

THE BULLETIN

of the

UNITED STATES GOLF ASSOCIATION GREEN SECTION

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Russell A. Oakley

Russell A. Oakley

The death of Dr. Russell A. Oakley at Monrovia, Calif., on August 6 of this year removes from the Green Section of the United States Golf Association its most valued member. He was well known among professional and amateur golfers for his interest in the improvement and more effective use of fine turf grasses. He and the late C. V. Piper were responsible for the creation of the Bulletin of the Green Section of the United States Golf Association and for the inauguration of extensive investigations on fine turf. With Doctor Piper, he was co-author of "Turf for Golf Courses." At the time of his death, he was chairman of the research committee of the Green Section and for many years he had been a member of the executive committee.

Doctor Oakley was born at Marysville, Kans., September 7, 1880. He graduated with the degree of B. S. from the Kansas Agricultural College in 1903 and was awarded the D. Sc. degree at Iowa State College in 1920. Doctor Oakley was appointed, July 16, 1903, scientific aid in what was then known as the office of agrostology of the United States Department of Agriculture. In 1913 he was appointed agronomist in charge of seed distribution. In 1925 he was a special representative of the Secretary of Agriculture in the campaign against foot-and-mouth disease in California, and the following year he was sent by the Secretary as a special delegate to the meeting of the International Institute of Agriculture at Rome. In 1926, upon the death of Dr. C. V. Piper, he was made senior agronomist in charge of the division of forage crops and diseases.

During the war period Doctor Oakley served as chairman of the seed stocks committee cooperating with the War Trade Board and other emergency activities. He had served as vice chairman of the Federal Horticultural Board and more recently was a member of the Advisory Federal Plant Quarantine Board. He was a fellow of the American Association for the Advancement of Science, a fellow of the American Society of Agronomy, a member of the Washington Botanical Society, the American Genetic Society, and the Cosmos Club, and an honorary life member of the Washington Golf and Country Club.

Doctor Oakley's keen appreciation of scientific work and his unusual skill in planning and conducting important and difficult experiments will long be remembered. His most important contributions to the agricultural and social welfare in the United States, however, in all probability are due to his unusually well-balanced and critical judgment and his aptitude for imparting to others his own vision of the relative significance of different and occasionally conflicting factors. Doctor Oakley will be remembered by a very wide circle of intimate friends as a man whose opinions, wittily expressed, were valuable as well as interesting. He possessed to a remarkable degree the quality of making friends and was endowed with almost superhuman courage and cheerfulness in long years of struggle against arthritis. His associates never ceased to marvel at the indomitable will which enabled him to go about his work day after day efficient and genial. He leaves behind a splendid record of achievement.

K. F. KELLERMAN,

Associate Chief, Bureau of Plant Industry.

Some Problems of Southern Golf Courses

The articles which will be found in this and the following number of the Bulletin are devoted primarily to problems of maintaining turf on southern golf courses, and although they describe conditions in widely separated areas they supplement one another to a large extent.

In a general way, the problems of maintaining turf on golf courses in the South are the same as in the North. There occur, however, certain details, more or less established by latitude, by reason of the differences in types of grasses used under the different southern climatic conditions. In the South the problems are concerned chiefly with the maintenance of Bermuda grass and carpet grass, the two grasses in most general use. The longer period of growth of these grasses, coupled with the general deficiency of organic matter in southern soils, renders the problem of fertilization more serious as compared with conditions on northern courses. So far comparatively little experimental work has been done with materials and methods used for fertilizing Bermuda grass turf in the South, especially on the sandy soils of the coastal plain. Another special problem arises from the need of different grass for winter play than are used for summer play on many of the southern courses. This change from one grass to another occasions two critical periods at which skill in greenkeeping is given a severe test. One of these periods is in the fall, when the summer turf is being converted to winter turf; the other is in the spring, when the winter turf dies and the Bermuda turf is being brought back for summer play.

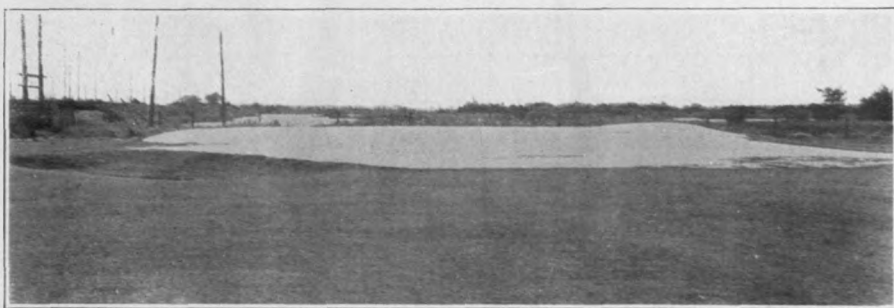
The dividing line between northern and southern turf grasses follows approximately the 37th degree of latitude, extending through the southern parts of Virginia, Kentucky, Missouri, Kansas, Colorado, Utah, and Nevada and through Central California. There is, however, some deviation from this direct line due to the influence of mountains and oceans on the climate. South of this line is the belt where Bermuda grass and carpet grass predominate in the fairways and the rough of golf courses, whereas north of it is the region of the northern grass belt, where Kentucky bluegrass, fescue, and bents predominate. This line of demarcation, as are the lines between any other distinct types of vegetation, is necessarily a broad one, since there is a belt in which neither the southern grasses nor the northern grasses grow at their best but where both are able to exist. Factors other than latitude, including topography, which influence climate and rainfall, and also the soil type, enter to regulate the extent to which either grass invades the territory of the other.

Bermuda grass is essentially a hot-weather grass and its reaction to frost accordingly presents quite different problems on the golf courses in the northern, middle, and southern portions of its range.

In the northern portion of the Bermuda grass belt the frequent frosts keep the Bermuda grass dormant throughout the entire winter season and large areas of it may be killed during unusually severe winters. The winterkilling of Bermuda grass is more apt to occur on putting greens than on fairways or other areas where the grass is allowed to grow longer. Bermuda grass, even though dormant and brown, offers a satisfactory turf for fairways and tees, but it may be badly worn before the end of the playing season, making it necessary

to have large tees or to use clay and sand. It is good practice to stimulate, by the use of fertilizers and by other means, a heavy growth of Bermuda grass on fairways and tees during the growing season to provide as thick and lasting a turf as possible over winter. On some courses in the northern portion of its range the Bermuda grass fairways are improved during winter by the invasion of northern grasses and weeds.

To overcome the difficulty of maintaining putting greens in the northern part of the Bermuda grass belt some interesting methods have been devised. As described elsewhere in this number of the Bulletin, the method at Pinehurst is the use of small sand putting greens surrounded by well-kept Bermuda turf. Most of the play up until the last short putts is on turf, but the heavy wear immediately surrounding the cup is on sand. It has been found that satisfactory putting surfaces can be maintained better in this manner than by



A Bermuda grass putting green at Tulsa, Okla., which was winterkilled during the winter of 1929-1930. In regions where this type of loss is common there is an increasing interest in creeping bent for putting greens.

using turf. Another method, which has been used satisfactorily in the Atlanta district, is the installation of double putting greens, one green being maintained for winter use while the other is covered with a mulch to protect it from the rigors of winter. On some courses clippings of annual bluegrass containing seed heads are saved in the spring and used in the fall in preparing the putting greens of winter grass. Pine needles or other coverings have been used to protect the Bermuda grass and to keep the putting greens free from weeds and foreign grasses which are likely to become established on Bermuda turf left uncovered during the winter months when the grass is dormant. The use of double putting greens is described in the Bulletins for October and November, 1929.

In the northern section of the Bermuda belt there is an increasing interest in the use of bent grasses for year-round putting greens. In this section the bent grasses grow sufficiently during the winter months to maintain good putting areas but difficulty is experienced with them during the summer months. The development of remedies for brown-patch in recent years, however, has done much to extend the practical limits of bent grasses farther into the Bermuda grass belt. On many courses in this section the topsoil is a heavy clay which bakes badly and would be unsuitable for the growth of bent even in latitudes where it thrives. The improvement of the physical properties of this stiff soil for putting green purposes by the addition

of organic material and sand, also the adequate provision for surface and tile drainage, have made it possible to maintain bent putting greens on golf courses where it would otherwise have been impossible. As more information becomes available on the culture of bent grass under the most trying soil and climatic conditions found in its southern range, it is probable that bent will be used in regions where it once would have been regarded as entirely impractical. The increasing use of seaside creeping bent on putting greens on golf courses in the vicinities of Oklahoma City and Tulsa, Okla., furnishes an example of the extension of the use of bent grass into a section which formerly relied primarily on Bermuda grass. The Green Section has established demonstration gardens at Tulsa, Okla., and at Greensboro, N. C., where, it is hoped, further information will be developed as to the practicability of using other grasses as a base for putting greens in this section where Bermuda grass has proved to be unsatisfactory.

In the middle portion of the Bermuda grass belt, which extends approximately between the latitudes of central Georgia and the Gulf and northward somewhat along the coastal plain, temperatures are more moderate. In this region Bermuda grass, although dormant, can generally survive the winter months even on putting greens and it is not necessary to resort to sand putting greens or separate putting greens for winter play. In order that the putting greens for winter play may present a much finer putting surface and also the attractive appearance of green, growing grass, the method generally used is to plant northern grasses directly on the Bermuda grass putting greens. The methods used for the transfer from winter to summer putting greens, and vice versa, vary to some extent in different localities. In the fall, when Bermuda grass is checked by cool weather, it is cut close and heavily top-dressed. Northern grasses, such as rye grass, redtop, and Kentucky bluegrass, are seeded on the heavily top-dressed putting greens, which are then cared for during the winter months much as the northern putting greens are cared for during the summer. The mat of Bermuda grass provides a firm base, which makes it possible to establish and preserve a true putting surface soon after the seedling grass is well established. Without this mat the newly seeded greens would have the same objection as newly seeded greens in any other regions, in that it would take a long time to get them in condition for putting. With this method, winter play is actually not on an entirely new putting green, but rather on a new grass growing on a heavy top-dressing. Difficulties are frequently encountered in establishing a new grass early enough in the season before the heavy winter play begins. If the planting is made too early the seedlings may be destroyed by sudden hot spells soon after the seeds germinate. Also if the winter seeding is done before the Bermuda grass has become dormant, the Bermuda may continue to grow and its coarse shoots will make the putting green uneven and unsightly. On some courses there are decided preferences for certain of the northern grasses, but probably in most cases mixtures of seeds of different grasses are used for planting winter greens. Rye grass and redtop are the grasses chiefly used, but in recent years there has been a tendency to use more Kentucky bluegrass for this purpose since on many courses it has been found to give more lasting turf during the winter months.

For a number of years the Green Section, in cooperation with the Florida Agricultural Experiment Station, made tests of the growth characteristics of several northern grasses when grown for winter putting greens on a Bermuda base at Gainesville, Fla. The results obtained were published in the Bulletins for May, 1927, and November and December, 1928. Some of the details involved in the maintenance of a course at Charleston, S. C., which is in this general belt, are explained in the current number of the Bulletin.

The fairways in the middle section of the Bermuda belt are chiefly of Bermuda grass, which becomes practically dormant during the winter but still provides a good cushion for play and usually survives the winter without much difficulty. The only objection is that it is brown and unattractive during this season and some attempts have been made to improve the appearance of the fairways by encouraging plants that will remain green during winter. In the Bulletin for October, 1928, was described a method of using bur clover in the fairways to provide a green covering during the winter at Waco, Tex. The bur clover adds nitrogen to the soil, which encourages a more vigorous growth of Bermuda grass when it returns in the spring.

In the extreme southern section of the Bermuda grass belt, as is represented by the southern part of Florida, it is practical to maintain putting greens of Bermuda grass the year round. Occasional frosts occur even this far south, and Bermuda grass under natural conditions lies dormant during most of the winter. However, by using quickly-available fertilizers and by watering, set-backs are only temporary and new growth may be soon encouraged after any cold spell. In Cuba the winter climate is sufficiently moderate to permit the Bermuda grass to remain in a healthy growing condition throughout the winter even though not stimulated by extra fertilizing and artificial watering. In Cuba, however, they have problems of their own with Bermuda grass; the Bulletin for March, 1925, contains an article describing the problems there, including the use of two tropical grasses, Acapulco grass and Bahia grass. The Bulletin for November, 1924, contains an article by the late Dr. C. V. Piper describing the value on golf courses of various southern and tropical grasses.

In the following number of the Bulletin two greenkeepers will describe how their fairway problems on the west coast of Florida are solved for the most part by nature. The soil of the west-coast golf courses is usually heavier than the soil of the east-coast, and carpet grass, which there requires little or no attention, predominates. Although Bermuda grass may be maintained successfully throughout the year in this region even here many of the putting greens of the courses are planted with northern grasses for winter play. The use of northern grasses here is due chiefly to the objection of northern golfers to Bermuda grass for putting green purposes. It is likely that finer strains of Bermuda grass or some other southern grasses may be developed in the future to overcome this objection and make unnecessary this additional expense of upkeep and inconvenience to play of transferring to winter greens and back again to summer greens.

The Green Section has established a demonstration turf garden on the Bay Shore Golf Course, Miami Beach, Fla., and hopes to derive much information useful to the golf clubs in that section of the

country. Some of the preliminary results from this garden will be found in the next number of the Bulletin.

In the coastal-plain area the golf courses are for the most part flat and are built on soils which are generally sandy and low in essential plant foods. It is not on account of the soil or topography that many golf courses are built in this area but because it is a winter playground for thousands from the North. The warm and humid climate tends to hasten decomposition and consequent depletion of the organic matter in the soil, and the porous nature of the soil assists in rapid leaching of soluble plant foods.

One can not fail to realize, when reading these experiences of southern greenkeepers as presented in the Bulletin, that the supply of plant food is a most important factor in maintaining good turf of Bermuda grass. The articles also indicate the need of maintaining the supply of organic matter in the soil of putting greens for the purpose of conserving moisture and plant food. Under putting-green conditions both Bermuda grass and the seedling winter grasses are only shallow-rooted, and can not survive drought to the same extent as under fairway conditions. Fortunately, however, throughout the coastal-plain area there is, in places, an abundant natural supply of organic matter in the form of plant remains which have accumulated under poor drainage conditions and are available for increasing the organic content of the soil.



Covering sand with layers of marl and muck in constructing fairways at Boca Raton, Fla. The materials were later mixed by discing. This process is an expensive one but on some courses it has been considered advisable in order to make the soil more firm and better able to retain water and plant foods.

Considering the type of soil in the coastal-plain area it is customary, if not necessary, to prepare a heavier topsoil on the putting greens by mixing with the sandy topsoil marl, clay, and organic matter such as peat or muck. Organic matter is applied to the topsoil from time to time by the practice of mixing considerable of these materials with sand for top-dressing purposes. Some of the clubs in Florida have incurred heavy expense in top-dressing their fairways with large quantities of soil which is more fertile than the underlying sand. The next Bulletin will contain a description of the methods used on a course

built on beach sand. A top-dressing of several inches of heavier soil was applied before the fairways of this course were planted. It was not, however, until a fairway water system was installed that it was possible to keep the fairways green and growing throughout the winter. Ample amounts of fertilizer are used and, with the present water system, it is not necessary to depend on rainfall to wash the fertilizer into the soil and to supply the necessary moisture to the plants. On other courses in Florida it has been demonstrated that it is possible, by the use of artificial watering and by adequate fertilizing with soluble materials, to keep the Bermuda grass thick and alive over winter even where planted on sand. Some clubs feel that top-dressing fairways with heavier soils is justified since the ball rolls farther on turf on such soils, and this no doubt adds to the enjoyment of most golfers.

Three ways of improving Bermuda grass fairways, which are receiving more attention each year by southern greenkeepers, are top-dressing, plowing, and disking. During the growing season Bermuda grass often responds splendidly even to top-dressings of sand, although the use of fertile soil gives still better results. But top-dressing acres of fairways is costly. Equally good results have been found to follow a shallow plowing of Bermuda fairways every three or four years or a disking every season. Neither of these latter methods is as expensive as top-dressing. Disking, in fact, entails little expense. The disc is set back only enough to cut into the turf without bringing up much soil. The fairways are disked in at least two directions, and then rolled. If fertilizer is applied at the same time the results are remarkable.

There are many golf courses in the South that have special problems on account of their short season of play. Courses connected with winter resorts or hotels are often open only from shortly before Christmas till early in April, when most of the winter guests have left. Those in charge of these courses are interested chiefly in having the winter grasses remain until the winter season is over but care little about the condition of the turf during the summer except in so far as economical maintenance affects the ease of bringing the course back into condition early in the winter. Such clubs endeavor to get their courses into playing condition before the winter with as little expense as is necessary during the eight months of the year that the course is not in use. Most clubs or hotels which maintain courses of this nature find it profitable to do a certain amount of mowing in order to keep ahead of weeds and to keep the turf from becoming too coarse.

Damage from the Japanese beetle in the Philadelphia district was considerably reduced on account of the excessively dry heat of the drought of 1930, according to T. L. Guyton, chief entomologist of the Pennsylvania State Department of Agriculture, who points out that the eggs of the beetle which had not been deposited far enough below the surface of the hard, baked ground were destroyed by the dry heat. Damage to crops from the Mexican beetle, corn borer, and Hessian fly was likewise less severe due to the same cause. On the contrary, the unusual weather conditions had an opposite effect on the grasshopper, codling moth, and red spider, which were unusually abundant and destructive.

Bermuda Turf and Sand Greens at Pinehurst, N. C.

By Frank Maples

We have here at Pinehurst, within a radius of six miles, eight complete 18-hole golf courses, one 9-hole golf course, four polo fields, and one airport, all planted with Bermuda turf and covering over 400 acres. These have been built within the last 32 years, and my experience in their maintenance covers a period of 29 years. They were built by myself from the plans of a golf architect. Our soil is light and sandy and does not require much drainage.

Practically all of our play is in the winter when there is very little growth of grass. As the play is heavy, we have so far found it impossible to produce grass greens with a satisfactory putting surface. We have, however, wonderful sand greens. We have on our land a natural mixture of sand and clay, consisting of about 75 per cent of 1/16-inch-grain sand and 25 per cent of clay, which drains very quickly. We cover the greens with about 5 inches of this mixture, roll it and scrape it until it is thoroughly smooth and firm, and then apply enough 1/16-inch-grain sand, free from clay, to permit a ball to run true. In maintaining these sand greens for play, a circular space around the cup is sprinkled with water and then brushed with a carpet 5 or 6 feet wide.



In maintaining sand greens at Pinehurst, a circular space around the cup is watered and then brushed with a piece of carpet

Our Bermuda fairways are kept cut close and the fertilizer is applied during June, July, and August. We have tried almost every fertilizer that has been put on the market but have obtained best results from a commercial mixture, the base of which is Peruvian guano. One application of fertilizer a month, applied at the rate of 600 pounds to the acre, gives wonderful results on light sandy soils. We occasionally top-dress our Bermuda turf during June. A compost for top-dressing purposes is made very cheaply by taking a few acres of land and plowing in 6 or 8 inches of rough manure. This is left from 8 to 10 months, or until well rotted, and is then plowed and disced until well mixed. It is kept harrowed for about 30 days so as

to kill germinating weed seeds. Fresh stable manure is not used for top-dressing Bermuda turf, for it has been tried and found very undesirable. Since we have no water supply on our fairways, we have to depend entirely on rainfall. Occasionally when we have a drought our fairways have a tendency to burn or turn brown. We have noticed that agricultural lime is very helpful in carrying Bermuda fairways through a drought. Hydrated lime gives equally as good results more quickly but it is a little more expensive.

We have large Bermuda grass tees which we seed to Italian rye grass in the fall. We also seed around our putting greens with Italian rye grass and keep it cut close during the playing season. By doing this our approaches are kept smooth and even.



Distributing fertilizer on a Bermuda grass fairway at Pinehurst

One of our problems at Pinehurst has been the control of the grubs of the June beetle. We are able to control them satisfactorily by making an application of arsenate of lead at the rate of 8 to 10 pounds to 1,000 square feet. This is mixed with fertilizer and applied with a lime drill.

We have had good results from seeding new land since our soil on such areas does not contain seeds of troublesome weeds, such as crab grass. In preparing new golf course land for seeding to Bermuda grass, we clear the ground and, after plowing, disc it several times in order to mix the soil thoroughly for a seed bed. After the soil is well mixed, all roots removed, and smoothed, we make an application of organic fertilizer at the rate of one ton to the acre. When this is thoroughly mixed into the soil with a spike-tooth harrow, we seed Bermuda grass at the rate of 50 pounds of seed to the acre. This is then harrowed three or four times in different directions, raked with hand rakes, and rolled with a roller of about one ton in weight.

In preparing old land, which, as a rule, is infested with seeds of undesirable plants, we find we can obtain the quickest and best results by planting stolons of Bermuda grass. During April or May we cover the stolons by shallow plowing with a one-horse plow. The ground is then kept harrowed regularly with a spike-tooth harrow, in order to prevent the growth of crab grass and other weeds until the Bermuda has covered the ground. By following the above procedure we have been able to establish a beautiful, thick Bermuda grass fairway in one summer.

Turf Maintenance at Wappoo Links, Charleston, S. C.

By J. Keitt Hane, Jr.

The Wappoo Links of Charleston Country Club are in their infancy, relatively speaking. The course is now in its seventh year of play.

It is constructed on two types of soil, sandy loam and muck. In common with other golf courses in its neighborhood, the predominating soil type is a sandy loam. The entire course, including greens, tees, and rough, is thoroughly drained. The rough and fairways are drained with farm drain tile and troughs made of cypress. Perhaps it is too thoroughly drained when droughts are taken into consideration, a common condition in the last two years. On the other hand, without this thorough drainage it is possible we might be bothered more with salt concentration in the soil, as the course is below sea level. The concentration of salt in the soil appears to give us the most trouble.

The soil of the greens has been greatly improved by the use of good organic fertilizers and, about once a year, a complete fertilizer. The organic fertilizers have been cottonseed meal, castor bean pomace, and rape meal, and from these we have obtained excellent results. Twice a year each green receives 400 to 600 pounds of organic fertilizer, and about once a year 300 to 400 pounds of lime. The greens are 5,000 to 10,000 square feet in area. The use of castor bean pomace seems to discourage some of our most common pests, such as grubs, earthworms, and mole crickets. Tobacco stems, applied at a rate of 400 to 500 pounds to a green, also seem to be a good insecticide. By the use of these fertilizers a luxuriant turf is obtained. The fertilizer is applied immediately after top-dressing a green and three weeks or a month before seeding. In this way it can be thoroughly mixed with the top-dressing and worked into the turf at the same time, and becomes more available for the young grass than if applied at the time of seeding. Water is always applied immediately after fertilizing. I am a great believer in frequent applications of sulphate of ammonia. This we apply at the rate of 20 to 40 pounds to a green as often as it seems to be needed, which, with us, is about once a month. This tends to make the soil slightly acid, but any excess of acidity may be readily corrected by the application of lime.

Up to date we have been very unfortunate as regards water supply, but hope to have an ample supply in the near future. At present we have four surface wells, each averaging 1,500 to 2,500 gallons of water daily. This is very little water for courses in our section. This water receives natural purification and is free from salt, which, as I

have said, occasions us most trouble. Fortunately we are not troubled with offensive plant growths in the water hazards, due no doubt to the saltiness of the water in the hazards.

The greens and tees are Bermuda grass in summer and Italian rye grass (domestic grown) in winter. The fairways are mixed Bermuda grass and carpet grass, the latter predominating. The Bermuda becomes dormant in the winter and we do not sow rye grass on the fairways. The rough is Bermuda grass, carpet grass, and our native grasses.



Bermuda grass putting green at Wappoo Links

The greens are seeded with Bermuda grass in April at the rate of 100 pounds of seed to a green. It is not necessary to rake the greens since they are thoroughly spiked just before seeding. The seed is sown with a mechanical seeder and about two yards of good sandy loam top-dressing is applied to cover the seed. Water is applied just before seeding so as to moisten the soil for quicker germination, and again after the top-dressing is applied so as thoroughly to wet the soil. At the time of seeding no attempt is made to destroy the winter grass so as to hasten the summer grass, since it is then that we have our heaviest play; we try therefore to maintain the winter turf as long as possible. As a consequence we never have really fine summer greens before the middle of July or the first of August. The summer greens are changed to winter greens between the 1st and 20th of October. This summer turf also is maintained as long as possible. The winter greens are sown with rye grass at the rate of 400 to 600 pounds to the green. This seed is sown with a small fertilizer distributor.

The greens are played on every day of the year. The members are never asked to play on temporary greens while the permanent greens are being seeded. This does not seem to injure the turf in any way. We have indeed been very fortunate in being able to maintain excellent turf practically the year round, the only exception to this being the period from the first of June to the middle of July, during which period the Bermuda is in process of recovery, a fairly slow process at best. While it is easy to change the greens from

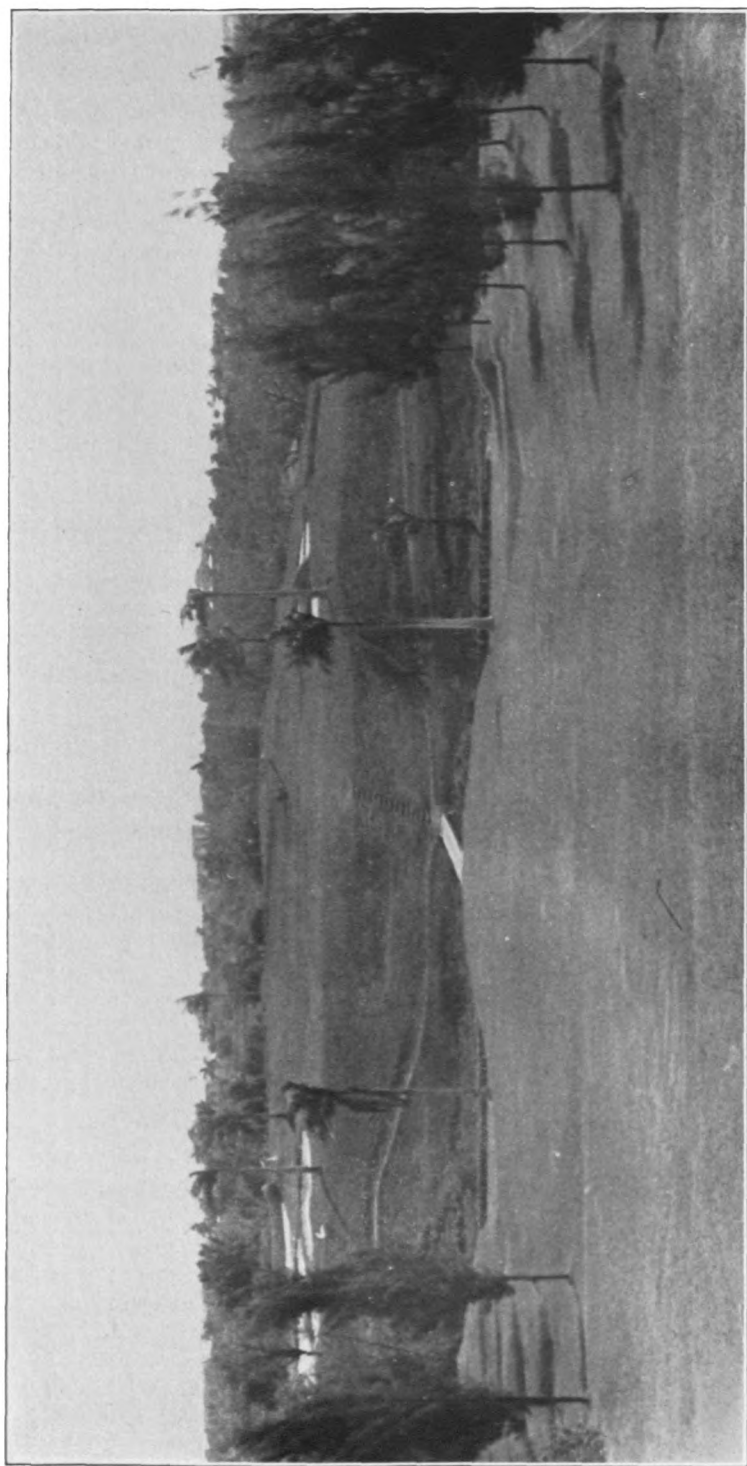
Bermuda grass to Italian rye grass it is difficult to change them from Italian rye grass to Bermuda grass. This would probably not be so if we should kill the rye grass earlier in the season.

Our water system was planned and laid out by one of our members who is an engineer; it is considered to be a very good one. We use two rotary sprinklers to a green and they have proved very satisfactory. The greens are watered at night in summer and in the morning in winter. They are mowed with power putting green mowers every day including Sundays. The clippings are removed and put into a topsoil bed. The greens are never rolled, as the power mowers seem to roll them sufficiently. They are top-dressed at least once a month with a sandy loam top-dressing, about two yards to a green, and at the same time they receive an application of sulphate of ammonia. The top-dressing is applied with shovels. We usually top-dress 9 greens a day; this is a task for 5 men, 4 handling the top-dressing and 1 brushing it in. The tees are cared for in the same manner as the greens.

Our worst weeds are crab grass, clover, and crowfoot or goose grass. Crab grass and crowfoot grass can be easily controlled by hand weeding. We hire 4 or 5 women to weed these out. This is very cheap help, costing on the average 75 cents a day. If crab grass is removed in its earliest stages it is never really troublesome, and this holds true also for any of our most common weed pests. Clover can be killed by the application of powdered sulphate of ammonia. The patch of clover is first sprinkled with a little water from a sprinkling can and the sulphate of ammonia is then applied as a dust, a handful or more being used on a patch, depending on the size of the patch. No more water is applied. We usually select a day when the sun is shining brightly for making the application. Although this practice will turn the Bermuda grass slightly amber in color it will not injure it.

Our most troublesome insects are mole crickets and grubs. The mole crickets are poisoned with a mixture of 100 pounds of cotton-seed meal, 200 pounds of wheat bran, 30 pounds of arsenate of lead, and 6 gallons of molasses syrup (poor grade) with sufficient water to make the mixture moist enough to spread readily by hand. These materials are thoroughly mixed, the molasses first being diluted with at least an equal quantity of water. The grubs are partially controlled by the frequent application of arsenate of lead at the rate of 10 to 30 pounds to a green.

The female *Typhia* wasp, in destroying a Japanese beetle grub, is supposed to detect the presence of the grub in the soil by the sense of smell. It burrows into the ground until it finds the grub, climbs on the grub's back, and stings it several times before it has a chance to free itself. The stinging causes temporary paralysis and relaxation of the grub. The wasp then cleans and polishes the beetle grub's abdomen in preparation for egg laying. It first kneads the spot with its mandibles and then polishes it with the tip of its abdomen. It then lays its eggs in a furrow between the fifth and sixth segments of the grub's abdomen. It often takes a wasp as long as 30 minutes to lay its eggs. The wasp grubs that hatch out first suck the fluids from the beetle grub's body and finally devour the remains.



Eleventh hole (173 yards) Country Club of Havana, Havana, Cuba



**The ladder of life is full of splinters, but they
always prick the hardest when we are sliding down.**

William L. Brownell

