotland and Ireland as well as England, and extending through Italy and Western Asia.

Bromus arvensis, var. *patula*, has the panicle much more spread, and the spikelets also broader and heavier; the flowering glumes are nine-ribbed, and the anthers are much smaller than in the normal form. We cannot claim it as a British native, for it only appears occasionally in cornfields and waste places, where the seed may have been conveyed artificially. It is indigenous in France and Germany.

Bromus arvensis, var. *multiflorus*. Many-flowered Field Brome is a handsome variety, with very long spikelets, broad flowering glumes, and enlarged outer glumes.

The *B. arvensis*, and all its varieties, are valuable when cut early among other grasses for hay. They flower from the middle of June to the beginning of July, and seed in the latter month.

7. *Bromus giganteus*, Linn. Tall Brome-grass.

Root perennial, fibrous; stems three to four feet high, or even taller, smooth, glossy, striated, leafy; leaves rather erect, pointed, a foot long, broad, flat, ribbed, rough on both surfaces, and at the margins; sheaths long, striated, quite

smooth; ligule short, purplish, clasping the stem; panicle elongated, branched, drooping, of many spikelets, compound; rachis rough; branches rough and compound; spikelets ovate, lanceolate, smooth, drooping, containing from three to six florets, small; outer glumes unequal, the lowest with one rib, the upper with three, both pointed and smooth; flowering glumes ovate-lanceolate, smooth, scarcely keeled, awned; awn on, or a little below the apex of glume, more than twice its length, very slender, white, and sometimes bent; ovary glossy.

This is one of the most elegant of the Brome-grasses, vying with the Hairy and Barren species in its drooping panicle, and greatly exceeding them in the beauty of its



foliage, its long verdant ribbon-like leaves being remarkably elegant. It is often to be seen in the grove or hedgebank, sheltering itself from the rough winds amid the branches of the bushes, and bending forwards its graceful panicles and green pennons at will.

The number of florets in the delicate spikelets is variable; many authors have created a second species of such specimens as they have found with only three blooms in the spikelet, but this is

not a reliable distinction. Yorkshire, Oxfordshire, and Kent, are the counties assigned to this species by Sir J. E. Smith; and we can testify to its presence in the

first- and last-named counties, and also in Herefordshire. It is pretty frequent, indeed, all over England, but more scarce in Scotland.

Flowers late in June and early in July.

Its foreign homes are Germany and Denmark, and most temperate countries of Europe.

8. **Bromus secalinus**, Sir J. E. Smith. **Rye-like**
Brome-grass.

Root annual, fibrous; stems simple, round, smooth, and leafy, about three feet high, striated; joints five, somewhat hairy; leaves broadish, flat, pointed, ribbed, rough on the edges and under surface, downy above; sheaths furrowed, but not rough; panicle spreading, erect, somewhat drooping in seed; branches nearly simple, the lower ones placed in clusters of three; spikelets ovate-lanceolate, compressed, seven- to ten-flowered, closed when young, but when in seed so spreading that the rachis branch is seen all along the spikelet, glossy, yellow-green; outer glumes unequal, awnless, broad, acute, roughish, membranaceous at the edges, toothed on the upper part of the keel, the inner seven-ribbed, the outer three-ribbed; flowering glumes roundish or oval, smooth, rarely downy, flat, seven-ribbed, awned; awn rough, about the length of the glume; paleæ linear, oblong, toothed or fringed.

This grass is a native of England, especially prevailing in Norfolk, where it is a troublesome weed among corn; it flowers early in June, lifting its handsome panicle above the tops of the young wheat or rye, and preparing abundant seed to mix with that of the corn, the effect of which is to impart a bitterness to the flour made from such mixed grain.

It is frequent throughout the British Isles, and also

in Norway, Sweden, Germany, France, Italy, and western Asia.

B. secalinus, var. *velutinus*, has large oblong spikelets, the florets of which are more numerous than in the normal form, sometimes amounting to as many as fifteen, all of which are thickly clothed with soft down. It has the same habit as *B. secalinus*, of expanding its florets when in seed so as to disclose the rachis.

B. secalinus, var. *vulgaris*. Pendulous Rye-like Brome-grass.—A graceful variety, with the panicle drooping elegantly to one side; the spikelets expand still more than in the normal form, and the margins of the flowering glumes curl in, so as to exhibit the rachis in a striking manner, and give a very light appearance to the spikelet; the spikelets are very large, and the branches of the rachis drooping.

9. *Bromus mollis*, Linn. **Soft Brome-grass.**

Root annual, of a few simple fibres; stems erect, about two feet high, simple, striated, generally smooth; joints swelling, thickly clothed with hairs; leaves rather narrow and short, very downy; sheaths also very downy; panicle compound, erect, close, two or three inches long, expanding when the flowers open; rachis and branches downy, the latter in half-whorls and angular; spikelets nearly upright, ovate, acute, thickened, imbricate; outer glumes unequal, scaly at the edges, keeled, ribbed, downy; flowering glume resembling the outer ones, awned; awns situated a little below the summit of the glumes and about their length, rough; paleæ without ribs, membranaceous, the edges thickened, green, and fringed.

This is a common grass in pastures, meadows, and waste places, easily distinguished by its general downi-

ness and dense panicle of heavy spikelets. The contrast which its more solid form and grey tinted foliage affords to the light panicles and verdant leaves of the surrounding Poas, is very striking and agreeable.

It is cried down as useless or worse than useless as a meadow and pasture grass, and experienced agriculturists examine their Rye-grass seed with great care lest there should be any admixture of Soft Brome. But such was not always the opinion of the learned in agriculture. About the commencement of the present century this grass was grown in the district of Kilkenny and other parts of Ireland, and it is reported that the English dragoon regiments quartered there were ready to give ten shillings a ton more for hay made of Brome-grass than for hay made of Rye-grass. In Withering's time Brome-grass was often sown among clover. Curtis and Martin both recommend it in their botanical writings, because of its early growth and the largeness of its seeds, which, in their opinion, made the hay more nutritious.

It used also to be cultivated extensively in Scotland, and Mr. Lawson speaks of the practice, which he strongly reprobates, and makes it account for the prevalence of the grass in the present day. He says, "To that early practice of sowing the Brome-grass may be traced its present appearance in Rye-grass fields, where it is now considered an intrusive weed, indicative of impurity in the Rye-grass seed; though, like the Wild Oat, and other indigenous annuals, its presence may, at least occasionally, be traced to the seeds of former crops retaining their vitality when buried to a certain depth in the soil."

The present agriculturists of Scotland are in no danger of repeating so useless an experiment as raising crops of Brome-grass instead of Rye-grass.

The *B. mollis* flowers in June and ripens its seed in July.

B. mollis, var. *pratensis*. Meadow Soft Brome-grass is a less downy form of *B. mollis*, but cattle do not find that that makes it more palatable to them, for they reject both the normal form and the variety whenever they can get any more juicy grasses. Neither of them produce any great quantity of herbage.

10. ***Bromus racemosus***, Sir J. E. Smith. **Smooth
Field Brome-grass.**

Root annual, fibrous; stems erect, from one to two feet high, leafy, downy; joints rather downy; leaves linear-lanceolate, flat, downy, pointed; sheaths striated, the upper smooth, the lower downy or hairy; panicle nearly erect, spreading, simple, rachis and branches rough; spikelets ovate, of about eight imbricated, depressed, ribbed, smooth florets, of a light green colour; outer glumes nearly equal, outermost three-ribbed, inner seven-ribbed; flowering glume longer than the outer glumes, seven-ribbed, awned, bifid; awn nearly as long as the glume, rough, and slightly wavy; paleæ oblong, narrow, ribbed at the margin, the ribs green and fringed with white.

This grass is accounted by Sir W. Hooker as a mere variety of *B. mollis*. It is of more slender growth, and not hairy, and these are the only differences which strike the general observer. A more minute examination shows the distinctions so carefully noted by Dr. Parnell, the toothing on the midribs of the outer glumes, and the position of the apex of the larger outer glume *just half-way between its own base and the summit of the third floret on the same side*. Besides this, the spikelets of *B. mollis* are rough to the touch, and those of *B. racemosus* are smooth.

It is found not unfrequently on gravelly soil throughout the British Isles. It is indigenous in Norway, Sweden, Denmark, Germany, France, Switzerland, North Africa, and North America.

It flowers a little later than *B. mollis*, but is not more valuable in an agricultural point of view.

B. racemosus, var. *subsecalinus*, Smooth Oval Brome-grass, is a variety with shorter and broader spikelets, externally resembling *B. secalinus*, but distinguished by the difference in the length of the larger outer glumes. The other characteristics are the same as in the normal form of *B. racemosus*.

11. **Bromus squarrosus**, Linn. **Corn Brome-grass.**

Root annual, fibrous; stems a foot high, simple, smooth, ribbed, leafy, glossy; joints four, the upper ones covered by the sheaths; leaves linear-lanceolate, flat, covered with a very short, deflexed down; sheaths covered with the same down as the leaves, soft, except the uppermost one, the hairs of which are stiffer; ligule notched; panicle of few spikelets, nodding to one side; rachis rough, branches simple, compressed, thickening upwards, rough; spikelets very large, oval, inflated, closely overlapping, containing about ten florets; outer glumes unequal, awnless, outer one smaller and three-nerved; inner one five-nerved; flowering glumes larger than the largest outer one, with nine nerves, and three teeth at the apex, membranaceous and glossy at the margin, awned; awns awl-shaped, rugged, as long as the glume; palea short, thin, white, blunt, with green ribbed edges, and white hairs on the margin; seed adhering to the flowering glume and palea, elliptic, downy at the apex.

This species is a very doubtful native. Its spikelets are often tinged with reddish-brown, and Dr. Parnell

has discovered that the apex of the larger outer glume is just halfway between the apex of the *second floret* and its own base; the spikelets are broad in comparison to their length, and their awns spread widely. By these distinctions the species may easily be recognized when it appears amongst us from time to time in the corn-fields of the south of England.

It flowers in July, and ripens its seed in August.

Genus XXXI. FESTUCA. FESCUE-GRASS.

Gen. Char. Spikelets slender, roundish, two-ranked; outer glumes erect, unequal, keeled; flowering glumes lanceolate, somewhat cylindrical, pointed, awned; scales either two, ovate-lanceolate, and acute, or one concave, notched and horizontal; filaments three, hair-like, shorter than the flowering glume; anthers oblong; ovary turbinate, glabrous, sometimes a little downy; styles two, short, reflexed, stigmas downy; seed oblong, slender, sharply pointed at both ends, marked with a longitudinal furrow.

1. *Festuca ovina*. Sheep's Fescue.

(*F. duriuscula*, *F. cæsia*, and *F. rubra*, Eng. Bot.)

Root fibrous, perennial; stems upright, angular, roughish under the panicle, smooth on lower part; sheaths roughish; leaves very narrow, awl-shaped, only one or two on the stem, growing in dense tufts from the root; panicle small, short, close, upright, the branches all on one side; spikelets upright, containing six florets; outer glumes acute, unequal, the upper one three-ribbed, the lower with only one rib; flowering glume five-ribbed and awned; awn very short, rough; palea with two teeth at the summit and green ribs on the margin.

One of the most useful of our British grasses, the fa-

vourite of sheep, abounding in all our hilly districts, and producing a constant crop of sweet, short, nourishing herbage. Its slender stems and minute panicles are easily overlooked, and its dark tufted foliage alone attracts the eye; the leaves so narrow as to be almost bristle-shaped. In the Highlands this grass forms the main sustenance of the sheep, indeed Linnæus declares that sheep have no relish for hills where it is absent. We learn from Gmelin that the Tartars had a great appreciation of Sheep's Fescue, for they sought about among the hills until they found a tract where it abounded, and then fixed their tents there for the summer. As a meadow grass Sinclair considers it inferior to the variety *rubra*, excepting for its after-math, which cannot be excelled. It is very useful as a lawn-grass.



Throughout Britain it is common in healthy situations, and also in Lapland, Norway, Sweden, Germany, France, Switzerland, Spain, Portugal, Italy, Russia, Iceland, Siberia, Greenland, and North America.

F. ovina, var. *vivipara*, is not uncommon in alpine situations; we have seen it thus in Scotland, and in the hilly districts of Yorkshire and Durham; leaves grow out of the glumes, and the panicle becomes a mass of long ragged foliage.

F. ovina, var. *duriuscula*. Tall Sheep's Fescue.—This is accounted a distinct species by most authors. It has

a creeping habit, its stems grow from one to two feet high, the stem-leaves are lanceolate and finely striated, the radical ones are very narrow, the panicle is erect and branched, larger than that of *F. ovina*, the spikelets are larger, and contain seven florets; the outer glumes are lanceolate and unequal, the flowering glume, awn, and palea are like those of *ovina*, but the stem is quite smooth, even beneath the panicle, and the upper leaf is smooth on the outer surface. Recommended by Messrs. Wheeler for nearly every kind of meadow land.

Soil and situation take great effect on these Fescue grasses, and modify their characteristics so as to give rise to numerous varieties. Dr. Parnell treats of the *F. duriuscula* as a distinct species, and he considers it liable to the following varieties:—

F. duriuscula, var. *hirsuta*, more decidedly creeping in habit, and with the flowering glume covered with hairs.

F. duriuscula, var. *filiformis*, very slender in its habit of growth, tall, and the upper part of the panicle drooping gracefully, flowering glume with a slender awn half the length of itself, the stem-leaves long and narrow, the stem branched near the root.

F. duriuscula, var. *arenaria*, of smaller size, short, and compact in every part, root widely creeping, foliage scanty and soon withering; a native of the seacoast or sandy places.

F. duriuscula, var. *humilis*, another slender variety, distinguished by the extreme narrowness of its panicle, and the smoothness of the outer surface of the leaves, whilst the sheaths are hairy, the stem is smooth, with one or two joints far from each other. This is an alpine form.

The Tall Sheep's Fescue is very productive, and its herbage springs early in the season; it endures drought well, and is much liked by sheep. The herbage is not remarkably nutritious, yet it is valuable because reliable. When grown on a poor siliceous soil, the culms become so fine that Mr. Sinclair recommends them for the manufacture of straw hats. Hares are as fond of it as the sheep are. When grown for meadow grass, it should be cut when in flower.

F. ovina, var. *rubra*, is a very important variety, often also accounted a species. It is a large plant, its stems growing two feet high, and less slender than the other varieties, and its root creeping extensively; its spikelets contain seven or eight florets, and all the leaves are awl-shaped. Its natural habitat is sandy and stony ground, on the seashore or among hills. It is sometimes called var. *sabulicola*. Its qualities are the same as those of the other varieties. Messrs. Wheeler recommend it especially for lands on lower red sandstone formations.

F. ovina, var. *hordeiformis*, Long-awned Fescue-grass, is an imported variety, very valuable to agriculturists. Sinclair pronounces its herbage better, more tender and succulent than that of the other varieties, and recommends it highly for permanent pastures; and its culms for straw-hat work.

F. ovina is highly recommended by agricultural seedsmen for hilly situations. Messrs. Wheeler include it in their lists for land on chalk, arenaceous, London clay, oolitic, limestone, Wenlock, and lower Silurian formations.

2. *Festuca elatior*, Linn. **Meadow Fescue.**

Root perennial, creeping, tufted; stems erect, numerous, cylindrical, smooth, furrowed; three to five feet high; joints about five, tinged with dark blackish-green; leaves flat, linear or rather broad, acute, the upper leaf the smallest, rough on the inner surface; ligule short; sheaths smooth; panicle spreading or spike-like, very variable, leaning to one side; rachis rough; spikelets containing from five to ten florets, ovate-lanceolate, nearly an inch long; outer glumes unequal, the inner one three-ribbed, the outer only keeled; flowering glumes long, broad, roughish, five-ribbed, blunt or toothed at the apex, awned; awn very short, rough; palea large, acute, with a green rib along each edge.

The Meadow Fescue selects moist meadow or pasture land when it is self-planted.



Rich Yorkshire meadows bordering the hillsides, and supplied with many a brook, and an occasional swamp, are favourite homes of this grass; and very graceful its tall, bending, tapering panicle looks, as it overtops the Poas and Cynosurus, and bends to the breeze as if from courteous choice rather than necessity.

It is a very valuable agricultural grass, praised by the experienced Mr. Sinclair and the grass students who succeeded him, and included by Messrs. Wheeler in nearly every group of grasses recommended for land on the

different strata. It is specially suited for good loams and clayey soils, and all rich and rather moist land, but it will also flourish on dry loams. It is very good for permanent pasturage or meadow, producing a large quantity of hay if cut in flower, and very good afterwards if grazed. Mr. Sinclair values it next to *Alopecurus pratensis*; taking it for the whole season for a hay crop merely, it is superior to the Meadow Fox-tail. Cattle are very fond of it.

It flowers at the end of June or beginning of July, and ripens its seeds three or four weeks later.

The slender manner of growth, narrow spikelets, compound panicle, and short, almost invisible awns, distinguish the species.

It is general throughout Britain. Its foreign homes are Lapland, Norway, Sweden, Germany, France, Switzerland, Italy, and North America.

F. elatior, var. *loliacea*. Spiked Meadow Fescue. This has generally been accounted a distinct species, but Mr. Bentham considers it but a variety. It has a perennial, fibrous root; erect, round, striated stems; lanceolate, acute leaves; and a slightly decurrent ligule. The spike, or rather raceme, occupies a third of the stem, the rachis leans to one side, and the slender spikelets stand on minute footstalks, and contain each from six to ten florets; the outer glumes are small and unequal; the flowering one longer, five-ribbed; the paleæ narrow, acute, membranaceous, with green ribs on the margin.

This Fescue resembles the *Lolium perenne* in the form of its spike, though the spikelets are more tapering and elegant. The presence of two outer glumes to each spikelet distinguish it from the *Lolium*. There is a

grace about the whole plant to which the *Lolium* is a stranger.

The Spiked Fescue grows naturally in the same kind of fields as those selected by the Meadow Fescue. It is a very valuable grass for permanent pasturage; its herbage is superior to that of the Rye-grass, but it does not ripen seed in sufficient quantity to make it as easy of cultivation as that favourite grass. It springs earlier, affording a dainty mouthful when grass is very scarce, and it becomes more productive as its age advances.

It is frequent in Germany, France, and Italy.

It flowers in the middle of July.

F. elatior, var. *pratensis*. Common Meadow Fescue resembles the *F. elatior* very closely, but very generally considered as a distinct species. The panicle is quite simple; the height of the stems from fifteen to twenty-four inches; the spikelets ovate-lanceolate, containing five or six florets; flowering glumes furnished with a very short rough awn; the radical leaves broader than those of the stem.

This variety is frequent in Britain, and has the same qualities as the normal type. Its foreign homes are also the same.

F. elatior, var. *arundinacea*. Tall Meadow Fescue is a variety frequenting watery places, and affecting a reed-like manner of growth. The panicle is more spreading than in the normal form, and the leaves broader. It prefers maritime situations.

F. elatior, var. *variegatum*. Variegated Meadow Fescue. Here the spikelets are tinted with purple and white, the branches of the rachis are very short, and the leaves are broad and hairy on the inner surface. Resembles the last variety in its choice of habitat.

3. *Festuca sylvatica*, Vill. **Reed Fescue.**

(*F. calamaria*, Eng. Bot.)

Root perennial, creeping, tufted; stems upright, slender, roughish, two to three feet high, with broad scales at the base; leaves broad, flat, acute, glossy, striated, of a light green colour; sheaths rough; ligule blunt; panicle compound, drooping, unilateral; rachis rather rough; branches roughish, placed in pairs; spikelets small, numerous, containing four or five flowers; the outer glumes narrow, acute, awl-shaped; flowering glumes rough, three-ribbed; the keel toothed, sharply pointed, but not awned; palea fringed at the margin.

This is a tall reed-like grass, the panicle small, because the spikelets, though numerous, are of minute proportions and much crowded together. It is rare; it makes its home in Alpine woods, and though found in various localities in many parts of Britain, it is nowhere abundant.

It is indigenous in France and Germany.

It flowers in July.

F. sylvatica, var. *subaristata*. Awned Reed Fescue.

In this form of the Reed Fescue the midrib of the flowering glume extends a little beyond the glume, so as to form a rough point or short awn. It is found, according to Dr. Parnell, in various parts of the United



Kingdom. It flowers in June, and sheds its readily falling seed in July.

4. **Festuca Myurus**, Linn. **Rat's-tail Fescue.**

(*F. bromoides*, Eng. Bot.; *F. sciuroides*, Bab. Man.)

Root annual, tufted, fibrous; stem upright, slender, smooth, cylindrical; joints smooth, three in number, the highest halfway up the stem; leaves narrow and awl-shaped, short, smooth behind, hairy above; panicle simple, long, slender, slightly arching; rachis rough; branches rough, angular; spikelets containing five florets; outer glumes unequal; flowering glumes as long as the largest of the outer ones, and furnished with an awn as long as itself, rough, and very slender; palea thin, lanceolate, toothed at the summit.

This Fescue is a frequent denizen of waste places, rocks, and wall-tops. It is said to be more frequent in England than in Scotland, but we have found it on "dykes," both about Edinburgh and in the Isle of Bute. The normal type of this grass has a panicle three inches long, the spikelets turning one way, the awns nearly as long as the spikelets. It is a starved-looking grass, and soon withers in drought. It is of no agricultural value.

Difference of situation af-



fects it considerably, and causes it to run into the following varieties:—

F. Myurus, var. *bromoides*. The panicle is longer and more slender, and the glumes shorter in comparison to the awns. More starved-looking than the normal type.

F. Myurus, var. *nana*. The sheaths entirely envelope the stem to the very base of the panicle. Still more starved-looking.

Dr. Parnell describes the *F. Myurus* as a handsome grass in cornfields, where it grows two feet high, is graceful in style, and of a pleasant green colour. These are the best circumstances in which to see it, for in waste places and on wall-tops its height varies only from two to eight inches!

In Belgium, France, Germany, Switzerland, and Italy it is as common as in England.

It flowers the second week in June, and ripens its seed in the middle of July.

5. *Festuca uniglumis*, Soland. One-glumed Fescue.

Root annual; stems about six inches high, slender, angular, leafy; joints three, the two lower ones covered by the sheaths, the upper exposed; leaves small, awl-shaped, hairy on the inner surface, smooth on the outer; sheaths loose, smooth, striated; ligule very short; panicle spike-like, one-sided, about two inches long; spikelets crowded, their footstalks erect, short, thickened at the top; outer glumes unequal, the first so small as to be microscopic, the second about five lines long; the flowering glumes are shorter than the second outer one, and are furnished with awns longer than themselves; palea thin, narrow, bifid, edged with a thick rib of green, and fringed above.

The extreme minuteness of the outer glume causes it often to be overlooked, and thus the grass has got the name of One-glumed Fescue.



This is a maritime species, frequenting sandy and stony places about the coast. It resembles the last in many respects, and is common throughout England, but is not found in Scotland.

It has no agricultural value.

It flowers in June and ripens its seed in July.

It is indigenous on most sandy shores in western Europe.

Genus XXXII. DACTYLIS. COCK'S-FOOT.

Gen. Char. Inflorescence in a slightly branched panicle; spikelets several-flowered, crowded into dense clusters; outer glumes unequal, pointed, keeled, convex; scales lanceolate, pointed, swollen at the base; filaments three, slender, longer than the flowering glume; styles spreading; stigmas feathery; seed oblong, naked, furrowed.

***Dactylis glomerata*, Linn. Clustered Cock's-foot.**

Root perennial, fibrous, tufted; stem cylindrical, upright, ribbed, rough, two feet high, leafy; leaves flat, linear-acute, flaccid, rough at the edges, of a dull green colour, five or six on the stem; sheaths rough, striated; ligule long, ragged; panicle erect, slightly branched, spreading; the rachis rough, branches few, simple, rough, the lowest much longer than the others standing nearly at a right angle with the stem,

each branch with a tubercle at the base; spikelets flattened, ovate, three- to five-flowered, crowded in dense clusters, and placed on very short footstalks, several at the end of each branch; outer glumes unequal, lanceolate, strongly keeled, the keels very hairy on the upper half, and ending in an awn-like point; flowering glume long, closely resembling the outer ones, the point longer, five-ribbed; palea membranaceous, fringed at the edge, bifid at the summit.

This grass is very common not only in pastures and meadows but in orchards, waste places, and by roadsides. It was originally introduced into England from Virginia by the Society of Arts. It has become thoroughly naturalized, for it pervades grass-land throughout the kingdom, flowering during the whole summer. It thrives the best in damp situations, but it does not reject dry ones, nor even seem much injured by the droppings of trees and their constant shade. It is a coarse, hardy grass, growing in dense tufts, and easily recognized by its tall strong stem and oddly branched panicle, the long horizontal branch at its base having a fanciful resemblance to the solitary claw on the cock's foot.



As an agricultural grass it possesses very high qualities, but requires careful treatment. Both the leaves

and stems are highly nutritious in their early state, but when old and rank their nourishment is reduced by half. Hence it is better for pasture than for hay, as the constant cropping secures a frequent succession of young herbage. It is valuable also for hay, and superior, in the opinion of Mr. Sinclair, to the Rye-grass. It does best in deep soil, as its roots strike deep. If allowed to grow very high, it becomes very coarse; but when kept down by frequent cutting, or well grazed, it affords first-rate food for sheep. In an essay on grass-land, inserted in the Communications to the Board of Agriculture, it is stated that women and children make good earnings by gathering the seed of this grass at 4s. a bushel. Farmers are recommended to sow two bushels in an acre with 10 lbs. of red clover; by the time the clover is worn out, the grass fills the land. It is not necessary to collect the seed in this manner now, as Messrs. Wheeler, and many other seedsmen, have it ready in stock; it is also thought very preferable to sow it with equal quantity of other grass seeds: in this way the most superior permanent pastures are formed. In the Norfolk Report on Agriculture, 1788, we read that "Sir Mordaunt Martin, observing, by an experiment, that this grass grew four inches in less than three days, determined to attend more particularly to it; he remarked that when sheep were let out of a fold, they ran over everything to get at a balk that was full of it, and ate it in preference to other grasses. In some parts of Norfolk it is called cows' grass, from their being very fond of it. He began to cultivate it in 1794. It grows at Midsummer, in a drought, when everything else is burnt up. He sows it with Nonsuch, instead of Ray-grass, and finds it much more profitable. Mr. Overman, also, observing

the eagerness with which sheep, when let into a field at Burnham-Market that had some Cock's-foot grass in it, ran over Ray-grass, and everything else, to get a bite of this plant, thought it worth cultivating, and sowed about an acre on the dry gravelly part of his farm, just above the marsh. This spot was the only one, in a large field, that did not burn in the severe drought of 1800, and this convinced him of the excellence of the grass."

This grass soon arrives at maturity, thrives in every variety of situation, produces a large quantity of herbage, grows very rapidly, and is a favourite with every kind of cattle. It is found in the best pastures of Devonshire, Wiltshire, and Lincolnshire, and it does not impoverish the ground as Rye-grass does; on the contrary, instances have been known of a fine crop of wheat being produced on land for some time occupied by the Cock's-foot grass. It is very excellent as a lawn grass.

Mr. Wheeler in his 'Little Book on Grasses,' tells us that this grass is getting into extensive cultivation in America, where it goes by the name of "Orchard-grass." He recommends it among those grasses suited "for a poor stiff soil on a clay subsoil."

The Tussac-grass of the Falklands (*Dactylus cæspitosa*) is a near ally of our Cock's-foot. It is a very nutritious grass, producing great quantities of herbage, but it is not eligible for general cultivation, because it cannot thrive out of reach of the sea-spray.

The Cock's-foot grass is indigenous in Norway, Sweden, Denmark, Germany, France, Spain, Portugal, North Africa, Russia, and the United States.

Genus XXXIII. CYNOSURUS. DOG'S-TAIL.

Gen. Char. Involucre pectinated; spikelets unilateral, many-flowered, sessile; outer glumes two; flowering glumes long, concave; paleæ flat, awnless; scales two, ovate, acute, swollen at the base; filaments three, hair-shaped; anthers oblong; ovary top-shaped; styles reflexed, hairy; stigmas simple; seed oblong, pointed.

Cynosurus cristatus, Linn. Crested Dog's-tail.

Root perennial, tufted, fibrous; stem cylindrical, upright, smooth, finely ribbed, often wiry, nearly two feet high; joints several, small; leaves linear, acute, even-surfaced, flat, rough on the inner surface, smooth and glossy behind; sheaths cylindrical, striated, quite smooth, about five on the stem; ligule short, blunt, notched; panicle spike-like, blunt, stiff, straight, semicylindrical, green; rachis rather zigzag, smooth, angular; ribbed branches very short; spikelets alternate, regular, all turned to one side, ovate, many-flowered, on very short footstalks, with a beautiful pectinated involucre; outer glumes linear, acute, keeled, the keels rough; flowering glume longer than the outer ones, ovate-lanceolate, faintly five-ribbed, and tipped with a very short awn; palea transparent, fringed at the edges.

This is a very valuable pasture-grass prevailing in dry hilly situations and upon the downs, abundant all over Britain. The stems are too hard and tough, when dry, to please the taste of cattle, so this is better as a pasture than as a meadow grass. When in flower the whole plant is succulent and nutritious, and cattle are very fond of it, especially sheep and deer. It increases in its nutritious qualities till the seed is ripe, when it is at its best. Mr. Sinclair recommends its introduction into irrigated meadows, and all pastures

destined for sheep-feeding. Messrs. Wheeler, on the other hand, recommend it chiefly for upland pastures, because "from its never growing in tufts it thoroughly mixes in the pattern of the turfy carpet." It is a very durable grass, thoroughly perennial in character, and forming beautiful turf for park as well as pasture. Mr. Wheeler further informs us, that "sheep are said to be less liable to be affected by the disease called 'foot-rot,' when fed on pastures containing a considerable proportion of this grass, than on such as are composed of the more tender and soft-leaved sorts."



The rich pastures of Paignton, in Devonshire, those about Liskeard in Cornwall, and some at Little Malvern, famed for excellence, all abound in the Dog's-tail grass. Mr. Marshall, in his 'York Economy,' declares this to be the prevailing plant in the best grass meadows of the Vale of Pickering, "some of which will feed a large cow from May-day to Michaelmas." In the Communications to the Board of Agriculture it is asserted that the *Cynosorus cristatus* "abounds much with seed, so that many bushels may be gathered in a season by poor women and children, and farmers purchase it at one shilling a pound, and lay down many acres with it very successfully."

It is common throughout Europe and Western Asia.

It flowers during all the summer months, and is attractive because of its abundant purple anthers, which partially cover the green spike.

Mr. Sinclair recommends the culms of this grass above all others for straw-plait, which it makes of a superior quality; he gives ample instructions for collecting, preparing, and bleaching them, as may be seen in our chapter on Industrial and Economic Grasses. As a lawn-grass the *Cynosurus cristatus* is very valuable, not only for its creeping interweaving habit, but because its full-coloured short foliage mingles so harmoniously with that of *Festuca ovina* and its varieties, which are the best adapted for lawn turf.

2. *Cynosurus echinatus*, Linn. **Rough Dog's-tail.**

Root annual, fibrous, downy; stems ascending, leafy, cylindrical, striated, smooth, ten to thirty inches high; joints short, small; leaves lanceolate, ovate at their base, acute, flat, striated, rough on both surfaces; of a pale, dull green colour; sheaths a little inflated, somewhat compressed or two-edged, furrowed, roughish; ligule lanceolate; panicle simple, dense, of a silvery green, half an inch to three inches long; spikelets alternate, ovate, with a beautiful pectinated involucre at their base, the divisions of which are rough; outer glumes nearly equal, rough at the keels, thin, awnless; flowering glumes ovate-lanceolate, five-ribbed, roughish; palea finely fringed.

A curious and even handsome grass when well-grown. Its bristly head, all turned to one side, distinguishes it from the *Cynosurus cristatus*, and still more broadly from all other grasses. Generally it grows in a stunted form, frequenting dry fields and waste places in the Channel Islands and other warm situations; but it was

recently detected by Professor Graham in a field of Italian Rye-grass near Grantham, on the Firth of Forth, in a most luxuriant state, the stems three feet high, the panicles three inches long, and the foliage abundant in proportion. This growth was doubtless from foreign seed, imported along with that of Rye-grass, which had been brought from the South of France.



The Rough Dog's-tail has been found in the Shetland Islands, of a very dwarfed form, and also in Northumberland and Durham.

Its foreign homes are France, Spain, Portugal, Italy, and North Africa.

It flowers at the end of June, and ripens its seed in August.

The bristly head and long awns are its distinctive features. There is an Indian species, *C. corocana*, the seeds of which are eaten instead of rice in times of scarcity.

Genus XXXIV. BRIZA. QUAKE-GRASS.

Gen. Char. Spikelets several-flowered, pendulous; panicle loose; outer glumes spreading, blunt; flowering glumes the same shape as the outer ones; palea very small, flat and roundish; scales two, narrow and notched; filaments three, capillary; anthers oblong; ovaries roundish, styles two, stigmas feathery; seed compressed, adhering to the flower-glume and palea till they open and drop it.

1. **Briza media**, Linn. **Common Quake-grass.**

Root perennial, fibrous, elongated; stems erect, round, leafy, very smooth, slender, from twelve to eighteen inches high; leaves acute, flat, striated, a little rough, few in number; sheaths very long, striated, smooth; ligules extremely short; panicle widely spreading, of many spikelets, branches long and slender, lower ones in twos; spikelets pendulous, trembling, ovate or a little heart-shaped, smooth, shining, variegated with white and brown; outer glumes nearly equal, concave, blunt, scale-like at the margins; flowering glume broad, blunt, compressed, membranaceous at the margins, without lateral ribs; palea membranaceous, with two lateral ribs delicately fringed on the upper part.

This elegant perennial grass is a familiar favourite with all lovers of nature, from early childhood to extreme



old age. Eagerly do children repair to the hill-side pastures in June to gather the "Trembling-grass," "Quaking-grass," "Cow-quakes," "Shakers," "Ladies'-hair," or "Bird's-eye," accordingly as the grass is named in the particular district where they live. Alike in cottage and hall, we see bunches of the Quake-grass as a winter ornament, only the cottager frequently suspends it in bunches from the ceiling,

while the Squire's lady mingles it with Everlasting flowers in the elegant cornucopia.

As an agricultural grass it is not very valuable, but

it excels most of the species which frequent the poor soils where it finds its natural habitat. For the sake of its beauty alone, we would fain mix some of its seed with that of the Sheep's and Hard Fescue in hilly lands.

Mr. Lees, in his 'Botany and Geology of Malvern,' describes a curious variety of this grass with ovate spikelets of about five abortive florets, and a flexuous wiry panicle of few spikelets, which grows in the bog at the base of the Worcestershire Beacon.

Common throughout Britain, and in Norway, Sweden, Prussia, Germany, France, Spain, and Portugal.

2. **Briza minor**, Linn. **Lesser Quake-grass.**

Root fibrous, small, annual; stems upright, cylindrical, roughish, about seven inches high, with minute bristles pointing downwards, leafy, often branched at the base; joints five, the uppermost about the centre of the stem and generally covered by the sheath; leaves sheathing, erect, lanceolate, acute, flat, striated, rough at their margin, of a pleasant green colour; sheaths striated, smooth, uppermost one longer than its leaf; ligule lanceolate, very long, embracing the stem, decurrent, adhering to the leaf above, very tender; panicle spreading widely, branches growing two together, roughish, slender, forked, hair-like, green; spikelets pendulous, trembling, triangular, smooth, beautifully variegated with white and green, seven-flowered; outer glumes nearly equal, concave, very blunt, striated, membranaceous at the edges, three-ribbed; flowering glumes smaller than outer ones, broad, blunt, swollen at the back, membranaceous at the margin, lobed at the base in front, that of each floret gradually smaller to the apex of the spikelet; palea thin, flat, and ribbed at the margin with green.

The roughness of the stem is not visible to the naked eye, but is sensible to the touch.

This is a rare plant in England, only occurring occasionally in the southern counties, especially in Cornwall, and near Cork in Ireland, and in the Channel Islands. The long slender ligule, rough stem, and large comparative size of outer glumes are its distinctive feature.



Its foreign homes are France, Germany, Switzerland, Italy, Portugal, Spain, Turkey, Greece, and North Africa.

It flowers in July, and ripens its seed in August.

This plant is as attractive as *Briza media* in its way, but its smaller size renders it less effective in decorations, while its rarity makes it difficult to obtain in any quantity; these are also disqualifications for agricultural purposes.

Both these grasses and many of the Airas are admirably adapted for natural pictures, and young ladies would do well to exercise their ingenuity in grouping minute sprays of these with detached Forget-me-not blossoms, and the dried starry flowers of the Yellow Pimpernel, for the adornment of valentines, which may thus be made in much better taste than those procured at great cost in the shops.

Genus XXXV. POA.

Gen. Char. Inflorescence a simple or compound panicle; spikelets several-flowered, awnless, ovate-oblong, two-ranked;

outer glumes rather unequal, ovate, pointed, mostly keeled; flowering glumes ovate, pointed, concave, more or less keeled, compressed, rather longer than the outer ones, membranaceous at the margins; scales acute or torn, swollen at the base; ovary roundish; styles two, reflexed, hairy; stigmas feathery; seed oblong, pointed, compressed at each side.

A large group of Poas are characterized by a fine web of silky threads at the base of the florets.

1. ***Poa aquatica*, Linn. Reed Poa.**

(*Glyceria*, Bab. Man.)

Root perennial, creeping; stems upright, stout, smooth, striated, a little compressed, three to six feet high; leaves flat, acute, broad, straight, long, rough at the edges and keel; sheaths nearly smooth; ligule very blunt, short, entire; panicle very large, numerously branched, widely spreading, the branchlets rather zigzag, rough; spikelets numerous, erect, green or brownish, upper large and ovate, lower smaller and narrower, containing from four to eight florets; outer glumes blunt, almost equal, whitish, polished; flowering glumes seven-ribbed, the central rib extending the whole length of the glume, and minutely toothed, the lateral ribs roughish, but not toothed or haired; palea shorter, and with two teeth on the summit.

This is a very handsome, stately, reed-like plant of a universal pale green colour, not the least glaucous. Its growth is perfectly upright, and the large groups of reed-like stems with their abundant sword-shaped foliage and large panicles form a noble river-side object, though the plants individually are too stiff to be called graceful. The numerous florets open in July, and are soon succeeded by the stiffer seeding stage.

Although so large a plant, and of such stiff aspect, the Reed Poa is by no means tough in its texture, but

rather tender and succulent. When in flower it contains a good proportion of nutritious matter, which decreases



gradually when the flowers are past. On the banks of little islands in the Thames and in marsh land it is mown for hay, and is much liked by cattle. It is frequent in England and Ireland, but rare in Scotland. It forms a welcome shelter for the moor-hens and other water-fowl, and on the banks of such rivers as the Wye it is not uncommon, on a summer's day, to see a careful mother-bird glide from among the tall Reed Poa stems followed by her tiny

brood of moor-chicks, and dabble about in the shallow water, until some unusual noise alarms them, and drives them back to their grassy hiding-place.

Its foreign homes are Norway, Sweden, Germany, France, Italy, Russia, and North America.

2. *Poa fluitans*, Scop. **Floating Poa.**

(*Glyceria fluitans* and *G. plicata*, Bab. Man.)

Root perennial, creeping extensively; stems weak, succulent, spreading widely, often floating with their lower leaves on the still surface of the water, from fifteen inches to two feet long; joints numerous; leaves long, linear, roughish on both surfaces, the radical ones flat, those of the stem folded; sheaths long, compressed, striated, smooth;

ligules short, triangular, serrated; panicle simple, somewhat spreading, long, and tapering; branches spreading and arching, the branchlets short and erect; spikelets few, very long and narrow, cylindrical, containing five to seven ribbed florets, beautifully variegated with green and white; the summit of the lowest floret extends beyond the large outer glume; outer glumes unequal, blunt, one-ribbed, small; flowering glumes ribbed five or seven times, blunt, but with the midrib toothed its whole length, often protruding a sharp point; palea small, having two teeth on the apex, and a green rib on each margin.

This very elegant grass is abundant in slow streams, on the margin of ponds, and in swampy places. Its rich green hue, tall stems, and remarkably graceful panicles, stately in their uprightness, and yet arching slightly, as if out of courtesy to the weeds of humbler growth, attract the collector who is in search of plants for a bouquet. But in securing the panicles of the Floating Meadow-grass for the drawing-room vase, the eager collector is condemned to disappointment. So weak is the stem of this grass, though it is rather thick than otherwise, that it bends and breaks before you have carried it a dozen yards, and it even needs care in carrying home specimens for the herbarium.



It is not without agricultural importance. In marshy land it forms a considerable proportion of the herbage, and cattle eat it readily enough when there is no great choice. In moist pastures it yields a fair crop. It is carefully cultivated in Germany for its seeds, which, according to Dr. Parnell, form the Manna Croup of the shops, and are considered a delicacy in soups and gruels. The seeds made into flour afford bread of fair quality; birds and trout are said to be very fond of them in their natural state.

The Floating Poa is common throughout Britain, and also in Norway, Sweden, Germany, Switzerland, France, Spain, Portugal, Italy, North Africa, New Holland, and North America.

Poa fluitans, var. *subspicata*, has a spike-like form of inflorescence, the long spikelets being placed on short footstalks, and planted singly at distances of nearly their own length along the alternate sides of the rachis. Its leaves are narrower and more pointed than in the normal form, and it has larger anthers. This is a frequent form of *P. fluitans* in Scotland, it grows in rich moist land, or about pools and slow streams, and forms excellent pasturage for cows.

It flowers in June, and the seed is ripe in August.

It is supposed that the seed has been conveyed to New South Wales from England.

There is an Australian species (*Poa pilosa*) described by Host, which possesses the united charms of *Poa fluitans* and *Poa aquatica*, and some which belong to neither of them. Its culms are tall, shining, with large points and long tapering leaves, rising gracefully from their smooth glossy sheaths. The panicles are lanceolate, quickly expanding from the base, and then tapering to

a long point like the fronds of *Asplenium Adiantum-nigrum*. The rachis is much branched, the branches in whorls and compound, very slender, flexible, and drooping, bearing innumerable narrow spikelets, each of which contains several florets, the flowering glumes of which are beautifully tinted with rose-colour. The panicle looks like a cloud of green and rose-coloured insects held together in a swaying cone by most delicate green threads; the contrast of the pale green flag-like foliage with this coloured panicle is perfect. We earnestly recommend the species to those who cultivate ornamental grasses.

3. *Poa maritima*, Huds. **Sea Poa.**

Root creeping, perennial; stems decumbent at first, then erect, smooth, about a foot in height; leaves short, narrow, folded or rolled in, compressed; panicle branched, spreading slightly in flower, the branches diverging at that time, but becoming erect or nearly so in seed; spikelets not numerous, linear, turning to one side, stalked, containing six to ten florets; outer glumes rather more than half the length of the flowering ones, rounded on the back, blunt and scale-like at the apex; flowering glumes five-ribbed, long, acute, the point almost awn-like; palea the same length, with green marginal ribs.

The Sea Poa is a native of salt-marshes, especially those where sand prevails rather than mud, or it will grow in maritime situations which are not marshy, but its preference is strongly for the wet ground. It is found in such situations on all the coasts of Britain excepting the east of England. Its foreign homes are Lapland, Norway, Sweden, Germany, France, Italy, Iceland, and North America.

It flowers in July and ripens its seed in August.

This *Poa* is not remarkable for beauty, and we are not aware of it having any agricultural value or of any especial interest attaching to it.



P. maritima, var. *hispida*, has a compressed stem, a furrow along one side of the rachis, and its branches rough with small bristles.

Mr. Babington gathered this grass in Suffolk, and identified it with the *Sclerachloa* of Fries. He calls it the "Rough Sea Meadow-grass."

4. *Poa distans*, Linn. **Reflexed Poa.**

Root perennial, fibrous; stems scaly, decumbent at the base, striated, smooth, about a foot high, numerous, slender; leaves flat, glaucous, acute, seldom folded; sheaths long; ligule blunt, emarginate; panicle branched, spreading, erect; the branches slender, rough, placed at certain distances on the rachis in pairs or threes, of various length, the lower ones bending downwards more and more decidedly as they increase in age; spikelets small, containing five florets, the summit of the lowest floret extending considerably beyond the outer glume; outer glumes three-ribbed, small; flowering glumes five-ribbed, larger, the central rib not reaching the summit; palea small.

The Reflexed Poa resembles the last species in general

appearance, but its stems are less decumbent at the base, the branches of its panicle are strongly deflexed in maturity, and the spikelets are smaller.

P. distans grows in meadows, on waste ground, and on banks near the sea. In Cornwall it is very frequent, clothing the firm ground on the banks of the tidal rivers, and it is also of frequent occurrence in other countries.

It is found throughout Europe and western Asia, and also in North America.

It flowers in July, and ripens its seed in August.

For agricultural purposes it does not possess many qualifications. It is an easy grass to recognize, for not only are the reflexed branches a striking feature, but it is often found growing in a slanting position, the stems bearing an oblique direction to the earth on which it grows.

P. distans, var. *obtusa*, has larger spikelets than the normal form, and broader and blunter flowering glumes. Dr. Parnell describes it as gathered by Mr. Babington, at Breedon, in Leicestershire, where it grows in great quantity, and is cultivated as a hay crop.

P. distans, var. *minor*, a dwarfed form of the last variety, with fewer florets in the spikelets, also discovered by Mr. Babington.



5. ***Poa procumbens*, Curt. Procumbent Poa.**

Root annual; stem decumbent, round, smooth, slender, from six inches to a foot in length; leaves flat, ribbed, rough on the inner surface, smooth behind, acute; upper sheath longer than its leaf; panicle lanceolate, dense, turned one way, compound; rachis and branches rough, round, never deflexed; spikelets linear, cylindrical, containing about five florets; outer glumes very small indeed; flowering glumes five-ribbed, the central rib extending beyond the blunt summit, hairy at the base, palea very narrow, fringed.

The compact narrow panicles of this grass, its lower growth, decumbent habit, and the greater preponderance of foliage distinguish it from *P. maritima*. It grows in waste places in maritime situations, preferring sand to mud. It has no beauty to boast, nor any ascertained agricultural use. It is found in most of the English counties that lie on the coast, but is rare in Scotland and Ireland. A-broad it is indigenous in

Germany and France, and in all countries from the Spanish peninsula to Holland.

It flowers late in June and through July, and seeds in August.

P. Borreri, as described by Dr. Parnell, is probably a variety of this species. It has smaller but broader spikelets, is rigid in its habit, both the rachis and its



branches are erect, though the stem is somewhat prostrate at the base; its leaves are short and rough both above and below, and rolled in at the margins, and the panicle is compact, the branches seldom spreading, and never deflexed.

It is found in the Isle of Wight, and on the coasts of Hants and Dorset, growing in and about brackish ditches.

6. **Poa rigida**, Linn. **Hard Poa.**

(*Sclerochloa*, Bab. Man.)

Root annual, fibrous, tufted; stems decumbent at first, then erect, smooth, round, stiff, finely striated, about six inches high, with three or four joints; leaves narrow, tapering, rolled in, roughish on the upper surface, and smooth on the under; sheaths smooth, striated, upper one longer than its leaf; ligule long, acute; panicle lanceolate, dense, smooth, two-ranked, turning one way; rachis bordered, rough; branches slightly spreading, rigid, undulating; spikelets cylindrical, narrow, compressed, containing seven florets; outer glumes unequal, acute; flowering glumes broad, sharp-pointed, the ribs near the margins are broad and green, with a white line down their centre, the central is toothed on the upper part, the other ribs are very faint; palea short and bordered with green.

A minute species, often found on wall-tops and in quarries. It is of very stiff habit, and always looks like an old plant. In quarries among the Cotteswold Hills, on venerable old walls in Devonshire, on the glorious cliffs that bear the rush of the waters of the Atlantic on the Cornish coast, and among sandstone rocks in Kent we have found this compact little grass quite recently.

Dr. Parnell says that hares and rabbits eat it with avidity, and it certainly grows in places likely enough



to court their notice. Its closely-packed panicles and tough stems, with their moderate complement of tapering leaves, soon feel the effect of sun and heat, and gradually assume a reddish-brown tint, but they do not lose form,—that rigid stalk has no thought of drooping; those erect leaves stand firm through scorching sunshine and withering frost. Look

at the tough little plant attentively, and you see that it is of the indomitable texture that might be charred by intense heat, but would never bend its head, nor allow its leaves to hang limp.

Its foreign homes are Germany, Switzerland, Italy, and North Africa.

It flowers in July and ripens its seed in August.

7. *Poa loliacea*, Huds. **Darnel Poa.**

(*Triticum*, Eng. Bot.; *Sclerochloa*, Bab. Man.)

Root annual, fibrous, tufted; stems stiff, round, about six inches high; leaves short, pointed; sheaths long; panicle spike-like; spikelets sessile or nearly so, in two rows, alternate on the rachis, but leaning in one direction, two or three clustering together at the base sometimes, containing from six to eight florets each, from nine to twelve spikelets in each panicle; outer glumes keeled, but without lateral ribs,

or having them very indistinct, the summit of the upper glume is on a level with the base of the fourth floret; flowering glumes of the same character as the outer ones, obtuse, or slightly pointed, keeled; palea keeled, the keel fringed.

A seaside grass, occurring occasionally on our coasts, much resembling the *P. rigida*, and even exceeding it in stiffness, and of smaller size. Its panicles resemble the Ray-grass in miniature. It has no agricultural value, except that of being able to exist where no other grass is capable of living, on the driest sands and under a parching sun. This little grass is to be found in dry spots among those wild Cornish cliffs, it has all the characters of alpine plants, so firm, fully formed, and perfect, in so minute a form: like the *P. rigida*, it turns a reddish-brown when sun-burnt, and is little observed except by such as examine the rock stores very closely.



Sir J. E. Smith places it in the genus *Triticum*, and Mr. Babington makes it a *Sclerochloa*.

8. *Poa annua*, Linn. Annual Poa.

Root annual, with numerous fibres; stems at first decumbent, throwing out rootlets, and thus extending itself widely; joints rooting; leaves flat, sword-shaped, often crumpled here and there, light green, smooth on both sur-

faces, rough at the edges ; ligule acute ; sheaths compressed ; panicle widely spreading, erect, triangular, loose ; rachis smooth ; branches smooth, spreading, inclining to one side ; spikelets stalked, ovate-oblong, or linear, containing from five to nine florets, variegated with green and white and purple ; outer glumes acute, unequal, three-ribbed, the central rib toothed on the upper part, the summit of the larger glume scarcely reaching the apex of the first floret ; flowering glumes five-ribbed, the ribs smooth save for a few silky hairs on the central one ; palea shorter, bordered with a green rib.

This is perhaps the commonest of all the Poas. Although an annual, it scatters its seed so widely that



plants of it are for ever springing unbidden in every direction ; the new-laid garden walks become green unexpectedly with a promising forest of *P. annua* blades, and the stones of the courtyard soon become fringed in green borders of the same grass. It forms a principal ingredient in lawns and parks, especially about London, and many a bald place

in a much trodden grass-plot is cured by transplanting thither the young Poas that have sprung as weeds in the flower-borders.

From its great prevalence in Suffolk it is often called Suffolk grass, and, according to Mr. Sole, it is the quickest grower of all grasses "coming up, blooming, and ripening its seeds in the course of one month!"

It is very sweet and succulent, and is a favourite with cattle. But its life is too evanescent to make it desirable for cultivation.

It is common throughout Europe, North Africa, South America, and Northern Asia.

P. annua, var. *sericea*, has shorter leaves that do not become crumpled, its spikelets contain the minimum number of florets, three, and the lateral ribs of the flowering glumes are furnished with silky down. This variety is found in watery places.

9. *Poa compressa*, Linn. **Flattened Poa.**

(*P. polynada*, Bab. Man.)

Root perennial, creeping; stem ascending, much compressed, decumbent at the lower part, smooth; joints from four to seven, the uppermost high on the stem; leaves short, flat, acute, roughish on the edges, and on the inner surface, smooth at the back; sheaths short, flattened, the upper one the same length as its leaf; ligule short, blunt; panicle dense, unilateral, erect, ovate-lanceolate; rachis and branches rough, the latter short and in pairs; spikelets small, ovate-oblong, four- to six-flowered; outer glumes slightly unequal, three-ribbed, toothed on the upper part of the central rib; flowering glumes five-ribbed, the first, third, and fifth ribs hairy in the centre, the second and fourth very faint, the summit of the lowest flowering glume extends slightly beyond that of the largest outer glume; palea short, edged with green; scales acute, notched; florets often webbed at the base.

This grass is of a somewhat glaucous hue, and this along with its very much flattened stem, and dense panicle, form easily distinguishable features. Mr. Pursh

says that in America it is called Blue-grass, from its glaucous tint. The webbing of the florets is variable,

Sir J. E. Smith mentions it as a permanent feature, whilst in the species *polynoda* of Dr. Parnell, the webbing is most frequently absent. Yet the other characteristics of the plants are identical.



Dr. Parnell describes another grass, which he calls *Poa subcompressa*, which only varies from this in the presence of two extra ribs in the outer glumes; this peculiarity is not touched upon by other authors, or it would be accounted at any rate a

variety. It is found in the neighbourhood of Edinburgh on the earthy tops of the dykes, and about Aix-la-Chapelle, Coblenz, Ratisbon, and Vienna. It grows to a less size than the true *P. compressa*.

Dr. Parnell's *P. polynoda* is so called because of its numerous joints, which are as many as those of the true *compressa*. His plant contains a large quantity of siliceous matter in its sheaths and stem, which he recommends to turners as a substitute for sand-paper in polishing wood. This peculiarity can be perceived without a lens, by drawing the stem through the teeth. On account of the presence of the flint particles, no cattle care to eat the grass.

It flowers in June, and seeds in July.

Dr. Parnell found it near Edinburgh. He mentions a variety of his *Polynoda* with the middle rib of the flowering glume toothed its whole length, and having a single hair at the base of the floret. Mr. Lyle gathered this grass at Airth, near Stirling.

The normal form of *P. compressa* grows about a foot high, and frequents wall-tops and dry banks throughout Great Britain and Ireland, excepting the north of Scotland.

Its foreign homes are throughout Europe and in North America. It begins to flower in June, and produces a succession of panicles until August. Mr. Sole considers it a good grass for parks and sheep pastures, as it causes the mutton to cut short and be fine-flavoured, where it grows; the sheep take care that not a panicle of it ever lives to flower.

The webbing of *P. compressa* and its varieties seems most capricious.

10. *Poa pratensis*, Linn. **Meadow Poa.**

(Also *P. subcærulea*, Eng. Bot.)

Root perennial, creeping; stems smooth, one to two feet high, erect; leaves linear, flat, pointed, rather narrow, rather rough on the edges and the inner surface, sheaths somewhat inflated, smooth; ligule short, blunt; panicle spreading, generally tinted with purple, two to three inches long, sometimes drooping; branches roughish, slender, spreading, placed in clusters of three or five; spikelets four-flowered, ovate, slightly flattened, numerous, nearly all stalked; outer glumes lanceolate, three-ribbed, connected by a web, nearly equal; flowering glumes five-ribbed, keels covered with delicate silky hair, side-ribs very faint; palea short, the summit cut into two teeth.

This is a familiar grass, of great utility, and a fair share of beauty. The universal fresh green of the stem



and leaves is relieved by a purple or brownish tinge on the numerous spikelets. Its smoothness distinguishes it well from the allied species *P. trivialis*, and it comes into flower rather earlier. It frequents drier situations than the *trivialis*. It has a habit of throwing out creeping scions, which makes it increase rapidly.

This is a good meadow and pasture grass, indeed Mr. Sole calls it "the most noble of all the grasses for agriculture." Its herbage begins to shoot up early in the spring, and all cattle

are fond of it; it makes good hay and good pasturage. It does not throw up a succession of flowering stems, but produces them freely at once. It is well suited for parks and lawns, seldom dying out of land where it has once made a settlement. Its after-math is more valuable than its hay-crop, according to Mr. Sinclair's judgment; he recommends that the meadow grass, where it prevails, should be cut early, as the whole plant becomes sickly and exhausted in seeding-time. Its creeping root is said to impoverish the soil.

P. pratensis, var. *subcærulea*, is common in meadows where the soil is peaty.

P. pratensis, var. *planiculmis*, has short broad leaves, larger spikelets, a flattened stem, and is of a dark green colour. This variety is often found in waste places by roadsides.

P. pratensis, var. *umbrosa*, is a more elegant form, slender, tall, and drooping, the panicle more spreading, the branches nodding, and very numerous. It is as much paler in tint than the normal form as var. *planiculmis* is darker, and it abounds in shady places.

P. pratensis, var. *arida*, is a dwarfed form, the stem sheathed nearly to the foot of the panicle, and its uppermost leaf standing erect and reaching the apex of the panicle, which droops as in the last variety, though the aspect of the plant in other respects is rather sturdy. It has a bleached appearance, and prevails in stony and parched situations.

P. pratensis, var. *retroflexa*, is also dwarfed in size, and slender, but the lower branches of its panicles are bent downwards, not merely nodding. It affects shady nooks.

P. pratensis, var. *arenaria*, is a maritime variety, glaucous in tint, stout in habit, with large angular spikelets, flowering glumes seven-ribbed, and palea deeply toothed. As its name indicates, it lives in sandy ground.

The normal form of *P. pratensis* abounds in the best meadow lands in England, as well as in many that cannot lay claim to such a title. In one or other of its varieties it is to be found in all sorts of pastures, on hillsides, by the dusty road, in the shady wood, on walls and rock-tops, and by the seashore.

It flowers in June or very early in July.

Abroad it is common in Lapland, Norway, Sweden, Germany, Prussia, France, Spain, Portugal, Switzer-

land, Italy, Northern Asia, Iceland, and the United States.

11. ***Poa trivialis*, Linn. Roughish Poa.**

Root perennial, creeping; stems roughish when drawn through the hand, a foot and a half high, not throwing out creeping scions at the base, slender; leaves thin, flat, acute, rough on both surfaces, bright green, pliant; sheaths about the same length as the leaves, striated, rough when rubbed upwards; ligule oblong, pointed; panicle erect, slender, spreading, ample; branches rough, the lower ones placed in clusters of three or five; spikelets three-flowered, ovate, compressed; outer glumes lanceolate, five-ribbed, connected by a web, nearly equal; flowering glumes five-ribbed, the central rib hairy on the lower half; palea minutely fringed, and with a green rib on the margin.

The rough stems and sheaths, and the absence of hairs on all but the central rib of the flowering glume, distinguishes this species from *P. pratensis*. It is a very valuable grass in agriculture, and is called in Lombardy "La regina dell' erbe." The experienced Mr. Boys, of Kent, cultivated it carefully and used to extol its virtues. He declares it to be "an excellent grass on good, sound, moist loams. Good for dry pastures or water meadows, multiplying itself much by seed, and little by the root. Excellent for all sorts of cattle." Mr. Sinclair considers it superior to *P. pratensis*, because preferred by cattle; its after-math is excellent. It answers best, he says, when combined with other grasses. Mr. Sole pronounces it to be "a fine grass for hay as well as for pastures, but inferior to *P. pratensis*." "It delights," he says, "in moisture and sheltered situations, on which

account it is tender though productive. In rich land it grows tall. Its fattening property is considerable. It is, however, apt to go off after mowing, being overpowered by those grasses of the bent kind. Its radical leaves, as well as those on the stem, grow much larger than in the *P. pratensis*." Messrs. Wheeler do not recommend this grass to be grown by itself, as its produce is then inferior in quantity; but they praise its qualities as an ingredient in a mixed crop, particularly its early and late growth, its nutritious properties, and the partiality which oxen, horses, and sheep evince for it. It yields a greater bulk of hay than the Rye-grass, and its quality is of a higher order.



This Poa is best when in seed, and should therefore be cut for hay in July.

Mr. John Worlidge gives an account of this grass, which he calls Orcheston grass, which we think must be overrated. "At Maddington, in Wiltshire, about nine miles from Salisbury, grows a grass, in a small plot of meadow ground, which, in some years, grows to a prodigious length—sometimes twenty-four feet long—but not in height, as is usually reported; the length being caused by the washing of a sheep-down, that the rain in a hasty shower brings with it much of the sheep-dung

over the meadow ; so that, in such springs as are not subject to such showers, this grass thriveth not so well." Such a locality would, doubtless, favour the growth of *P. trivialis*, and the description suits well its thickly matting growth, but the length of its creeping shoots is at least six times greater than any which it now attains.

Lawson remarks that "its stoloniferous shoots begin to grow pretty early in spring, and by lying prostrate on the ground, make a beautiful verdant carpet ; as the season becomes more advanced, however, these shoots become dried, from the effect of much sunshine, but shoot out again towards the end of the season, when the weather becomes more moist, and continue green during the most of the winter,—a habit of growth which fits it for mixing with the Italian Rye-grass, or any of the upright growing sorts.

P. trivialis, var. *parviflora*, has small spikelets, containing only one, or at most two florets ; its stem is generally smooth. It is found in shady woods.

The foreign homes of *P. trivialis* are Lapland, Norway, Sweden, Denmark, Prussia, Germany, France, Switzerland, Italy, Spain, Portugal, Iceland, Asia, and North America.

12. *Poa nemoralis*, Linn. **Wood Poa.**

Root perennial, creeping ; stems smooth, flattish, erect, slender, compressed, eighteen to twenty-four inches high ; leaves narrow, taper pointed, rough on the edges and the inner surface, and smooth on the lower part of the back ; sheaths smooth, tight, compressed, shorter than the leaves ; ligule short, notched or torn ; panicle slender, erect, loose, slightly drooping ; branches slender, hair-like, zigzag, rough,

lower ones in pairs; spikelets lanceolate, compressed, containing from two to five florets; outer glumes acute, obscurely three-ribbed, the central rib toothed on the upper part, nearly equal, slightly webbed; flowering glumes five-ribbed, lanceolate, tapering, with three ribs covered with silky hairs; palea with its green margins delicately fringed.

An elegant slender grass, with the panicle sometimes compressed, seldom spreading nearly so much as in the other species, bending slightly, and with the lower branches drooping a little also and turning to one side. The whole plant is of a delicate green colour.

As its English name indicates, it is an inhabitant of woods and shady places, and the tall thin herbage of the woods and groves in the north of England, as well as in alpine woods in other countries, is chiefly composed of this grass.

For agricultural purposes it is much recommended, especially for land which is shaded by trees, it forms a good close sward in such situations, which would ill suit other grasses and produces a considerable quantity of fine, nutritious, succulent herbage. Mr. Sinclair says it is much appreciated by cattle, and will grow in exposed situations as well as in sheltered ones. Its preference is for a rich soil and shade.

It is frequent in hilly districts in England and Ire-



land, but scarce in Scotland. It is found in Lapland, Norway, Sweden, Denmark, Prussia, Germany, France, Spain, Italy, North Asia, Iceland, and the United States.

It flowers the last week in June, and ripens its seed at the end of July.

P. nemoralis, var. *cæsia*, lacks even the slight webbing to the florets present in the normal form, has fewer branches in the panicle, longer spikelets, shorter stem, with the last joint nearer to the base, and the upper sheath the same length as its leaf. The whole plant is very glaucous, instead of having the fresh green tint of the normal form. It is a native of the Highlands of Scotland, especially of Ben Lawers and the Clova Mountains. The spikelets are variegated with purple, white, and green. It is not recorded as an inhabitant of many European countries, only of Switzerland and Arctic localities. It grows from six to twelve inches high.

P. nemoralis, var. *angustifolia*, has an erect panicle, and very long narrow leaves. The highest joint of the stem is near the panicle, the spikelets are small, only containing two florets. This is a common variety, familiarly known as the "Narrow-leaved Meadow-grass." Mr. Sole gives it a very good character as an agricultural grass, "A very sweet grass, especially for hay, but like the *trivialis*, liable to go off after mowing."

P. nemoralis, var. *glauca*, Slender Glaucous Meadow-grass, is another mountain variety, with a slender, erect, glaucous panicle; outer glumes bluntish, silky-edged, webless, and spikelets of three flowers more ovate and close than in the normal form. It is perennial, flowers in June, and is found on the mountains of Wales and Scotland.

P. nemoralis, var. *Parnellii*, Babington's Meadow-

grass, has the upper joint in the middle of the stem, the flowering glume five-ribbed, and the upper sheath longer than its leaf. This variety was first discovered by Mr. Babington, near that magnificent waterfall called the High Force, in Teesdale; it was growing in sheltered nooks; it has since been found in similar situations in other parts of England. Its florets are not webbed.

P. nemoralis, var. *Balfourii*, Balfour's Meadow-grass, closely resembles the last variety, but its florets are webbed.

P. nemoralis, var. *albocaulis*, White-stalked Meadow-grass, has leaves veined with white, and white stalks; it is very elegant and pretty, and was raised by Mr. Gorrie at Annat.

P. nemoralis, var. *elatio*r, Tall Wood Meadow-grass, is a robust variety, introduced by Messrs. Lawson for purposes of cultivation.

P. nemoralis, var. *sempervirens*. Evergreen Wood Meadow-grass.—This variety first attracted notice by the luxuriance in which it grew in the Botanic Gardens at Edinburgh. Mr. Thomas Bishop, of Methven, visited the said gardens in a very drougthy season, and seeing this grass so healthy and verdant at such a time, he straightway began to cultivate it on his own land. His experience of it after some years confirmed his first impressions in its favour. Its verdure is perpetual, it grows with wonderful rapidity after being eaten down or mown, and it begins to grow very early in the spring. It is a native of North America, and is known as *Poa nervosa*, or Hudson's Bay grass; but Messrs. Lawson have rightly decided it to be a variety of *Poa nemoralis*.

13. **Poa laxa**, Hænke. **Wavy Poa.**(P. *flexuosa*, Eng. Bot.; P. *minor*, Bab. Man.)

Root perennial, fibrous, somewhat creeping; stems round, smooth, slender, from six to ten inches high; joints only two, the upper one nearer to the root than the panicle; leaves flat, narrow, tapering, flaccid, roughish on the edges and the inner surface; ligules lanceolate; panicle dense, somewhat drooping, zigzag, spikelets ovate-oblong, green or tinged with purple, containing three florets, from one to three on each branch of the panicle; outer glumes acute, equal or nearly so, ovate, webbed; flowering glumes three-ribbed, ribs hairy on the lower part; palea shorter, with green ribs at its edges.

This plant is of a pale glaucous hue, the branches of its slight panicle are very slender, and it grows either in tufts or in a creeping manner. It is a native of the higher mountains in Scotland, having first been found by the lamented Mr. Mackay, who gathered it on Ben Nevis. It is perennial, and flowers in July. We do not know of any use, agricultural or industrial, for which it is adapted.

P. laxa, var. *flexuosa*, Zigzag Meadow-grass, is distinguished by the branches of the panicle being zigzag or wavy; it has very short leaves, and is often viviparous.

P. laxa is found in Lapland, Germany, Switzerland,



Spitzbergen, and Greenland. In these countries it flowers in June.

14. **Poa alpina**, Linn. **Alpine Poa.**

Root perennial, fibrous, tufted, with smooth fibres; stems smooth, shining, often purplish above, leafy below, tufted, often swollen at the base, four to twelve inches high; joints two, small; leaves short, flat, rough on the edges and inner surface, smooth and polished behind, those of the stem folded, compressed, radical ones forming a dense tuft; sheaths long, smooth, striated; ligule long; panicle loose, ovoid, about two inches long, erect; branches angular, smooth, generally in pairs; spikelets broad, shining, elegantly variegated with green, white, and purplish-brown, three- to five-flowered, often viviparous, crowded, ovate; outer glumes ovate, rather falcate, acute, equal, three-ribbed, minutely toothed on the keels, not webbed; flowering glumes three-ribbed, the ribs hairy on the lower part, pointed, the lateral ribs faint; palea shorter, green bordered, and fringed.

This species is found on the mountains of Perthshire, Inverness, and Carnarvon, and in alpine pastures in Ireland and the north of England. In moist situations it is liable to become viviparous, the florets changing into buds and forming young plants.

It is a native of alpine pastures in Lapland, Norway, Sweden, Germany, France, Switzerland, Italy,



Russia, Greenland, Iceland, North America, and the United States.

The nutritive properties of this grass are considerable, but until recently its diminutive size was considered a sufficient objection to its cultivation. About a dozen years ago Mr. Archibald Gorrie having heard the Highland shepherds extol the merits of their "broad-leaved hill-grass," he procured plants and set about giving it a fair trial. He planted it at Annat, about 170 feet above sea-level, and it produced its panicles early in May, opening its flowers at the end of the month, and ripening a rich profusion of seeds at the end of June. Its roots are strictly fibrous, and the broad, tufted foliage, which is very abundant, averages about six inches in length; its stems attain to fully a foot in height, and are terminated by the densely-formed seed panicles. As a pasture grass he particularly recommends it to the attention of upland stock farmers, as it may be introduced into hill pastures by transplantation, where, if not too closely eaten down, it will ripen abundance of seed, and quickly establish itself. Or he suggests it being sown in quantities of from five pounds to ten pounds per acre, on moorlands, early in spring, after the heath has been burned, and tramped in by driving sheep repeatedly over the ground.

15. **Poa bulbosa**, Linn. **Bulbous Poa.**

Root perennial, bulbous; stems bulbous at the base, cylindrical, smooth, from five to nine inches high; joints three; leaves flat, acute, roughish on the inner surface, finely serrated at the edges, short, smooth behind; sheaths smooth, striated, those at the root swollen, the uppermost

longer than its leaf; ligule prominent and acute; panicle oblong, spike-like, or slightly spreading, only a little more than an inch long; rachis somewhat zigzag, branches rough, alternate, generally in pairs; spikelets ovate, green or purplish, three- or four-flowered; outer glumes equal, three-ribbed, pointed, keeled; the keels toothed on the upper part, webbed; flowering glumes also pointed and keeled, five-ribbed, the central and marginal ribs hairy, the intermediate ones naked; palea small, white, pointed, edged with a green rib, and fringed.

We find this grass only on sandy seacoasts. The plants begin to grow early in the spring and flower in April and May, at that time yielding an abundance of short sweet herbage, and afford a welcome meal for cattle. Mr. Sole declares this species to have all the good qualities possessed by *Poa pratensis*, as far as its size permits, and recommends it highly for hilly dry grounds, where it loves to grow. The plants form young bulbs during the summer, which are blown about among drifting sand for weeks, but when the autumn rains fall the bulbs settle themselves and presently take root and begin to put forth leaves; they root themselves deeply in the sand, otherwise they would be liable to be blown about as their solitary bulbs were, and are ready with their dense tufts of foliage in the spring, and their early panicles of purplish spikelets glistening with silvery sheen. In their natural state the stems only grow about six



inches high, but under cultivation they become much taller. The bulbous roots, the enlarged stems, and the broad glumes are the distinctive features of the species.

It is not found in Scotland or Ireland, and prevails chiefly on the eastern coast of England, about Yarmouth and Lowestoft.

Abroad it is found in France, Germany, Spain, Portugal, Italy, Siberia, and North Africa.

Genus XXXVI. **CATABROSA. CATABROSE.**

Gen. Char. Spikelets containing only two florets, the outer glumes broad, blunt at the summit, or indented.

Catabrosa aquatica, Beauv. Water Catabrose.

(*Aira aquatica*, Eng. Bot.)

Root perennial, creeping, fibrous, the fibres often floating in the water, long, white, glossy; stems procumbent or floating at the base, often elongated, stout, ascending, cylindrical, smooth; joints rooting; leaves long, flat, broadly-linear, blunt, smooth, flaccid, light green, the lower ones often floating on the surface of the water; sheaths smooth, striated, the upper one shorter than its leaf; ligule membranaceous, blunt; panicle spreading, compound, erect; branches numerous, smooth, placed in several half-whorls along the rachis, of unequal lengths, and with secondary branchlets, the lower ones becoming ultimately deflexed; spikelets small, numerous, pendulous, containing two florets; outer glumes unequal, blunt, membranaceous, roughish on the keels and sides, the outermost short and small, the inner larger, broad, and blunt; the flowering glumes three-ribbed, squarely blunt and notched at the summit, smooth at the keel, with two plain marginal ribs; paleæ rather smaller, narrower in proportion, notched at the summit, and with two plain marginal ribs.

The Water Catabrose grows on the margin of pools and in watery places, running in the water to a considerable distance in the same manner as the *Poa fluitans*. It is remarkable for its floating stems and leaves, and the purple or bluish colour of its light spreading panicle. It is one of the sweetest grasses in Britain, but is only suitable for wet situations. The author of the 'Farmer's Dictionary' asserts that this grass contributes chiefly to the sweetness of Cottenham cheese, and the fineness of Cambridge butter. The leaves, stems, and flowers have a taste like liquorice, and are much appreciated by cattle. Waterfowl are very fond of its seeds and young shoots.



It is frequent in watery places throughout the British Isles flowering in July, and ripening its seeds in August.

Its foreign range of growths extends through Lapland, Norway, Sweden, Germany, France, and Italy.

Catabrosa aquatica, var. *littoralis*. Littoral Catabrose. —This variety was first noted by Sir W. Hooker, as found by Mr. Wilson on the north shore of Liverpool. Dr. Parnell records the finding of it by himself in many places on the west coast of Scotland growing among sand within reach of the tide, and sending its shoots out freely in all directions. Like the normal type its stems are at first procumbent or floating, and rooting at the joints, its leaves and sheaths are smaller, and the spikelets sometimes contain only one floret; this peculiarity

and the smaller growth are the distinctive features of the variety.

Its stems, leaves, and flowers contain the same proportion of saccharine matter as the normal type, and like it are agreeable and nutritious to cattle, but, owing to the necessity of superabundant moisture for its well-being, it is not adapted for cultivation.

Genus XXXVII. MOLINIA.

Gen. Char. Spikelets small, flattened; outer glumes pointed; palea with a small bristle at the base.

1. *Molinia cærulea*, Moench. **Purple Molinia.**

Root perennial, fibrous, fibres very strong; stems stiff, reed-like, one to two feet high, smooth, cylindrical, rather bulbous at the base; one small joint situated near the base; leaves long, linear-acute, tapering, rough toward the ends on both surfaces, smooth on lower part, pungent, involute in drying, glaucous, tufted; sheaths smooth, striated, upper one shorter than its leaf; ligule very small; panicle narrow but loose, erect, six inches to a foot long; rachis smooth, angular-ribbed; branches numerous, short, compound, roughish, wavy, arising in clusters on alternate sides of the rachis; spikelets small, numerous, erect, narrow, and pointed, containing about three florets, generally purple, but pale in shade; outer glumes acute, smooth, ovate, three-ribbed, much shorter than the florets, unequal; flowering glumes acute, three-ribbed, smooth; palea of the same length and form, with a green rib along the margin. Only two out of the three florets are perfect, the second is placed on a foot-stalk. The anthers are of a very dark violet colour, which gives a deep shade to the purple panicle.

This grass is a frequent inhabitant of exposed moors, growing in great abundance, and along with the Heath-

grass, forming the entire herbage between the stretches of Heath and Ling. It grows in the same localities which are selected by the Bog Asphodel, and the golden spikes of starry blossoms of that lily-like plant contrast charmingly with the sombre purple plumes of the *Molinia*. Or, when a late season throws back the grass flowers, they may chance to hang out their fringes of dark anthers when the seed-vessels of the *Asphodel* have become as golden as their blossoms were, with the added glory of a crimson tinge like autumn sunset.



The charm of contrast is the poor *Molinia*'s only charm. Its stems are too stiff and its purple florets too dense for grace, when viewed as a solitary object; and its herbage is too hard and dry to tempt the taste of cattle. The industrious fishermen of the Orkney and Shetland Isles make ropes of its stems, and on the English moors the poor make brooms of it, but these are all the uses to which it can be adapted.

Its foreign homes are Lapland, Sweden, Norway, and nearly all Europe.

It flowers in July, and ripens its seed in August.

Molinia depauperata, Tawny Melick-grass, is a mountain species only, growing in situations 3000 feet above the sea-level. It is found among the Clova Mountains. It is distinguished from *M. cærulea* by the flowering

glume being *five-ribbed* instead of three-ribbed, and by the upper leaves overtopping the panicles. The panicles contain fewer spikelets, and these are pale green, not purple, and are one-flowered. It is a much less attractive-looking grass than the common species.

Molinia cærulea, var. *breviramosa*. Small Purple Molinia, a dwarfed variety of the Purple Molinia.—Its panicles are smaller, narrow, and of a darker purple, and it flowers in August. It grows on peaty moors. Sheep will eat the herbage of this variety when young, but they reject it as soon as it becomes hard.

Genus XXXVIII. MELICA. MELICK.

Gen. Char. Panicle simple or compound, containing a few large spikelets; spikelets awnless, containing one or two flowers and a wedge-shaped glume, enclosing one or two rudimentary florets; outer glumes ovate, concave, thin, nearly equal; flowering glumes ovate concave; palea ovate, flat; scale single, fleshy, horizontal; ovary top-shaped; styles two, bristle-shaped, spreading; stigmas oblong, feathery; filaments hair-like, thickened at the base; anthers oblong, cloven at each end; seed ovate, with a longitudinal furrow on the upper side.

1. *Melica nutans*, Linn. Mountain Melick.

Root perennial, fibrous; stems several, about a foot high, leafy, slender, and naked above, with rough angles; leaves lanceolate, flat, rough-edged, erect, smooth on the backs, but hairy on the inner surface; sheaths long, rough, striated, upper one shorter than its leaf; inflorescence racemed, one-sided, long, having about ten spikelets; branches slender, rough; spikelets large, pendulous, two-flowered; outer glumes bright purple or brown, thin, and scale-like at the edges, bluntish; flowering glumes nearly as long as the outer ones,

broad, blunt, wedge-shaped, seven-ribbed; palea broad, blunt, with two green marginal ribs, delicately fringed; the second floret is placed on a short smooth footstalk; the rudimentary floret is placed on a long footstalk, but does not project beyond the glumes.

A simple and very elegant grass, with pale green foliage and spikelets so broad and so brightly tinted as to seem like lily flowers. The raceme is slender, and bends gracefully when in flower, and all the spikelets are more or less nodding, so that the form of the plant is one of perfect grace. But in seed the culm and rachis become much stiffer, and the beauty of the plant is soon lost.



The situations where the Mountain Melick grows are such as would lend beauty to a plant with fewer claims of its own. In alpine woods, among gay vetches, and by the side of the nodding heads of the water-avens, overshadowed by wild Guelder-rose and spindle-tree, and sheltered by birch and alder; the Mountain Melick makes one of a goodly brotherhood.

In the north of England, within sight of the towers of Fountains Abbey, and in the romantic glades about Rokeby, as well as in the Highland homes still more dear to Scotland's poet, the Mountain Melick flourishes luxuriantly. This grass is to be found also in the woods of Westmoreland, Cumberland, and Cheshire.

The racemed inflorescence, and two perfect flowers in the spikelet, distinguish this from the next species.

The herbage is produced early, and the plant thrives well where it once becomes settled. In hilly districts it is worth introducing into permanent pastures, especially those on the borders of woods.

Abroad it is found in Lapland, Norway, Sweden, Denmark, Germany, France, and Italy. It flowers late in May, and ripens its seed in July.

2. *Melica uniflora*, Linn. **Wood-Melick.**

Root fibrous, perennial, creeping; stems simple, slender, erect, roughish on the upper part, twelve to eighteen inches high; leaves long, flat, thin, bright-green, broadish, rough at the back and edges; sheaths rough, striated, with a few white hairs on the upper part, the upper sheath shorter than its leaf; ligule short, blunt, membranaceous, with a small slender bristle projecting from one side, where the sheath is closed opposite to the blade, after the manner of the Sedge family; panicle simple, slightly drooping, of few spikelets; the lower branches in pairs, rough, slender; spikelets erect, ovate, containing one perfect and one imperfect floret; outer glumes unequal, smooth, deeply tinged with red-brown, the lower one the smaller; flowering glumes broad, blunt, smooth, seven-ribbed; palea broad, oval, shorter, with green, fringed, marginal ribs; the imperfect floret situated on a long smooth footstalk.

The branches, panicle, erect spikelets, and single perfect florets are good specific distinctions.

An elegant and showy grass attaining a height of from one to two feet. The leaves are ribbon-like, arching elegantly, and of a beautiful sunny green, which throws out the deep ruddy-brown tint of the spikelets perfectly.

It is much more frequent than the last species, abounding in groves and bushy places, in hilly districts all over England and Ireland, and in parts of Scotland. It has no agricultural properties, but cattle eat its herbage readily.

It flowers in June, and ripens its seed in July.

Like the last species, its stem becomes much more rigid after the flowers have gone off, and though its bright-coloured glumes continue to adorn its panicle, the added stiffness takes away its beauty.

Abroad it is found in Germany, France, and Italy. It is not known in America.



Genus XXXIX. TRIODIA.

Gen. Char. Spikelets several-flowered; outer glumes nearly equal; flowering glume with three nearly equal teeth at the top; scales two.

Triodia decumbens, Beauv. **Decumbent Triodia.**

(*Poa*, Eng. Bot.)

Root perennial, creeping, fibrous; stems smooth, round, striated, from six inches to a foot long; leaves narrow, linear, smooth, but rough towards the point; sheaths hairy, the upper one shorter than its leaf, no ligule but a tuft of hairs instead; panicle spike-like; spikelets few, large, containing three or four florets on smooth branchlets; outer

glumes nearly equal, acute, smooth, three-ribbed, of a firm consistence, scale-like towards the edges, glabrous; flowering glumes ovate, five-ribbed, deeply concave, with three minute teeth at the summit, the central one the most prominent; palea broad, blunt, with green ribs on the margin, fringed.

Grows abundantly on dry mountain pastures, especially those bordering moors, also in wet, barren grounds.



It is commonly called Heath-grass, and often grows along with the Purple Molinia. Its only beauty consists in a rosy tint upon the glumes, the blending of which with the green is very pretty.

It is common throughout Britain, also in Norway, Sweden, Prussia, Germany, France, Spain, Portugal, Switzerland, Italy, Turkey, and Greece.

It flowers the last week in July, and ripens its seed in August.

Genus XL. **KOELERIA.**

Spikelets few-flowered in dense clusters, nearly sessile; panicle spike-like; outer glumes keeled, pointed, and scale-like at the edges.

Koeleria cristata, Pers. Crested Koeleria.

Root perennial, with long downy fibres; stems numerous, erect, round, downy, from three inches to a foot in height; joints smooth, all near the base of the stem; leaves narrow,

acute, stiff, roughish, downy on both surfaces, and rough at the edges, in dense tufts about the root; sheaths few, situated near the base of the stem, striated, hairy; ligule obtuse and jagged; panicle spicated, cylindrical, one to three inches long, silvery, erect, interrupted in the lower part; the branches short, downy, in pairs on the rachis, very close before and after flowering, somewhat spreading when in flower; spikelets two- or three-flowered, compressed; outer glumes longer than the footstalk, and as long as the floret, toothed on the keels, the upper one three-ribbed, unequal; flowering glume white and glossy, minutely toothed on central rib; palea delicately fringed at the margin, and cloven at the summit. Second floret stalked, the stalk long and downy.

The Crested Kæleria is a compact plant, the chief beauty of which is the silvery gloss of its variegated green and white panicle. It is very rare, and is capricious in its choice of localities, preferring the neighbourhood of the sea and dry sandy soils or rocks at considerable elevation, or wall-tops in alpine districts. It occurs in most of our hilly counties, and also in Germany, France, and Italy.

It was formerly included in the genus *Aira*, but is taken from it because it is destitute of awns.

It flowers the third week in June, and ripens its seed at the end of August.



Genus XLI. **SESLERIA.**

Gen. Char. Spikelets few-flowered; inflorescence spike-like, cylindrical; outer glumes nearly equal, ovate-lanceolate, concave, acute; flowering glumes erect, acute, nearly equal, toothed at the top; palea folded, two-ribbed, cloven; filaments three, hair-like, longer than the flowering glumes; anthers pendulous, oblong, notched at both ends; ovary ovate, styles two, varying in length, somewhat combined; stigmas long, cylindrical, feathery; seed ovate, smooth.

Sesleria cærulea, Ard. Blue Sesleria.

Root perennial, tufted, deeply descending, with long firm fibres; stems simple, cylindrical, smooth, naked, except at the base, slender, light-green, six to twelve inches high; leaves linear, obtuse, recurved, broadish, keeled, rough-edged, those from the root narrow, long, and pointed; those on the stem broader, ribbed, roughish on the inner surface, and smooth on the outer; sheaths short, tubular, compressed, covering the joints which are all situated near the base; ligule very small; spike (or raceme) oval, oblong, terminal, solitary, erect, an inch and a half long, of a shining purple-grey; spikelets imbricated on all sides of the rachis, in pairs on very short footstalks, each containing two or three florets; outer glumes nearly equal, without lateral ribs, toothed on the upper part of the keel; flowering glumes five-ribbed, toothed at the summit, a slight awn arising from the middle one; palea narrow, with two teeth at the summit, and the marginal ribs fringed. Ovary small, white; styles joined at the lower part only.

The Blue Sesleria, or Moor-grass, is a native of mountainous pasture, where it raises its bluish heads in the spring. It also thrives among calcareous rocks in alpine districts of Yorkshire, Westmoreland, Cumberland, Durham, and Ireland (county Sligo); it also prevails in

similar districts of the Highlands of Scotland. It is a peculiar-looking plant, stiff in its manner of growth, and more like a rush than a simple grass. It flourishes well in the Botanic Gardens at Edinburgh, flowering freely in April and May.

Its foreign homes are Iceland, Sweden, Germany, France, and Italy.

Sir J. E. Smith gives an interesting account of the generic name of this plant. It was given, he says, by Professor Scopoli, who states in the first edition of his 'Flora Carniolica,' that, "He never could forget the delightful garden, so rich in rare plants, which he used to visit while at Venice in 1745. It was formed in the island of St. Helen, by Dr. Leonard Sesler, whose great diligence in observing and cultivating plants justly entitled him, in Scopoli's opinion, to this botanical commemoration."



Genus XLII. ARUNDO. REED.

Gen. Char. Inflorescence paniced; spikelets several-flowered; outer glumes unequal, oblong, pointed; flowering glumes as long as the outer ones; palea the same length; from the base of the florets arise a number of long hairs.

Arundo Phragmites, Linn. Common Reed.

Root perennial, creeping; stems annual, erect, simple, six feet high, leafy; joints fifteen, smooth; leaves lanceolate,

acuminate, spreading, striated, rough at the edges, underneath very smooth and glaucous, fifteen upon the stem, one foot long, often split at their summits; sheaths cylindric, striated, smooth; ligules very short, panicle erect, diffused, much branched, very large, chocolate-coloured, drooping to one side; branches numerous, compound, lower ones half whorled, angular, often with a tuft of fine hair at their base; spikelets numerous, narrow, containing three awnless florets; outer glumes unequal, acute, keeled; flowering glume lanceolate, three-ribbed; palea short, delicately fringed on the upper part; seed covered with the indurated corolla.

This plant is so common, that we are apt to overlook its great beauty. As it stands on the river's bank,



mirroring itself in the transparent stream, its stately stem, clothed all the way up with broad pennons of leafy green, and crowned with a glossy plume of chocolate florets, a more beautiful object can scarcely be imagined. And it is as useful as it is beautiful. Mr. Gorrie, in treating of agriculture, says, "In places suitable for it, that is, too wet and boggy for osiers, no plant will be found so profitable as the *Arundo Phragmites*, or Com-

mon Reed. It grows where no other useful plant will, it requires no care or cultivation, and the only expense is in cutting it down. Though reeds are grown to the greatest extent in the Fens, yet the following will show

that there is no farm possessing a bit of wet undrainable land that may not be made to produce them. I have often seen them growing in the muddy bottoms of old clay-pits. Reeds flourish best in mud or moorish soil, with from half to a whole foot of water flowing over their roots. The piece of reeds I mean to give an account of, consists of a pond, or rather marsh, of about four acres in extent; soil, peat mud; subsoil, hard gravel: the water is hardly ever more than one foot deep over the reeds. This marsh is surrounded by a ditch, and the water is drawn from it at pleasure by a sluice. About the middle of March the water is drawn off till the pond is as dry as it can be got, then the reed-cutter goes and cuts it down with a hook of a scythe shape. The reeds are laid in small heaps at the side of the pond, and afterwards carted away, and stacked till wanted. The weather will not hurt them. The reeds grown upon the four acres produce a yearly crop worth £20. Reed is used to thatch houses and farm buildings; it is the best roofing for dairies, and is often used for summer-houses, for its neat appearance and coolness; it is superior to slate-roofing, because it keeps out cold in winter and heat in summer; it will last about eighty years. Yards and gardens are often divided by reed fences, which have a very light appearance; posts six feet high are set in the ground, seven or eight feet apart, and light spars are nailed at the top and bottom of one side, two other spars are nailed over the reed on the other, and the whole is bound tightly with tar line. Sides of sheds and other erections are often made of reeds in the same manner. Light screens are also made of reeds and laths for a protection for fruit walls.

Reeds are also valuable for laying plaster floors and

for plaster partitions. In Sweden, a dye suitable for woollen cloth is made from the flowers. Until, in the seventh century, quill pens came into use, all pens were made from the stems of reeds. They are even yet used occasionally for arrows. The young shoots cut from the root, where they are not exposed to the light, make an excellent pickle.

Many as are the uses of reeds, we do not recommend their culture on land that is fit for a better crop, but there are few farms where there is not either a marshy slip of land by the side of river or brook, or a shallow pond, and in either of these situations, where nothing else would grow, Reed roots should be introduced, and a lucrative harvest will soon succeed.

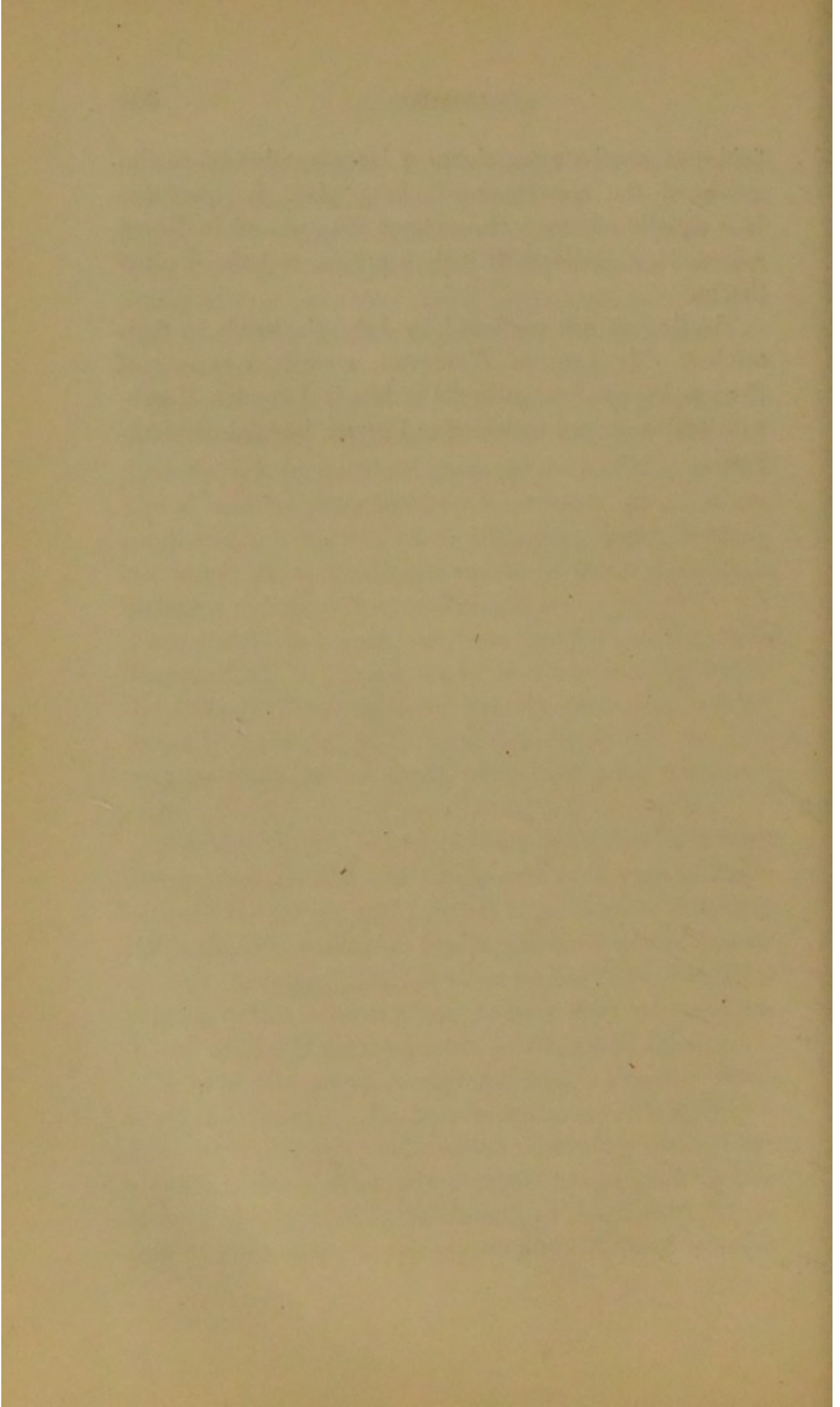
On marsh land which has been drained and the reeds thereon have to be got rid of, if the drains be deeper than the roots the battle will soon be at an end, and the formerly welcome reeds be killed by thirst; or they may be ploughed to death, or choked with ashes and soot.

The reed forest is a spot dear to the little brown Sedge Warbler, and she builds her nest, suspending it between the stems, and lays her eggs there. Withering states that entomologists find a great variety of insects on this *Arundo*; they resort in numbers to the dense panicle, which affords them at once food and shelter. Wildfowl find a welcome cover in the reed-banks.

Arundo Phragmites is very common in England, Scotland, and Ireland. In Somersetshire and Wiltshire it fills or borders large ponds, and the harvest is reaped from a punt; miles of ditches in Durham are peopled by reed stems. As we traverse the length of the United Kingdom at railway speed, the perpetually changing scene of

field and wood-stream shows a large number of settlements of the conspicuous-looking plant in question. It is equally common throughout Europe and in North Africa, New Holland, British America, and the United States.

The flowers are perfected in July, the seeds in September. Mr. Lees, of Worcester, records a variety of *Arundo Phragmites*, gathered by him in Longdon Marsh, with leaves striped in white and green, like the Ribbon-grass.



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Styles, 14.
Sugar cane, 41.
—— grass, 73.
Summer-grass, 50.
Sweet vernal-grass, 117.

Teff, 39.
Timothy-grass, 124.
Triticum caninum, 209.
—— cereal, 15.
—— cristatum, 210.
Trypsacum, 77.
Tulip root, 35.
Turfs, 49.

Tussac-grass, 56, 251.

Uniola, 81.

Vernal-grass, 117.
Vetiver, Indian, 63.
Victoria bere, 28.

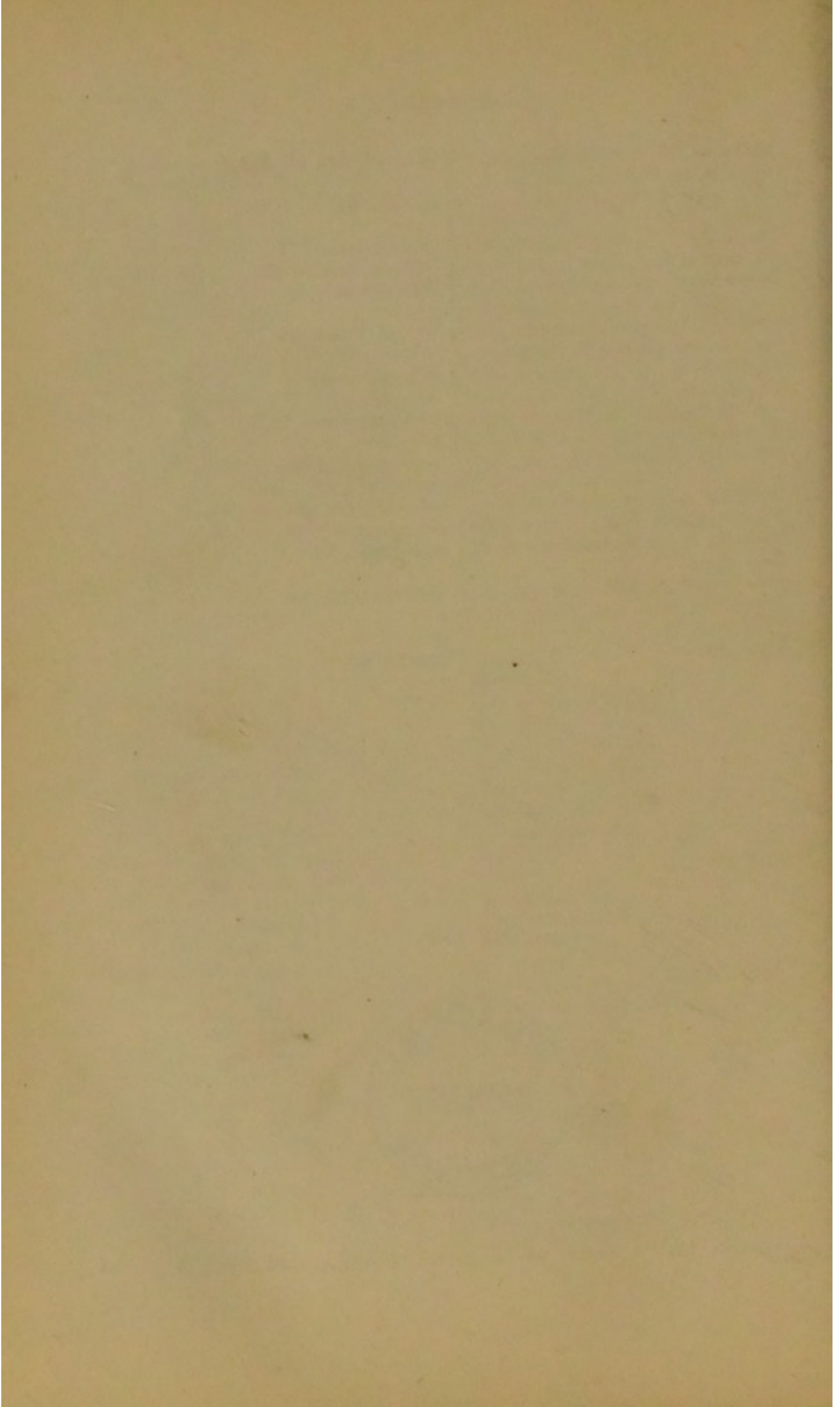
Windle straw, 84.
Wireworms, 35.
Wheat, cereal, 15.
—— cone, 19.
—— Egyptian, 18.
—— fern, 18.
—— grass, 209.
—— Irish, 18.
—— midges, 23.
—— mummy, 19.
—— pearl, 17.

Yorkshire fog, 54.

Zea, 73.
Zizania, 43.

THE END.







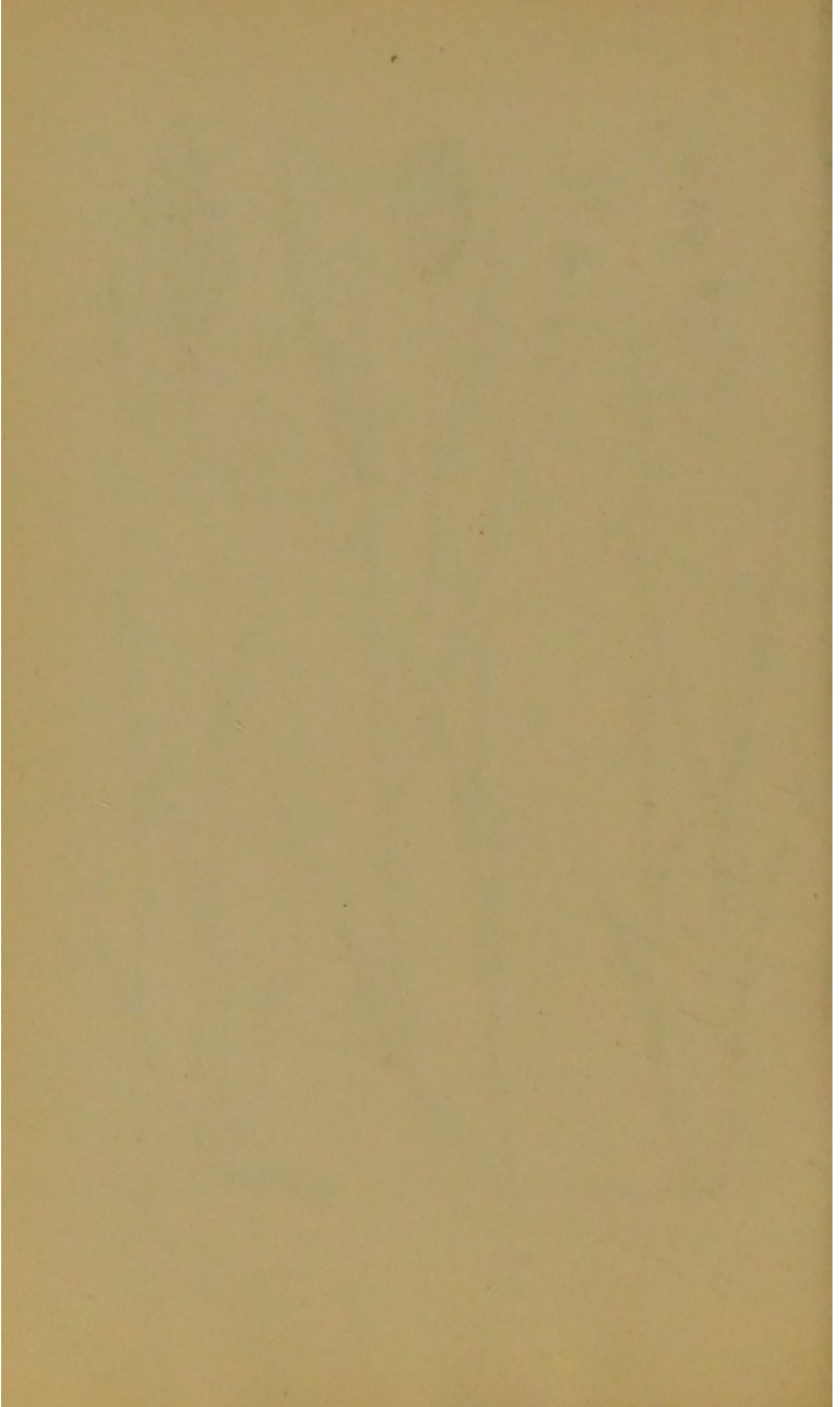


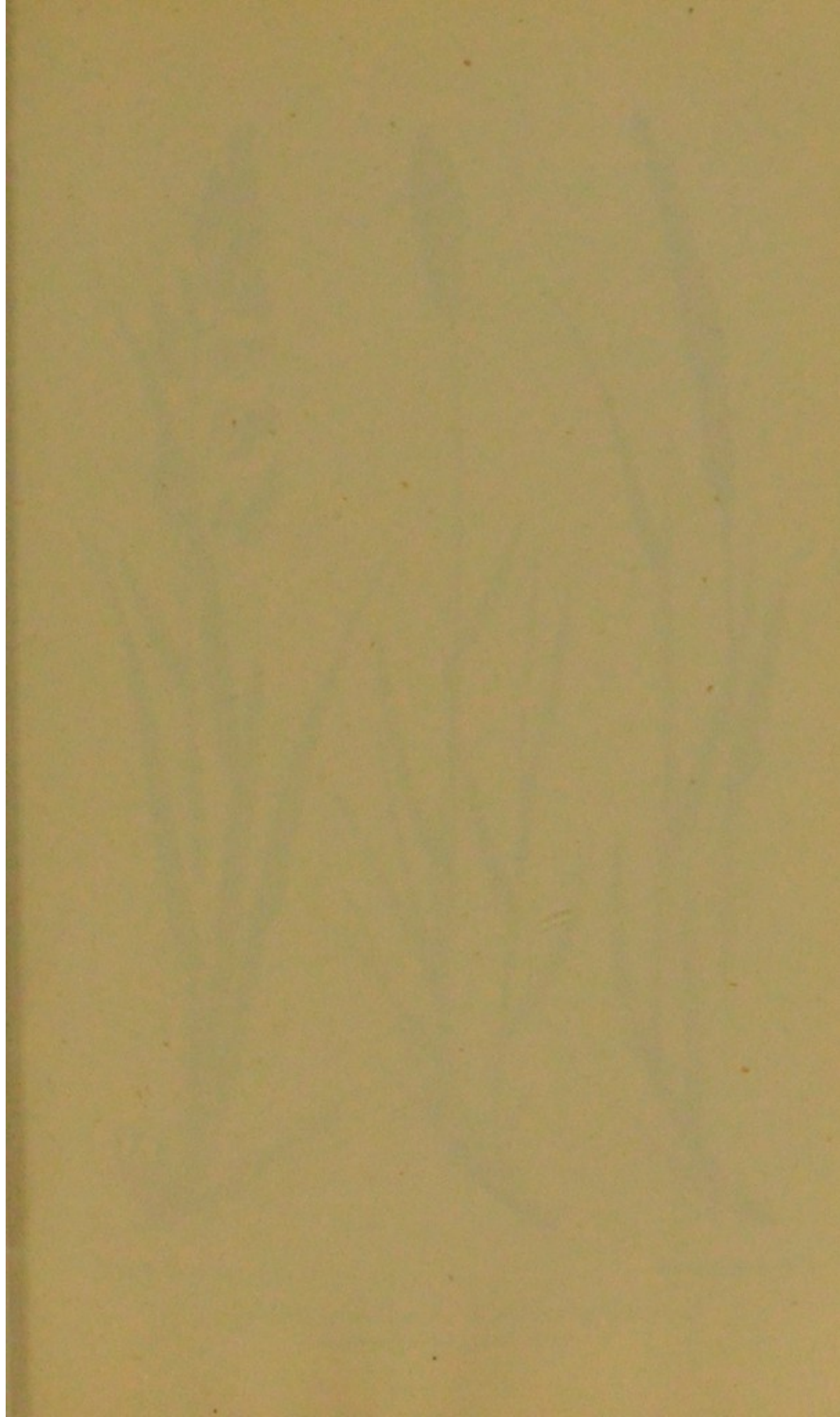


W Fitch, del et lith

Vincent Brooks, Imp

1 *Hierochloa borealis*. 2 *Anthoxanthum odoratum*.
3 *Phalaris canariensis*.





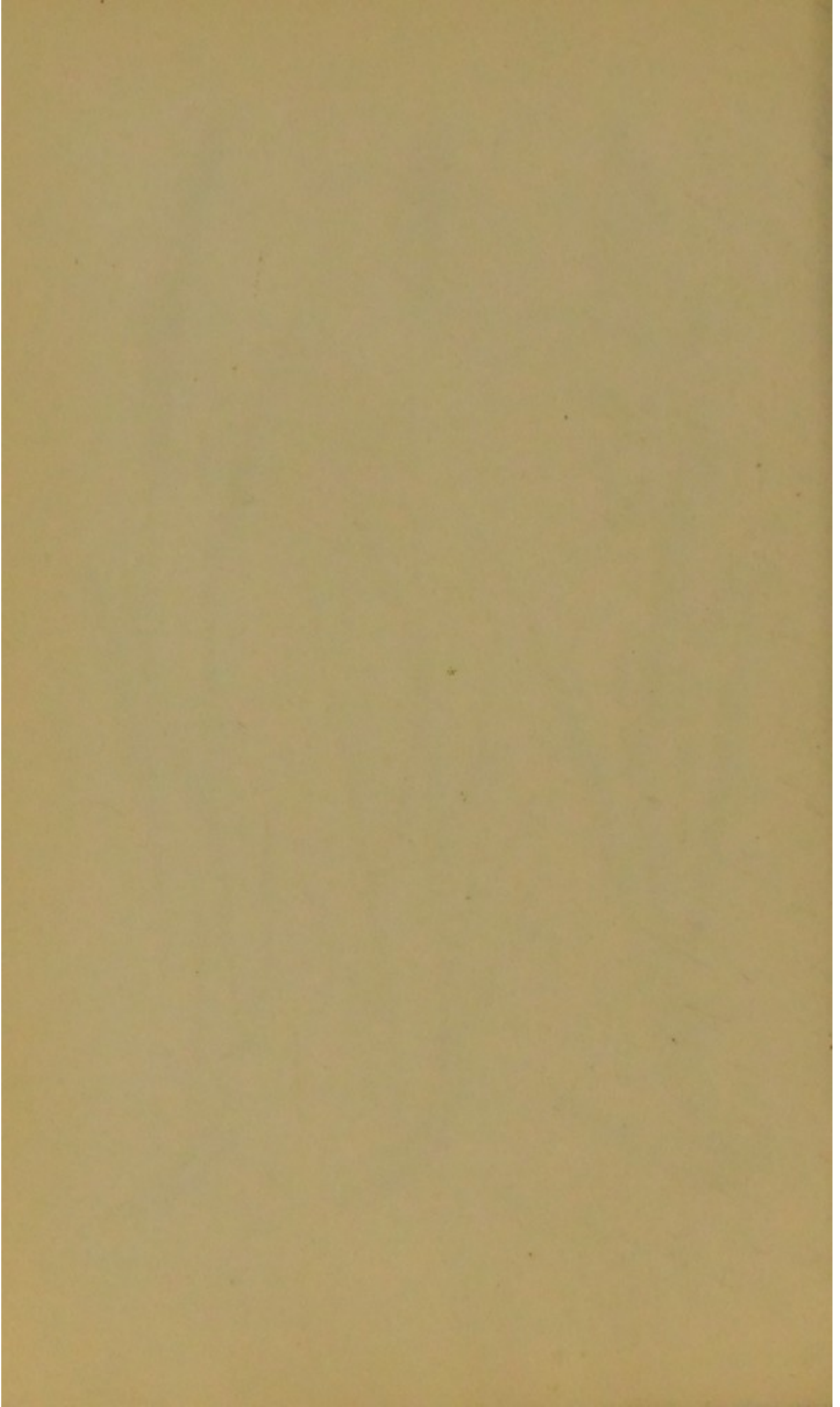




W. Fitch, del. et lith.

Vincent Brooks, Imp.

1. *Digraphis arundinacea*. 2. *Phleum pratense*.
3. *Alopecurus pratensis*.





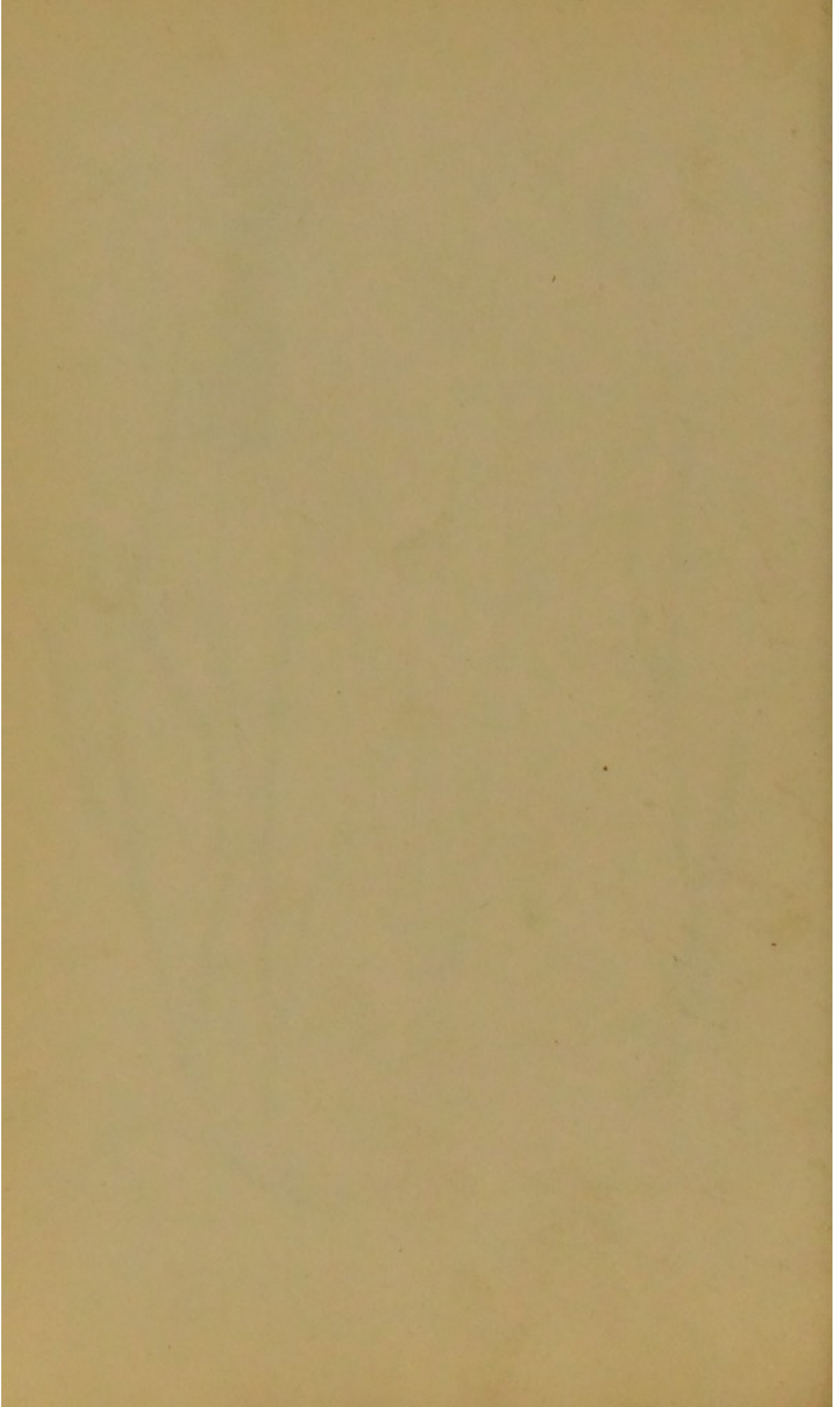




W. Esch, del. et lith.

Vincent Brooks

1 *Chamagrostis minima*. 2 *Lagurus ovatus*.
3 *Polypogon monspeliensis*.





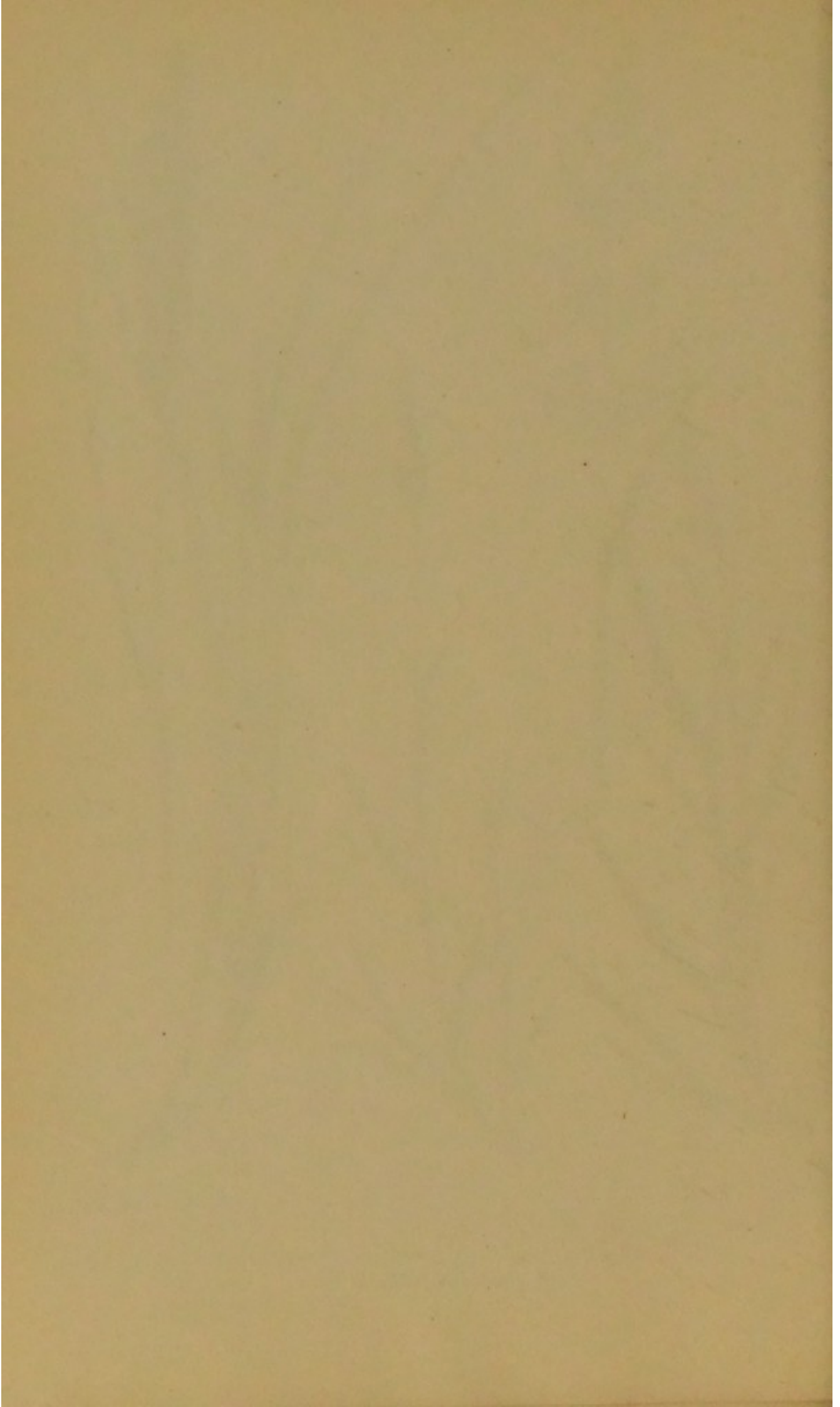


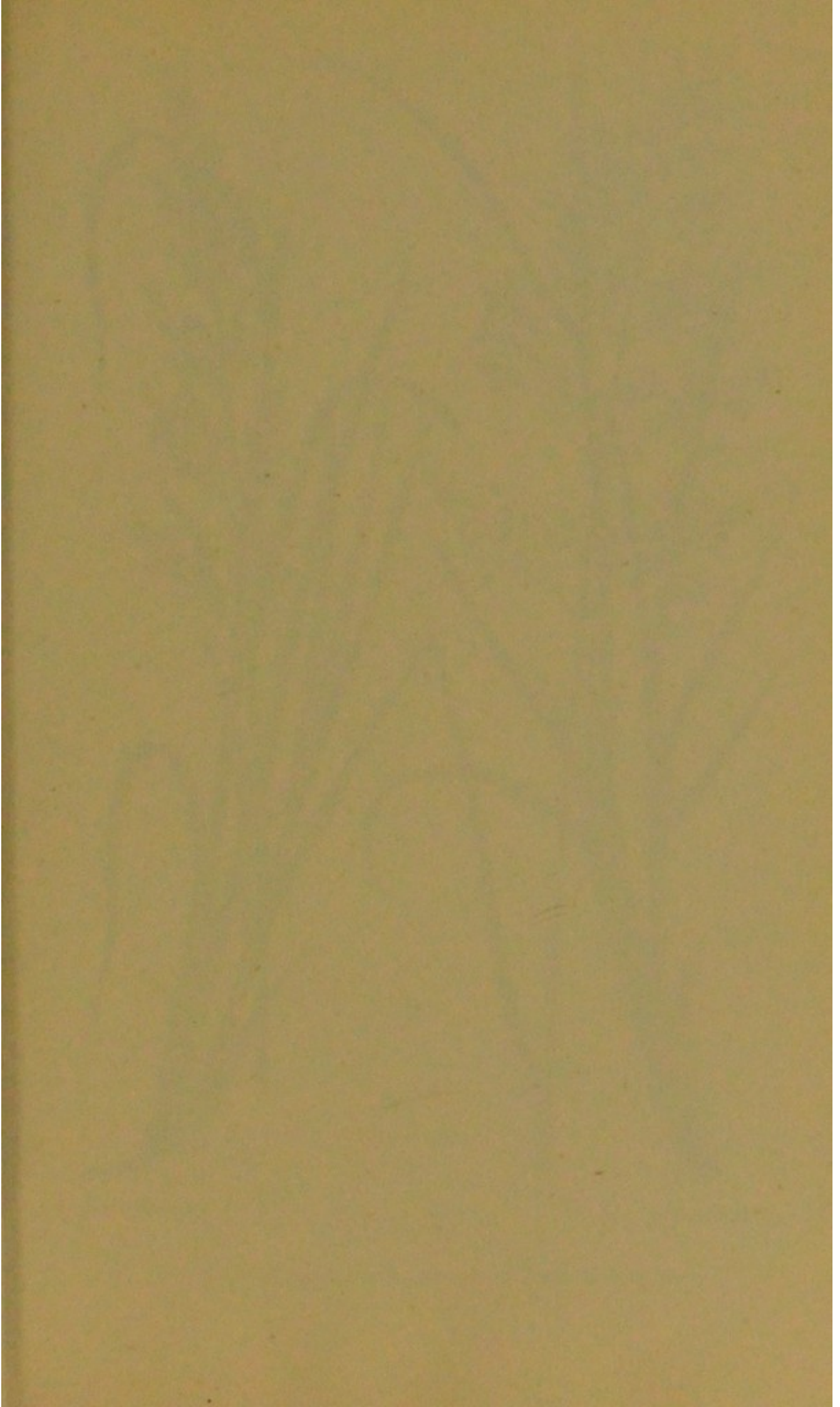


W. Fitch, del et lith.

Vincent Brooks, Imp.

1. *Agrostis alba*. 2. *Gastridium lendigerum*.
3. *Psamma arenaria*.





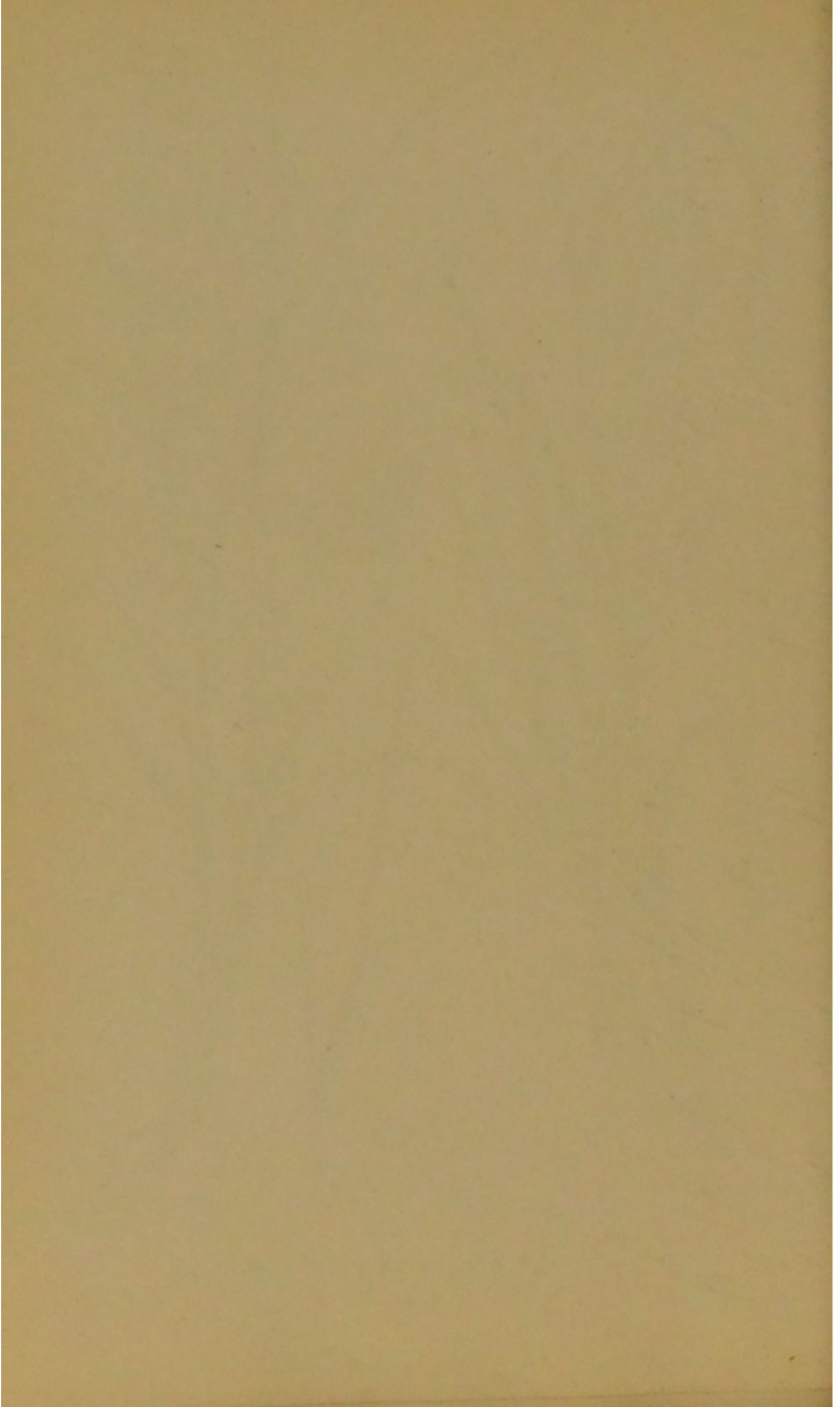




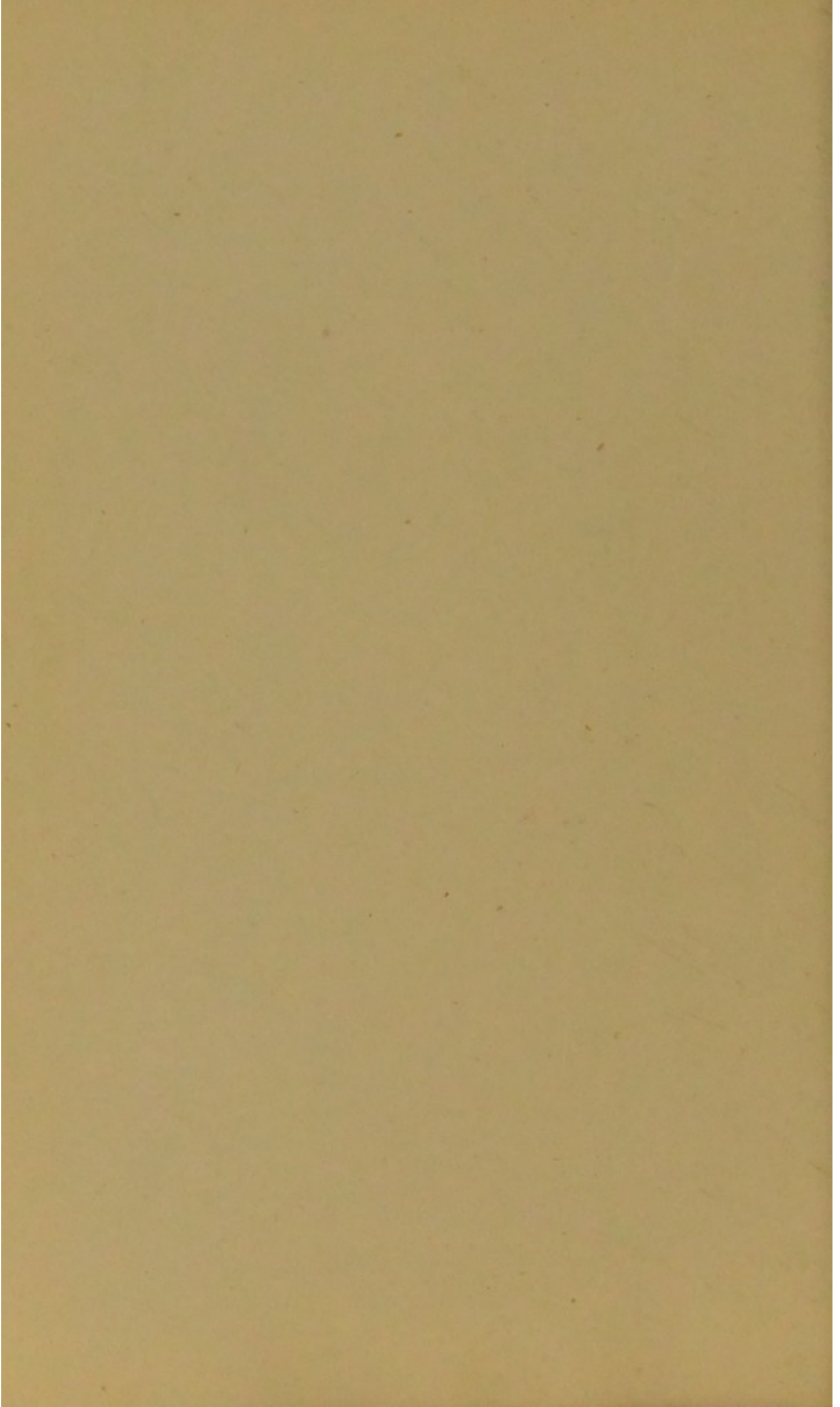
W. Fitch, del. et lith.

Vincent Brooks, Imp.

1 *Calamagrostis lanceolata*. 2 *Aira cæspitosa*.





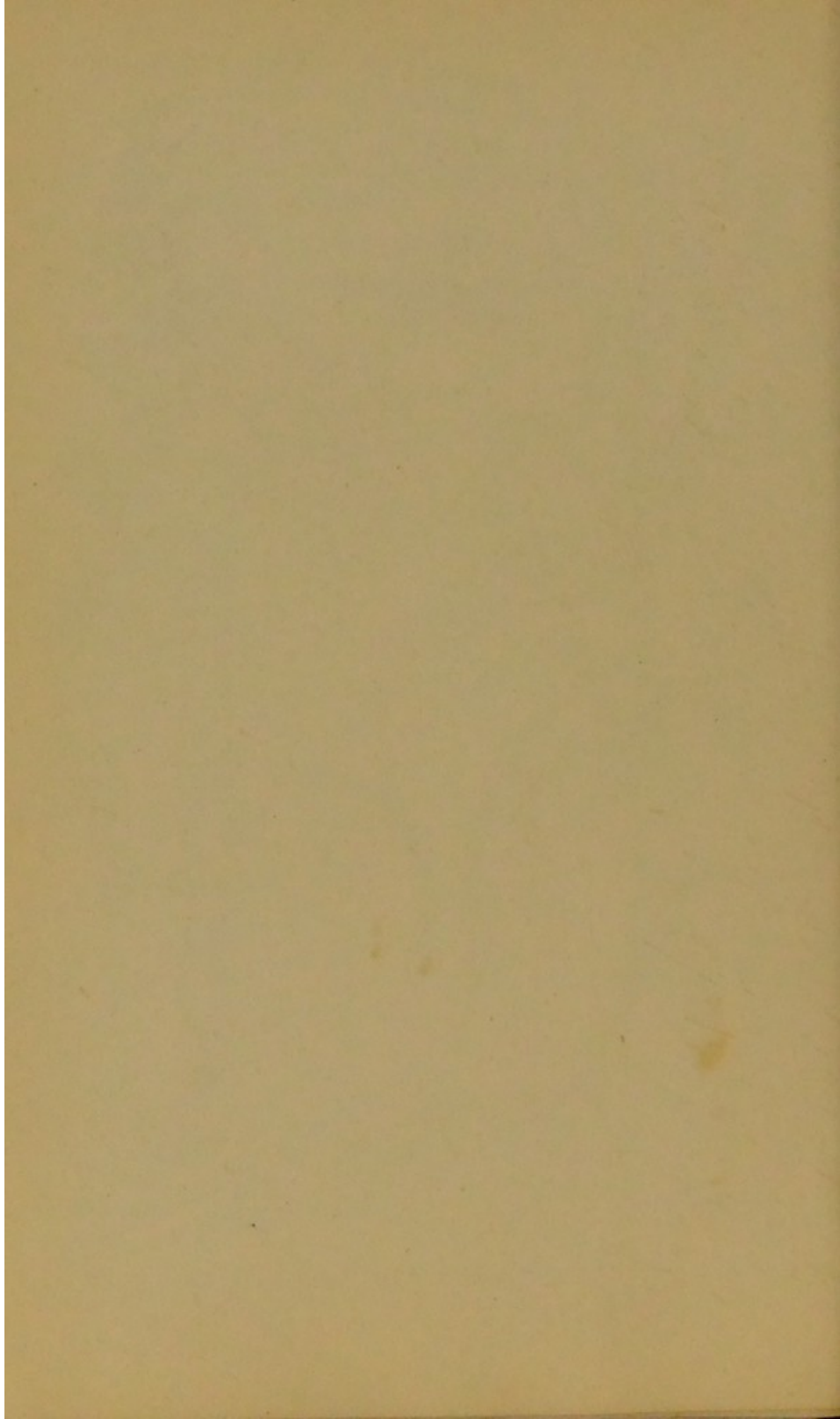


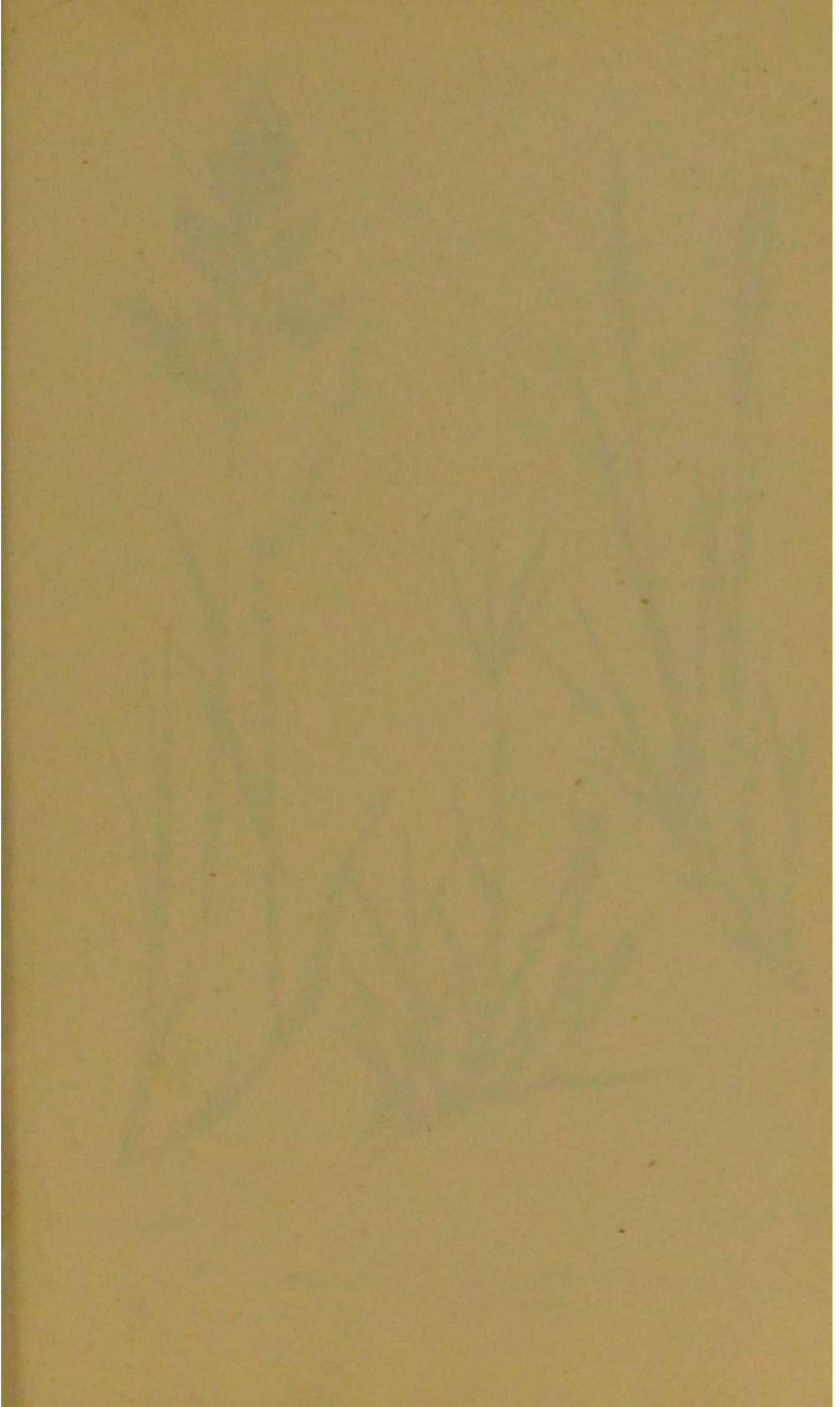


W Fitch, del et lith.

Vincent Brooks, Imp

1. Avena fatua. 2. Arrhenatherum avenaceum.





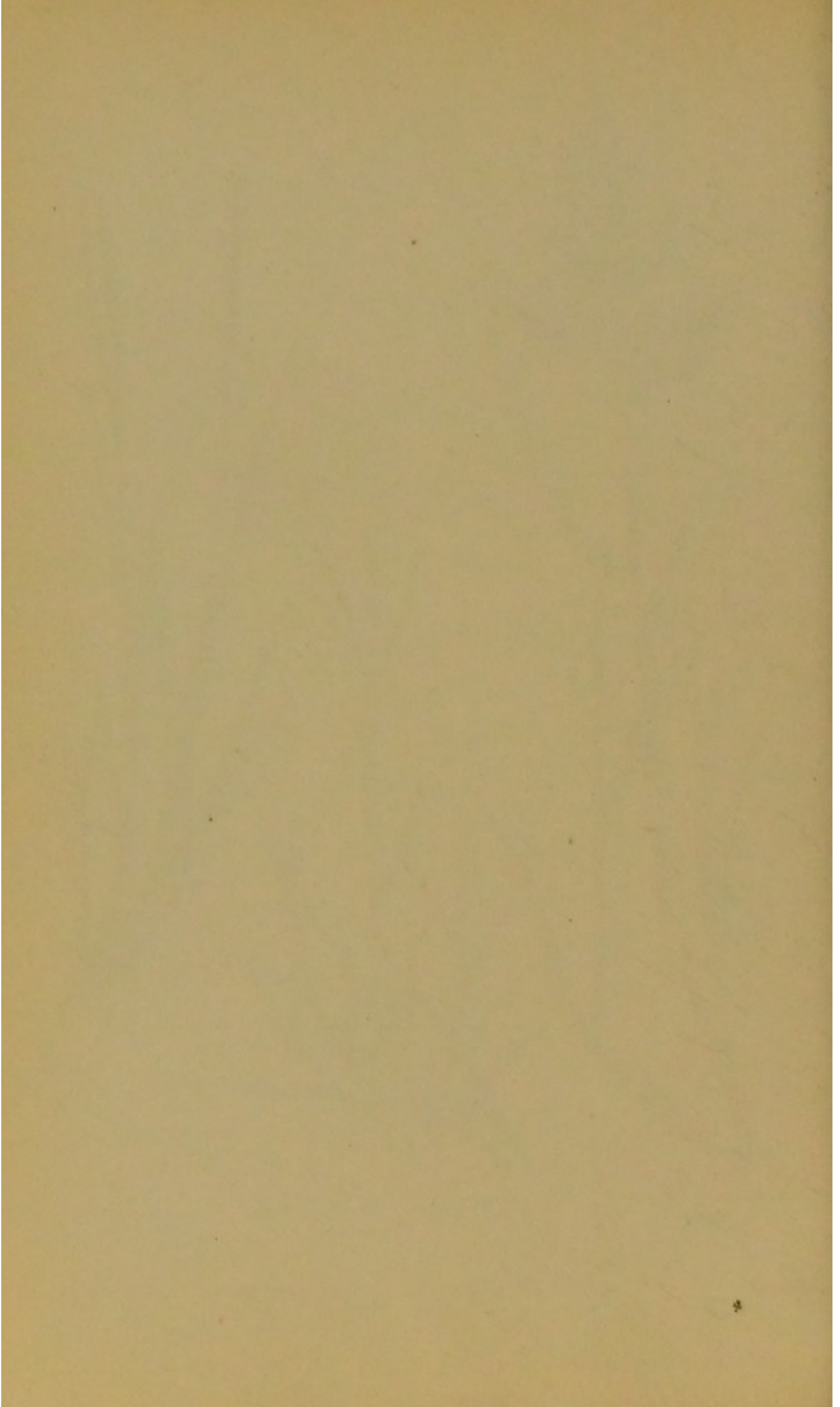




W. Fitch, del. et lith.

Vincent Brooks, Jr.

1 *Holcus lanatus* 2 *Cynodon Dactylon*
3 *Spartina stricta*









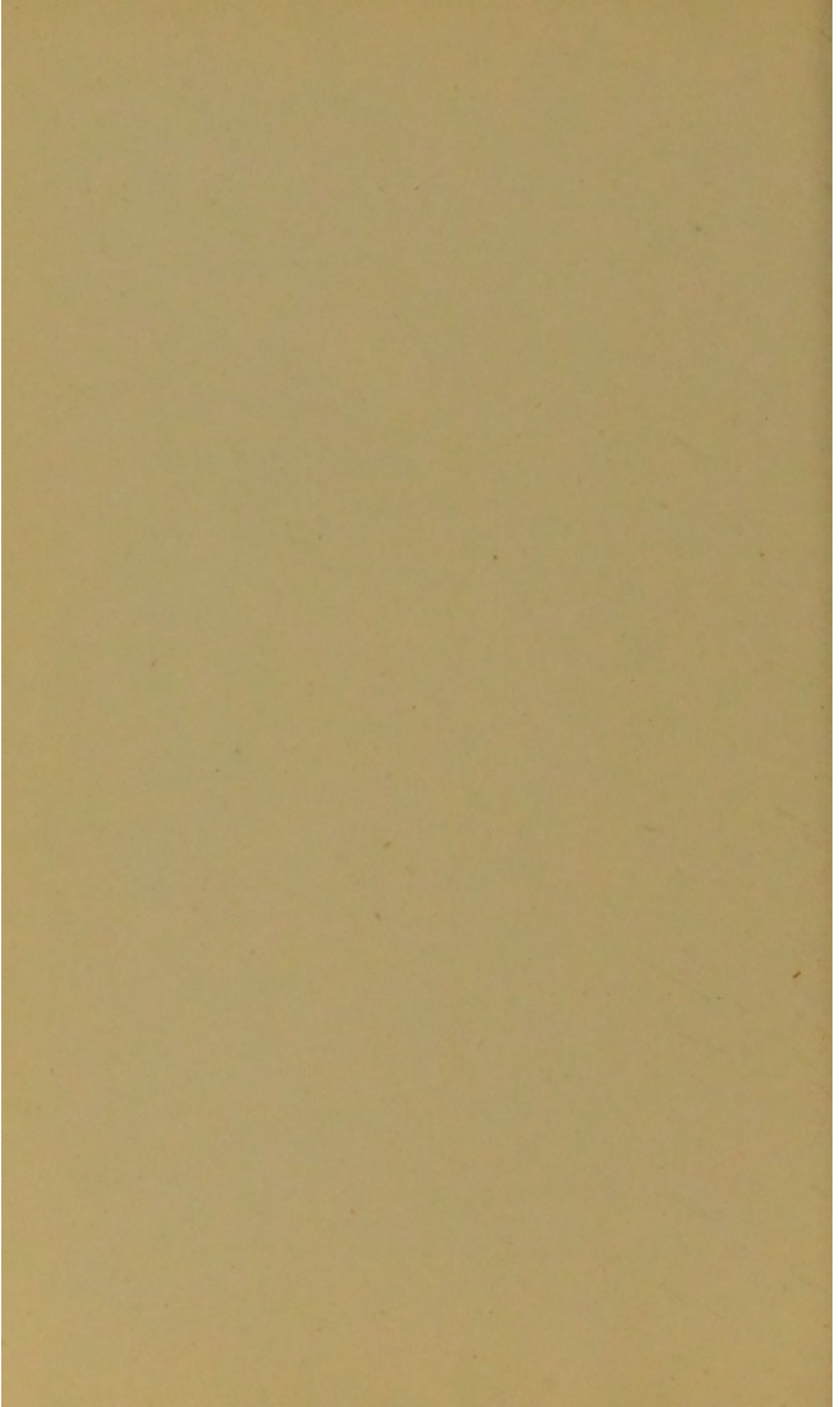
W. Fack. del. et lith.

Vincent Brooks. Imp.

1. *Lepturus incurvatus*. 2. *Nardus stricta*.
3. *Elymus arenarius*





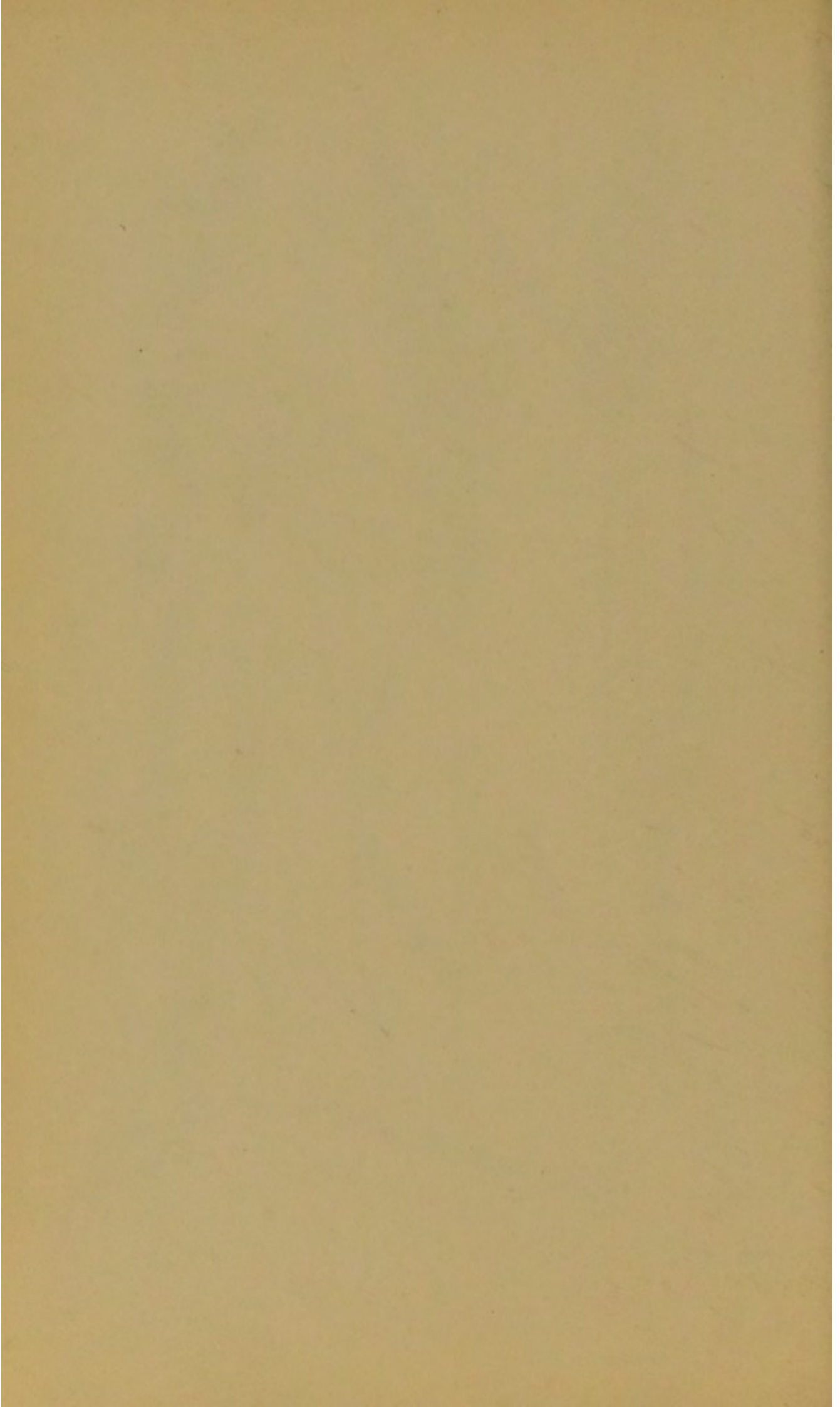




W. Fitch, del. et lith.

Vincent Brooks, imp.

1. *Hordeum pratense*. 2. *Triticum repens*.
3. *Lolium perenne*.









W. Fitch, del et lith.

Vincent Brooks, Imp

1 *Brachypodium pinnatum* 2 *Bromus sterilis*





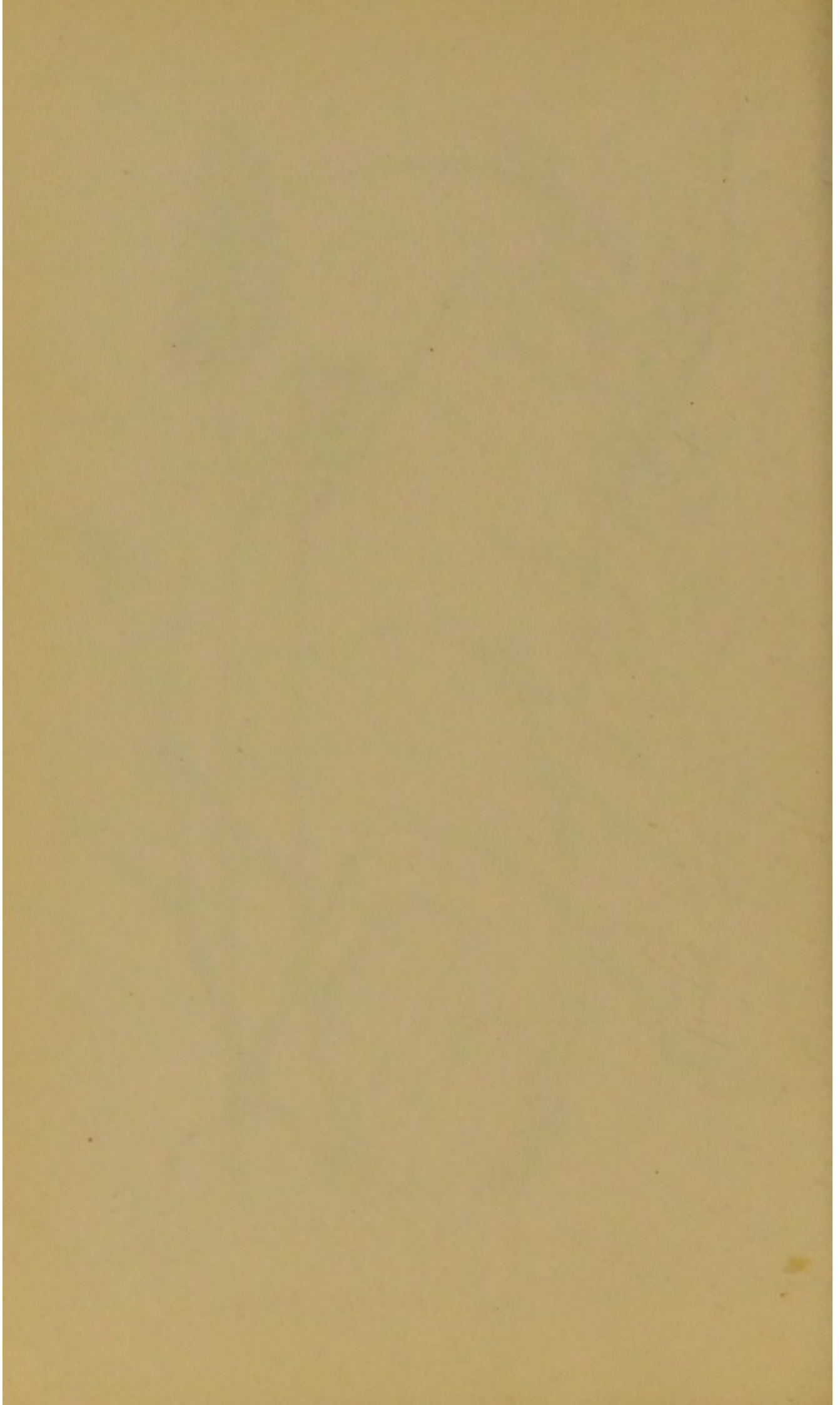




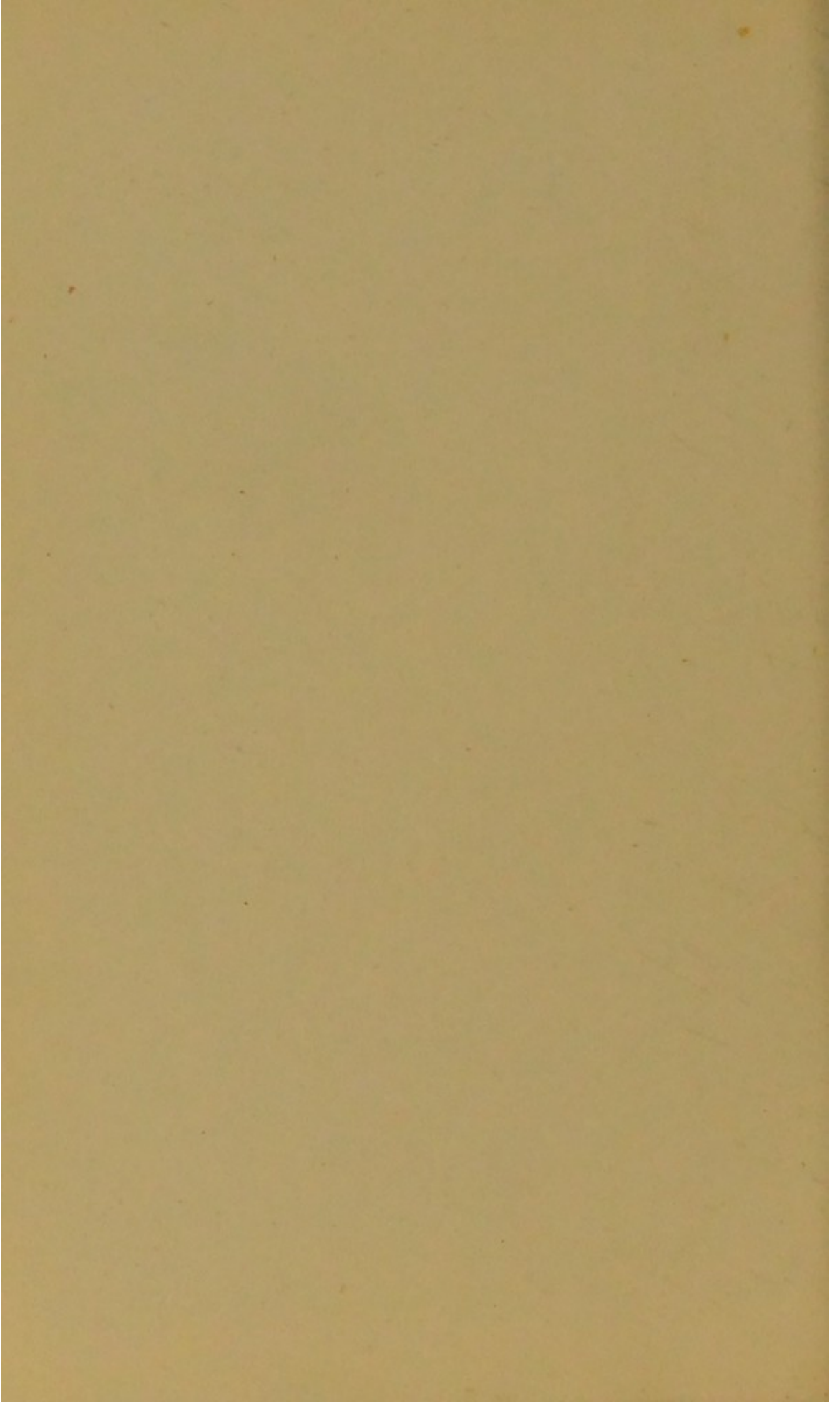
W. Fitch, del et lith.

Vincent Brooks, Imp.

1. *Festuca elatior*. 2. *Dactylis glomerata*.





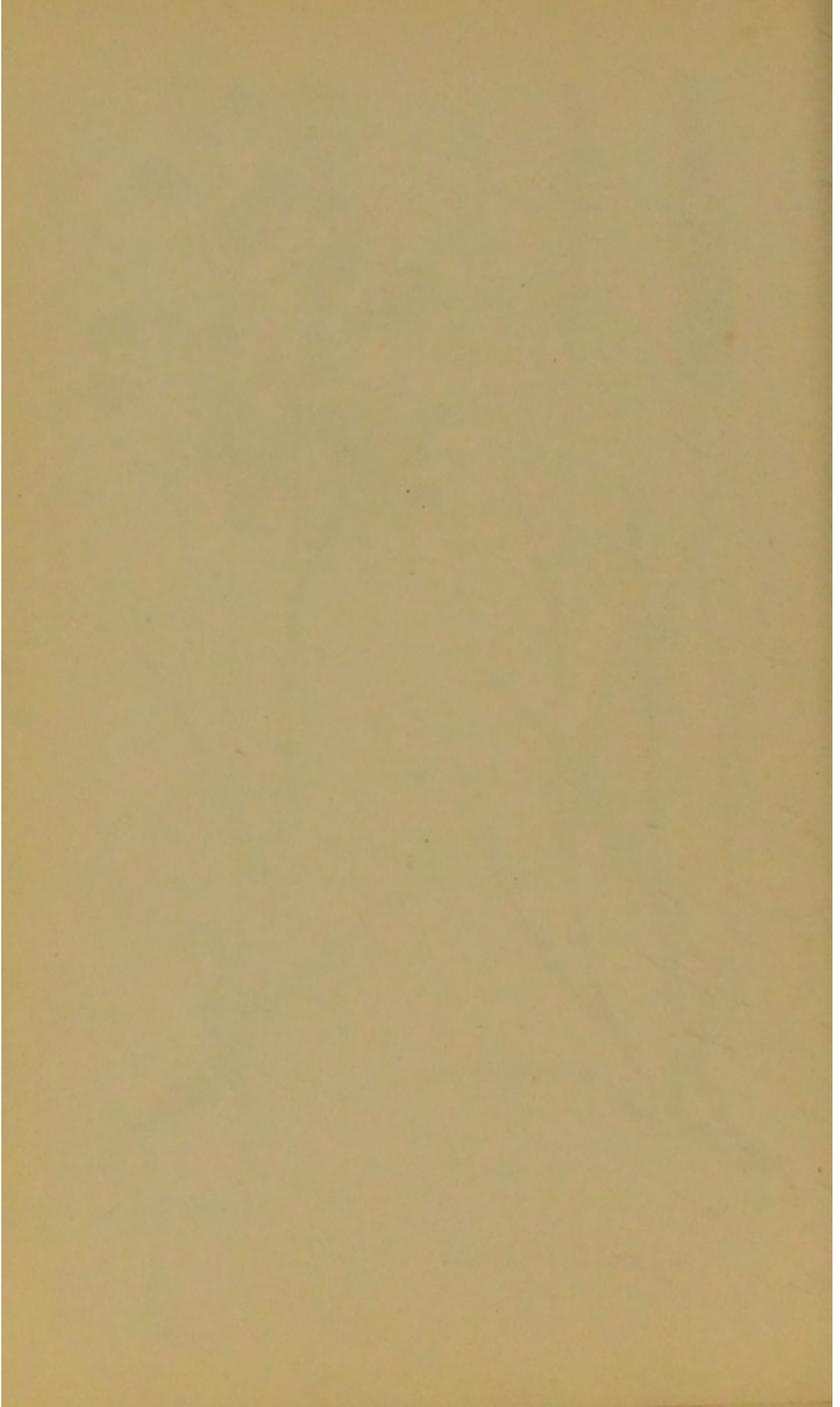


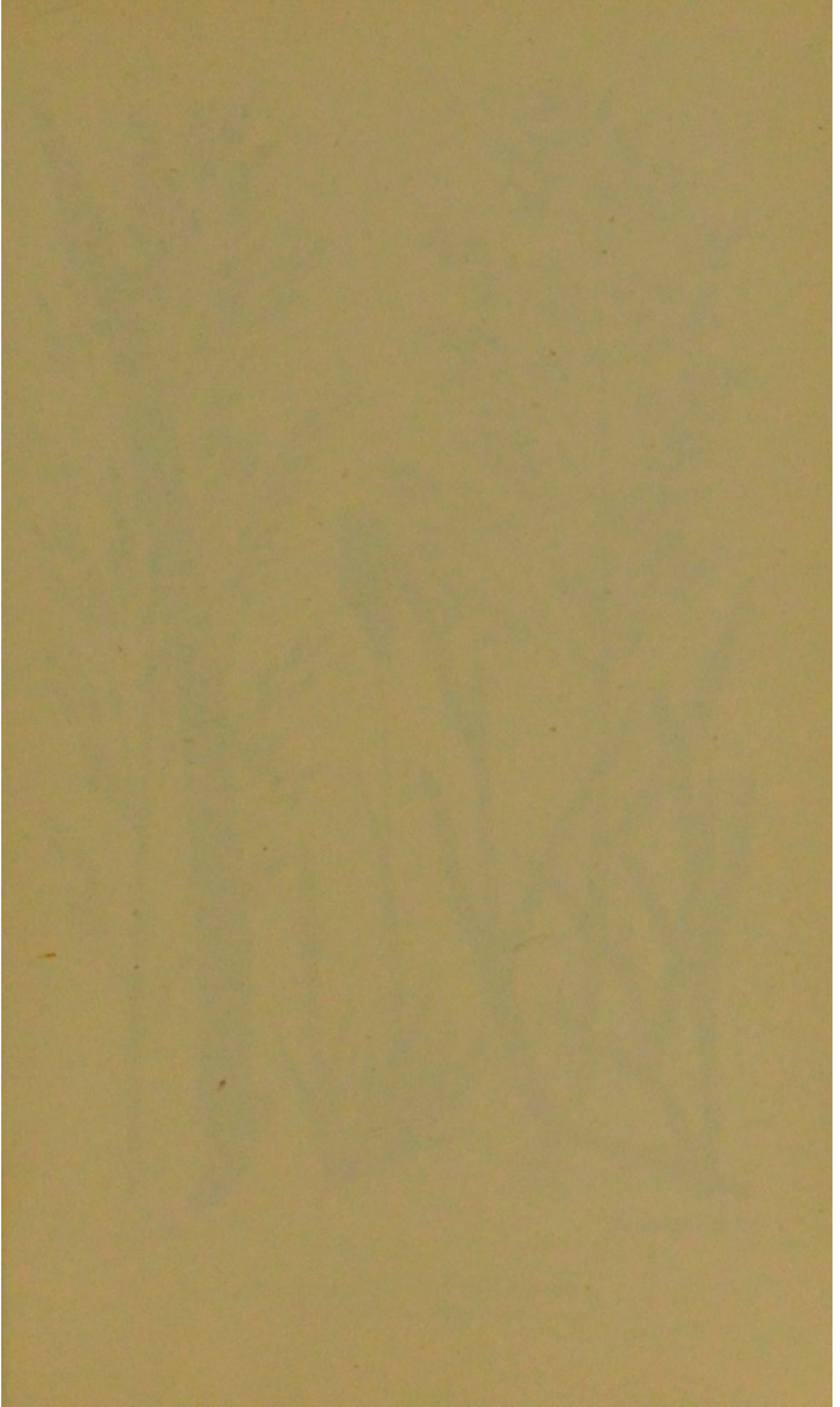


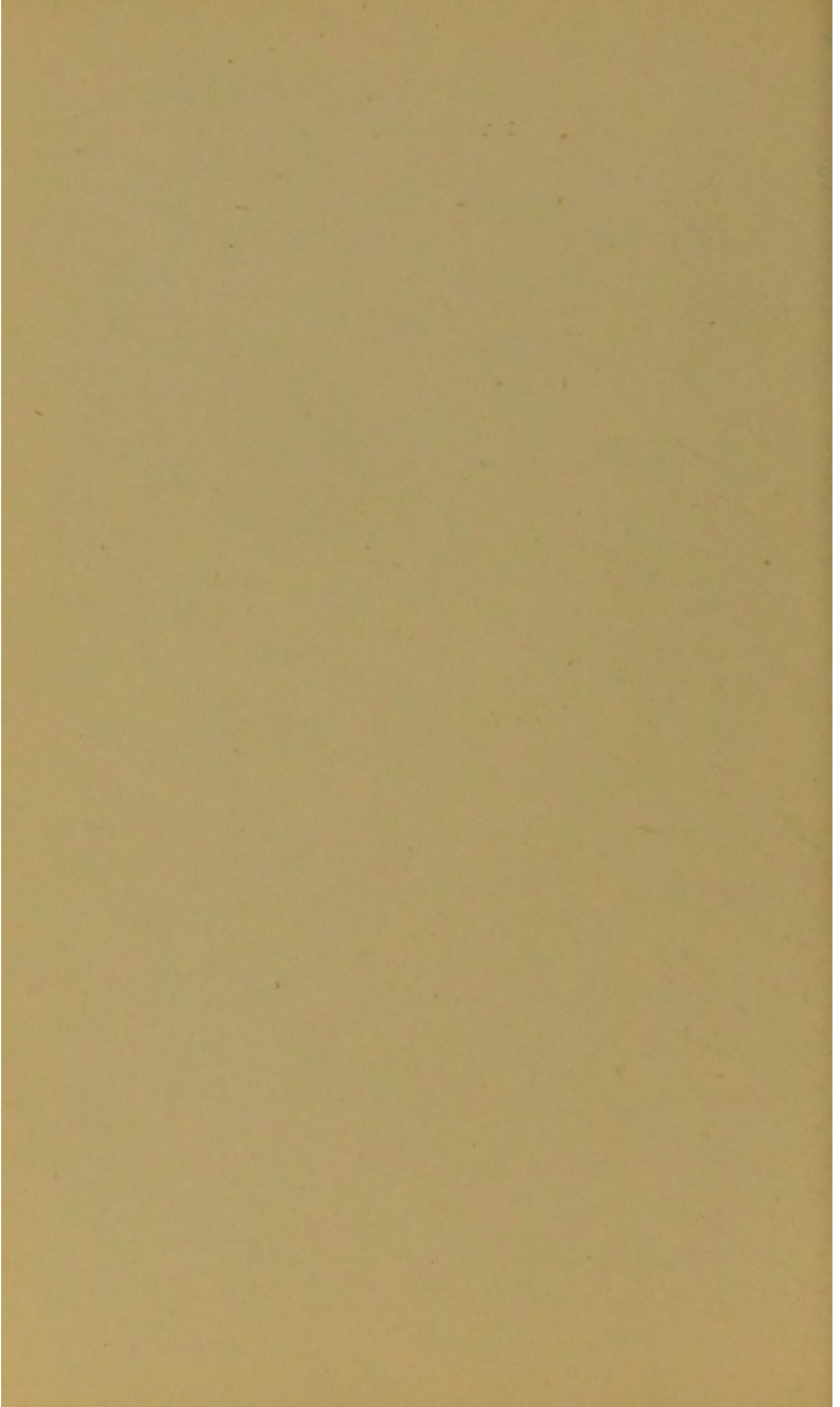
W. Fish, del et lith.

Vincent Brooks, Imp.

1. *Cynosurus cristatus* 2. *Briza media*.









W. Fitch, del. et lith.

Vincent Brooks, Imp.

1. *Poa aquatica*. 2. *Poa bulbosa*.
3. *Catabrosa aquatica*.









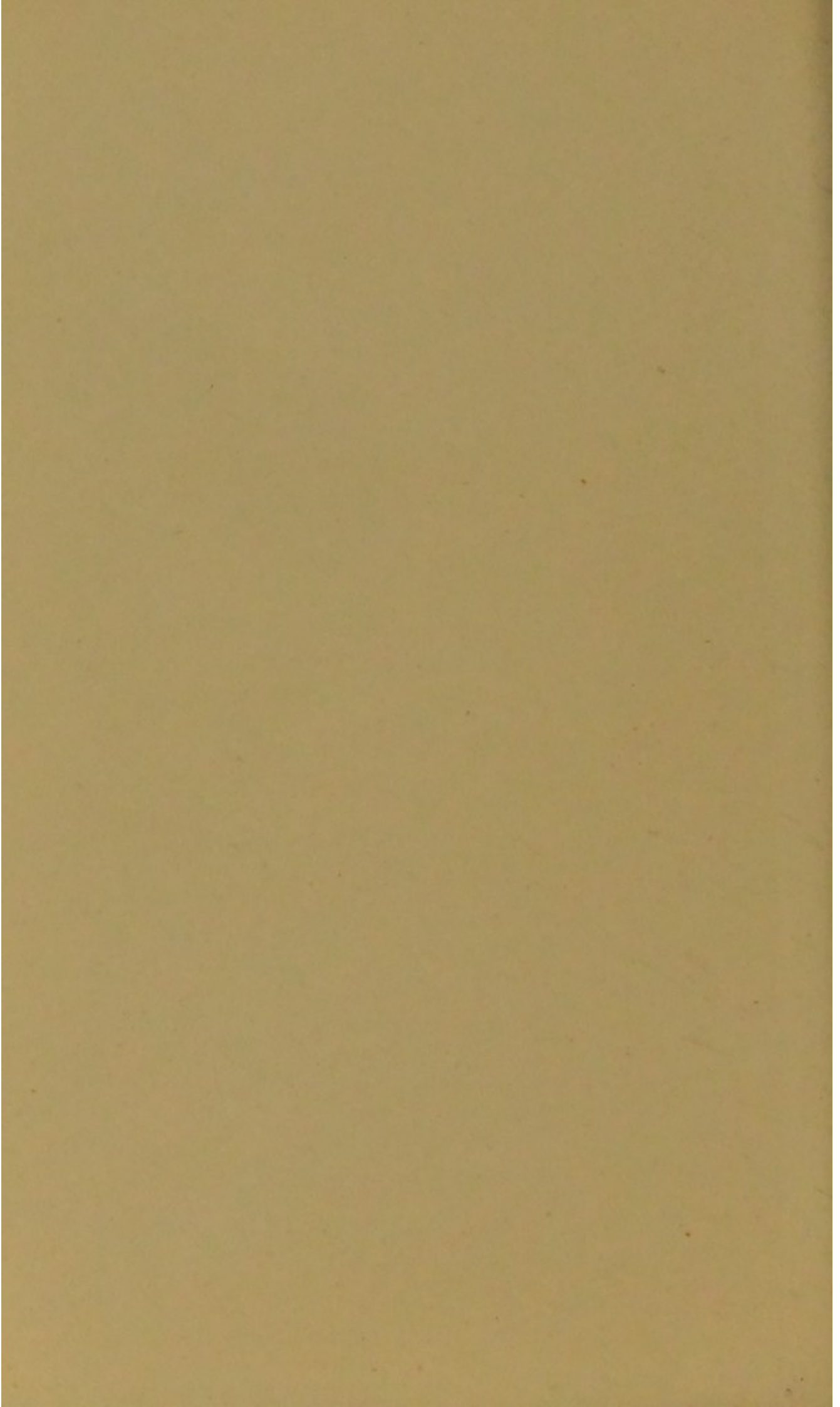
W. Fusch, del. et lith.

Vincent Brooks, Imp.

1. *Molinia caerulea*. 2. *Melica nutans*.
3. *Triodia decumbens*.









W. Fitch, del. et lith.

Vincent Brooks, Imp.

1 *Koeleria cristata* 2 *Sesleria caerulea*
 3 *Arundo Phragmites*







