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of the

UNITED STATES GOLF ASSOCIATION GREEN SECTION

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Contents

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Green Section Summer Meeting at Interlachen

Requests have been received from friends in the Middle West that the Green Section call a meeting at Minneapolis at the time of the National Open Tournament. It has therefore been decided to have a gathering of those who are interested in the turf problems of golf courses, on July 9, at the Interlachen Country Club. One of the Green Section's demonstration gardens is located on the Interlachen course, and it is planned to give visitors an opportunity to discuss the various tests under way at this garden during the course of the meeting. The many grasses and fertilizers used on these demonstration gardens, as described in the Bulletin for December, 1929, will provide much of interest to club officials who have charge of courses. Details of plans for this meeting will be given later in the Bulletin.

Annual Meeting of the Green Section

As previously announced in the Bulletin, the program for the 1930 meeting of the Green Section was reduced to a single session instead of including three sessions of meetings as held in previous years. This change was made as a result of the increased activities of the Green Section during the summer months. During 1929, meetings were held at Washington and Chicago, at which the attendance was well above that at any of the winter gatherings. In addition to these summer programs various local meetings during the season in different golf centers provided an opportunity for the Green Section staff to carry its work to a much larger number of individuals interested in turf improvement than had been possible in any previous year. Our experience indicates that visitors are more likely to obtain useful information from these summer meetings than from lengthy programs consisting entirely of lectures and indoor discussions. Therefore it was decided that the Green Section program might profitably be changed this year, not with any idea of reducing its activities but merely to shift its efforts to summer programs, which prove more interesting and profitable to all concerned.

The annual meeting of the United States Golf Association was held on Saturday morning, January 11, and, as customary, the Green Section annual meeting was held on the preceding day. The Green Section's various activities throughout the season were briefly summarized and several interesting talks given. These will be printed in the Bulletin for the benefit of those who were unable to attend.

A new feature of the annual meeting was an exhibit of seed, fertilizers, and soils. The specimens were exhibited in the Green Section's customary impartial manner and proved of much interest to many who lingered long after the close of the regular program. One of the most attractive features of the exhibit was a set of tubes of soil showing the effect of type of soil on the movement of water from the subsoil to the surface. Many of the visitors expressed much interest and surprise when they saw the effectiveness of an extremely thin layer of peat in checking the natural movement of water through the soil. In a nearby tube it was clearly demonstrated that the same amount of peat properly mixed with soil had no appreciably harmful effect on soil water movement. Many who witnessed this exhibit remembered having seen thick layers of peat applied to soil for the pur-

pose of increasing the water available for putting green turf; consequently the effect of even the very thin layer which was used in this tube of soil was decidedly instructive.

A French entomologist killed the ants in five hills by means of a poisonous gas and undertook to count the dead. In the smallest hill 18,000 dead ants were found, in the largest 94,000, and he was afraid to estimate how many live ants had escaped.

Annual Report of the Green Section for 1929

By Wynant D. Vanderpool, Chairman

Presented at the Annual Meeting of the Green Section in New York City, January 10, 1930

During the past summer the Arlington turf garden was reorganized. Much of the turf which had served its purpose for experimental work was discarded. Approximately two-thirds of the garden was planted anew or sodded with old turf. During the season the experimental work was continued as usual. Particular attention was paid to the control of leaf-spot disease of turf grasses, and promising results in controlling this type of disease were obtained with certain chemicals. Further work will be necessary before these methods can be recommended for general golf turf use. The number of strains of velvet bent being tested at the turf garden was greatly increased and the work attracted much attention from visitors throughout the summer. A new soil and tool shed was built and the old clay road was graded and surfaced. These improvements should greatly facilitate the work in the future.

The new experimental garden at the Mill Road Farm Golf Course in the Chicago district developed rapidly during its first year. In the fall the planting at the garden was almost doubled, so that now practically the entire property leased to the United States Golf Association Green Section is in use. It was too early to expect any striking results from any of the tests started at this station, but the behavior of the various grasses proved of much interest to those working at the garden and to those who visited it.

During the season members of the Green Section staff availed themselves of the opportunity to work on turf problems at the universities of Chicago, Minnesota, and Wisconsin. Some investigations of physiological problems have been undertaken at the University of Chicago and snow-mold studies have been conducted at the universities of Minnesota and Wisconsin. These institutions have furnished laboratory facilities and personal advice gratis to the Green Section. The Green Section staff feels greatly indebted for the many courtesies and privileges they have received from these institutions.

The Green Section has continued its cooperation with State experiment stations in conducting turf investigations. The New Jersey, Florida, Nebraska, and Kansas experiment stations have received the usual small amount of financial assistance from the Green Section.

During 1928 demonstration turf gardens were planted on 15 golf courses in various golfing centers. In addition to those planted on

golf courses, similar plantings were made at the Massachusetts Agricultural College at Amherst and the Leland Stanford University in California. During the summer these demonstration turf gardens have been a source of much interest to greenkeepers and green-committee members in the neighborhood of the gardens. At intervals during the summer reports were made of the condition of the various grasses and treatments in these plantings. The reports were prepared in duplicate, one copy being retained for the home files and the other copy sent to the Green Section office in Washington. These reports have been consolidated for publication in the Bulletin. Although representing only a single season's observations, the summary has much of interest to those interested in golf turf production.

During the season many requests were made for further expansion of this work in sections not represented in the 1928 plantings. New plantings of this same series were made in 1929 on the course of the Druid Hills Golf Club, Atlanta, Ga., and on the Niagara Falls Municipal Golf Course, Niagara Falls, N. Y.

The demand for Green Section advice on turf problems showed an increase over previous years in spite of the fact that on the whole the season was a most favorable one for turf production. Due to the small personnel, most of the service to clubs had to be limited to correspondence. Approximately the same number of visits were made to golf courses as in the previous year. During these visits many problems were discussed with the club officials and many helpful suggestions were made.

There was the usual large number of interested visitors at the Arlington turf garden throughout the year. The new experimental turf garden in the Chicago district was frequently visited by club officials of the Mid-West. The new demonstration gardens throughout the country also attracted the attention of large numbers of those interested in turf culture. These visits to the experimental and demonstration gardens served to help the Green Section present its findings to those who are best able to carry them to the golf clubs of the country.

During the summer two Green Section meetings were held, one at the Arlington turf garden and one at the new experimental garden in the Chicago district. Over 300 greenkeepers and green-committee members attended these meetings. In addition to these meetings there were several local gatherings on the various demonstration turf gardens, at which members of the Green Section staff were present to take part in the program.

The Green Section had exhibits at the International Golf Shows in New York and Chicago, and at the National Greenkeepers' Golf Show in Buffalo.

Members of the staff were called upon to give lectures at or otherwise to take part in various meetings of greenkeepers during the year.

During the year there were printed nine 20-page issues of the Bulletin and three 16-page issues. The policy of this publication has been much the same as that adopted the preceding year. The paid circulation of the Bulletin showed an increase of 125 during the year, but many names were dropped from our complimentary mailing list, so that the total circulation is only slightly higher than last year. The present circulation is as follows:

United States Golf Association member clubs receiving Green Service service (2 copies per club)	2,200
Privately owned or daily-fee golf courses receiving similar service (2 copies per course)	38
Canadian clubs receiving Green Section service (2 copies per club)	12
Canadian clubs receiving the Bulletin through the Royal Canadian Golf Association	165
Private subscriptions, domestic	382
Private subscriptions, foreign	69
Municipal courses receiving the Bulletin without charge	45
Complimentary mailing list	221
Total Bulletin mailing list	3,132

It is very gratifying to report that the New Jersey State Legislature made an appropriation of $5,000 for work to be carried on at the New Jersey Agricultural Experiment Station at New Brunswick, and it is understood that this appropriation will be continued from year to year. This research work, under the direction of Dr. Jacob G. Lipman, Dr. Howard B. Sprague, and Mr. Evaul, is being conducted for the development and improvement of turf for golf courses, parks, and homes. It is to be hoped that other legislatures may take similar action where the State agricultural colleges are cooperating with the United States Golf Association in research work.

It is a pleasure to report that Dr. R. A. Oakley has returned to Washington, and while he has not entirely regained his health and strength is still actively interested in the direction of the work of the association.

It is earnestly hoped that the Green Section will continue its active work for the next year and many years to come.

Carpet Grass for Southern Fairways

By Robert White
Ocean-Forest Country Club, Myrtle Beach, S. C.

(Mr. White was requested to present to readers of the Bulletin these experiences of his with certain Southern turf problems as detailed by him in a discussion of the subjects at the annual meeting of the Green Section in New York City, January 10.—Editors.)

In the construction of our course at Myrtle Beach we proceeded on the assumption that Bermuda was the only grass suitable for seeding fairways in the South. It is indeed the prevailing grass over most of the South for both putting greens and fairways. The suggestion, however, was made that we try some carpet grass in the fairways. We accordingly seeded the fairways with a mixture of 90 per cent Bermuda grass and 10 per cent carpet grass. Much to our surprise we got parts of fairways that are all carpet grass, and the percentage of carpet grass all over the course is increasing rapidly. It has proved to be much better for us than Bermuda grass. Like Bermuda grass, carpet grass wilts after a frost, but unlike Bermuda grass it will produce green leaves again after a few warm days have come. We have reached the conclusion that the solution of our fairway turf problem in our climate is carpet grass.

Southern golf courses should be grateful to Dr. Hinman and his associates for developing the system of double greens in the South. Of course we have to depend on Bermuda grass for our putting green turf during summer, and in providing a winter putting turf we have followed the prevailing custom in the South of sowing in the fall either redtop or rye grass, or both, on top of the Bermuda turf in the greens we use for summer play. This is the third year we have tried to make winter greens on the Ocean-Forest course in this way. The first two years we were fairly successful. I have always considered, however, that we were sowing the redtop or rye grass a little too late.

Club house of the Ocean-Forest Country Club. The foreground shows the type of sandy soil on which the course is built

So this year we sowed the rye grass the last week in September and followed later with redtop. Then, unfortunately, we did not have any cold weather. We had a rather hot fall, with the result that the Bermuda grass kept on growing and there was as much of it at the end of October as at the end of September, so that the redtop did not have a chance to grow. I went down there early in December, when they had just had their first frost. This year we have seeded these greens two or three times with redtop and are now, in January, gradually getting them covered. Conditions are doubtless worse in this respect in South Carolina than they are in Georgia, in that frost comes a little earlier with us and the season for Bermuda grass is apt to be shorter than in Georgia. As Dr. Hinman has pointed out, however, with two sets of separate greens, one for summer play and the other for winter, it is possible to skin the Bermuda off the winter greens before sowing them in the fall with the winter grass. Putting on top of dead Bermuda is all right, except for its looks. You can putt well enough, but the green looks badly. The greens we have this year, instead of being green all over, as they were the previous winter, show a great deal of the white stolons of the dormant Bermuda grass be-

cause the rye grass and redtop had been unable to make proper growth.

In the control of the mole cricket we have had some success with the use of arsenate of lead as a poison, but we have to use tremendous quantities of it. The mole cricket is a serious pest with us. We have tried in many ways to rid the turf of these insects, and have not been able to achieve any success with carbon bisulphide in our sandy soil.

Some Turf Problems of the South

By Thomas P. Hinman

Druid Hills Golf Club, Atlanta, Ga.

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

Golf turf problems in the South are different from those in the North. The basic soil in our section is red clay. At Druid Hills we started with sand greens, first keeping them wet, as they did at Augusta, Ga. Then we put oil on the sand greens. Later we used fuel oil or road oil to make a putting surface. Instead of a flag we had a small post. On the end of the post we put a cross-piece, and then a bit of carpet was put over that. It was about 2 feet wide, and when you went to putt the caddy dragged the cloth across the green; and that gave you your putting line. Later, about 1914, George Adair, who was one of the men in charge of the greens (and he was a man who probably did more for golf in our region than anyone else), figured that it was possible to combine a grass green with a sand green. Accordingly he put in the center of the grass green, which of course was of very poor quality, a small sand green about 6 feet in diameter. After a while we found that did not work well. Then we started to develop a putting green grass.

In the South we play all the year round. So far the only satisfactory grass that we have found is Bermuda grass. However, the trouble with Bermuda grass is that just as soon as a heavy frost comes it stops growing and when freezing weather arrives it becomes dormant. So it made a very unsatisfactory putting surface for winter play. After the Bermuda died down in early winter, annual bluegrass (*Poa annua*) began to come in on the greens. It appeared in little bunches all over the greens, so that after the latter part of January we could not putt at all.

In 1916, Scott Hudson, who is president of the Atlanta Athletic Club, conceived the idea of sowing a winter grass for winter play. He first sowed redtop, red fescue, and rye grass on the summer green. We then discovered that after a green had been played on all winter, the constant trampling on the dormant Bermuda grass so injured it that it was the latter part of July before the grass would recover sufficiently to make a satisfactory putting surface. Thereupon Mr. Hudson decided to make two greens for every hole; and that is the procedure we are following in our district today.

The new course of the East Lake Country Club has very large greens; and they are splendid. There are two types of these double greens; one is a very large green divided in the middle and the other is two separate greens. The latter type is certainly the more desirable. Unless Bermuda grass is protected over winter it does not

come up quickly in the spring. Particularly is this so at Atlanta, where we have temperatures as low as 10 degrees above zero. We have accordingly developed a method of covering the summer green as soon as the grass stops growing or as soon as we have the first killing frost or freeze. We use pine needles or wheat straw as a covering, and are now experimenting with cottonseed hulls. The object is to protect the dormant grass and keep it as warm as possible. Alongside of this covered summer green we have the winter green. We are now just gradually solving the problem of this winter green. We first tried to plant it on a Bermuda grass base; but found that if we sowed the seed on the Bermuda base too early, the Bermuda grass, as it kept growing, tended to heave the newly planted seed out of the ground. Therefore, as soon as we are ready to sow the winter grass, we take off all the Bermuda grass, mowing it as close as we can, then raking it, and then mowing it close again. We have tried several winter grasses. Neither redtop nor red fescue will answer in our climate. We have found that rye grass is the best grass we can use for our winter greens. The sowing of rye grass is a very simple matter.

The only objection to the double green is that in the play during the winter you have to drop off of this covering of pine needles, wheat straw, or cottonseed hulls into the fairway to play back to the green. Therefore at Druid Hills we have adopted the plan of building two distinct greens as nearly alike in type as possible and separated from each other as far as possible.

After a good many years of experience with rye grass and closer observation of what it really does under play, we have found that it gradually gets much coarser and then disappears to a great extent during late winter. We consider rye grass today as simply a vehicle to carry us over from the 1st of December to about the 1st of February. In the meantime our natural spring grass, which is annual bluegrass, comes in and fills the interstices, beginning to seed about the 1st of January. This seeding gives rise to a new turf, with the result that about the middle of February the rye grass has nearly disappeared and we have a beautiful green of annual bluegrass. There is no green that I have seen anywhere at any time that putts as well as a really good green of annual bluegrass. Our problem has been to maintain this green of annual bluegrass as long into the season as we can. About June 1 we have found, however, that the annual bluegrass begins to disappear.

In the spring we take the thick covering of pine needles or wheat straw off of the summer green, which, owing to the protection it has had over winter, will come in from two to three weeks earlier than an uncovered green would. So our problem is entirely one of maintaining a golf course with two separate and distinct greens for 12 months in the year.

I might say that the Green Section has been exceedingly good to us. It has established a demonstration garden at Druid Hills, where we are testing a good many grasses. We are hoping later to be able to make a satisfactory report on what we are doing. We are conducting at least twelve experiments with Bermuda grass and a number of experiments with the native fescue and bent.

There are as many strains of Bermuda grass as there are of bent. The interesting thing about Bermuda is that it is a first cousin to bent. It looks very much like bent. If you are going to plant a Ber-

muda green, take my advice and do not plant it from stolons unless you know where the strain comes from and the type of Bermuda you are using. In the giant strain of Bermuda grass the stolons are very large and the leaves rather large. The type of Bermuda that is wanted is one that has small stolons and about four or five times as many leaves as the giant strain.

The handling of Bermuda grass through the summer is not difficult. So far it has not seemed to be subject to any diseases or pests. If the season is rainy, as it was last year, the Bermuda green has to be mowed twice a day. The ordinary mower is practically useless for this purpose. If Bermuda greens are to be kept in good condition they have to be top-dressed frequently. Where we have this heavy red clay soil we make the top-dressing compost half of woods earth and half of sharp sand.

We have on our course three or four streams, and for a long while we took our sand from those streams, sifted it, and put it on our greens, with the result that we were planting weed seeds all the time. We have actually found it much cheaper to go out and buy building sand for the purpose of making top-dressing compost than it is to use the sand on our own course; and I believe this will apply to most courses generally.

The heavy stolons of Bermuda grass must be kept underground. You can never get a really fine green out of Bermuda grass, because if the weather is very dry the tips of the stolons come up above the surface of the soil and form a layer much like a door mat. We hope later to be able to develop a putting grass for the South that will be satisfactory. We have no particular trouble with our fairways, as Bermuda grows luxuriantly on them.

We have one real pest in the South, and that is nut grass. Of all things to get in your greens, nut grass is the worst. It is a problem with which we have not been able to do anything. If it once gets a foothold on a farm it will run the farmer off his land. There is a story of a man who had nut grass on his farm. He saw an advertisement in a paper in which it was claimed a remedy for nut grass would be furnished for the price of five dollars. He sent the five dollars, and the answer came back, "Move off." If you are going to build a green in the South, be very particular where you get your soil. Be sure to select your soil in summer, when you can see whether or not it is infested with nut grass. I have seen a good many courses built in and about Atlanta, and I have so frequently found the mistake made of unwittingly introducing nut grass into the greens that I feel a word of warning is in place for anyone contemplating the building of a southern golf course.

A chain harrow is a valuable implement for spreading manure or top-dressing on fairways. It breaks the clods and drags the material into low places without damaging the turf. With such a harrow coarser material can be applied with safety.

It is much more satisfactory to start a new creeping bent or Bermuda grass nursery each year than to attempt to carry over an old nursery. Nursery rows make much less new growth the second year than the first year, while stolons of young growth establish themselves on a green more quickly than stolons of old growth, and thus need not be used so thickly.

Two Serious Problems on Southern Courses

By Cornelius S. Lee
Jekyll Island Club, Brunswick, Ga.

(Paper read at the annual meeting of the Green Section in New York City, January 10, 1930)

The last few years have witnessed an enormous increase in the growth of and interest in the game of golf. Hardly any section of the country has not shared in this movement. With the increased interest has come a demand from golfers for perfection in course upkeep. In some localities this is a fairly simple matter; in others, due to extremes of temperature and to insect pests, good greenkeeping is a serious problem and an arduous task. The Jekyll Island golf course, situated off the southeastern coast of Georgia, has gone through a trying period the last few years. I shall endeavor to set forth our major problems.

A fairway at Jekyll Island

Our playing season lasts from the middle of December to the middle of April. During this period the temperature ranges from 25 to 80 degrees above zero. These extremes of temperature make it difficult to insure good putting greens, and, as is the case throughout the South, the greens have to be planted anew each fall. Experience and experiments have convinced us that a Bermuda grass base, topdressed and sown in September with redtop, gives the best putting surface. The main problem lies in maintaining a proper balance between the base of dormant Bermuda grass roots and the surface of active redtop. If the Bermuda base is not scraped off sufficiently deep and the redtop is sown too early in the fall, a subsequent wet season will result in the Bermuda's crowding out the redtop. If, on the other hand, the redtop is sown too late or too much of the Bermuda base is removed, frost will damage the redtop and the light sandy soil with its insufficient base will afford a poor putting surface.

The problem of securing a satisfactory grass base over winter is one which has given us no little concern. The best results so far have been obtained by cutting off the stolons of the Bermuda grass in the fall by the use of sharp hoes; this, however, is a laborious process, and uniform results are hard to obtain. No machine has yet been devised that will just skim off the surface Bermuda. A sod-cutter

will not work properly. Any device using knives simply churns up the stolons and induces a more active growth. This season we are planning to conduct several experiments with a base. In one experiment we shall make use of fine wire as a base; in another we shall treat the surface of a plot of Bermuda grass with arsenate of lead; in another we shall burn a plot with a heavy application of sulphate of ammonia.

For fairway grasses we have found carpet grass the best, and Bermuda next. Experiments with centipede grass have yielded no tangible results. Carpet grass, while slower in germinating, makes a thicker mat, remains greener in the winter, and is damaged less by the mole cricket than is Bermuda grass.

A drive to a green at Jekyll Island

Six or seven years ago our old course was suddenly attacked by the mole cricket, which is one of the worst pests Southern golf courses have to contend with. Overnight this insect practically destroyed entire fairways for us. The cricket somewhat resembles a long, brown grasshopper, with short legs. Its head is covered with an armored shield. It has a powerful pair of claws, like a lobster, which it uses in cutting the roots of grass. It flies, jumps, springs, swims, crawls, and burrows. In cold weather it digs five or six inches underground. As its burrows consist of countless passages, the use of poison gas is rather ineffective in combating it. We waged a short and hopeless war against the insect, and then sent to Washington for help. On the request of the Green Section, W. A. Thomas, of the United States Department of Agriculture, was sent down and spent two seasons at our course working out control measures. The following three methods of poisoning the crickets were finally adopted: spreading arsenate of lead mixed with soil over infested areas; squirting bisulphide of carbon in the burrows on greens that had been attacked; scattering a bait made from a mixture of rice flour, cottonseed meal, and arsenate of lead, in August when the insect was flying about, or at other times during warm weather when the insect was active at night. We abandoned our old course three years ago and built a new one out on the sand dunes. After using these methods of warfare against the mole cricket, I am pleased to say we are com-

paratively free from the pest. Had the Green Section not rendered us this invaluable service in securing the cooperation of the United States Department of Agriculture in attempting to solve our problem, I know there would be no golf course on Jekyll Island today. Our old course had been utterly destroyed by the mole cricket.

Let me solemnly warn anyone building a southern golf course to make adequate provision for combating the mole cricket before he does anything else. In time the insect will unquestionably work farther north, invading even the country north of the Carolinas. At Aix-les-Bains, in southeastern France, a place almost surrounded by high mountains, the mole cricket suddenly appeared last year. I dug a few up there and was surprised to see that they were at least three inches long. As labor at that place was very cheap, they could afford to fight the pest with bisulphide of carbon, which must be squirted by hand into the burrows.

New pests are certain to appear from time to time as the game of golf grows and more courses are built in other sections of the country. It is only by broadcasting knowledge gained from various sources, in a medium such as the Bulletin of the Green Section, that intelligent and steady progress in greenkeeping can be obtained. I firmly believe that the greenkeeper today occupies the most responsible position in the game of golf. Good results can not be obtained without a good greenkeeper. Under the guidance of an inferior man thousands of dollars may be wasted and the best conditioned course may go to pieces in a few years.

In closing, I want to express my thanks for the valuable advice in the use of fertilizers, preparation of soil, and other matters given to us by the Green Section when we built our new course. By following their recommendations we saved a large sum of money and obtained most gratifying results.

QUESTIONS AND ANSWERS

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

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

Early spring treatment of putting turf.—After the frost is out of the ground in the spring and the greens have been rolled, should the first treatment be the application of top-dressing, mowing the grass, or scarifying the turf with sharp-tined rakes? (Ohio.)

ANSWER.—After the greens have been rolled with a roller weighing from 150 to 200 pounds to the foot and having a diameter of at least 18 inches, the first treatment should be mowing the grass. Top-dressing should be delayed until the grass is growing sufficiently to require almost daily cutting. At that time the turf should be scarified

with sharp-tined rakes and then top-dressed and fertilized. Covering grass that is not growing is liable to result in smothering; also less injury will result from raking if this operation is delayed until the grass is growing vigorously. For the first application of fertilizer in the spring the use of a complete fertilizer is recommended, such as poultry manure tankage, cottonseed meal, or activated sludge (Milorganite). This should be applied at a rate of 15 to 18 pounds to 1,000 square feet, either by itself or mixed with the top-dressing. It would not be necessary to mix the fertilizer throughout all the top-dressing, but just in sufficient quantity to insure an even distribution. Such an application of a complete fertilizer should carry the greens for the first month or so in the spring, at the end of which time regular light applications of sulphate of ammonia should be started; these applications should be continued through the season until time for the last treatment in the fall, which should consist of another application of a complete fertilizer and a top-dressing and which may be expected to carry the turf over until the following spring. It is in early spring and late fall that complete fertilizers can be used to best advantage. Between these periods light applications of sulphate of ammonia (2 to 3 pounds to 1,000 square feet) and an occasional light top-dressing are all that putting turf seems to require.

Preventing the formation of crust on greens of stiff clay soil.—Our soil is a very stiff clay which becomes sticky and slimy after rain or if watered too much and baked hard in summer. The greens were constructed rather hurriedly two years ago. None have subdrainage, nor was sand, manure, or fertilizer worked into the soil at the time of construction. A hard scab forms on the surface of some of the greens. To improve the condition of the soil we have been top-dressing it with sharp sand. It is claimed by some that this practice is bad, in that the sand tends to form a crust under trampling, injures the grass by cutting into the growing shoots, and does not work down into the soil but is washed away to a considerable extent by rains. It is not practical for us to reconstruct the greens at present. What treatment would you suggest? (New York.)

ANSWER.—If the drainage of any of your greens is poor, permanent improvement may not be expected until satisfactory drainage is provided. It is evident that your soil is deficient in organic matter or humus. Such a soil may be so tight that even ordinary drainage will not benefit it. On the other hand, a soil of good physical structure will not drain properly if it is not elevated sufficiently to drain away free surface water. The formation of a scab on the surface of soil is usually not due to an accumulation of sand, although a considerable accumulation of sand on the surface of soil is liable to injure young grass by bruising it. A scab on soil is formed generally by the growth of algae resulting from poor drainage, or by the cohesion of top-dressing material when applied to a thin, poor top soil. The growth of algae on the surface of soil is sometimes not noticeable, but the constant growth of this low type of vegetation will leave a scabby residue. Where the improvement of drainage or soil texture fails to prevent the growth of algae, the growth can usually be checked by an application of corrosive sublimate at the rate of 1 to 2 ounces to 1,000 square feet; but if the grass does not again cover the bare spots caused by this scab, the algae will doubtless return. Such scabby areas

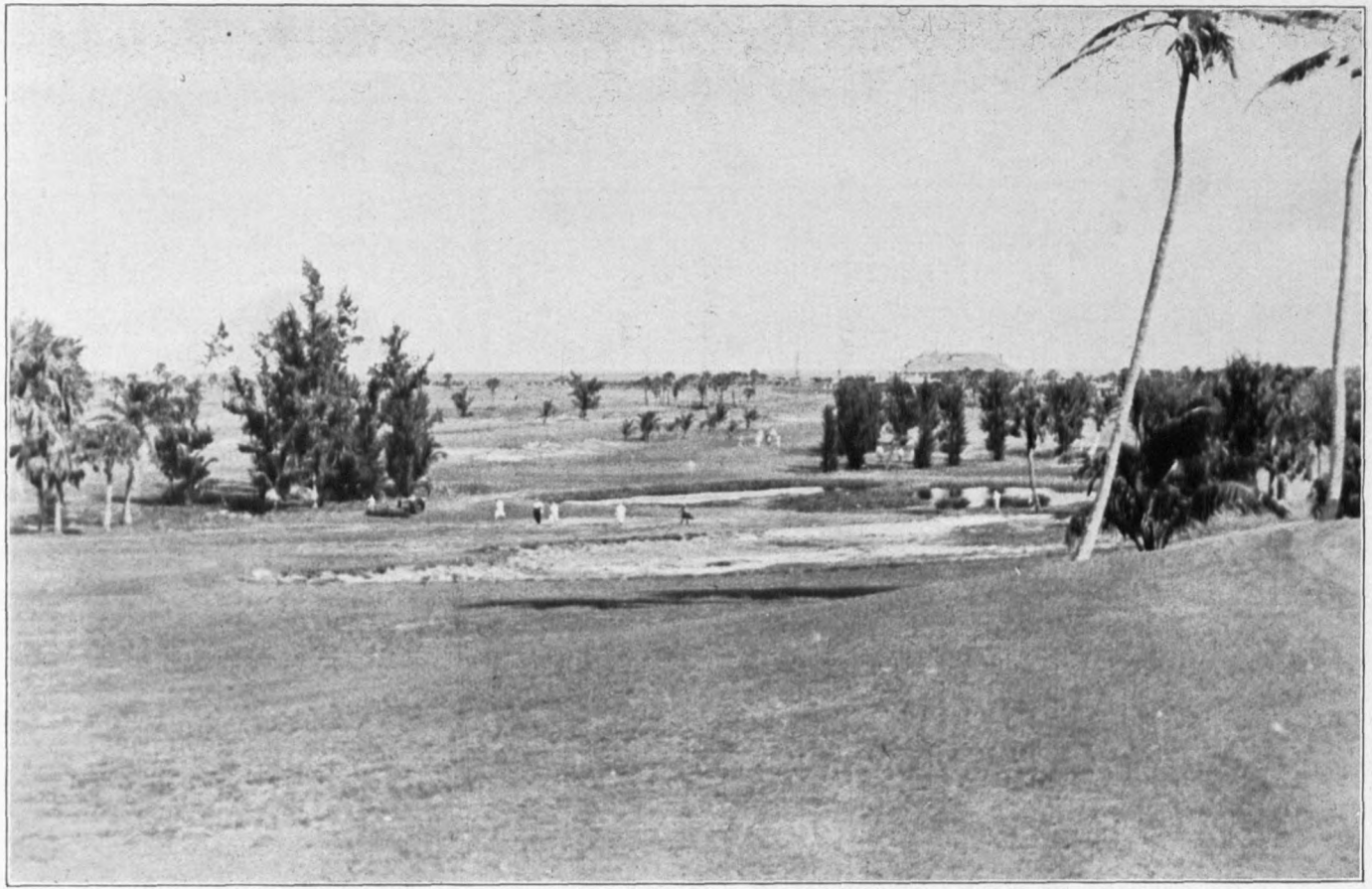
should therefore be broken up and steps taken to stimulate the growth of grass by reseeding and fertilizing.

We do not recommend the applying of sand alone, but we recommend mixing it with fine soil and decayed organic matter so as to furnish a sandy loam top-dressing. The continuous use of such a top-dressing does not work sand into the soil but does build up a sandy-loam top soil.

To benefit conditions such as yours the following procedure should be helpful. After the free moisture is out of the grass in the spring, rake the dead material from the greens by the use of sharp-tined rakes. Top-dress with clean, sharp sand at the rate of about 2 yards to 5,000 square feet. If the soil is acid or even neutral, apply ground limestone mixed with the sand at the rate of 225 pounds to 5,000 square feet. Then go over the greens with spiked rollers, or better still with spiked tampers. The spikes should be driven through the surface and as deeply as possible into the soil. As long as the putting surface is not made bumpy, the spikes may be agitated in the soil so as to loosen and break up the crust. Then brush or rub the greens so that as much sand as possible will be worked into the channels left by the spiking. Follow this after several days with an application of a good organic fertilizer, such as poultry manure tankage, cottonseed meal, or activated sludge (Milorganite) at the rate of 10 to 15 pounds to 1,000 square feet. Then water the greens with a fine spray, so that as much as possible of the sand, fertilizer, and lime will be worked into the spiked surface. Repeat this treatment the last thing in the fall, omitting however the lime. A single application of lime in spring would not likely bring in weeds or clover, as the fertilizer used would stimulate the growth of the grass sufficiently to prevent the undue development of weeds or clover. A single application of lime at the beginning of this treatment would be sufficient for several years. Lime has a tendency to make soil friable, although its continued use would make the soil too alkaline for the best development of turf grasses. We have seen good results follow in a few seasons by this procedure.

Sulphate of ammonia for bluegrass fairways.—Is sulphate of ammonia a good fertilizer for Kentucky bluegrass fairways? (New Jersey.)

ANSWER.—Kentucky bluegrass thrives best on soils derived from limestone or supplied with ample calcium carbonate (lime). Sulphate of ammonia will in time deplete a soil of lime, but with soils which are nearly neutral or are on the alkaline side it would be quite safe to use sulphate of ammonia either alone or along with organic fertilizers. It requires considerable time to change a neutral or an alkaline soil materially with sulphate of ammonia when the sulphate is applied only at rates required by turf. Acid soils should receive sufficient lime to make them at least approach the neutral point in reaction. Bone meal contains considerable calcium and is good for bluegrass on acid soils. Bone meal is more beneficial, however, when its nitrogen content is raised by the use of a little sulphate of ammonia. The sulphate may be mixed with the bone meal just before applying it to the turf, or it may be applied alone in the spring and the bone meal applied in the fall. Organic fertilizers such as cottonseed meal, activated sludge, poultry manure, and well-rotted manure also give excellent results on bluegrass fairways whether the soil is alkaline or acid.



On the course of the Palm Beach Country Club, Palm Beach, Fla.

Art little? Do thy little well,
And for thy comfort know
Great men can do their greatest work
No better than just so.

Goethe