



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>

NYPL RESEARCH LIBRARIES



3 3433 06662444 0



MVFE
Deo H

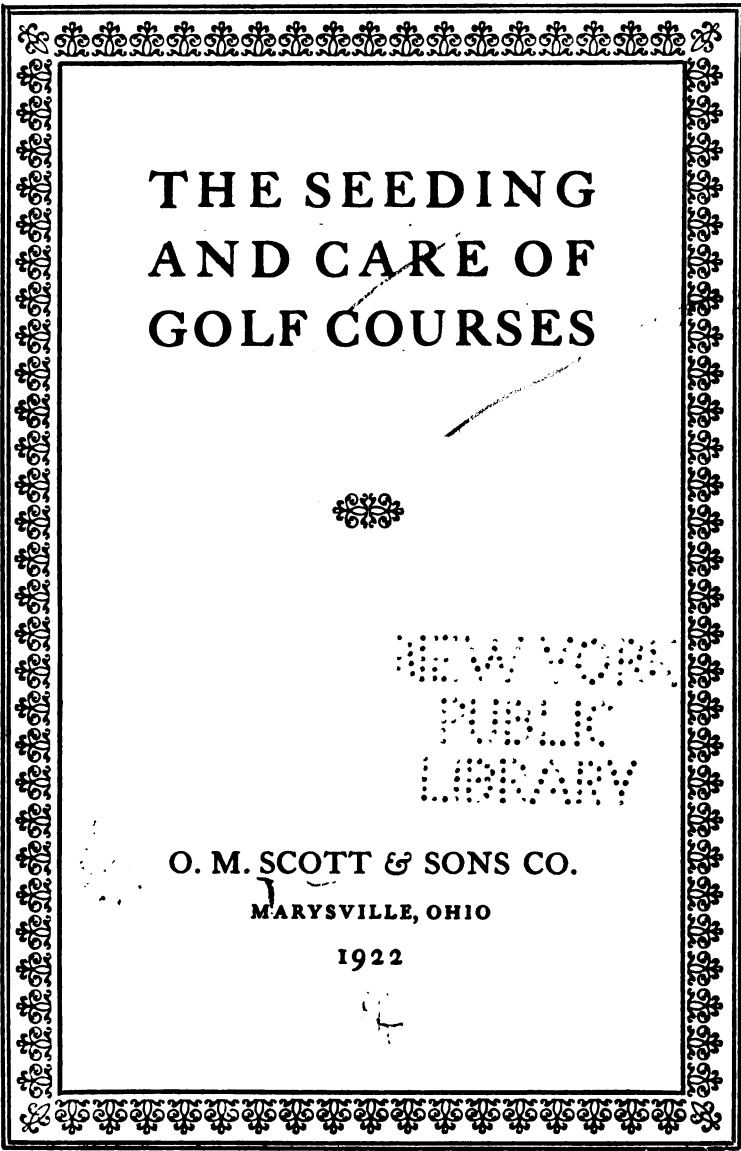
7
N
a

1922

W 5

South
MV





THE SEEDING
AND CARE OF
GOLF COURSES

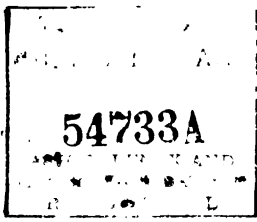


NEW YORK
PUBLIC
LIBRARY

O. M. SCOTT & SONS CO.

MARYSVILLE, OHIO

1922



COPYRIGHT 1922
O. M. SCOTT & SONS Co.

HOWARD
JAN
1922

PRESS OF
NORMAN T. A. MUNDER & CO.
BALTIMORE

HOWARD
JAN
1922

CONTENTS

	<i>Page</i>
TURF PROBLEMS —Producing Results on the Golf Course— The Turf-Nut—Seed Selection	5-7
THE SOIL —Making the Best of Poor Land—The Ideal Soil	8-9
MAKING THE FAIRWAY —Time Required—Humous Material— Plowing—Grading—Drainage—Enriching the Surface Soil— Harrowing—Sandy Fairways—Selecting the Seed—Mixtures— Soil-Testing—Seed Quality—Seeding	10-18
BUILDING THE PUTTING-GREEN —Drainage—Soil—The Seed-Bed— Seed for the Green—Weeds—Turfging	19-22
THE CARE OF THE TURF —Improving Old Turf—Maintenance of the Course—Mowing—Rolling—Watering—Re-seeding—Fertilizing— Sanding—Earthworms—Ants—Moles—Brown Patch	23-30
FERTILIZERS —Continuous Fertilization—Barnyard Manure— Sheep Manure—Peat and Muck—Mushroom Soil—The Compost Heap— Commercial Fertilizers—Nitrate of Soda—Acid Phosphate—Potash— Sulphate of Ammonia—Bone Meal	31-37
WEEDS —Persistence of Weeds—Controlling Weeds—Methods of Eradication—Crab-Grass—Pigeon-Grass—Dandelion—Buckhorn Plantain—Broad Leaf Plantain—Chickweed—Creeping Thyme— Pearlwort—Pennywort—Moss—Poa Annuæ—Clean Seed	38-45
TURF GRASSES —Kentucky Blue-Grass—Canada Blue-Grass— Red-Top—Rye-Grasses—The Bent-Grasses—South German Mixed Bent—Rhode Island Bent—The Fescues—Chewings' Fescue— Creeping Red Fescue—Sheep's Fescue—Meadow Fescue—Bermuda- Grass—Carpet-Grass—Japan Clover—White Clover	46-54



I
TURF PROBLEMS

THE purpose of this booklet is to answer in a comprehensive way the many questions which are asked concerning the seeding and care of golf courses and the development of a permanent and satisfactory turf. We are convinced that there is a pressing demand from golf club committees for practical and definite directions. It is our aim to place the desired information in small compass to meet the need of busy men.

For a more extensive discussion of the subject the reader is referred to Piper and Oakley's "Turf for Golf Courses," undoubtedly the most satisfactory volume obtainable on the care of the golf course. The authors are both associated with the United States Department of Agriculture and have rendered large service to the golfing interests of the country.

PRODUCING RESULTS ON THE GOLF COURSE

THE problems of the green committee are many and perplexing. It is not a simple matter even to grow a good lawn and the task of caring for the many acres of a golf course and meeting the peculiar requirements of the greens is far more complicated.

For the building of a satisfactory turf, many factors require consideration, among them the character of the soil, the use of fertilizers, the regulation of moisture, the control of weeds and, not least, the selection of seed. On these subjects some diversity of opinion will be encountered and local conditions make hard and fast rules impossible.





However, the general principles are well established, the problems involved have been made the subject of expert study, and practical methods have been worked out. This caution must be emphasized: It is unwise to attempt the building or maintenance of a golf course without careful attention to approved methods. Haphazard and hit-or-miss work does not produce results.

THE TURF-NUT

EVERY golf club, it is said, needs a "turf-nut" in its membership. He belongs to the company of cheerful martyrs in an unappreciated but vital cause. The turf-nut's helpful hobby is the velvety carpet of his much beloved greens. Problems of soil, sun, rain, frost, drouth, weeds, turf trials and troubles of all descriptions are solved by his undiscouraged enthusiasm. He is ever investigating, experimenting, importuning the green committee and preaching the gospel of better turf in the ears of the exasperatingly indifferent. No golf club is complete without his enthusiasm and vision.

There is many a club that worries along year after year with unsatisfactory putting-greens and ragged fairways, tolerating them because the work of reconstruction seems inconvenient and difficult. This is an unwise and unnecessary policy. By proper attention to scientific methods the difficulties may be overcome and a turf produced of which the club will be proud.

SEED SELECTION

APRIME essential always is the careful selection of seed. Of the many varieties and grades in the market, the best cannot be too good.

In presenting this general discussion on the care of the golf course, we do not disguise the fact that our calling is the distribution of seed. Our experience in this business extends back to the time when golf aroused no more fervor here than does American baseball in England.

A knowledge of seed itself, and the conditions under which it is raised, bought and cleaned, are quite essential to an intelligent handling of seed, whether it ultimately be sown in a pasture field, a public park, or on a private lawn or a golf course. Whatever the purpose for which it is used, there are always certain qualities that characterize good seed. To us, these qualities include not merely good germination, but also freedom from adulterations, weed seeds and chaff.

Our ambition is to merit recognition as good seed distributors by consistently maintaining quality and rendering helpful service.





II THE SOIL

WHILE the character of soil is a matter of great importance, it is likely to receive minor consideration in determining the location of the golf course. Other factors take precedence in the minds of the club members; among them being accessibility, cost of the land, and picturesque surroundings. While this is doubtless as it should be, a difficult situation is often thrust upon the club on coming to the task of making a permanent and satisfactory turf.

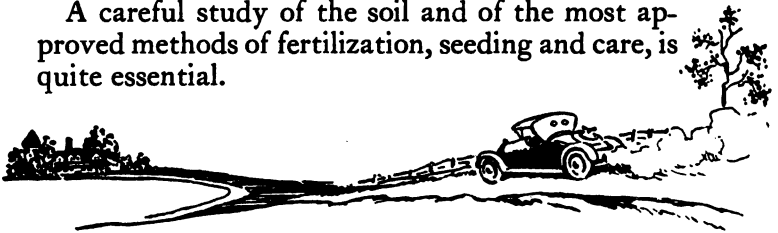
MAKING THE BEST OF POOR LAND

THE poorest land for agricultural purposes, which is likely also to be the poorest land for growing turf, can be purchased at tempting prices. The rough and rolling land so desired for the sporty course is likely to contain areas of difficult soil, and courses laid out on the ocean or lake shore are often sandy and unsuited to growing grasses.

The planning of the course, too, if done wholly from the standpoint of the game and in disregard of turf requirements, may make some difficult complications for the green-keeper.

All this means that one is often compelled to make the best of what he has.

A careful study of the soil and of the most approved methods of fertilization, seeding and care, is quite essential.



THE IDEAL SOIL

THE ideal soil for the golf course is a loam, rich in humus and from six to twelve inches in depth. Its texture should enable it to hold considerable moisture during dry times, while the subsoil should be sufficiently porous to provide adequate drainage to remove the surplus water.

Good garden or farm land with a permeable subsoil is ideal for the golf links, from a soil standpoint. Lacking such land, much can be done to improve poorer soil and make it a good turf producer.

The matter of soil is so important that it is best considered in connection with the various operations necessary in the building of new courses or the improvement of old ones.





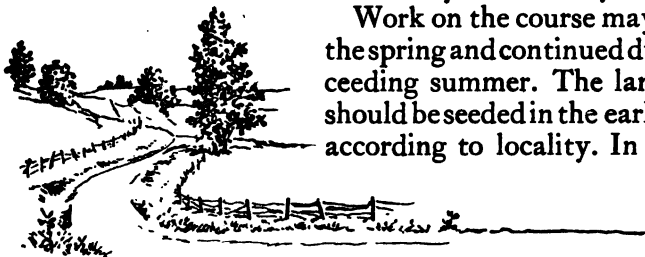
III MAKING THE FAIRWAY

WE do not attempt to deal here with the problem of laying out the course, locating hazards and building bunkers. These matters belong to the scientific aspects of the game. Our concern is only with the making and maintaining of a desirable turf. The problems of making a fairway and of building a putting-green are separately treated, as they are quite different. The putting-green requires much finer textured grass than the fairway, and its limited area admits of more intensive labor.

TIME REQUIRED

TURFING, which is often practiced on the putting-green and which will be considered later in that connection, must be confined on the fairway to limited areas, such as hillsides where there is danger of erosion. The task, then, is the preparation of a seed-bed on which is to be grown a permanent turf. This work must not be hurried, as the fitness and beauty of the course for years to come depend greatly on its thoroughness. New clubs anxious to begin the use of their grounds may do well to content themselves with a nine-hole course, roughly developed on half the area while the other half is being put into permanent condition. When this is usable the first half may be similarly treated.

Work on the course may be begun in the spring and continued during the succeeding summer. The land ordinarily should be seeded in the early or late fall, according to locality. In the extreme



Northern States where the climate is severe and there is danger of winter-killing, seeding should be done the following spring.



HUMOUS MATERIAL

OF prime consideration is the introduction into the soil of an adequate amount of humus, that is, partially decayed organic matter. No fertilizing substance can take its place. Nearly all soils, reasonably fertile, contain the essential plant-food elements, such as nitrogen, potassium, and phosphorus. Soil filled with humus permits the circulation of air, retains moisture, and is a favorable medium for bacterial life. It also gives the resiliency so desirable.

One method of introducing this humous material into the soil is by plowing under a green crop, such as clover. If such a crop has been raised in anticipation of transforming the land into golf links, it will be an advantage.

The method of introducing humous material most commonly used is that of plowing under well rotted barnyard manure. Such manure is the best soil-builder. One ton of it is worth several tons of commercial humus.

PLOWING

THE plow should turn the soil over to a depth of from six to eight inches and should be equipped with a jointer to insure the burial of the old growth. If this is heavy a log chain may be attached to the clevis.

GRADING

THE grading of portions of the fairway may be necessary. In this, it must be remembered that the top-soil with its accumulated humus is of great value. If possible, it

should be preserved. The task of building a good top-soil by the addition of humous materials to a sterile subsoil is too difficult and expensive a labor to be undertaken lightly. On limited areas the top-soil should be entirely removed before grading, and spread again over the graded surface. Hollows should be avoided or provided with surface drainage, as the alternate freezing and thawing of the winter season is ruinous to the grass roots in spots where water collects.

DRAINAGE

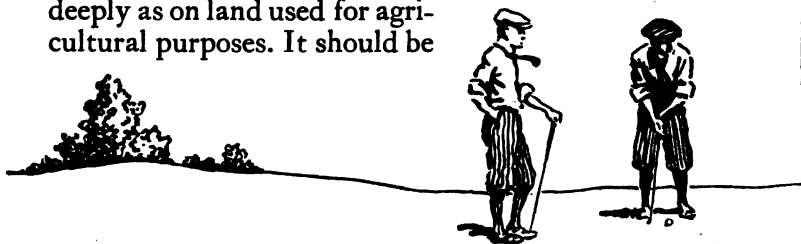
THE matter of drainage, under usual conditions, is of vital importance.

Soil of close texture resists the passage of water and tends to become cold and lacking in air and bacterial life. This condition is inimical to the growth of plants. The remedy is in laying tile in the subsoil.

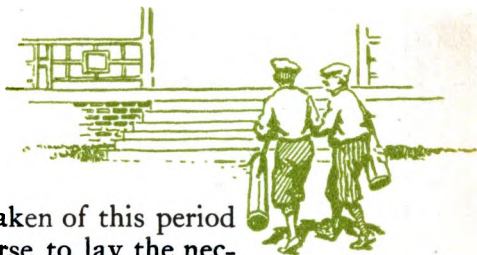
A gravelly or sandy subsoil is porous and may be expected to care for the drainage without help. A clay subsoil, however, is often impervious and, particularly on flat land, must be tiled.

Low ground, naturally, should be carefully drained. A soggy soil not only inconveniences the players but favors weed growth and permits the breaking up of the surface by trampling. Particular attention should be given to the drainage of greens flanked by higher ground.

Careful thought should be given to the whole scheme of drainage, provision being made for a sufficient fall to carry off the water. Tile on the golf course need not be laid as deeply as on land used for agricultural purposes. It should be



done under the direction of an experienced person, and, if practicable, should be completed six months before seeding, to permit settling of the trenches.



Advantage should be taken of this period in the making of the course to lay the necessary pipe for watering the greens and fairways. The installing of an adequate water system may be expensive but it pays in the long run.

ENRICHING THE SURFACE SOIL

IN addition to the humous material which has been plowed under, a dressing of organic manure should be applied after plowing, to be thoroughly worked into the surface soil by repeated use of the disc harrow. Barnyard manure is the best material for this purpose, if it is fine and without any quantity of living weed seeds. The various kinds of commercial dried manures are also available, but expensive. If chemical fertilizers or soil amendments, such as lime, are needed, they too may be added at this time.

HARROWING

PLOWING should be immediately followed by a thorough harrowing with a disc harrow, repeating the operation until the soil is worked into a fine and mellow condition. The application of an inch of sand to clay soil during the process of harrowing will be beneficial. Sand corrects the tendency to bake and crack and aids the circulation of air and water.

Harrowing should be repeated at intervals to kill successive weed crops. It is important that they be exterminated



before seeding. The cultipacker is an excellent tool to use in preparing for seeding, as it firms the soil without destroying the surface mulch. Finally, before seeding, use a smoothing harrow, or better yet, a Meeker harrow. This last tool consists of four series of straight discs set in a frame, and is excellent for fining and smoothing the surface.

It will be well during these final operations to provide special boots for the horses in order to avoid deep hoof tracks.

SANDY FAIRWAYS

A SANDY loam soil will make a satisfactory fairway, but the preparation of either coarse or fine sand is a difficult and expensive process. Such a course should be surfaced with three parts of clay and one part of manure to a depth of about two inches. If peat or muck is available, it is suitable for this purpose. Lacking this, a humus-forming crop of vetch, cowpeas or soy beans, which do well on sandy soils, should be grown and plowed under. Of the three, vetch grows on sand most luxuriantly. In any case, pulverized clay should be added.

SELECTING THE SEED

THE various species of grasses suitable for turf are discussed in a following section. Kentucky Blue-grass may be described as the ideal grass for the Northern fairway. It should be sown together with Redtop, which is an excellent fairway grass and complements Blue-grass effectively. Five parts of Blue-grass to one of Redtop is about the right proportion. When Blue-grass is scarce and costly we recommend a larger percentage of Redtop.

Blue-grass, while showing a predilection for lime, has a

wide range of adaptation to soil. Even on sand, which is likely to be more or less acid, it has been found in some cases to do better than any other turf plant.

Redtop does well on acid soil and in wet, sour areas is to be preferred to Blue-grass. It has also the virtue of cheapness and its use in a mixture greatly reduces the cost of seeding.

Chewings' Fescue, which is ordinarily considered a grass for the putting-green, is exceptionally fine for the fairway. In seasons such as the present, it is likely to be extensively used. It is now but little more expensive than Blue-grass and, if mixed with Redtop, the cost will not be excessive.

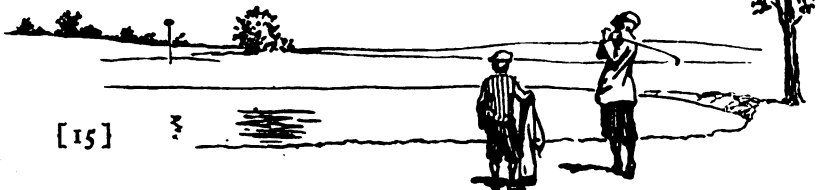
Chewings' Fescue should also be used under trees and around shrubbery as, unlike Blue-grass, it does well in the shade.

White clover is sometimes sown in the fairway mixture, and, being a legume, it has the advantage of enriching the soil by nitrogen taken from the air.

Italian and Perennial Rye-grasses are inexpensive and may be used in the mixture, especially for quick growth.

MIXTURES

COMMERCIAL mixtures in which the various grasses and their proportions are matters of mystery, are to be avoided. There is no magic mixture and no secret formula for making the best turf. A mixture of ordinary grasses, under a fancy name, may be sold at an exorbitant price, while the cost of pure seed of any particular variety must be held in bounds, being deter-



mined by market conditions. Satisfaction and economy are both served by buying the pure seed and mixing as may be required.

SOIL-TESTING

THE suggestion is sometimes made that samples of soil be submitted for analysis, so that a suitable mixture of seed may be recommended. The advantage of such a practice is largely fanciful.

Soil analyses are of two kinds, mechanical and chemical. Mechanical analysis determines merely the character of the soil texture, describing its constituents as gravel, sand, silt or clay. This analysis is quite unnecessary as these soils are easily recognizable. Chemical analysis determines the chemical constituents of the soil but does not ascertain if these elements are in a form available for plant-food. Soil-testing is thus of little value.

Furthermore, the important turf varieties have much the same range of soil adaptation, and analysis indicates little as to their proper selection.

SEED QUALITY

THE quality of seed is of great importance. The points to be considered are: Amount of weed seeds, amount of waste matter, and strength of germination. Cheap seed is usually the most expensive. Cost cannot be determined by price. If the impurity is made up largely of weeds, the cost of seed may be measured only in endless labor and dissatisfaction.

SEEDING

THE time of sowing is determined by preparation of the seed bed, degree of winter severity of the locality and, perhaps unfortunately, by the urgency with which the club

wishes to begin the use of the course. If winter conditions permit, the fall period is preferable. Turf-grasses stool better in cool weather, while if sown during the hot summer season, they tend to grow tall and slender. For this reason hot weather sowing requires greater quantities of seed. Fall sowing also avoids the period of greatest weed growth, which is a serious menace to young plants. Moisture conditions also are likely to be more favorable in the fall than during the summer.

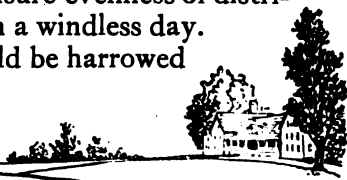
Even in the severe winter sections such as New England, turf experts now favor early fall sowing. Originally spring seeding was advocated because the season is likely to be cool and thus favorable.

Bermuda-grass should be sown in the spring or summer. It is extensively used in Southern States and while easily killed by frost, this grass is not discouraged by hot weather.

The amount of seed used on the fairway will depend upon variety, but may be stated in general as 100 to 150 pounds to the acre. Sow enough. No particular injury can result from heavy seeding, while too light seeding is often responsible for a poor turf. To insure an even stand of seedlings heavy sowing is usually necessary.

In sowing, the use of a drill is inadvisable as it produces ridges in the turf. The seed must be evenly distributed, for irregularity produces a spotted course and the bare places offer a harborage for weeds. Broadcasting by hand is wasteful of seed and results in an irregular distribution unless the sower is exceedingly expert. A wheelbarrow seeder or a hand seeder should be used. Sow the seed half in one direction and half at right angles, to insure evenness of distribution. Sowing should be done on a windless day.

After seeding, the surface should be harrowed



lightly to cover the seed. A weeder may well be used for this purpose.

Follow covering by a light rolling in two directions. This compacts the earth about the seed, insuring germination, and firms the soil, reestablishing capillary action. Rolling on clay soil should be done with discretion.

In the following early spring, the fairways should be gone over carefully and any bare spots fertilized and seeded. Such spots if left become nurseries for weeds.

New turf should have its first clipping when the grass is two or three inches long. Set the knives of the mower high to clip off the ends of the blades.

s
or
ea;
i



IV

BUILDING THE PUTTING-GREEN

PARTICULAR attention must be given the putting-green, where a dense, close-knit, springy turf is desired. On these restricted areas much intensive labor may well be expended. The poor condition of many putting-greens is due to inadequate preparation of the soil, or the sowing of unsuitable grasses.

In making a new putting-green, if there is already a good top-soil, it should be removed and replaced after plowing, draining and leveling.

DRAINAGE

THE putting-green on low ground should be drained by rows of four inch tile placed eight feet apart. In permeable loam they should be from eighteen to twenty-four inches deep, but on less permeable soil nearer the surface.

Drainage by use of layers of rubble is not recommended, as the process is expensive and often made ineffective through clogging.

SOIL

IF there is not a good natural top-soil, it must be obtained. Soil from a cultivated field is best. This should be mixed with stable manure, well rotted to kill the weed seeds.

Spread it to a depth of from eight to twelve inches, or even more.

Peat should not be used unless composted for a year and well mixed with the soil.

THE SEED-BED

THE top-soil thus formed must be raked and rolled until the upper inch in which the young plant will get its start is as fine as ashes. It should be mellow, but made firm by rolling. Rolling both ways reveals inequalities of the surface easily adjusted by use of the rake. This rolling makes a firm seed bed and allows the soil solution, containing available plant foods, to be brought up by capillary action. If capillarity is lacking, plant foods are carried down by the rains and cannot be brought back to the surface.

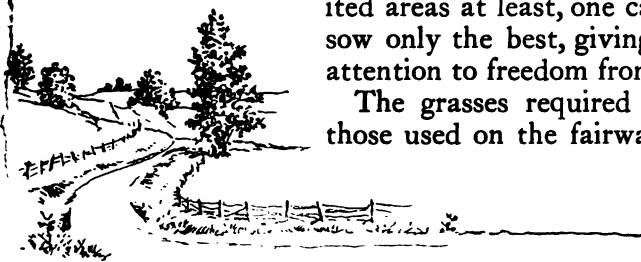
Frequent raking before seeding ventilates and warms the soil and, more important still, kills the young weeds as they sprout. The very fine soil acts as a blanket for the coarser soil beneath, prevents the escape of moisture through cracks, and assures quick germination.

In case the original soil of the putting-green is sandy and it is impracticable to build an entirely new soil, the condition may be remedied by adding enough pulverized clay and humous material to cover the surface three or four inches deep. The three elements mixed will form a satisfactory andy loam.

SEED FOR THE GREEN

IN selecting seed the general principles named under "Making the Fairway" should be noted. The needs of the putting-green are peculiar and more exacting than those of the fairway. The cost of seed is small as compared with the whole expense of preparing the green, and on these limited areas at least, one can afford to sow only the best, giving particular attention to freedom from weeds.

The grasses required differ from those used on the fairway. The turf



must be fine and dense and able to stand up under hard wear. Only a limited number of fine grasses are available, the most suitable for the Northern States being Chewings' Fescue, Red Fescue, South German Mixed Bent, commonly known as Creeping Bent, and Rhode Island Bent.



The Bents and Fescues should not be mixed as they are of varying shades of color and tend to separate in time, leaving a patchy appearance. Either of these grasses alone makes a perfect putting-green turf. The mixing of any other varieties with Bent or Fescue means the introduction of something not as good as the best.

Commercial putting-green mixtures are likely to contain some grasses suitable for the fairway, but undesirable on the green. For example, White Clover on the green must be considered a weed, as also Rye-grass and Blue-grass.

The method of sowing is similar to that followed on the fairway. If a hand-rake is used in covering, great care must be taken to avoid drawing the seed into rows. Do not be sparing in the use of seed, as a dense, even turf is desired, in as short a time as possible.

WEEDS

WEEDS offer a special problem on the green, as the fine grasses germinate and develop slowly, giving the weeds their opportunity. Begin weeding operations early, laying planks to avoid trampling. Remove crab-grass and the spreading perennials as soon as they can be plucked. Bare spots should be reseeded as soon as they appear. While the appearance of weeds on any newly broken ground is inevitable, avoid carelessly sowing them with grass seed. Sow clean seed.

TURFING

TURFING the green is a more expensive process than seeding and much less satisfactory. The proper variety of grasses can scarcely be obtained except from a specially prepared nursery or from an old green. Ordinary meadow grass lacks proper quality, is likely to be full of weeds and would take years of reseeding and care to become a first-class putting-green carpet. While a passable green or turf can be quickly made with such material it will probably be long before it offers a true putting surface.

For turfing, the soil of the green should be thoroughly prepared, as for seeding. One cannot remove turf from a rich soil and place it on a light and sterile surface and expect it to grow luxuriantly. The finer grasses particularly are likely to die out, leaving a surface of coarse grass and weeds.

Where turfing is resorted to, it should be done with care. For cutting turf, a special horse-drawn implement may be used. The essential points are that the turf be cut vertically and that it be of a uniform thickness of about one and one-half inches. Cut both ways to make conveniently handled pieces ten or twelve inches square.

In laying the turf do not set the pieces close together as they will expand under the roller. Work from a board to prevent injury to the surface. Sprinkle over the newly-laid turf a dressing of sand and sweep it into the interstices. Water thoroughly and roll twenty-four hours later. To protect the newly-laid turf from the sun, it may be covered during the day with cut grass, or drying out may be prevented by a sprinkling of fine soil.

One of the first cares of a new golf club should be the establishment of a turf nursery where the finer grasses can be raised on carefully prepared soil. This will supply the frequent demands for patching worn spots on the greens.



THE CARE OF THE TURF

THE problem of interest to most clubs is that of caring for and improving an old course, rather than that of building a new one. The improvement of the turf of an old golf course where the original preparation of the ground was inadequate requires patience and persistence.

IMPROVING OLD TURF

IMPROVEMENT must be accomplished largely through surface dressings and reseeding. Clay soil, being a natural home for turf plants, may be bettered with the least difficulty and expense. Surface dressings of fine and thoroughly rotted stable manure, compost, or good commercial fertilizer may be applied. Two pounds of pulverized sheep manure on each one-hundred square feet is an excellent dressing. Where the soil is very poor, in addition to manure, include two pounds of bone meal per one hundred square feet. If the soil is stiff, the addition of humus-forming material is important.

Applications of lime tend to make clay soil more friable. Lime is an important addition to sour soil as it neutralizes the acids, which are caused in part by decomposing organic matter, and restores the lime lost in drainage water.

On the golf course, however, the application of lime must be determined partly by the nature of the turf plants desired. Plants are classified with reference to lime as lime-lovers, lime-haters, and indifferents.



Blue-grass, which will probably be used on the fairway, unlike other northern grasses, is a lime-lover. Lime should not be used on the putting-green as the preferable grasses, the Bents and Fescues, are indifferent to it, while certain undesirable varieties, such as White Clover, thrive on lime soil. A considerable disadvantage in the use of lime is its stimulation of weed growth.

MAINTENANCE OF THE COURSE

THE most efficiently built course requires constant care for its maintenance. There is pitiful waste in permitting a course that has cost thousands of dollars to become so run down that reconstruction is necessary. As soon as turf shows any sign of impoverishment, it should have immediate attention. As for the ordinary operations incident to the care of the turf, it is worth while to carry them out in the most thorough manner. An efficient green-keeper should have behind him an interested and well informed green committee.

MOWING

THE mowing of the course should not begin in the spring until the root growth has a good start. Too early clipping hinders this root growth and weakens the plant. For the first mowing, the knives of the mower should be set high. Mowing must be done regularly throughout the season. Frequency of cutting promotes heavy growth of the roots and fineness of texture. In dry, hot weather avoid cutting too close or too often, as the roots then require top growth for their protection.



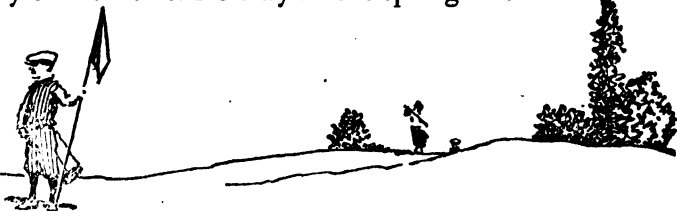
Grass clippings should never be removed from the fairway unless so long as to be a nuisance. They are a most valuable manure. A crop of hay annually removed from a field with no replacement, would soon impoverish the land. To remove continually the cuttings of growing grass is a still more serious drain on the soil, and necessitates the addition of much expensive manure.

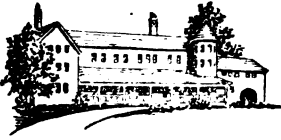
Mowing of the green requires especial care as the quality of the putting surface depends largely upon it. Sweeping the green lightly before mowing removes refuse and sets the grass up to the knives of the machine. Alternate the direction of the machine in successive mowings. Run it off the green to turn. The knives must be sharp and correctly set, to cut the grass cleanly without bruising it. Cut frequently rather than too closely.

The picturesque flock of sheep on the golfing landscape earn their living nicely by keeping the grass mown, but there are certain manifest disadvantages in their use. Among them are fouling of the fairway, scalding the turf, damaging the bunkers and being generally in the way. They are of doubtful advantage except possibly as a labor saver for a struggling club.

ROLLING

THE course should be rolled as soon as frost is out of the ground in the spring in order to compact the earth. The spring reseeding should precede this rolling. While a reasonably heavy roller may be used for this purpose a light roller should be used in the playing season. Heavy rolling on any soil is advisable only in the spring and fall.





Rolling was formerly practiced with great enthusiasm and unrestraint, but it is now generally recognized that it can be overdone. Repeated rollings during the playing season do not especially promote the growth of grass but are mainly purposed to smooth out surface irregularities. The surface of the green should be firm but porous, not hard, as over-rolling tends to make it.

Sandy soils are not readily damaged by rolling, but stiff clay, especially where the turf is thin, should be rolled only occasionally, and then lightly. On putting-greens use a light wooden roller.

WATERING

THE lawns of England, which are a perpetual wonder to the American tourist, are to be partially accounted for by a cool summer climate and frequent showers. In America, regular watering of the turf must take the place of the dependable English rainfall. There is little danger of overdoing this on well drained soil. Water thoroughly, rather than frequently. Soak the ground so that the water penetrates to the subsoil. Light sprinkling that does not penetrate deeply is to be avoided, as it encourages a shallow root growth. Nature's plan of a thorough soaking at intervals is best.

In dry weather the greens should be watered once in three days. In hot weather, water late in the afternoon or at night rather than in the morning. This permits the water to penetrate deeply before it is drawn up again by the sun. If watering is done under a hot sun there will be much evaporation and the surface of the soil will become crusted. Some form of sprinkler should be used which delivers the water in a fine spray, as a forceful jet washes earth from around the roots.

RESEEDING

RESEEDING of worn spots should be done in the fall of each year or, in severe climates, before the spring rolling. In the fall when the ground is hard a seeder equipped with small discs for cutting the seed into the ground may be used to advantage. In the spring the ground is likely to be sufficiently moist to make such an implement unnecessary.

Bare spots on the green may be patched with sod taken from the nursery, cut thick and transplanted immediately. Seed for the greens should be kept on hand constantly and sown on bare places as they appear. Sow when the ground is moist or immediately before a rain.

FERTILIZING

FERTILIZING during the summer season stimulates the turf at a time when its growth is naturally slow. The necessary constant watering, too, deprives the top-soil of much soluble plant food which should be replaced. Some form of prepared fertilizer may be used which mixes readily with the soil and does not become a nuisance to the players.

A recommended top-dressing for reviving the greens during hot, dry weather is composed of two parts of loam to one part of mushroom soil or well rotted manure, with an addition of nitrate of soda or sulphate of ammonia. This dressing is applied in an amount sufficient to be quite noticeable on the greens after it is brushed in. The chemical constituent need not exceed one and one-half pounds for one thousand square feet. After the greens are top-dressed, water them thoroughly, but in such a manner as to avoid washing the dressing into piles and ridges.



SANDING

OCCASIONAL light applications of sand on the putting-greens serve two purposes: first, the smoothing of the surface; and second, the lightening of heavy soil. Coarse sand should be used as it mixes readily with clay loam and does not inconvenience the players. Fine sand tends to form a crust.

EARTHWORMS

EARTHWORMS, although their presence is doubtless beneficial to the soil, are a nuisance on the green because of the casts they leave on the surface. The use of a putting-green sweeper is effective in breaking up the casts. It was formerly supposed that a layer of cinders under the soil would be an effective discourager of worms, but experience has proved this hope delusive.

Earthworms can be poisoned, corrosive sublimate (bichloride of mercury) being the favored executioner. This substance is a virulent poison and should be handled carefully. Mix one pound of corrosive sublimate with one hundred pounds of sand for each four thousand square feet. Corrosive sublimate may also be mixed with water at the rate of one-half ounce to fifteen gallons and sprinkled over the grass, but this method involves more labor. After scattering the poisoned sand, turn on the hose. The worm colony migrates to the surface and few of them get back. It only remains to rake up and suitably dispose of the slain. One must not expect, however, that one application will suffice for a season.

The various commercial worm-killers, composed largely of mowrah meal, are much more expensive and no more effective than corrosive sublimate.



ANTS

FOR ants, spraying is unsatisfactory. Each nest must be dealt with separately. They may be killed by mixing Paris-green and sugar and dropping around the holes. An ingenious method suggested is to soak sponges in sugar water and place them near the holes, occasionally throwing the sponges into hot water. Carbon bisulphide is an effective poison. Inject it into the ant-hole with a common machine oiler with a long spout. A heavy gas is formed which permeates the nests. Remember that this chemical is explosive. Potassium cyanide may be used effectively in the same manner, and is cheaper. Dissolve one ounce of ninety-eight per cent. potassium cyanide in one quart of water.

MOLES

MOLEs are often a great nuisance on the golf course and can be destroyed only by persistent trapping. As moles pass obstacles by going around them rather than by digging under, and as some species ordinarily work less than six inches below the surface, they may sometimes be kept out of small areas by sinking thin boards, edge down, just below the surface. Traps should be set with care, and gloves worn in the process as the animals have a keen sense of smell.

BROWN PATCH

UNTIL recently nearly every brown area appearing in a putting-green or fairway during periods of moist hot weather, was attributed to "sun-scald." Such patches of brown are often noticeable on the turf in early morning, giving a smoky or cloudy appearance to the affected



areas. As the day progresses and the sun becomes more intense, these spots turn brown, as if touched by fire.

Such a condition is now known to be the result of a fungous growth, not of the burning sun. This growth, *Rhizoctonia solani*, is a soil organism which attacks a large number of plants and grasses. It forms on dead stems and leaves. When germinating, a cobwebby covering called mycelium or "mildew," is caused, through whose agency the grasses are killed. The areas in which this disease may gain a foothold are often very small, but sometimes they approximate several feet in circumference. Under favorable conditions the "brown patch" infection may spread for several successive days, or, under adverse circumstances, such as cooling weather, it may terminate in a single night. Those noting that a dose of "brown patch" very often follows a thunder shower have attributed the disease to this cause. However, it is definitely known that the thunder showers themselves are not responsible, but that "brown patch" is favored by hot, muggy weather.

Numerous experiments have been performed in the hope that some definite means of stamping out the disease might be developed. Unfortunately, there is no certain remedy, although frequent sprayings of half strength Bordeaux have held the plague in check. This, however, is an expensive and tedious remedy. To be effective, Bordeaux must be kept on the leaves of the grass continuously, for it is a preventive and not a cure. The necessity of spraying daily or three to four times a week will depend upon the frequency of showers that wash away the Bordeaux covering. Bordeaux dust may be used and is easily applied. The bare spots left by "brown-patch" can usually be revived by liberal applications of compost and sulphate of ammonia.

VI
FERTILIZERS

FROM the foregoing it will be understood that thorough enrichment of the seed bed is essential in building the course. On the established course, the agricultural methods of fertilization, tillage, crop rotation, and the plowing under of humous material are impossible. Thus, surface dressings must be resorted to, for supplying the necessary plant food.

CONTINUOUS FERTILIZATION

THE practical problem of a club is often that of making the best of a poorly prepared course, and, no matter how thorough the preparation, continuous enrichment of the soil is essential. Consumption of food-elements goes on with the growth of the plant and unless nourishment is supplied by top dressing, impoverishment of the soil eventually results.

The inevitable leaching which takes place and the "locking up" of plant-food elements in plant tissues decreases the total amount of such elements available for growth. Nitrogen especially is likely to diminish by this process, and since this element more than any other, is responsible for an active growth of the grass, provision must be made for its application, either in manures, composts or commercial fertilizers. Grass must be fed.

A fairly good turf may often be brought to excel-

[31]





lent condition by repeated top-dressings and seedings. Light or sandy soil is capable of indefinite improvement by continued application of manures and fertilizers.

The most favorable time for manuring or fertilizing is spring and early fall. Late fall applications stimulate heavy growth when it is not needed. Spring dressing produces results most quickly.

A spiked roller is sometimes used on the fairway before and after humous dressing, to mix the humus with the surface soil. On the green a fine dressing may be worked into the turf with a broom.

Commerical dried manures are expensive and their use will ordinarily be confined to the green.

The following paragraphs are purposed to describe briefly the various kinds of soil-building materials commonly available. Soil improvement may be secured by the use of organic manures and commercial fertilizers.

Organic manures are composed of decaying vegetable and animal matter. Among them are the following:

BARNYARD MANURE

BARNYARD manure is commonly available and is the most economical and, in many ways, the best soil-builder. It not only furnishes plant-food elements, but also beneficially modifies the structure of the soil. Its presumed disadvantages, coarseness and the presence of weed seeds, are not serious. Both can be obviated by giving it time to rot thoroughly. Fresh manure must not be used. It should be left until decomposed, or should be composted with other material. While the value of manure is best conserved by plowing under, it can also well be used for top-dressing, if finely pulverized and reasonably free from straw. For use

on the green, it should be composted or mixed with clay, loam or sand, depending on the character of the soil.

The presence of living weed seeds can be readily determined by subjecting a sample to growing conditions. If weed seedlings appear, the manure requires further decomposition. If none appear, it may be used with safety.

SHEEP MANURE

FINELY pulverized sheep manure contains phosphorus, potash and nitrogen and is an excellent top-dressing. It is somewhat expensive for the results obtained. Apply at the rate of two pounds to one hundred square feet.

By soaking sheep manure in water, at the rate of one pound to five gallons, a liquid manure may be secured which can be applied to the green with a sprinkling can, thus avoiding litter.

PEAT AND MUCK

PPEAT and muck, which are composed of decaying vegetable matter, are altogether too expensive when sold as commercial humus. They are of far less value than an equal weight of barnyard manure, but, if available near the course, may be used economically. Owing to their frequently toxic qualities, they must be thoroughly prepared by aerating and leaching. For use on sandy fairways, peat and muck may be composted with clay and barnyard manure.

MUSHROOM SOIL

MUSHROOM soil which is soil largely composed of horse manure in which mushrooms have been grown, is recommended as an almost perfect humous material. It is of good texture, free from weeds and can be easily screened.



THE COMPOST HEAP

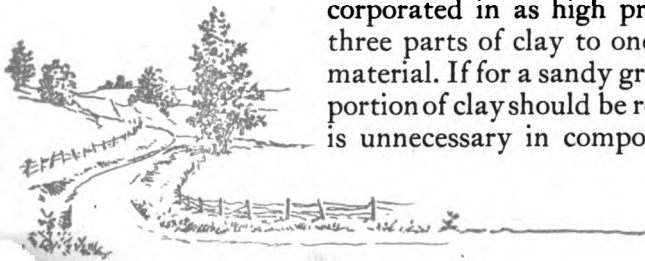
A COMPOST heap is a necessary adjunct to every golf course. This is a pile of various humus-forming and fertilizing materials, spread in layers about six inches thick and left to decay and to undergo chemical modification. It may include in its composition almost any decomposing vegetable matter, lime, inorganic fertilizers, earth, barnyard manure, peat, leaf-mold and sod.

Composting is a valuable process, producing a humous material very beneficial to the turf. If a good manure compost is used in spring and fall, nothing else may be found necessary, except for the occasional application of nitrate of soda or sulphate of ammonia as a quick stimulator.

The pile should be built under cover if possible, the various materials being laid in alternating layers of four to six inches. If peat is used, lime should be sprinkled in with it to neutralize acids and to promote bacterial action. Barnyard manure is a necessary ingredient for the introduction of bacteria. The pile is broken down vertically and thoroughly mixed several times during the composting period. The compost is then sifted through a screen and the coarse material saved for the next pile.

The composting process should continue at least six months before use. A year is better. Composting six months will kill most of the common weed seeds, but a year will dispose of all of them quite certainly.

The character of the soil ingredient of the compost will depend upon its use. If for sandy fairways, clay may be incorporated in as high proportion as three parts of clay to one of organic material. If for a sandy green the proportion of clay should be reduced. Soil is unnecessary in compost intended



for the clay fairway. Sandy loam greens need a compost dressing composed of a rich earth, and either manure or mushroom soil.

Applications of compost may be made about one-fourth inch thick, and on limited areas may be worked into the turf with a broom or other implement. Compost material will be found invaluable in many hurried repair jobs on the greens.



COMMERCIAL FERTILIZERS

BY the term "commercial fertilizers" is properly meant not dried manures, but chemical substances which may be made available as plant-food. These substances are found in natural deposits.

It must be remembered that inorganic fertilizers alone are insufficient, and can only be regarded as supplementary to humous material.

NITRATE OF SODA

NITRATE of Soda is largely imported from South America and is valuable for its nitrogen content, amounting to fifteen or sixteen per cent. It produces quick results, as it is readily soluble, penetrates the soil deeply and no chemical decomposition is necessary. Its disadvantages are that its effects are not permanent, and that it must be used with care on the greens, as it is likely to produce burning. Never apply heavily, but at intervals, in quantities of not more than five pounds to one thousand square feet. It should be thoroughly pulverized and mixed with sand. After application, water thoroughly. In the early spring, nitrate of soda will start a quick growth.

ACID PHOSPHATE

Acid phosphate results from the treatment of phosphatic rock. It is valuable for its phosphorous content, amounting to from fourteen to sixteen per cent. It has a stimulating effect on grass and is used especially when immediate results are desired.

POTASH

Muriate and sulphate of potash are not recommended except for very sandy soils. Clay is likely to contain enough potash. These fertilizers are very stimulating to the clovers.

SULPHATE OF AMMONIA

Much interest is now being shown in the use of sulphate of ammonia. This is a by-product of the manufacture of gas and coke, containing twenty per cent. of nitrogen. Its use is thought to increase the acidity of the soil, and the presumable effect of this acidity in eradicating weeds and undesirable grasses is attracting attention.

Certain varieties of Bents and Fescues, which are the most desirable plants for the green, are indifferent to acid and thrive under the presence of sulphate of ammonia. Weeds and undesirable grasses, it is supposed, either succumb to the acid condition it produces or are crowded out by the healthily-growing Bent or Fescue.

A long series of tests carried on at the Rhode Island Experiment Station and in other places show some remarkable results and suggest interesting possibilities in the use of this fertilizer. It is claimed that its use on the green for a few years will cause the practical disappearance of the weeds.

However, the favorable report of efforts to develop acidity at the Rhode Island Station, may be attributed par-

tially to the fact that the soil there is already acid, and that the applications were continued through a period of years. At the Wooster, Ohio, Experiment Station, tests were made to ascertain whether clover and crab-grass could be exterminated in this manner. The soil in that section is deficient in lime, and so not unlike that at the Rhode Island Station. For ten consecutive years the application was made, before any particularly unfavorable effect on these grasses was noticeable. If, on soil naturally acid, it requires ten years for sulphate of ammonia to make any noticeable impression, it would seem impracticable to use it on neutral soil or soil supplied with lime, with the hope of driving out weeds and clover.

BONE-MEAL

WHILE bone-meal is an organic material, it is not a humus-former, and is best considered as a chemical fertilizer. It is cheap and popular, is in no way injurious to the turf or soil and can be applied at any season. Its use on the green should be avoided if White Clover is present, as its lime content stimulates that undesirable plant. The nitrogen and phosphorus elements of the bone are more available if it is steamed. For top-dressing, bone-meal should be finely ground. Best results are produced by winter application, as the early spring growth is thus stimulated. On the green use about two pounds to one hundred square feet.





VII WEEDS

WEEDS are the Philistines of the golf course against which unceasing and relentless warfare must be waged. They are not only unsightly but they spoil the fair green carpet so necessary for the game. They are the robbers of the plant world, using the moisture and fertility that otherwise would go to the nourishment of good grass.

PERSISTENCE OF WEEDS

WEEDS are everywhere prevalent, making homes for themselves in every inch of unoccupied soil. Their seeds are borne by the winds and carried by birds. They are ever restless migrators. Careless people become their allies, introducing them into their fields and lawns by sowing impure seeds.

Land in preparation for turf growing should remain fallow for an entire season and be subjected to repeated harrowings until the successive weed crops can be exterminated. Even then occasional survivors and incoming migrants appear amid the young grass.

Weeds are inured to hardship through their generations of battle against drouth, the elements and man.

They know how to propagate themselves in the most difficult environment. Nature equips the perennials with deep and spreading roots that resist the most severe weather.



Annuals produce thousands of seeds each year. The seeds of some weeds are fitted with parachutes, sails, grappling-hooks and entrenching tools, and some shoot broadcast like bursting shells when the pod is touched.

When a weed drops its ripened seeds a part lie dormant in the ground, with abundant vitality. These dormant seeds may keep coming up year after year.

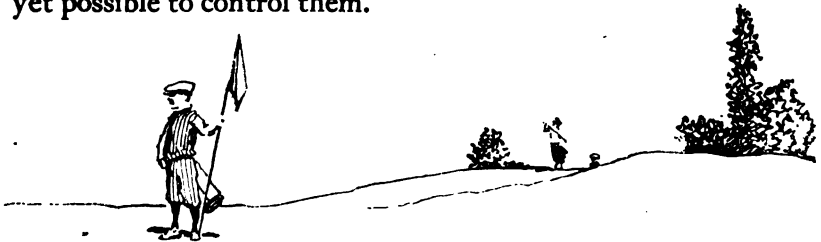
The extraordinary vitality of weed seeds is shown by the fact that in years when especially heavy spring rains soak the ground thoroughly and are followed by hot weather, the soaked seeds sprout and fields will be full of weeds which have not been seen in them for several years.

On the putting-green, weeds force upon the green-keeper one of his most difficult problems. On the entire course, if allowed to persist, they become a source of vexation, labor and expense; there can be no compromise.

For our purposes, weeds may be classified as annuals, depending upon a yearly seeding; and perennials, whose roots carry them through year after year. Many perennials cling so closely to the soil as to defy the mower, while others have long tap roots that are forever sending up new plants. The roots of some perennials creep beneath the sod, forming a mat of unsightly vegetation.

CONTROLLING WEEDS

FOR all of this, the practically weedless golf course is a possibility. While not all weeds may be destroyed, it is yet possible to control them.





The first essential is the sowing of pure seed. It is better to keep weeds out of the soil, than to spend unnecessary labor in destroying them after they have gained a foothold.

Absolutely weedless seed is an impossibility even with use of the most modern machinery, but to furnish seed as nearly free from weeds as possible is our ambition.

It has been our experience that no one can hope to supply seeds of the best quality without a thorough knowledge of producing sections. For example, consider Redtop: One small section produces nearly all the seed for this country and Europe. Most of this district harvests seed of doubtful quality. In only a very small area can seed be found that, after cleaning, will be practically weedless. Everyone knows that Kentucky grows most of the Blue-grass, but few are aware that several counties in another state raise Blue-grass seed that is far superior. The reason these small areas produce such good seed is that their soil is particularly adapted to a specific variety, the result being that it grows so luxuriantly that weeds are crowded out. This is true not only of Redtop and Blue-grass but of all other grasses, whether they be native to this country, Europe or New Zealand.

To secure pure seed is our constant aim. To sow pure seed should be the established custom of every golf club.

METHODS OF ERADICATION

THE common methods of eradicating weeds are hand-weeding, mowing, raking and seeding.

Some weeds may be removed from the greens by hand, but the process is tedious. Some may be laboriously cut out with

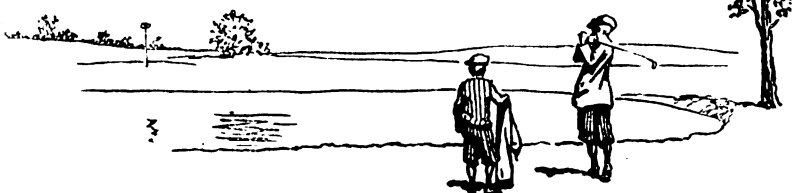
a knife. Regular mowing is the great discourager of weeds, particularly of the annuals, which are thus prevented from going to seed. Weeds find lodgment in unoccupied spots, and the frequent seeding of thin places is an effective preventive. Crowd them out with good grass. On a close turf weeds are likely to cause little trouble. Raking and seeding thin spots in the fall when weed growth has ceased for the season is especially desirable. Fertilizers leaving an acid residue are unfavorable to weeds.

To eradicate any weed requires a knowledge of the nature of its growth and often of specific methods. For this reason certain common weeds are treated below.

CRAB-GRASS

CRAB-GRASS is, without a doubt, the worst of all weeds that grow on putting-greens. The name is suggested by the flowering spikelet which is supposed to resemble the claw of a crab. Although an annual, it cannot be gotten rid of by close clipping, many of the stems growing so near the ground that they are missed by the mower. Thus, the plants reseed and increase from year to year. The seeds are very small, there being more than a million to the pound. Besides propagating from seed, it roots from stem joints that touch the ground, so that a single plant may cover considerable space.

In some sections Crab-grass is known as "Finger-grass." It is also called "Summer-grass" and "Fall-grass," because it does not start growth until hot weather and is most noticeable in summer or early





fall. It is killed by the first frost, turns brown and leaves unsightly patches. Because it is particularly noticeable in hot, dry seasons when much water must be artificially supplied, some call it "Water-grass," thinking that it is caused by sprinkling. In seasons like the summer of 1921, Crab-grass is particularly noticeable and seems to be able to overcome the more desirable grasses.

Nearly everything has been tried in an effort to find some treatment that will eradicate this pest, but, thus far, nothing but hand-pulling has been successful. This should be done when the plants are small. On fairways, although objectionable, Crab-grass is not as serious as on the greens, for it is usually replaced by the perennial grasses in the fall. However, it is likely to appear in larger quantities the following year.

PIGEON-GRASS

PIGEON-GRASS is not unlike Crab-grass. It is a most undesirable summer weed and should be treated the same as Crab-grass.

DANDELION

THIS is the commonest and is difficult to kill. Cutting, even below the surface, increases rather than decreases the number, as this often causes the crown to split and several new plants to spring from the old root. If a tablespoonful of salt or gasoline is applied where the root is cut off, it will die. The use of a dandelion-killer saves much back-breaking work. This is a tube with a plunger, to be filled with gasoline. Apply the point to the heart of the weed. One application of a tablespoonful of gasoline kills most perennials. Kerosene may be used but with more care, as surrounding grass might be injured.



BUCKHORN PLANTAIN

THIS perennial, which is becoming very common, can only be destroyed by pulling or spudding out. It is necessary to remove only the main root, which is not deep.

BROAD-LEAF PLANTAIN

THIS plant was called White Man's Foot-steps by the Indians, as it was unknown in this country until introduced by settlers. Unlike the Buckhorn plantain, it is most annoying on rich land. The same methods should be used in its destruction.

A good system in removing plantain as well as other weeds, is to mark off strips about three feet in width, taking all the weeds as one goes. After removing, grass seed should be sown.

CHICKWEED

OF the several varieties of this plant, Mouse-ear Chickweed is the most common. It is a dark-green hairy plant with oblong leaves which grow in pairs. The seeds are very small and numerous; the flowers white. It spreads by root-stocks and can best be controlled by digging out the entire patch. Courses that are badly infested with Chickweed should be treated with a solution of arsenate of soda. Use eight pounds of the chemical in fifty gallons of water and apply with a spray pump. This solution may also be used where the weed is so thick that digging is tedious.

CREEPING THYME

CREEPING Thyme somewhat resembles Chickweed but has larger leaves. Together with the many similar varieties of weeds, it should be dug out.



PEARLWORT

PEARLWORT is a small, grass-like annual which grows so close to the ground that mowing will not prevent its seeding. It is found in circular patches, which should be cut out as soon as they appear, as the plant spreads rapidly.

PENNYWORT

THE leaves of Pennywort resemble those of the well known ground ivy. Like the latter it must be dug up.

MOSS

Moss is seldom troublesome in greens, perhaps because they are usually well drained and well fertilized. On the fairways it may be found in shaded or undrained places and on poor soil. It has been generally thought that the proper treatment of infested ground is a liberal application of lime, but recent investigations have shown that moss will grow on neutral as well as acid soil. Where Kentucky Blue-grass grows it is well to use lime, first scarifying the surface. Lime may help to run out the moss and it will at least stimulate the Blue-grass. It may be impracticable to attempt drainage, but the soil can always be enriched by top-dressing.

POA ANNUA

EARLY in the spring, Annual Blue-grass, because of its pleasing appearance attracts considerable attention. It disappears in early summer. By some it is regarded as a desirable plant for the green, but in most sections of the country is treated as a weed. No matter how closely it is clipped, *Poa Annua* will produce seed, and it will increase each year if left alone. It is said that Creeping Bent will eventually crowd out *Poa Annua*.

CLEAN SEED

ASIDE from being blown across the fields and carried by birds, weed seeds get into the soil of the golf course in one of two ways:

First: They may be spread on the soil in manure.

Second: They may be sown with impure grass seed. This is the result of careless buying, and is inexcusable as long as clean seed can be obtained.

A recent bulletin issued by the Department of Agriculture begins with this statement: "In a sense, farming might be called a warfare against weeds. So powerful are weed enemies in reducing crop yields, and at the same time multiplying labor, that the farmer should at every turn strengthen his position against them."

This bulletin, like everything else that has ever been published on the subject, closes with the admonition that to be rid of weeds, pure seed must be sown. Exactly the same thing applies to the seeding of the golf course. If weedy seed is used, seedling grass plants may be overcome by the weeds sown with the seed, together with those already in the ground. The farmer can practice rotation of crops and cultivation as a means of keeping down weeds. This is impossible on the links, so it is even more important than on the farm that pure seed of strong vitality be sown.





VIII

TURF GRASSES

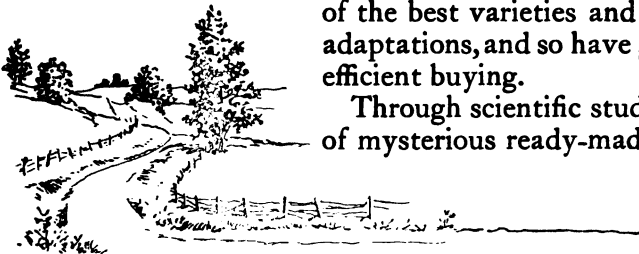
THE selection of proper grasses for the course requires close attention, but involves no highly technical knowledge. There are certain varieties which unquestionably have proved the best for particular localities and purposes. In this section we outline the general characteristics of the grasses most widely used on the American course.

The reason for selection of a certain grass plant for a given purpose is apparent when its habits of growth are studied. The idea that the precise proportions of each variety must be exactly determined by the peculiar conditions of a particular course, is without foundation. It is important, however, that the varieties used be carefully selected for quality and that weeds and undesirable adulterations be avoided.

In selecting seed, sacrificing quality is never a saving. The best seed proves the least expensive, for being free from impurities, it goes farther than cheap seed, produces a thicker, cleaner stand of grass and makes necessary a smaller expenditure for weed eradication. Only when one has several superior lots of seed to select from should price be made the basis of decision.

Messrs. Piper and Oakley, to whom reference is made in the introduction, have added much to popular knowledge of the best varieties and their special adaptations, and so have greatly aided efficient buying.

Through scientific study the fallacy of mysterious ready-made mixtures is



now exposed. They serve no logical purpose, but instead, introduce undesirable grasses and add greatly to expense. In purchasing different varieties separately, one is better able to judge quality, to secure the desired proportions and to reduce the cost.



The passing of mixtures has paved the way for our entrance into the golf course field. For years we have been selling the very grasses now most highly recommended, but the golf course seed business heretofore has seemed closed to all except distributors of nationally advertised dark-room mixtures. Since the facts in regard to mixtures have become known, we have had a constant demand from green committees for thoroughly cleaned seed of separate varieties.

Much is sometimes made of the advantage of sowing varieties indigenous to the locality of the course, and so presumably adapted to its climate. So far as possible, this is an excellent plan to follow on the fairway; but, on the putting-green the principle cannot apply, as the best grasses are imported varieties.

The Northern and Southern States require altogether different treatment. In the Northern States, varieties in common use are the Fescues, the Bents, Redtop and Kentucky Blue-grass. In the lower altitudes of the Southern States we may grow Bermuda-grass, Japan Clover and Carpet-grass with Italian Rye-grass and Redtop for a winter turf. The problem for the Southern course is complicated by the fact that it is used the year around and must have grasses of both summer and winter varieties. In high altitudes away from the coast, the Northern grasses like Redtop, White Clover and Blue-grass may be grown.

We list below the best known turf grasses used on the golf course, with the peculiar adaptations of each.

KENTUCKY BLUE-GRASS

KENTUCKY Blue-grass (*Poa pratensis*) is the ideal turf-maker for the Northern fairway, combining many points of excellence. Its densely creeping rootstocks cover the ground with a thick growth, while, being a true perennial, it lasts from year to year. Age, under favorable conditions, adds to its quality. Blue-grass thrives better on clay than on sand. While the heat of midsummer affects it adversely, it makes quick recovery in the fall.

Under favorable conditions it will crowd out other grasses that may be sown with it.

Blue-grass is not sufficiently fine for the putting-green and should there be regarded as an undesirable. Some putting-green mixtures have been found to contain as high as thirty-five per cent. of Blue-grass.

CANADA BLUE-GRASS

CANADA Blue-grass (*Poa Compressa*) differs in appearance from Kentucky Blue-grass mainly in the flattened stems and the bluer shade of color. In spite of its name, it is a native of Europe, but has now a wide distribution in this country. The seed is grown in considerable commercial quantities in Southern Ontario.

Canada Blue-grass turf is rather stubbly. The variety does well on very poor ground and may here produce a desirable golf grass. On other soils it is not suitable. The seed is considerably cheaper than that of Kentucky Blue-grass.



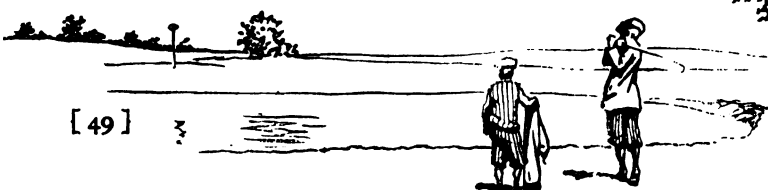
REDTOP

REDTOP (*Agrostis alba*) is a valuable plant for the Northern fairway. It remains green throughout the season. While related to the Bents, it is coarser and unfit for putting-greens except in the seedling stage. Redtop adapts itself well to varied conditions, resisting drouth, yet thriving on wet land, and enduring extremes of temperature. The seed is cheap, ordinarily, compared with other varieties. For this reason it is economically used with Blue-grass on the fairway.

Owing to its cheapness, it has been suggested that Redtop may be used for spring and fall reseedling of the greens. The theory is that while in the seedling stage this grass will be fine enough for the purpose, and that as it becomes coarser and so undesirable, it will be crowded out by the finer Bents and Fescues. In emergency, such a use of Redtop may be feasible, but it can be regarded only as a temporary expedient.

RYE-GRASSES

PERENNIAL or English Rye-grass is a very important turf plant in Great Britain. It is well suited to our dryer climate, and, especially where economy is to be considered, may well be made a part of the fairway mixture. Being large seeded, it grows very quickly. The Italian variety is more popular, especially in the South, where it is used to sow on top of Bermuda for winter greens. The Perennial can be used on the rough. Rye-grass seeds are much cheaper than other varieties.



THE BENT-GRASSES

THE finer textured varieties of Bent-grasses are properly regarded as the most valuable turf plants for the North-ern putting-green. These grasses are dense and velvety and withstand much trampling. When closely mown and properly cared for they form the ideal billiard-table surface for the green. About five pounds of seed per one-thousand square feet of putting-green surface should be sown.

SOUTH GERMAN MIXED BENT

THE larger part of the putting-green Bent seed sown in this country comes from a small district in Germany. Several good varieties are found in the mixture, such as Velvet Bent, which is unexcelled for the green.

These German Bents grow wild. Never having been successfully cultivated, hand harvesting must be resorted to. The total amount of Bent collected depends largely upon weather conditions. Due to the dry summer of 1921 the crop was short, which fact, coupled with the greatly increased demand, made the price abnormally high. Our supply of this seed would have been insignificant had not our representative spent several weeks in the producing section of Germany.

Because of its conditions of growth, Bent will always sell at a comparatively high price, but as it has no equal as a putting-green grass, there is seldom any seed left in the hands of dealers after fall sowing is begun.

RHODE ISLAND BENT



RHODE Island Bent (*Agrostis vulgaris*) is a variety similar to German Bent, although not so much inclined to creep.

For a time the seed was practically off the market, because of adulteration with Redtop. There is much Rhode Island Bent growing wild in New England, and during the past few years a limited amount of seed has been harvested. It is impossible to get seed of this variety that is well cleaned, although efforts are being made to perfect machinery that will remove much of the chaff. Regardless of its appearance, this is an excellent putting-green seed, and clubs that are unsuccessful in obtaining German Bent should not pass up the Rhode Island Bent seed because of its looks.

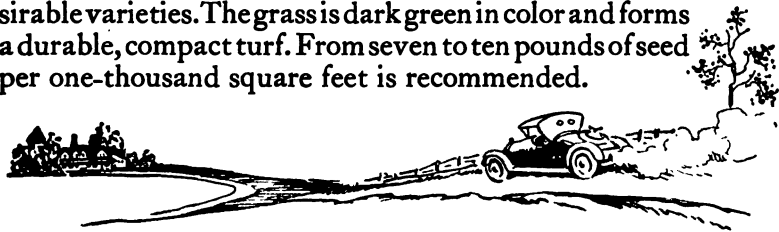
THE FESCUES

CHEWINGS' Fescue and Creeping Red Fescue are, next to the Bents, the most valuable grasses for the Northern green. By some they are preferred to the Bents on sandy soils, to which they seem peculiarly adapted. They do well on acid soil, and thrive in the shade. In fact, they find themselves at home almost anywhere, whether on the finest loam or on poor, dry or gravelly soil. On shifting sands they make a good binder.

The Fescues of interest to the golfer are, Chewings' Fescue, Creeping Red Fescue and Sheep's Fescue.

CHEWINGS' FESCUE

OF these varieties Chewings' Fescue is by far the most common. This was originally a European grass but now comes entirely from New Zealand, where it was introduced. The seed now available is clean and not mixed with undesirable varieties. The grass is dark green in color and forms a durable, compact turf. From seven to ten pounds of seed per one-thousand square feet is recommended.



CREEPING RED FESCUE

CREEPING Red Fescue spreads by means of slender root-stocks. The seed is gathered in Germany and is available in comparatively small quantities.

Pure Creeping Red Fescue cannot be bought, other varieties always being found mixed with it. The different varieties are collected by German peasants, and whatever they bring to the seedsman, is sold as "Creeping Red." Since Sheep's Fescue grows extensively in the same localities, some of it is certain to be gathered as Red Fescue. Thus, Red Fescue is never free from impurities. This information is substantiated by the experiment stations at Zurich and Hamburg.

Our personal observations have led us to purchase Red Fescue, so called, in very limited quantities, and then only after a thorough test.

SHEEP'S FESCUE

THERE is much confusion as regards Sheep's Fescue and "Hard Fescue." The distinction said to exist is favorable to the former because of its supposed finer texture. However, without exception, German seedsmen told our representative that Sheep's Fescue and Hard Fescue are taken out of the same bag. European experiment station authorities spoke of Hard and Sheep's Fescue as the same, drawing no distinction between the supposedly different strains.

Such matters may seem trivial, and yet quite often they are of enough consequence to save hundreds of dollars in seed-buying costs.

As Sheep's Fescue is in-



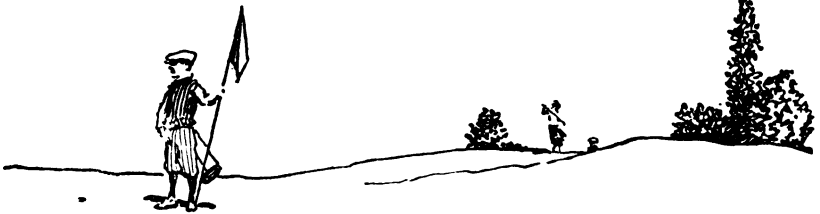
clined to grow in clumps, it is never recommended for greens; although if planted very thickly, the bunching tendency is not especially noticeable. It is to be recommended for the rough.

MEADOW FESCUE

MEADOW Fescue or English Blue-grass is a hardy perennial that is grown for seed in this country and in Europe. It does well on both sandy and clay soils, thrives in wet spots, withstands drouth and makes a very quick growth. For the rough it is a good substitute for Sheep's Fescue, is much lower in price and nearly always shows a higher purity and germination test. It can be sown alone or mixed with other grasses such as Perennial Rye-grass or Orchard-grass, which also are cheaper than Sheep's Fescue.

BERMUDA-GRASS

BERMUDA-GRASS is a native of India and was introduced into America at an early time. It is adapted to the climate of the Southern States, exclusive of the mountain regions. It grows in all kinds of well drained soil but does best in clay and is favored by the presence of lime. Its long, creeping stems which root at the joints, cover the ground with a fine mat, which is durable under the hardest wear. It is a summer grass and should be sown with Italian Rye-grass to maintain a turf the year around. It is scarcely adapted to the putting-green, but excellent for the fair-way. It can be propagated either from the seed or by rolling chopped rootstocks into the soil.



CARPET-GRASS

CARPET-GRASS thrives the year around in the extreme South. It makes a good solid turf, particularly on moist, sandy land. It is good for the fairway but too coarse for the green.

JAPAN CLOVER

JAPAN Clover does well on the sandy soil of the South, reseeding itself each year. It grows on the poorest land and improves the turf of the fairway the same season it is sown.

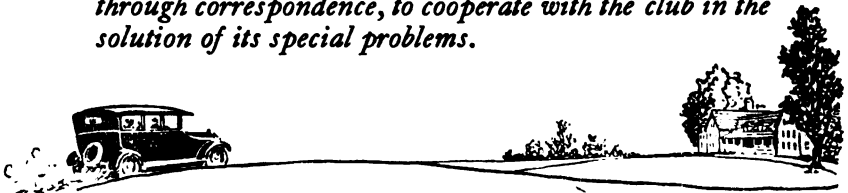
WHITE CLOVER

WHITE Clover is useful on the Southern fairway as a winter grass. It spreads naturally, makes a dense turf and thrives on poor soil.



WE have aimed, in the preceding pages, to place the essential facts concerning the care of the golf course in a convenient form, hoping that this book might find a permanent place in the club's library. No study of the subject can be complete, as more exact knowledge is constantly being acquired and new methods developed.

The green committee quite surely will be confronted by situations in which neither this book nor any other will prove a certain and infallible guide. In such cases, we shall be glad, through correspondence, to cooperate with the club in the solution of its special problems.



SEP 22 1937



