THE BULLETIN

of the

UNITED STATES GOLF ASSOCIATION GREEN SECTION

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Contents

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Annual Meeting of the United States Golf Association Green Section

The annual meeting of the United States Golf Association Green Section will be held in New York City at the Hotel Biltmore on Friday, January 10, 1930. In the past few years the annual winter meeting has consisted of three sessions, two on Friday and one on Saturday morning, at each of which there have been addresses on various subjects related to golf course maintenance. For the coming meeting it is planned to limit the formal program to a single session. This reduction is considered advisable chiefly because of the recent development of the summer meetings. The new experimental and demonstration turf gardens under the supervision of the Green Section have afforded a new means for presenting information of value to those interested in turf culture under widely different climatic conditions. It is felt that most turf problems can be much more effectually discussed where methods and results are available for first-hand examination and comparison than is possible in assembly halls. During the past summer the Green Section staff, through the medium of two large sectional meetings at Washington and Chicago and local meetings on its demonstration gardens, was offered an opportunity to discuss turf problems with well over 600 individuals representing golf clubs scattered throughout the country. In addition to the large number reached in this manner the Green Section work has been carried to many hundreds during the past year through visits of interested individuals to the turf gardens at Washington and Chicago at times other than the summer meeting days; through visits to golf clubs by the Green Section staff; and by meetings of many sectional organizations at which members of the Green Section staff have been invited to discuss their work. Since this method has proved so satisfactory this year both from the standpoint of those who attend these meetings and the Green Section staff, and since every indication points to even larger attendance at such meetings next season, it has been decided to condense the program at the indoor winter meeting.

The formal program of the Green Section meeting will begin promptly at 1 o'clock Friday afternoon. A résumé will be given of the Green Section activities for the year, together with a brief summary of the more interesting experimental results. Following the Green Section reports there will be a short program by four speakers: Dr. K. F. Kellerman, associate chief of the Bureau of Plant Industry, will discuss scientific agricultural developments and their application to greenkeeping; Prof. F. H. Hillman, of the seed laboratory of the United States Department of Agriculture, will speak on the problem of bent seed production, identification, and adulteration; Mr. Cornelius S. Lee, Tuxedo Park, N. Y., who is chairman of the green committee of the Jekyl Island Club, Brunswick, Ga., and Dr. T. P. Hinman, for many years chairman of the green committee of the Druid Hills Golf Club, Atlanta, Ga., will discuss southern golf turf problems. During Friday morning and the afternoon following the program, the Green Section will have on display in the hotel an exhibit of various golf course grass seeds, fertilizers, different types and constituents of soils, and other items pertaining to turf maintenance. As at all other meetings sponsored by the Green Section, attendance is not limited to membership in the United States Golf Association.

The Use of Peat, Muck, and Humus on Golf Courses

To the layman the terms peat, muck, and humus are usually regarded as synonymous. To one acquainted with these materials the terms are by no means interchangeable. There is, however, a close relationship between them, for the origin of all three is the same, namely dead organic material. Peat is past centuries' accumulations of wood, sedges, mosses, and similar material which are packed together and preserved through the ages in a partially decomposed condition. When peat is further decayed it breaks down into a finer form called muck, in which form it is usually found mixed with clay or silt. Still further decomposition changes the material into what is commonly referred to as humus. Since peat, muck, and humus represent various stages of decay and since they originated from many different types of vegetation, it can be readily understood why there should be such striking variations in the material classed under these names. In this number of the Bulletin Dr. Dachnowski-Stokes, physiologist conducting peat investigations for the Bureau of Chemistry and Soils, United States Department of Agriculture, gives a brief review of the information now available on this subject. Any of our readers who are further interested in this subject may obtain additional information by referring to the publications cited in his article.

Dr. Dachnowski-Stokes points out that peat and muck may be derived from any vegetation, including large trees or delicate mosses, which means that the texture varies according to the relative proportions of the coarser or finer constituents. Also the texture varies with the stage of decomposition. The color, mineral content, and other characteristics vary in different peat and muck deposits. All these variations make it impossible to predict with any degree of certainty just what results can be expected from the use of peat or muck on a golf course.

Many enthusiasts have in the past discredited peats or mucks for golf course purposes due to their improper utilization. Many greens have been built in the past with underlying layers of peat, and invariably the results have been disappointing. Many individuals have been misguided into extensive use of peat or muck as a turf fertilizer. The Bulletin has repeatedly warned against the use of such material in layers and has cautioned its readers against being led to believe that it had much value as a fertilizer. The Bulletin however has, from time to time, pointed out that peat or muck may wisely be used in compost to add organic material to the soil. The final stage in the decomposition of peat or muck is humus. This latter term applies also to rotted organic material derived from animal refuse. An adequate supply of humus in the soil is desirable, whether it comes from animals or plants. Little definite scientific information is available as to what value peat and muck may have for turf production. Most of the information available as a result of trials so far is negative; that is, peat does not take the place of fertilizers, when used in layers it does not stimulate turf, it does not greatly stimulate bacterial action, and it does not solve the watering problem. As has been pointed out for many years, the only value of peat or muck, worthy of consideration from the turf standpoint, is as an ingredient of top soil and top-dressing for soil texture improvement. Many soils on golf courses are greatly in need of organic material, and in such cases certain peats and mucks may be of much

value. Well-rotted manure serves the same purpose, but in addition to its humus content manure also contains certain fertilizing elements and beneficial bacteria. Peat moss is now being extensively used as stable bedding or for poultry-house litter, and when combined with manure in this manner it forms an excellent ingredient of top-dressing.

Some of the heavy peats have a relatively high nitrogen content; but this is not considered important, since this nitrogen is available to the plants only after a slow process of disintegration. Some mucks and dark-colored peats may contain such large amounts of sulphur and iron as to be poisonous to plants under certain conditions. Such material should be avoided in turf work. Some muck contains so much clay and silt that it is undesirable for golf course use due to its tendency to form a hard crust in dry weather.

It is sometimes claimed that the undecomposed portion of the organic material in peat may have a beneficial influence on the soil. It is believed that a soil well supplied with such material will produce a turf which will remain more resilient than one deficient in it. There have been no adequate tests made to definitely support this claim that the portion which is not broken down can be of much value, but it is well known that the portion which is changed to humus greatly improves soil texture.

Peat and Muck

By Alfred P. Dachnowski-Stokes

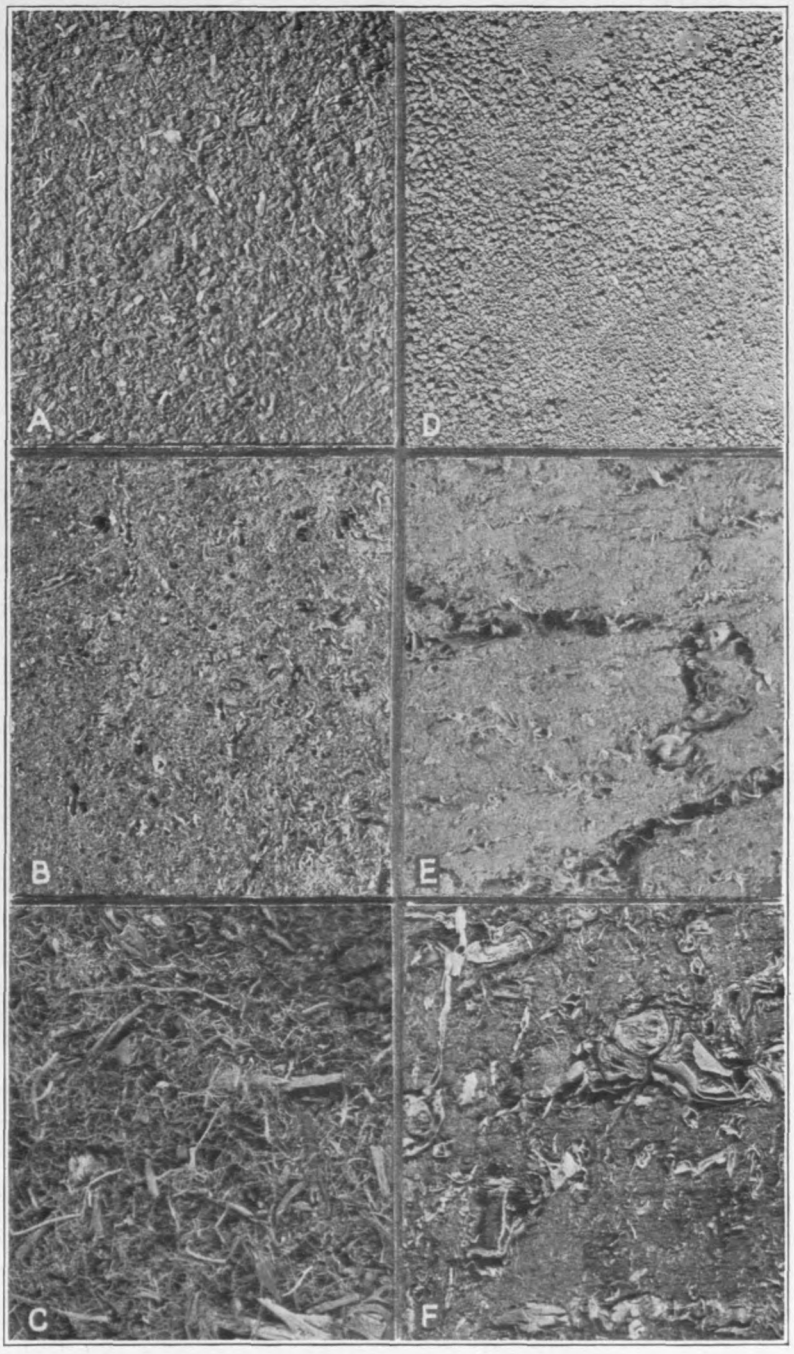
Bureau of Chemistry and Soils, United States Department of Agriculture

Many inquiries are received and considerable interest is shown concerning the agricultural uses of peat and muck and the conversion of these materials into organic manures and fertilizers. What is peat and what is muck? Where are the areas in which they are to be found? What can be done with them? These are questions which grow constantly more urgent, and they are difficult to answer briefly.

The aggregate area of peat and muck in the United States is approximately 100,000,000 acres. These deposits constitute not only one of the great resources of organic raw material and undeveloped land, but they also present an invaluable record of the history of plant life and changes in environment.

The visual differences between peat and muck have been pointed out in an illustration (plate 5) shown in Bulletin 1419* of the United States Department of Agriculture. The illustration is here reproduced. Reed muck, for example, is a well-decomposed granular residue derived from the plant remains of reed-like grasses; its existing characteristics are the result of many years of cultivation and cropping as well as weathering, oxidation, and the activities of micro-organisms at the surface and above the water level. The untilled and unaltered parent peat material below the surface is a brown, fibrous to felty network of rootlets and underground stems that are susceptible of botanical identification. Saturation with water had prevented access of air and stopped their decay.

*All the publications referred to throughout this article are publications of the United States Department of Agriculture. They are no longer available for free distribution, but may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C.



Varieties of Sedge and Reed Peat

(A) sedge muck; (B) radicellate sedge peat; (C) coarsely fibrous sedge peat; (D) reed muck; (E) partly fibrous reed peat; (F) coarsely fibrous reed peat. Each variety is shown here in natural size from air-dry sample. (From Bulletin 1419, U. S. Dept. Agriculture)

Different kinds of peat and muck are described and classified in Bulletin 802 of the United States Department of Agriculture. The most important types of peat in the sedimentary class are finely divided plant remains derived from soft herbaceous and aquatic plants, and the jelly-like material formed from organic suspensions in lakes and ponds. The fibrous class comprises the resistant material derived from roots and rootstocks of sawgrass, tule, rushes, and sedges, and from the leaves of various mosses. The woody class of peat has been formed from disintegrating shrubs and timbers of forests.

The physical and chemical properties of several distinct types of peat are to be found in Tables I and II of Bulletin 802. The organic constituents, such as waxes, resins, oils, crude fiber including celluloses and lignins, and nitrogenous and other substances of various peats from different States, are reported in a paper in the *Journal of Agricultural Research* (29:69-83, 1924), also published by the Department of Agriculture.

The inherent structural differences between areas of peat in the United States are pointed out in Bulletin 1419. The character, number, and sequence of the chief layers of peat of which they are composed greatly modify the practices and purposes of peatland agriculture. The bulletin contains descriptions of the more common profiles which constitute series of peat soils, and the factors involved in a proper selection of peatlands are discussed. It draws attention to the difficulties encountered in their utilization, and emphasizes their principal uses for the production of forage crops and timber and for the regulation of stream flow and water supplies. In Circular 252 of the Department, an account is given of different methods employed for excavating and handling peat and for preparing peat composts. Profitable methods of farming have been described in Farmers' Bulletin 761, and some of the crops adapted to peat soils are listed in Bulletin 6.

The location and acreage of peat and muck in the United States are shown on maps of the Soil Survey, United States Department of Agriculture. In order to correlate and coordinate field and laboratory work, the peatlands of this country have been broadly divided into three main regions. They differ in surface vegetation, structural framework, and climatic conditions. These regions are described as follows:

The first main region consists of areas whose characteristic peat layers are derived from sedges, reeds, and similar vegetation. The group is technically designated as eutrophic, because the peatlands have an abundance of mineral salts and are neutral to alkaline in reaction. Outstanding members of this region are the sub-tropical Everglades of Florida, the semi-arid Delta peatlands of California, the valley peatlands of the Klamath and Willamette Rivers in Oregon, and the areas of peat in the valley of the Mississippi River.

The second main region comprises the group of peat areas deficient in plant nutrients (oligotrophic). It is chiefly confined to the northern portion of the New England and the Great Lakes States, and includes a belt of domeshaped, raised moors in Maine and Minnesota. The "high moors" in Maine contain moss peat up to 10 feet in thickness. The surface peat soils are usually acid in reaction, lack available nitrogen and mineral salts, notably lime, but have a

relatively high content of decomposable fiber. However, the cool soil temperature during the growing season is not conducive to the activity of micro-organisms that ordinarily bring about decomposition and the availability of mineral plant food constituents.

The third main region includes peat lands from New Jersey westward to the southernmost boundary of the glacial drift toward South Dakota. These areas of peat have a more or less complex structural framework and are designated as the mesotrophic group. Lime, phosphates, and nitrogen may be present in the surface peat soil owing to the greater depth at which decomposition, favored by evaporation and warm summers, releases soluble plant food constituents.

A belt of peatland represented by the Dismal Swamps along the Atlantic coastal plain from Virginia to Georgia has been included, for the present, in this third main group. They are predominantly woody and acid in reaction. Their relationships and uses are not well established.

Little is known regarding the characteristics of muck and humus derived from various peats, how they are formed, and the nature of the chemical compounds of the residual material in different regions and climates. Reed and sedge peats appear to give a larger fraction of nonfibrous soluble constituents, and to yield more rapidly available nitrogen and mineral matter. On the other hand, moss peat, for example that from Maine, offers a "crude fiber" with a higher cellulose content, but its utilization as a food supply and an available source of energy for micro-organisms must be aided by the addition of liquid manure or a solution of some readily available nitrogen carrier such as nitrate of calcium; hence the greater demand for moss peat as an absorbent in stables, bedding for poultry, and for composting waste products of agriculture. Changes in water content, the action of freezing, leaching, the growth of plant roots, the presence of iron, sulphur, and other salts, and various micro-organisms, all play a part in the process of decomposition. The forces that are active in the transformation of peat into muck and humus are, therefore, mechanical, chemical, biological, and climatic as well.

The formation of muck from peat of different kinds is accelerated by factors which are within the control of man. It is favored by the addition of manure and fertilizers, and by the application of lime, especially in States of the eastern humid belt. Peatlands pass more or less slowly from the natural state of well-preserved plant remains, through the muck stage, to the final transformation into humified organic matter. After that period has been reached, there remains a black soil with a high humus content to suggest the former location of the areas of peat. Since the settlement of the States, many extensive shallow deposits of peat which had once been under cultivation have disappeared. Today they constitute more properly a mineral soil type in the respective localities, with characteristic requirements and crop adaptations quite different from those of the original organic material.

Birds are the greenkeeper's friends. It is rare that they are destructive to turf, and the quantities of earthworms, ants, and grubs which they dig out of or pick off the turf is scarcely appreciated. They can be attracted to a golf course by planting fruit-bearing shrubs and providing bird houses.

Double Bermuda Greens and Their Treatment

By Thomas P. Hinman

Druid Hills Golf Club, Atlanta, Ga.

The problem of putting greens in the South, where Bermuda grass is used almost exclusively, has been rather difficult of solution. Previous to 1917, these Bermuda greens were used throughout the year. When the frost killed the Bermuda grass we putted on the dead surface, frequently sprinkling a little sand on the greens to make the surfaces more true. We were then greatly annoyed by the presence of what we called "winter grass," or annual bluegrass (*Poa annua*), which grew in clumps on the green and practically destroyed what putting surface the dead Bermuda made. The continuous use of the putting green while the Bermuda lay dormant packed it so that frequently large areas of the grass roots were destroyed and the green came through the winter with the surface in a very unsatisfactory condition.

Double green of Number 11, Druid Hills Golf Club, Atlanta. The two distinct playing areas of this green are divided by a steep turf bank where grass is allowed to grow long. The decided difference in elevation and the difference in slope of the fairway give a variation in playing this hole depending on whether the winter or the summer part is in play.

In 1916, Scott Hudson, president of the East Lake Country Club, conceived the idea of sowing a mixture of Italian rye grass, fescue, and redtop on a portion of the Bermuda green and using it as a winter green. The portion of the green that was sowed with the grass mixture was, however, found to be in a very poor condition in the spring when the Bermuda grass started to grow. After a number of years of testing, we found that rye grass sowed alone gave best results, as fescue and redtop did not last long. In 1917 Mr. Hudson decided to make two greens for each hole, maintaining the length of the hole as nearly equal as possible for both greens. This plan was so satisfactory that it has been adopted in this section as standard, and nearly all of the courses now have two sets of greens, one for summer and one for winter play. In this climate, where golf is played the year round, we believe it is necessary to have these two sets of greens, for in that way there is no interruption of play and no necessity of in-

stalling temporary greens between the time of abandonment of one green and beginning play on the other. In using single greens, if a green is planted in rye grass and is played during the winter, there is always a certain amount of time during which it can not be played. This interval usually amounts to at least six weeks. Moreover, in the spring there is no gradual transition between the rye grass green and the Bermuda green, so that temporary greens have to be put in again for at least six weeks.

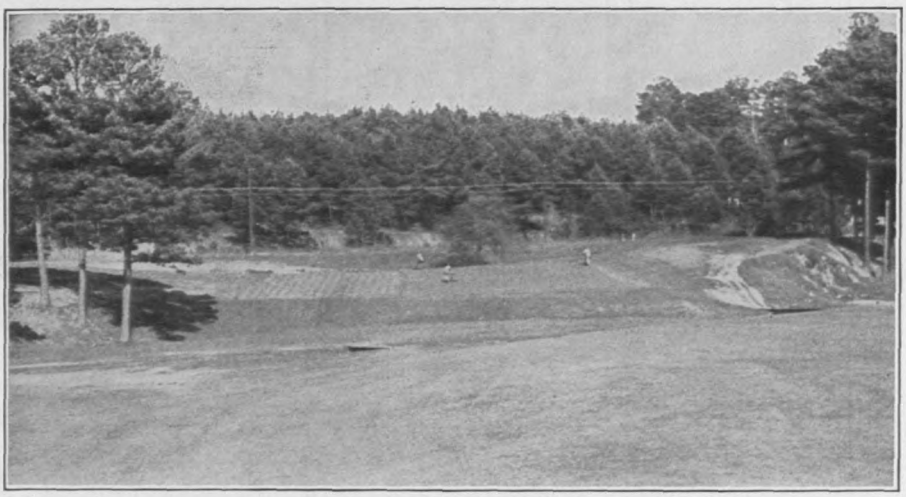
Two distinct types of double greens are illustrated in the photographs appearing on these pages. The new course of the East Lake Country Club has two separate greens for each hole, although the line of division is not as clearly defined as in some of the greens at the Capital City Club, which were designed and built by Howard Beckett. As it has been found both economical and advisable to cover the summer or Bermuda greens in the fall just as soon as the grass becomes

Double green of Number 8, Capital City Club, Atlanta. This green is distinctly divided into summer and winter playing areas with the trapping similar in each case. The winter green is on the left and the summer green is on the right of the dividing sand trap.

dormant, it is better to have the summer and winter greens as far apart as possible, since it is rather difficult to play over the summer green, which is covered with pine needles, wheat straw, or some other substance. Under this latter condition there is a local rule to the effect that the player must drop off or around the covered green.

Two methods have been used for planting the winter greens. The method most generally adopted is as follows. After the winter green has been laid aside and we begin to play the summer green, the Bermuda comes up in scattered spots on the winter green and gradually spreads until it covers the whole green. During the summer, this winter green is kept mowed with a machine that is set to cut at about ½ inch. In the fall, approximately October 1, these winter greens are cut very close, then thoroughly raked and cut again, and then sowed with about 80 pounds of Italian rye grass seed to each green. They are then fertilized with about 100 pounds of tankage, and as the rye grass germinates in about six days, the first cutting is done around the tenth day after sowing. The frequency of the cutting is dependent entirely upon the growth of the green. We usually start playing these greens about the 1st of December. The rye grass gives

a very fair putting surface; but annual bluegrass begins to make its appearance about this time and by the 1st of February has filled in the green so as to make an excellent putting surface. By the 1st or 15th of June, when these greens are laid aside to use the summer greens, the rye grass has practically disappeared and we have nearly a pure annual bluegrass green. The annual bluegrass however disappears shortly after this. The other method of planting, which has been adopted by Mr. Beckett of the Capital City Club, is early in September to skin the green of all grass with a hoe, rake it up, then cover with top soil to which has been added 100 pounds of tankage, and sow the third day in rye grass. It is his opinion that we thus get a better putting surface. The local greenkeeper's club is watching these two methods with a great deal of interest, and we shall be able to report later which is more satisfactory.



The simplest type of double green, Number 7, Capital City Club, Atlanta. Where space or construction requirements are prohibitive it is found that double greens of this type will suffice instead of the more clearly defined areas such as shown in the two preceding illustrations. One-half of the putting area of this green is set aside for winter use and the other half is groomed for summer play only. No structural differences mark the line between the two sections.

Regarding the treatment of the summer green that is abandoned over winter, it has been found economical and satisfactory to cover the green with pine needles, wheat straw, or some other substance which will prevent the frost from destroying the dormant roots of the Bermuda grass. In this particular section there is a great deal of winterkill of the Bermuda roots, and the greens come up very spotted and grow very slowly. This covering accomplishes two things: first, it lessens the quantity of annual bluegrass which has to be cut out with a hoe when the green is being prepared in the spring for summer play; second, the green comes up more evenly and grows more vigorously in the spring. In the October number of the Bulletin Mr. Beckett has discussed in more detail this subject of covering the summer greens over winter, and his article merits careful study in connection with my own observations on the subject. However, in the spring we have found it necessary in every case to sow some additional Bermuda seed. The amount depends, of course, on the number of bare and thin spots on the green. Covered greens come up much more rapidly and evenly and are ready to play from two to

three weeks ahead of those that have been left to the mercy of the weather. The United States Golf Association Green Section has a local experimental plot at Druid Hills where we are making some tests with Bermuda grass covered with various materials, including cottonseed hulls. Some of the plots will not be covered, in order to provide a control. Next year some of the results of these tests may be available for publication.

Save the birds from starvation over winter.—The providing of food for birds on golf club properties this winter is urged by the golf club bird-sanctuary committee of the National Association of Audubon Societies. A pamphlet entitled "Winter Birds as Guests of Golf Clubs" has just been issued by the association and is being distributed from its offices at 1974 Broadway, New York, N. Y. In the pamphlet the following statement appears: "It is not the cold weather that kills birds. It is the lack of food. Their presence adds a touch of life and good cheer. As we feed these winter guests we come to regard them somewhat in the light of personal possessions, and with the satisfaction of one who feels that he has done the right thing by his neighbors." The pamphlet contains specific instructions as to the simple methods that may be successfully employed to care for birds about golf club properties during the winter months. This pamphlet, it is announced, is the first of a series of publications to be distributed in the campaign which has been inaugurated by the National Association of Audubon Societies to make bird sanctuaries of golf club properties.

About 337,000 insect parasites of the Japanese beetle were received in the United States from Japan and India during the 12 months ending June 30, 1929. It is reported that 5 or 6 species of these insect parasites have now become well established in this country. It is expected that the introduction of these insects will keep the abundance of the beetles reduced to such an extent that the damage the beetles may cause from year to year will be no more serious than it is in the Orient.

The development of an organic insecticide which may take the place of arsenate of lead is a problem which specialists of the United States Department of Agriculture are encouraged to regard hopefully. An organic insecticide now being studied with this end in view is rotenone, at present obtained chiefly from the roots of derris, a plant occurring in Sumatra and the Malay Peninsula. A new source of rotenone promises to be a wild plant occurring in the mountains of Bolivia and Peru, called "cube." The Indians of those countries use the roots of this plant to poison fish. Small quantities of the plant thrown in streams stun the fish sufficiently for the natives to catch them with spears or nets. It is thought the plant may be adapted to growing in the southwestern part of the United States. The demand for organic insecticides, such as mowrah meal, nicotine, and pyrethrum powder, seems to be much greater than the supply. For most agricultural purposes these materials are to be preferred to the inorganic insecticides, such as mercury and arsenic compounds, since their poisonous effects are attended with less dangerous consequences, especially when used on fruits and vegetables.

Essentials of Cost Grouping

By William H. Aston

Meadowbrook Country Club, Northville, Mich.

Accounting at the average golf club is conducted inefficiently. This is not hard to understand when it is borne in mind that the accounting policy of the average club is subject to the whims and fancies of changing directorates. As a rule, a golf club director is more interested in the physical aspects of his club, in the things he can see and feel, than in the unromantic drudgery which is so necessary but which to him seems so foreign to the peculiar benefits which membership in a golf club provides. In many American industries conditions would be very bad today were it not for the assistance which individual firms receive from trade associations. A district golf association could bear somewhat the same helpful relation to its member clubs as a trade association bears to individual enterprises. Can not such district golf associations help golf clubs toward a more businesslike handling of their affairs? In this connection a uniform system of accounting for golf clubs would be a splendid thing. This could however be installed only by some governing body, such as a district golf association or some larger organization. But we should bear in mind that no system of uniformity can be completely worked out at any one time. It requires a period of development, which may extend over a number of years. Such a system must be broad enough to cover the requirements of any club, big or little. Time alone can produce a satisfactory system, as the experience of a number of clubs is drawn upon. It would not be necessary to try out a proposed system in a large number of clubs the first year, as its value could be determined by its application in a few clubs only. In fact, it might be preferable to start with only a few.

At the end of a year the balance sheet in any system of cost accounting will show what has been spent. But will it contain enough information to enable one to make an intelligent analysis of the expenditures? If it does not, then different cost headings must be set up on the books. Lump expenditures can not be intelligently analyzed. The larger expenditures must be broken up into subdivisions, such additional headings being made as seem necessary. If this is done, very interesting and instructive information will be obtained, which will possess great value in checking expenditures of succeeding years and in suggesting further refinement of the accounts. It is well to remember, however, that it is impractical to make changes on the club books during the busy season.

The key to a successful system of cost accounting is finding out what the essential divisions are to the cost grouping in the particular kind of business involved. When these are determined, half of the work is done, and what remains is a simple matter of bookkeeping. It is simply necessary to have the headings determined upon set up on the books, and then to have all bills and payrolls marked, before sent to the office, so as to indicate to which account they should be charged. One word of caution is advisable: do not fall into the error of posting such petty details as cutting the grass on this tee or raking that trap; such subsidiary records can readily be kept by the greenkeeper in a separate account, where they may be referred to when needed.

My experience and study of golf course accounting over the past five years at the Meadowbrook Country Club and in the Detroit district lead me to suggest the following headings as the essential grouping in golf club accounts. These are the headings in use at the Meadowbrook Country Club. The expenses of tennis courts and miniature golf courses are not included in this grouping, as such items should be kept in separate accounts. It will be necessary, of course, to make further subdivisions of these major titles, especially in the case of house and greens costs; but the same rule of grouping the essentials will apply to such minor divisions.

Office.—Rent, salary, printing, telephone, postage, insurance, interest, taxes, office furniture.

Greens.—Supervision and management of all club property not otherwise specifically provided for in the cost grouping. Greens costs should be divided into 7 major headings: labor, supplies, equipment, motive power, water system, replacement, and construction. These should again be divided into minor divisions such as may be shown on a greens cost sheet. The dividing line between maintenance and construction leaves a possibility of a wide range of opinion and uncertainty. It is true that some construction work can be done in spare time; but if uniformity is desired, a sharp line must be drawn between the two.

House.—Supervision and management of the house, café, locker house, and similar buildings. This may be divided into four subheadings, as shown on the house cost sheet: house, café, locker house, and bar.

Sports and Entertainment.—Entertainments, tournaments, juvenile events, music, and similar features.

Building Maintenance.—New buildings, roof repairs, outside repairs, outside painting, and major repairs and alterations both inside and outside. This applies to all buildings on the property, including also septic tanks and sewers. These costs should be met from a depreciation fund or a special amount set up in the annual budget. Some clubs would charge the expense of a new roof on a barn to the greens. That is entirely wrong. All accountants annually write off as a club expense an amount for depreciation. Consequently, if the cost of a new roof on a barn is charged to the greens, it is being charged twice. The new roof is prolonging the life of the building and should therefore be paid for either from the depreciation account or from an amount set up in the annual budget and a credit made to depreciation. In other words, the depreciation charge would be reduced by the cost of the new roof.

Grounds Maintenance.—Roads, walks, shelter, lawns, gardens, shrubbery, and similar improvements adjacent to the club house and the locker house. This does not apply to roadways on the course which are used for greens service. Items under grounds maintenance being purely decorative and in no way necessary for the playing of golf, should be entered on the books as a club account. Although at first thought they might appear to be included within the supervision of the greens, they are not a greens expense. Grounds maintenance should have two subheadings, (1) labor and (2) material.

Professional.—Salaries and expenses of the shop.

The most impressive hazard on a golf course is sand; then, in order, water, mounds, and rough grass.

New Agricultural Bulletins Applying to Golf Course Problems

Many of the bulletins issued by the State agricultural experiment stations and the United States Department of Agriculture have much of value and interest for those responsible for the care of the golf course. Below are given brief reviews of some recent publications of this type. If any of our readers seek further information on the subjects covered in the bulletins they may obtain copies of the bulletins on request from the authors or the institutions which issue them.

"The Persistence of Certain Lawn Grasses as Affected by Fertilization and Competition"

This is the title of Bulletin 217 of the Agricultural Experiment Station, Kingston, R. I. The authors are E. S. Garner and S. C. Damon. The bulletin gives recent observations and an interpretation of results on the turf plots at the station, which was a pioneer in investigation of turf in this country. The grass plots at the Rhode Island station were started in 1905, long before golf turf problems had aroused much popular notice. The early observations on these plots led to the conclusion that soil acidity was an important factor in controlling troublesome weeds in turf and was largely responsible for the widespread use of sulphate of ammonia in turf culture in this country. The authors summarize the results of their studies as follows:

"The data contained are critically examined and afford evidence that—

"The fertilizers given have been effective in producing healthy turf and a wide range of H-ion concentration.

"The bent grasses are particularly tolerant of an acid-soil reaction.

"Kentucky bluegrass does not persist as well as the acclimated bent grasses, especially under conditions of relatively high soil acidity.

"Red fescue and fine-leaved fescue are exceptionally durable grasses in alkaline as well as in acid soils.

"Redtop and crested dog's-tail are short-lived under acid or alkaline lawn conditions.

"Acclimated velvet bent is an aggressive and persistent species and an excellent lawn grass.

"Without top-dressing, certain strains of creeping bent show a marked tendency to 'run out' after a few years under New England conditions.

"The number of weeds persisting is in inverse ratio to the degree of acidity; the higher the acidity the fewer the weeds.

"White clover volunteers most freely in soil having a slightly acid reaction."

"Transplanting Trees and Shrubs"

This is the title of Farmers' Bulletin 1591 issued by the United States Department of Agriculture. It was written by F. L. Mulford, of the office of horticultural crops and diseases, Bureau of Plant Industry. The bulletin deals with the care and methods used in transplanting trees and shrubs, both deciduous and evergreen. Such a bulletin should be useful in any greenkeeping library, since the moving of trees and shrubs is a common task about golf courses, and

all too frequently the work shows every evidence of absence of information on the subject or lack of interest. As pointed out in the bulletin, "transplanting trees and shrubs is a means of quickly transforming natural desolation and that brought about by human operations into attractive scenes." If work is poorly done the expenditures for the work may be in vain; and in addition to the money losses there is the serious loss of time. Various methods of handling must be employed with different types and sizes of plants as soil conditions vary. Mechanical helps, such as derricks, pulleys, and jacks, are advisable for large plants. The following considerations, according to the bulletin, are essential for success in the transplanting of trees and shrubs.

"A good plant, including a well-developed root system and a healthy top.

"Moving at the proper season: deciduous plants while dormant; evergreens when the ground is sufficiently warm and moist to stimulate the plant to the immediate formation of roots.

"Proper digging: dormant deciduous plants to be dug with a minimum of injury to the roots, but without soil; evergreens with a ball of earth about the roots.

"Well-protected roots; that is, kept covered and moist, and the ball, if any, unbroken.

"An adequate hole, wider and deeper than the spread of the roots.

"Proper setting: set at the depth at which it formerly grew, with the roots well spread.

"Suitable soil as to moisture, texture, and fertility.

"Correct planting: the soil to be brought into close contact with the roots.

"Top pruning, to balance the loss of roots or other injury.

"Maintenance of adequate soil moisture until the plant is reestablished."

"Better Lawns"

Under this title the Ohio Agricultural Experiment Station, Wooster, Ohio, has recently issued Special Circular 18, by F. A. Welton and R. M. Salter. The circular contains instructions on the building and maintenance of lawns. The discussion appears under four main headings, (1) establishing a new lawn, (2) maintenance of turf, (3) rejuvenation of old lawns, and (4) pests. Advice is given on the subject of grading a new lawn, its drainage, preparation of its soil, its fertilization, and the tools useful in these operations. There is also a discussion of various standard seed mixtures suitable for lawns both in sandy and in shaded locations. It is pointed out that weeds and grasses are responsive to soil reaction, and suggestions are made as to the suitable soil reaction for success with different lawn grasses. Special treatment is recommended for the extremely sandy soils often found in the lake ridges of a State. It is pointed out that commercial seed mixtures are apt to be badly contaminated with weeds and worthless grass seed, although it is stated that "satisfactory results may be obtained from the use of ready-mixed seeds providing care is exercised to purchase them from reliable firms." Advice is given as to the time, rate, and method of seeding. There is a short discussion of creeping bent, in which it is pointed out that creeping bent although suitable for lawns under special conditions is not recommended for ordinary use.

In a discussion of the maintenance of turf, a mixed fertilizer of approximately a 10-6-4 analysis is recommended. Compost is recommended for grass and suggestions are made for using leaves and waste material for the compost pile. Lime is recommended only where the soil is acid. It is pointed out that "on the limestone soils of western Ohio, it is seldom if ever that lawns need the addition of lime." Where the soil is naturally acid it is stated that "an application of 25 pounds of hydrated lime or double this quantity of finely pulverized limestone to 1,000 square feet once every 5 or 6 years is sufficient." Rolling is recommended in the spring. It is pointed out that grass should not be cut too short, especially in dry weather and in early spring and late fall. Clippings should be left on turf except in shady and damp situations. An application of "water in liberal quantities at intervals of several days, rather than in light and frequent applications," is recommended.

Advice is given as to the best methods of rejuvenating old lawns. It is pointed out that this can not be accomplished in a short time and that "two or three years, even, may elapse before a satisfactory turf can be reestablished." It is explained that the rejuvenation of old turf involves three steps, "(1) elimination of weeds, (2) liberal fertilization, and (3) reseeding." Each step is explained in the circular.

Suggestions are also given on the control of four common lawn pests. Carbon bisulfide treatment is recommended for ants; arsenate of lead for the control of grubs; cyanide of calcium, carbon bisulfide, or trapping for the control of moles; and bichloride of mercury or arsenate of lead for the control of earthworms.

"Artificial Manure from Straw"

The New York State Agricultural Experiment Station, Geneva, N. Y., has recently issued its Bulletin 573 under this title. The authors are R. C. Collison and H. J. Conn.

On many golf courses there are large quantities of hay, leaves, and other refuse which are usually burned or hauled away. The golf club officials frequently inquire as to whether this material can not be profitably used as organic matter for compost. Different methods have been tested out in recent years for decomposing waste material, particularly straw. The bulletin here referred to deals with the problem of decomposing piles of straw to form artificial manure. Although the authors of the bulletin conclude that this method is not an economical one for farms in New York due to certain requirements, especially that of the large water supply that is necessary, the system might nevertheless be practical on certain golf courses. Those who are associated with clubs where grass and leaves are regarded as a nuisance would do well to obtain a copy of the bulletin and test for themselves the practicability of the method. It also contains detailed descriptions of the various raw materials, decomposing chemicals, and methods of composting used in the experiments. The results are summarized in an introductory abstract, from which we quote:

"For some years investigations have been under way at this station concerning the injury to plants caused by the presence of cereal straw in the soil or other medium in which the plants are growing. The most recent work has been concerned with methods of treating

straw to overcome this injurious effect. While these investigations were in progress, an English method was announced which, it was claimed, would rot straw quickly to an artificial manure. This method, together with a simple fertilizer mixture which had already been used for the same purpose, was used to rot straw in these experiments. Both methods, in about three months, rotted the straw to a point where no injurious effect was noted on the growth of plants. The investigations indicated, however, that the labor involved, the large water supply necessary, and the cost made it questionable if the method would be practical under average farm conditions, at least in New York. Where the necessary requirements mentioned can be met, the method is worth a trial. Cutting down labor and water supply by depending on natural rainfall was not successful in producing a good grade of 'artificial manure' within a reasonable time."

"Facts on Lawn Management"

This is the title of Extension Leaflet 85, issued by the Extension Service, Massachusetts Agricultural College, Amherst, Mass. The author is L. S. Dickinson. The leaflet gives advice on the management of lawns both from the standpoint of construction and maintenance.

In discussing the subject of construction the importance of the foundation and subsoil is stressed since these not only furnish the means of escape of excess water but also should hold a quantity of water in reserve for dry periods. A layer of a 5-inch depth of good top soil should be used. Some detailed advice is given on the subjects of preparation of the seed bed, seed, and seeding. Tables are given showing the grass seed found in typical lawn grass mixtures. Different rates for mixing seed of different grasses used on good soil, sandy soil, and shady locations are given.

It is pointed out that "it is far better and cheaper to restore to a good condition a poor lawn than to rebuild it, especially if there is some good grass already growing." A list of fertilizers is given, with notes on their rate of application and effect on turf. It is advised that clippings be left on lawns, and that the mowers be raised during dry weather. A thorough soaking once in six or eight days is advised in preference to short and daily sprinklings. It is advised that grass go into the winter rather long and that it be raked thoroughly and rolled in the spring. Suggestions are also given on the control of ants, moles, earthworms, dandelions, and crab grass.

To measure the area of a putting green: If rectangular, multiply the length by the breadth.

If circular, multiply the square of the radius by 3.1416.

If triangular, multiply the length of one side by half the distance from the middle of that side to the tip of the triangle.

If oval, add the long diameter to the short diameter, divide by 4, multiply the resulting figure by itself, and then multiply this final figure by 3.1416.

After allowances are made for the areas of indentations, projections, or other irregularities of the green, the figures obtained will closely approximate the area of the green.

QUESTIONS AND ANSWERS

All questions sent to the Green Section will be answered in a letter to the writer as promptly as possible. The more interesting of these questions, with concise answers, will appear in this column. If your experience leads you to disagree with any answer given in this column, it is your privilege and duty to write to the Green Section.

While most of the answers are of general application, please bear in mind that each recommendation is intended specifically for the locality designated at the end of the question.

Ridding greens of coarse Bermuda grass.—We have been using in our summer greens for many years Bermuda grass grown from Arizona seed. It has been satisfactory except that some coarse Bermuda grass persists, which was doubtless introduced when the greens were first planted. We seed our greens each summer with the new fine strain of Bermuda grass but are unable to rid the greens of the old coarse strain. In several of our greens other grasses have become mixed with the coarse Bermuda and seem to make it a little finer and softer and better suited for putting purposes, by restricting its growth. Is it advisable to attempt to introduce bluegrass or some other grass into our greens in order to keep the Bermuda turf fine in texture? (North Carolina.)

ANSWER.—Practically all of the Bermuda grass seed on the market is grown in Arizona. It is true that considerable seed of the fine-textured Bermuda grass is produced in Arizona, but since Arizona Bermuda grass is not uniformly fine a considerable proportion of the Arizona seed is likely to be from the coarser strains. It would appear from this fact and the fact that you are seeding your greens each summer, that you are introducing some coarse Bermuda on the greens each year. It is probable that the proportion of fine strains is increasing; but since a considerable part of the Bermuda dies out each winter you are likely to introduce some coarse Bermuda with each seeding. It is also possible that some coarser strains can survive the winter better than some of the finer strains. We believe the best method of producing a uniformly fine Bermuda turf on all the greens of a southern golf course is the planting of stolons of selected fine strains of Bermuda grass in the same manner in which selected strains of bent grass are introduced into northern greens. A nursery of these fine strains can be established by selection of fine strains already in the greens. The greens can be planted each summer in the vegetative manner by scattering on the greens stolons cut from the nursery, and then top-dressing. In this manner nothing but the fine selected strains would be introduced on the greens. We know of nothing better than the fine strains of Bermuda grass for summer greens in your locality, unless it be creeping bent grass. Several courses in Virginia and North Carolina have all or some of their putting greens in the Washington or Metropolitan strain of bent grass, and it might be well for you also to try out one of these bent strains on your greens in view of the success appearing to result from their use under conditions very similar to yours.

Necessity for proper balance in complete fertilizers.—We are offered a commercial fertilizer analyzing 15-30-15 at $90 a ton de-

livered. What is its value in comparison with cottonseed meal at $45.50 a ton delivered? (Virginia.)

ANSWER.—We compare fertilizers for turf work chiefly on the basis of the nitrogen content since this is the element which is most costly and of most value for growing fine turf. Cottonseed meal usually analyzes 6-3-2. If 6 per cent of nitrogen, such as contained in the cottonseed meal, costs $45.50 a ton, 15 per cent, as contained in the commercial fertilizer you mention, would be worth $113.75 a ton. Therefore on the nitrogen basis alone the commercial fertilizer at $90 a ton would be an economy. We do not, however, recommend a fertilizer analyzing 15-30-15 for regular use on putting greens or fairways, since it is too high in phosphorus (30 per cent) and potash (15 per cent). One or two applications of such a fertilizer to greens or fairways would probably be beneficial, but if used constantly the phosphorus and potash content of the soil might be increased to such an extent as to cause trouble from clover and weeds. Cottonseed meal, pulverized poultry manure, and activated sludge, each of which analyzes about 6-3-2, are in our opinion better balanced for fine turf purposes than the commercial fertilizer to which you have referred. These three 6-3-2 fertilizers possess further advantage in that, being organic fertilizers, they decompose more slowly and thus have a more lasting effect than the inorganic fertilizers. Where quick results are, however, desired, the inorganic fertilizers are to be preferred. Sulphate of ammonia and nitrate of soda are of this latter class, and are very valuable as such. Sulphate of ammonia at a cost of about $60 a ton contains 20 per cent nitrogen. Detailed information on determining the value of commercial fertilizers is contained in the article on page 113 of the Bulletin for June, 1928.

Controlling chickweed with arsenate of lead.—We have usually been able to control chickweed in our greens by the annual weeding process, but this year it is altogether too much for us. One of our greens is liable to be entirely lost unless we can rid it of chickweed by some other method than weeding. In the Bulletin for September, 1927, a report is published of the control of chickweed by the use of arsenate of lead at the Pine Valley Golf Club. Would you recommend the use of this chemical under our conditions? (New York.)

ANSWER.—We have received a great many reports and have made some observations to the effect that arsenate of lead will rid turf of chickweed on some soils. If your putting greens are made up of any of the bents, fescues, or Kentucky bluegrass, we should recommend that you commence treating them with arsenate of lead, for it is probable that under your conditions the result would be successful. It is generally applied at the rate of 5 pounds to 1,000 square feet, mixed with compost or other top-dressing material. If however your turf is made up largely of annual blue grass (*Poa annua*), we should not advise you to apply arsenate of lead at this time, as we have received some reports that this chemical will kill annual bluegrass. You mention that one green is practically covered with chickweed. It is therefore probable that if the chickweed were killed there would not be sufficient grass turf to take its place. In that case it would be necessary to replace the dying chickweed with sod. When a green becomes too badly infested with a foreign grass or a weed, it is usually advisable to remove the turf and either replant with seed, stolons, or sod.

To live in a scientific age, an age of rapidly accumulating knowledge, imposes heavy obligations upon education and upon the resultant social and industrial controls. In the presence of modern science those who do not know can not long survive, else they must seek the primitive places of the earth where the more elemental practices may persist for a time. Even in these primitive places, science will soon catch up and there will again recur the old biological requirement to learn, to move, or to cease to exist.

Otis W. Caldwell