THE BULLETIN

of the

UNITED STATES GOLF ASSOCIATION GREEN SECTION

Vol. 10 Washington, D. C., March, 1930 No. 3

Contents

THE BULLETIN is published monthly by the United States Golf Association Green Section, at Room 7207, Building F, 7th and B Streets, N. W., Washington, D. C.

Address all MAIL to P. O. Box 313, Pennsylvania Avenue Station, Washington, D. C.

Send TELEGRAMS to Room 7207, Building F, 7th and B Streets, N. W., Washington, D. C.

Subscription Price: In United States of America, Mexico, and West Indies, $4.00 per year; in all other countries, $5.00 per year.

Entered as second-class matter, April 21, 1926, at the post office at Washington, D. C., under the Act of March 3, 1879.

Green Section Summer Meetings

The United States Golf Association Green Section is planning to hold six meetings on golf courses during the period June 30 to July 14, 1930. Excellent opportunities will be furnished at these meetings to discuss golf turf problems on the ground. The success which has attended the Green Section's summer meetings in the past has called for an increased number of these meetings, and it is fortunate that the six meetings now arranged for can be held under representative conditions within so short a period during the summer of this year. At all these meetings opportunity will be afforded on the demonstration turf gardens to compare different strains of grasses, different fertilizer tests, and the results of different cultural practices. The meetings will be open to anyone interested in such problems whether or not he may be affiliated with a club supporting the work of the Green Section. The meetings will be held at turf gardens on the golf courses listed below.

June 30, 11 a. m. Detroit Golf Club, Detroit, Mich.
July 1, 2 p. m. Sleigh Municipal Course, Grand Rapids, Mich.
July 2, 2 p. m. Niagara Falls Municipal Course, Niagara Falls, N. Y.
July 8, 11 a. m. Mill Road Farm Course, West Lake Forest, Ill.
July 9, 2 p. m. Interlachen Club, Minneapolis, Minn.
July 14, 11 a. m. Allegheny Country Club, Sewickley, Pa. This meeting will be held at the time of the Pennsylvania Golf Association's amateur and open championship tournaments.

The meeting on July 9 at the Interlachen Club will be held just before the National Open Tournament. This is the first time in several years that a Green Section meeting and the National Open Tournament have been held jointly, and it should accordingly prove of special interest, affording visiting turf enthusiasts an opportunity to follow the matches and become familiar with interesting features of the course while at the same time joining in the study of turf problems at the meeting to be held at the demonstration turf garden. Under the liberal support of cooperating local golf courses the demonstration garden at Interlachen has become a real asset to the greenkeepers in the Minneapolis district. The garden is reported to be in excellent condition. In the evening there will be a dinner and a short program of talks on turf problems. The local greenkeepers' association and green committees are cooperating in the plans for this meeting.

STATEMENT REQUIRED BY POSTAL LAWS AND REGULATIONS OF THE OWNERSHIP AND MANAGEMENT (AS OF APRIL 1, 1930) OF THE BULLETIN OF THE UNITED STATES GOLF ASSOCIATION GREEN SECTION, PUBLISHED MONTHLY AT WASHINGTON, D. C.

The owner is the United States Golf Association, a corporation organized and existing under the law not for profit and having no capital stock, outstanding bonds, mortgages, or other securities.

The publisher is the United States Golf Association, 110 East 42nd St., New York, N. Y.

The editors, managing editors, and business managers are John Monteith, Jr., and Kenneth Welton, Washington, D. C.

Sworn to and subscribed at Washington, D. C., April 4, 1930, by Kenneth Welton, business manager, before F. E. Singleton, notary public.

Identifying Turf-Grass Seed

By F. H. Hillman
Seed Laboratory, United States Department of Agriculture

(An address given at the annual meeting of the Green Section in New York City, January 10, 1930)

The greenkeeper's experience in handling the seed of turf grasses leads him to become acquainted with the identification characteristics of some of the kinds most commonly used. Differences in size, shape, and color indicate differences in kind. Unusual proportions of chaff and weed seeds can not easily escape notice. Thus seed of Kentucky bluegrass, redtop, fescue, crested dog's-tail, sweet vernal grass, and Bermuda grass are readily distinguished one from another. The chaffy German bent seed is conspicuously different from the well cleaned seed from the Pacific coast and from Canada. Some imported bent seed is easily distinguished from domestic seed by its numerous accompanying weed seeds. These kinds of seed and the physical condition of the sample can be recognized with the unaided eye, a magnifying glass not being necessary.

Some of the kinds of seed referred to are representatives of groups of closely related kinds which are also of interest to the greenkeeper. Close relationship of plants usually is accompanied by close similarity of their seeds; this is conspicuously true of the turf seeds under discussion. Kentucky bluegrass (*Poa pratensis*) is one of at least five kinds of Poa of more or less interest to greenkeepers in one section or another of the country. The word "bluegrass" appears in the common names of four of them, and the words "meadow grass" appear in the names of two; thus the common names do not suggest the close relationship of all of them. Excepting Kentucky bluegrass of domestic production, the remaining kinds, which are imported, are Canada bluegrass (*Poa compressa*), rough-stalked bluegrass or meadow grass (*Poa trivialis*), wood meadow grass (*Poa nemoralis*), and annual bluegrass (*Poa annua*). Seed of Canada bluegrass, which may be of turf interest in some sections, has been used as an adulterant of Kentucky bluegrass and would be an undesirable substitute for the latter in many sections of the country. The two meadow grasses and annual bluegrass have their place in the turf problem, and when these grasses are specifically desired their seeds should not be confounded. How can the greenkeeper, provided with nothing better than a hand-magnifier and probably unfamiliar with the points of distinction and identification of the kinds, distinguish between them? The expert seed analyst, knowing the fine points of distinction, requires the best of hand-magnifiers, and sometimes a compound microscope, to insure accurate identification.

The turf fescues represent several kinds according to the names under which they appear in the trade. Red fescue (properly *Festuca rubra*) is a popular name. Much seed labeled thus comes from Europe. Chewings' fescue (*Festuca rubra fallax*), a variety of red fescue, comes from New Zealand. Often the preference is for the New Zealand variety. How is the greenkeeper to distinguish them if he is not provided with the means and the knowledge with which to use it? The slender seeds of the so-called red fescue from Europe have a brownish color when a small quantity is examined spread out. A hand-magnifier shows that some of the seeds are very finely hairy,

and it is to be observed that many of the tapering seeds terminate in a slender bristle, or awn. Chewings' fescue seed is usually lighter colored and has a slight purplish tinge. They are all smooth and only an occasional seed terminates in a very short awn. Turf fescue seed from Europe is imported as red fescue (*Festuca rubra*), sheep's fescue (*Festuca ovina*), hard fescue (*Festuca duriuscula*), various-leaved fescue (*Festuca heterophylla*) and fine-leaved fescue (*Festuca capillata*). The last named has comparatively small and smooth seeds and can be distinguished from the others by these characteristics. The other kinds are practically indistinguishable by an examination of their seeds, and it is claimed that they are much mixed in the trade. At present we know of no way by which the seed of the creeping red fescue produced in Alberta, Canada, can be identified with certainty; so assurance rests upon direct dealing with the producer or with a reliable agent.

Two kinds of sweet vernal grass seed come from Europe; one the perennial sweet vernal grass (*Anthoxanthum odoratum*), the other the annual sweet vernal grass (*Anthoxanthum puelii*). A greenkeeper would have to see the two kinds together in order to distinguish them. Unhulled seed of the perennial kind is darker reddish brown than the other, as is also the hulled seed. The thin tip of the outer scales of the seed of this kind is rounded, while in the other kind it is usually notched. Seeds of crested dog's-tail and of Bermuda grass are generally recognizable because of the absence of other closely related kinds accompanying them.

Redtop is classed as one of the bent grasses, in books on botany. The bent grasses (species of Agrostis) probably represent the most important group of closely related turf grasses with which the greenkeeper has to deal. Part of the seed on the market is domestic-grown and part is imported. The fact that there are several kinds, the multiplicity of names both common and botanical, the small size and similarity of the seeds, the frequent misnaming and adulteration in the trade, all combine to render the greenkeeper practically helpless in identifying this class of seeds. While redtop may have a legitimate place in the list of golf course turf grasses, a person trying to get seed of one of the fine bents does not want to have redtop supplied him in place of it either accidentally or intentionally. The similarity of the seeds of bents doubtless has led to many trade errors in labeling. It also has led to much intentional adulteration of the more expensive fine bent seed with the cheaper redtop, sometimes redtop being wholly substituted for the fine bent. In one instance a large shipment of American grown redtop went to New Zealand, then came back as New Zealand grown browntop or colonial bent. In another instance American redtop sent to Germany was resold in the United States as genuine German bent. These were cases of complete substitution of redtop. Many instances of adulteration, varying in extent, are on record. Because of the coarse character of redtop turf, unfitting it for the more exacting requirements of the golf course, and the relatively low price of its seed, inviting its use as an adulterant, we are becoming inclined to refer to the commercial kinds of Agrostis as redtop and the bent grasses.

The most widely used and produced kind of bent seed is that generally known in the United States as Rhode Island bent, for which the name colonial bent recently has been adopted by the United States

Department of Agriculture. It has been produced commercially in Rhode Island. It is now being produced in limited quantity in Washington and Oregon. Much seed is harvested on Prince Edward Island, Canada, from fields which have been certified under government inspection as practically free from redtop. This well recleaned seed is sold in the United States as Prince Edward Island bent. Large quantities of this seed are received in well cleaned condition from New Zealand. This seed is the chief ingredient of the mixed bent seed produced in southern Germany, velvet bent seed being the other valuable ingredient, varying much in its proportion. Some lots of the German seed are essentially pure colonial bent, aside from the chaff which is almost invariably prevalent in the German seed.

Seaside creeping bent, as its name suggests, is primarily a seacoast grass, but it is known to grow naturally inland. The bulk of the seed on the market is produced on the Oregon-Washington Pacific coast, chiefly in southwestern Oregon. Seed marketed under the trade name "Cocoos bent" is produced in the region of Coos County, Oregon. Some seed of creeping bent has been produced on Prince Edward Island, Canada. It is now under production in New Brunswick, Canada. The seed produced in Canada is certified by the Canadian Department of Agriculture after field inspection. Creeping bent has a pronounced capacity for spreading by means of over-ground trailing and rooting stems.

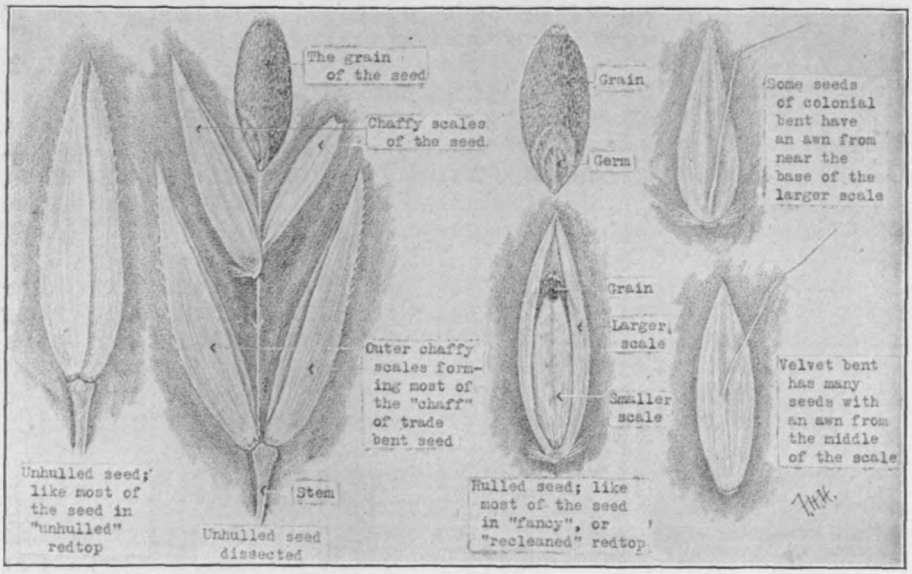
Velvet bent, admired for the fine quality of its turf, is also a stoloniferous grass, from which especially desirable strains are being developed. Until recently, seed of this grass was known in the United States only as an ingredient of the mixed seed coming from Germany. Now, seed, more than half of which is seed of velvet bent, is produced on Prince Edward Island, and very pure seed has been produced in Alberta, Canada.

Two new forms of bent being produced in Oregon are now becoming established in the trade. In Oregon, both spread widely by underground stems and appear to have much promise as turf grasses suited to golf purposes. One of these is Astoria bent, produced near Astoria, in northwestern Oregon. The other has been marketed as Oregon bent and is a highland grass of interior Oregon. Both are believed to be varieties of the colonial bent previously discussed.

"Hybrid seed" is a term being applied to a form of bent seed coming from Germany under the names "creeping bent" and "German bent," implying that it is the same as the South German mixture of colonial and velvet bents. This seed probably has been a variable ingredient of the German mixture for many years, but within recent years it has been practically all the seed of some lots. The real nature of the plants produced from this seed is not now known here; but the plants are under study and it is expected that more will be known about them in the near future. In the meantime, this seed is distinguishable from that of the other commercial kinds.

The question has been asked, "To what extent can the greenkeeper identify the seed of redtop and the fine bents?" The general impression is that he is not properly equipped or prepared to do this accurately. The seeds are so small, and the points of distinction so minute and obscure, that most of them can not be seen even with the aid of the best hand-magnifier. A compound microscope is necessary, and even with that one must know what to look for and be able to

interpret what he finds. Not all seed analysts equipped with a microscope are prepared to make these identifications. The seed now appearing in the trade can be identified as to kind under most conditions. In mixtures of certain kinds, it is very difficult to distinguish all of the seed of each kind in a test sample, which must necessarily be very small to permit the work being done at all. In making determinations of this kind, the problem varies with the conditions involved. Thus with a mixture of redtop and creeping bent seeds, practically accurate determination of the true proportions of ingredients is possible; but with a mixture of colonial bent and Astoria bent seeds an accurate determination of proportions is not now known to be possible.



Structure of the seed in redtop and bent grasses, which may be seen with the use of a good hand-magnifier

A general understanding of the means by which the different kinds of bents may be distinguished by their seed may be gathered from an explanation of the structure of the seed in the group Agrostis. At the time of flowering, a single flower terminates each ultimate branchlet of the flower cluster. Each flower produces a single seed, which until maturity remains enveloped by two similar chaffy scales which have little, if any, value as indicating the particular kind of bent. Removal of the two chaffy scales exposes what is here referred to as the "seed," consisting of the grain containing the germ and surrounded by two additional scales, one longer than the grain, the other shorter, thin, and transparent. The longer scale has a slender bent bristle, or awn, from near its base in some of the seeds of colonial bent, including the Astoria and Oregon varieties, but in none of the others. These awns are noticeably numerous in seed of the Astoria, some of the seeds of which are unusually large and robust for these three kinds. The surface of this scale in these kinds is comparatively dull and the seeds average smaller than those of redtop and creeping

bent. These features are somewhat evident under a good magnifier. The length of the shorter transparent scale, and whether its tip is notched, rounded, or truncate, are important points to consider in naming the seed. The magnifier is of little use in observing these points. Seeds of redtop and creeping bent, also the "hybrid" seed, are more or less shining on the longer scale about the grain. This is somewhat evident under the hand-magnifier and may be useful in disclosing the presence of the "hybrid" seed in German bent seed. This "hybrid" seed is very much like redtop, but mostly smaller and more slender. Other structural features necessary to use are too obscure to justify consideration here. Velvet bent seed may be distinguished from all the other commercial kinds with a good hand-lens, since the individual seeds are dull, the surface of the longer scale around the grain being finely roughened and often awned from the middle, the smaller scale being so small that it is practically invisible, and the grain soft with a semifluid interior while the grains of all the other kinds are hard and mealy.

The kind of the bent seed coming before the analyst often is suggested by the evident origin of the seed. The region of production, or origin, of the seed is indicated chiefly by the seeds of other kinds of plants usually present with the bent seed. Some of these associated seeds are those of weeds, others those of cultivated crops. One can readily understand that plants growing naturally, and even certain cultivated crops, will differ in kind in regions remote from each other. Thus German bent seed usually contains seeds never found in seed of any of the bents produced in the United States or Canada. The same applies to seed grown in different sections of the latter regions. The greenkeeper's hand-magnifier would be very useful if he could know the origin-indicating seeds and had sufficient patience to find them.

The chaff of German bent seed usually indicates the origin of this seed, because it consists chiefly of the two outer scales of the seed separated from the heavier stem, and is therefore very fine and light in weight. It varies from 20 to 60 per cent of the total weight of the bulked seed. The virtue of its presence in the seed probably is best appreciated by the foreign dealers when they think of the price per pound paid by American consumers.

The evolution of better turf grasses is by no means complete. Throughout the whole great realm of animal and plant life the process of evolution is ceaselessly though silently going on. In this development the hand of man plays no small part. In 1840 the average weight of fleece sheared from American sheep was less than 2 pounds. By 1900 it had been increased, through selection and breeding, to nearly 5½ pounds. Today it is approaching 8 pounds.

The house wren, for all its diminutive size, is a most useful bird, says the Bureau of Biological Survey. It feeds almost exclusively on harmful insects, and as it usually rears two broods a year the parents are kept busy from morning till night searching for food. This wren's only bad habit is to interfere with the nests of other birds.

Classification of Redtop and the Common Bent Grasses

By John Monteith, Jr.

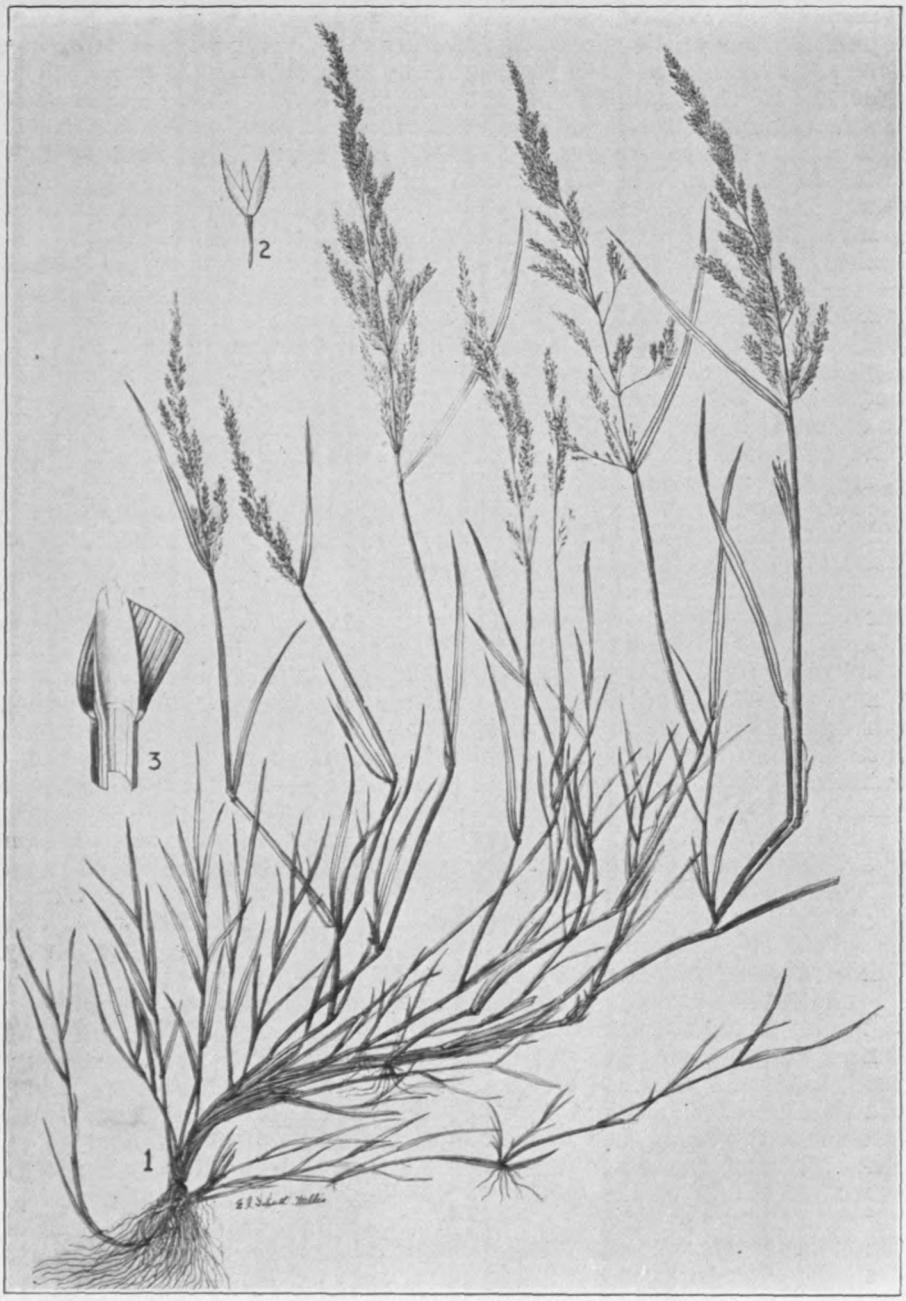
Classifications and names are devised primarily for convenience in handling or in making reference to things. Grasses are frequently classified as hay grasses, pasture grasses, putting green grasses, fairway grasses, and under other headings based on the purpose for which the grass is to be used. Another classification is on the basis of geographical distribution. Of all the many classifications of plants, that of the botanist is of most general use. In making the botanist's classification, the flower parts of a plant are of prime importance, but the many characteristics of the seed, leaf stalk, and root are also given consideration. Unfortunately the dividing lines between groups in any classification are more or less artificial, and there are always members which seem to straddle these lines and cause confusion. An example of this is the arrangement of grasses into the two groups northern and southern grasses. Bermuda grass is readily recognized as a southern grass and red fescue as a northern grass. However, such grasses as annual bluegrass and crab grass, which thrive in both the North and the South, can not be separated by such a classification. In spite of these difficulties there are admittedly many occasions when it is convenient to use such an arrangement. Likewise the botanist also find many hindrances in establishing sharp lines for separating his different groups. In some groups of plants he finds a greater number of intermediate forms than occur in other groups. The bent grasses offer an example of much variation, which has given botanists a great deal of difficulty in establishing dividing lines between groups.

When any group of plants is classified by botanists the different divisions are given names for convenience in reference. A large group is termed a genus, and this is then subdivided into species. Distinct groups belonging to a single species may be referred to as varieties. The reasons for such a classification are complex and can not be fully explained in this brief discussion. The botanist uses a Latin name to designate both the genus and the species and occasionally to denote varieties. Species and varieties of common plants are usually given common names, and sometimes a common name is used for a whole genus. The Latin, or scientific name, remains the same everywhere, but the common names vary in different countries where different languages are used and frequently vary in different sections of the same country. The scientific name Agrostis is given to the genus containing the bent grasses and also redtop. The common name "bent" is applied to all but one of the subdivisions or species of this genus. This one exception is the species known under the common name redtop. The grass usually known as velvet bent is a species to which the botanist gives the scientific or Latin name *Agrostis canina*. As with all scientific names, the first name, *Argostis*, is the name of the genus and the second, *canina*, designates the species. Several selections have been made of especially promising individual plants of velvet bent. These selections, known as strains or varieties, have, in a few cases, been given common names, but are not sufficiently distinct botanically to warrant scientific recognition. Thus the Acme velvet bent and Highland velvet bent are two distinct strains of a single species, *Agrostis canina*.

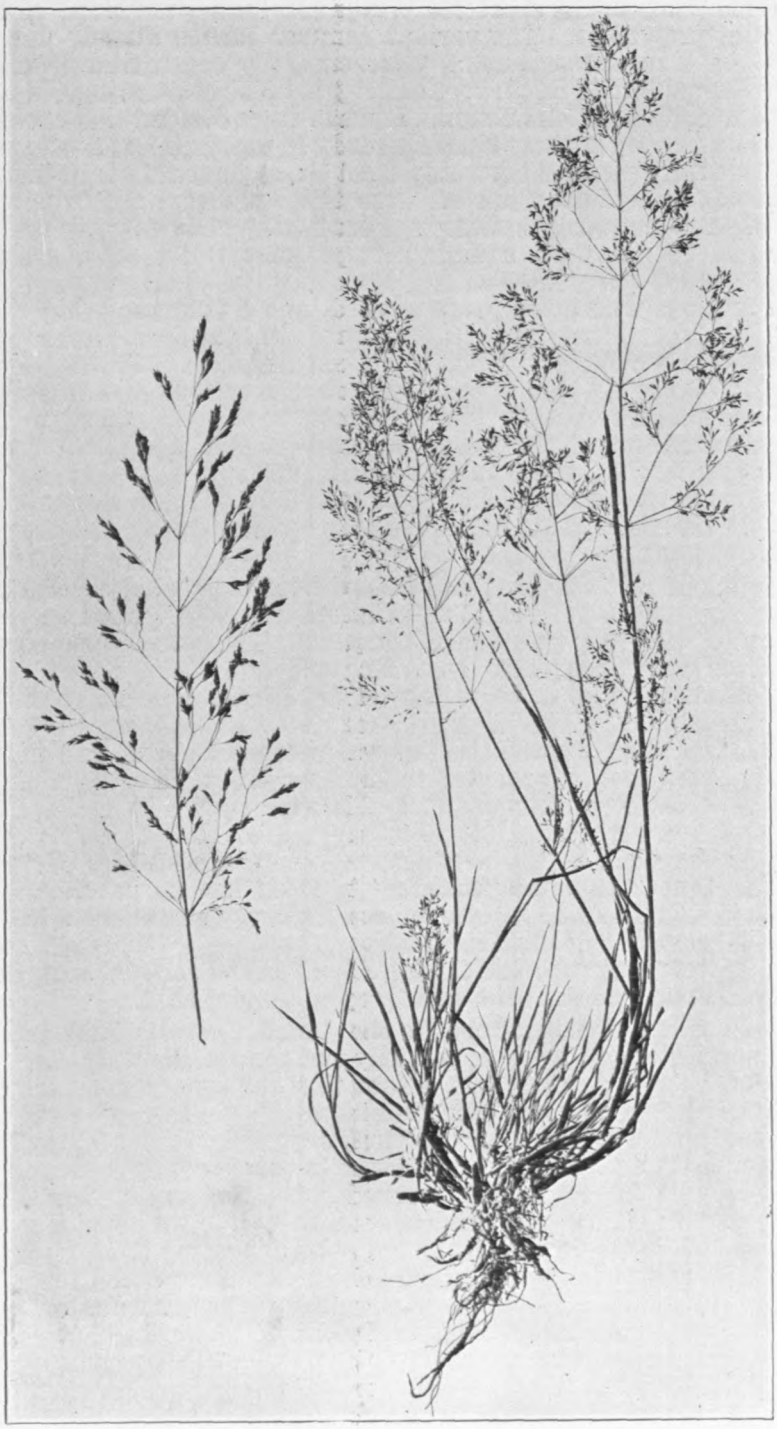
Names, whether scientific or common, are applied to objects for convenience in referring to them verbally or in print. As long as each person in a group knows what one of them may be referring to, it makes little difference what name he uses. However, if two persons in referring to an object call it by different names and each is ignorant of the name the other uses, it naturally follows that each thinks the other is talking about something entirely different. Local names for plants frequently lead to much misunderstanding and futile argument. The bent grasses furnish an example of the confusion in both common and scientific names. One needs only to glance through a few seed catalogs to discover the wide range of names now in use for the same grass. For example, a single species of bent grass is found to be designated by the following names: Rhode Island bent, colonial bent, browntop bent, browntop, fine bent, Waipu bent, Prince Edward Island bent, Astoria bent, *Agrostis tenuis, Agrostis capillaris, and Agrostis vulgaris.* Anyone who is not acquainted with grasses naturally assumes that these names refer to different kinds. Seedsmen and those who use the grass in question have been confused and often misled by the many names under which it appears on the market.

For greatest convenience in any one country, a plant should have only two names, the common name and the scientific name. The common name is largely determined by popular usage. The scientific name is determined by botanists who have made a special study of the plant, or group of plants to which the one under consideration belongs. Since the work of the Green Section constantly brings its staff in contact with the confusion of names of the bent grasses, many seedsmen and others handling these grasses have urged that our organization attempt to obtain the opinions of those who are most interested in this subject for the purpose of presenting and recommending adoption of the names which seem most convenient and simple in the light of present knowledge. No classification or group of names can be regarded as permanent, for when new information is available some changes become desirable. However, in the interest of better understanding, it is generally admitted that some names might well be dropped from common usage, and that those who write or talk about bent grasses would materially clarify the situation by using only one common name for any one accepted species.

The species of bent which has perhaps had the greatest superfluity of names is the one known generally in this country as Rhode Island bent, colonial bent, or browntop. The earlier and most commonly used American name was Rhode Island bent, since in the United States seed of this grass was first harvested in Rhode Island. In more recent years, seed of this species having been raised also in other regions, seedsmen have made a practice of designating the source of origin of the seed they handle. However, a geographical name to show the origin of seed, when coupled with a geographical common name, makes a clumsy and confusing combination, which has been objected to by dealers and purchasers of the seed. There are thus such combinations as New Zealand Rhode Island bent, Prince Edward Island Rhode Island bent, and Rhode Island Rhode Island bent, which are obviously awkward. Furthermore, the Rhode Island bent seed years ago fell into disrepute, due to adulteration, through ignorance or intent; and even though this fault has been largely



Creeping bent (Agrostis palustris). 1. Portion of flowering plant (about one-third natural size). 2. Spikelet (much enlarged). 3. Ligule (much enlarged).



Colonial bent (Agrostis capillaris)

remedied many of the seedsmen prefer some other name to avoid any lingering prejudices. The various common names already used, together with some new names, were carefully considered by officials of the United States Department of Agriculture and the United States Golf Association Green Section. It was finally decided that the choice should best be from three names already in use, namely, Rhode Island bent, colonial bent, and browntop. All the arguments which had been raised for or against each of these three names were briefly enumerated and a mimeographed sheet containing the summary was submitted to 16 seedsmen handling large quantities of this grass, 16 representative greenkeepers and 16 chairmen of green committees in the regions where the grass is used, and 5 interested individuals at State experiment stations or other institutions. Four greenkeepers and 4 chairmen failed to return the sheet indicating a preference. Of the 45 who expressed their choice, 40 were in favor of the name "colonial bent." The seedsmen were unanimously in favor of this name. Two voters suggested new names, 2 were in favor of Rhode Island bent, and 1 in favor of browntop. It was accordingly decided that the name colonial bent would be adopted by the United States Department of Agriculture as the common name which it would use for this grass.

The name colonial bent had indeed been suggested several years previously, due to historical associations which attended the introduction of the grass into various regions. The grass is supposed to have been introduced into New England and Nova Scotia by the early colonists, who, in embarking from England, brought the seed with them in quantities of dried grass used as bedding. When the bedding was changed, the stuffing was scattered about, and the seed so distributed soon germinated in the new soil, thus establishing the grass in colonial territory. It is likewise supposed to have been carried from Canada by colonists moving to New Zealand, and it probably also went to the west coast of the United States with early settlers. Since the name "colonial" in itself has no particular geographical significance, it can be conveniently combined with geographical names to designate the special source of the seed, as, for example, New Zealand colonial bent, Rhode Island colonial bent, Prince Edward Island colonial bent, and Oregon colonial bent.

The various classifications of the genus *Agrostis* have included many species which were apparently not clearly defined. This has, no doubt, been due partly to the fact that the bent grasses have not been regarded as of much economic importance. In recent years the increased attention given to fine turf, especially for putting greens, has stimulated a much greater interest in this group of grasses. The botanists who have recently worked with the group now divide those grasses in it that are used commercially into four major groups. There is still some dispute as to the scientific name to be applied to each group and to the subdivisions to be made under each group. For practical purposes it is, however, significant that there is an agreement as to the main subdivisions. Dr. M. O. Malte, in his classification, which was reviewed in the November, 1928, number of the Bulletin, recognizes three species, one of which he divides into two distinct groups. He therefore has four major subdivisions. These same four groups are listed in a recent book by Charles C. Dean, of the Indiana Department of Conservation. As explained by Prof. F. H.

Hillman, in his article "Identifying Turf-Grass Seed" in this number of the Bulletin, the seed analyst uses entirely different characteristics from those of the botanist in making his distinctions between groups. Using seed characteristics only, the seed analysts also can separate these same groups. Those who study the characteristics of these grasses in turf are also able to distinguish these same four groups without taking into consideration the characteristics used by the botanist and the seed analyst. Even though other subdivisions are recognized by botanists, seed analysts, and turf specialists, it seems significant that these same groups should be set apart by specialists using entirely different methods, and it seems very reasonable to assume that the other groups which have been set up by different individuals as distinct species are in reality superfluous and tend merely to confuse those who are working with these grasses. The Green Section, therefore, accepts these four groups in its classification of redtop and the bent grasses, and until new information seems to justify a change it will, when referring to these grasses, use the common names or the scientific names given in the accompanying list in heavy type to designate the grasses coming within the four groups. The scientific names appear in italics; they are the scientific names being used by Dr. A. S. Hitchcock, agrostologist of the United States Department of Agriculture. Under each division are given also the other common and scientific names which have been used more or less frequently for the grasses within the groups.

A GROUPING OF REDTOP AND THE COMMON BENT GRASSES

1. Redtop — ***Agrostis alba***

Whitetop, English bent, southern bent, herd's grass, white bent, marsh bent, fiorin.

Agrostis dispar, *A. stolonifera major*, *A. palustris* (misapplied).

2. Creeping bent — ***Agrostis palustris***

Fiorin, carpet bent, seaside bent.*

Agrostis alba maritima, *A. maritima*, *A. stolonifera compacta*, *A. stolonifera*.†

3. Colonial bent — ***Agrostis capillaris***

Rhode Island bent, fine bent, browntop, Waipu bent, English bent, furzetop, Burden's grass, Prince Edward Island bent, dew grass, Astoria bent.

Agrostis vulgaris, *A. alba vulgaris*, *A. tenuis*.

4. Velvet bent — ***Agrostis canina***

Brown bent, dog bent.

In addition to the seed of these different species on the market there are available mixtures containing seed in varying proportions of the different species. One of the best known of these mixtures is the seed known in the trade as German bent, German mixed bent, or South German mixed bent. Seed sold under these names usually contains all four of the species listed above. When this mixed seed is sown on a green the appearance of the turf during the first two or three years usually very closely resembles turf produced from colonial bent seed. Even though the velvet and creeping bents be present in only relatively small amounts they begin to appear in distinct patches throughout the turf when it is several years old. In time the creeping bent and velvet bent may practically crowd out all the other species

* Some Seaside creeping bent is sold under the trade name Cocoos bent.

† *Agrostis stolonifera* is still another species of Agrostis which, not being on the market nor of economic importance, does not come within the scope of this article.

of bent. Some greens planted with mixed bent seed years ago are at this writing composed almost entirely of velvet bent or creeping bent. As new sources of bent seed are developed, it is likely that there will be on the market additional mixtures of seed of the different bent grasses. As an example, in regions where colonial bent and creeping bent are both produced commercially there is bound to be some seed on the market containing mixtures of these two grasses, since the seed of the different bents can not be separated by any means at present available for commercial purposes.

In recent years there have been selected a large number of strains of creeping and velvet bent for putting green purposes. These are selections of individual plants which are propagated by the stolon method. In some cases these selections have become so popular that they are known almost entirely by the strain name. They are, as selections, on a par with the horticultural varieties of roses, apples, or other cultivated plants, being distinguished by certain characteristics which are not distinct enough to class them as botanical species or varieties. Seed of these strains is not available for commercial use. Some of the strains of creeping bent which are well known are the Washington, Metropolitan, Virginia, Columbia, Inverness, and Ekwanok. Examples of named strains of velvet bent are Capitol, Highland, Acme, and Kernwood. All of these strains are propagated by the stolon method and no seed of any of them is at present available commercially. There has been some misunderstanding with regard to the application of the name creeping bent on account of the erroneous idea held by some that it alone of the bent grasses possesses the stoloniferous or creeping habit. As a matter of fact, the creeping characteristic is more or less common to all the species of Agrostis, including redtop. Any of the commercial bents may, indeed, be propogated by the stolon method.

Many insects have a marked ability to make themselves at home in the place wherever they happen to be carried, by flight or through commerce. Many of our present-day crop pests formerly fed on wild plants, but when the land was planted to cultivated crops they not only changed their diet to man's food but prospered on it. The Colorado potato beetle is a good example. This beetle formerly lived on a wild nettle in the foothills of the Rocky Mountains, and when the potato was introduced into the region the bug apparently adopted it, and in 20 years had spread to the Atlantic Ocean.

The average weight of roller best suited for putting greens is probably between 150 and 200 pounds, depending more or less on the type of soil and the diameter of the roller in relation to its length. A roller 18 inches in diameter should weigh approximately 100 pounds to each foot in length. If the diameter is less than 18 inches, the weight to the linear foot should be reduced. Light or sandy soils require more rolling and the use of heavier rollers than heavy soils.

A rainy day is a good day for the greenkeeper to be out on his course. It is then that he can most readily detect areas that need improved drainage.

Identifying Strains of Creeping Bent

During the past fifteen years there has been much interest in the selection and propagation of different strains of creeping bent for golf course turf. On old putting greens which were planted with mixed bent seed many years ago, there usually appear more or less circular patches of creeping bent with different characteristics as regards color, fineness of leaf blade, density of turf, and other qualities, marking these particular patches as desirable or undesirable turf for putting greens. These distinct patches probably each came from a single seed of creeping bent contained in the original mixed bent seed. The fact that single plants were able to spread out to form such large patches and were able to crowd out all other grasses in so spreading has indicated the vigor of some of these individual plants and suggested the method of developing them in order that an entire green, or even an entire course, might be planted with a uniform turf originating from a single plant. Plugs from desirable patches were torn apart and planted in nursery rows apart from all other grasses. Stolons from such nursery rows furnished material for planting greens.

Turf produced from seed is composed of countless individual plants each with certain more or less distinct characteristics, even though they be of the same general appearance. With the stolon method of planting, however, the turf all comes indirectly from one parent plant by the mere replanting of shoots from the original plant. This method is quite similar to the method used in strawberry culture. When a new variety of strawberry is produced from seed, it is propagated by runners cut from the plant. If plants are grown from seed of a particular variety of strawberry, they will not be exactly like the variety from which the seed was obtained, due to the genetical factors introduced by seed. The runners, however, do not vary, for they represent actually the one plant without any involved genetics. In a similar manner seed from a Baldwin apple does not produce a Baldwin apple tree, but buds or shoots taken from a Baldwin apple tree when grafted to any wild stock will produce a Baldwin apple. It is sometimes difficult for one not acquainted with plant life to grasp the distinction between these two methods of reproduction, because he is familiar with only the method common to the higher animal kingdom, and this always involves individual variation due to crossing.

Every viable seed of a plant subject to propagation from the vegetative parts has the potentialities of a new variety or strain. Creeping bent, like apples and strawberries, shows endless variations as to individuals, but only a relatively few of them have been picked out for propagation on a large scale. Identification of creeping bent strains is therefore limited to these few strains which have been grown on any extensive scale. Occasionally some turf enthusiast wandering about a golf course picks up a conspicuous piece of creeping bent sod and sends it to the Green Section for information as to strain. Obviously it is impossible to identify the countless thousands of different creeping bent plants that occur on the golf courses of this country where mixed bent seed was used. Identification and naming of varieties is of value only in the few cases where the varieties have been tested and have some known record. In the few

cases of creeping bent strains, such as the Washington, Metropolitan, Virginia, Columbia, and similar well-tested strains, an identification is of value because of the many tests that have been made with them.

Bent Identification Rows at the Arlington Turf Garden

Samples of bent grass received by the Green Section for identification are planted in the rows shown in the illustration, where the samples are grown beside plugs of known strains of bent. Each plug is marked with a wooden label. After the samples have developed sufficiently they are compared with the Green Section's stock. Identification is not attempted until the stolons have grown several inches from the original sample.

If a club purchases a strain of creeping bent turf as the Metropolitan strain, because the characteristics of that particular grass seem desir-

able for its course, it is important that the strain be as represented; but if an unknown and untested strain be planted, the club of necessity shoulders the full responsibility. Much disappointment and waste of funds has resulted from the indiscriminate planting of unknown strains of creeping bent on golf courses.

To enable clubs to determine the strain of creeping bent used on their courses the Green Section is prepared to identify the most common strains at present available commercially. Just as varieties of apples or strawberries vary somewhat in appearance when grown on different soils in different climates, so creeping bent strains vary slightly in certain characteristics when grown under different conditions. The general habit of growth of the strains remains much the same under varying conditions, but due to the many minor differences that may appear positive identification is not made by the Green Section until the strain under question is compared with known stock under identical conditions at the Arlington turf garden. To accomplish this direct comparison, plantings are made on land which has been in cultivation for some time and kept free from creeping bent. A sample to be identified is planted beside a similar-sized sample from the known stock growing at Arlington. The known sample and the sample to be identified are grown side by side for several months and comparisons are made and recorded from time to time. In this manner the stolons of all samples are grown in the same soil under identical conditions, which enables anyone who is thoroughly familiar with these strains to readily distinguish between them without making any allowances for differences due to varying soil and climatic conditions. This method, of necessity, requires much time for growth, since no attempt is made to identify a sample until it is thoroughly established in the soil at the Arlington turf garden. It is possible to make fairly reliable identification of strains growing on courses, but it has been the experience of those acquainted with the work that such identifications are not always dependable and that positive identification requires some such procedure as that now used at the Arlington turf garden. Even with the method of comparing strains as here outlined, the Green Section does not attempt to positively identify every strain that is received, since some of the commercial strains appear similar unless a more elaborate series of comparisons is made. Thus the strain commonly known as Columbia is difficult to distinguish from several similar strains that have been distributed commercially in recent years. All of these strains give a somewhat similar type of turf, which has generally been regarded as unsatisfactory. All of these strains are merely identified as of the Columbia type. To distinguish between some of the closely related strains of the Columbia type would necessitate plantings to establish closely cut turf for a comparison of disease resistance and other qualities in which these strains are known to vary. Such comparisons would be far too costly to be justified except in rare cases, and then only at the expense of the club or individual desiring the exact name. This necessity for comparing certain stages of plant growth for the identification of strains or varieties is not by any means new to those acquainted with plant culture. When a man buys young apple trees, for instance, he may have to wait from 5 to 10 years until fruit is borne before the variety can be positively identified. Certain types of apple varieties can be recognized from leaves and bark, but the final identification

of particular varieties must await comparison of fruits; and likewise positive identification of some creeping bent strains must await certain stages of development in the turf. The buyer of apple nursery stock must depend on reliable nurserymen to assure getting the variety he orders, and golf clubs must do likewise in obtaining creeping bent stolons unless they raise their own stolons and are careful to do it on land which is free from other strains.

In some cases the same strain of creeping bent has been distributed from different nurseries under different names. If a nurseryman chooses to rename a strain, he is at liberty to do so. The Green Section in its identification of a strain of creeping bent uses the name that was applied to that particular strain when it was first listed in the records of the Arlington turf garden.

QUESTIONS AND ANSWERS

Selecting strains of Bermuda grass.—We are considering the substitution of grass greens for our sand greens and are wondering whether it would be practicable for this purpose to make use of a local strain of Bermuda grass. In an experimental way we have just put into play a green which we have sodded with a local strain. (Mexico)

ANSWER.—There are numerous strains of Bermuda grass, but since there has been little experimental work done so far on individual strains the different strains are not named, except in a general way. In Atlanta, Ga., fine strains were selected and were all called the Atlanta strain. This name indicates no strain in particular, but is generally considered to refer to any fine strain. Giant Bermuda grass, on the other hand, is spoken of when referring to one of the coarser strains. The St. Lucie strain of Bermuda grass is found in Florida and is slightly different from other strains in that it produces no underground rootstocks but spreads entirely by stolons aboveground. Pure seed of the St. Lucie strain is not available. From Bermuda seed on the market many different strains of Bermuda grass may be produced. Golf courses in the South should maintain nurseries of Bermuda grass grown from seed, and when particularly fine strains appear, or strains suitable for particular purposes, they should be isolated and planted in separate nurseries. Cuttings from these could then be used for planting putting greens or for other purposes. Certain strains of creeping bent were originally developed in this manner. If particularly fine patches of Bermuda grass are developed on your putting green from one source or another, it would be well to dig up the sod and plant nurseries from them in the manner recommended for planting creeping bent nurseries as described in various numbers of the Bulletin. Such a nursery would, in time, furnish material from which to plant all putting greens with a uniform strain of fine Bermuda grass.

Mixing arsenate of lead with sulphate of ammonia.—In the control of earthworms and grubs can arsenate of lead be applied mixed with sulphate of ammonia in order to let a single application serve for both fertilizing and applying the insecticide? (Ohio)

ANSWER.—The mixing and applying of these two chemicals together will not destroy the efficiency of either.

Looking from the tee on No. 8 hole, Charles River Country Club, Newton Centre, Mass.

A little neglect may breed great mischief. For want of a nail the shoe was lost; for want of a shoe the horse was lost; and for want of a horse the rider was lost, being overtaken and slain by the enemy; all for want of a little care about a horse-shoe nail.

Benjamin Franklin