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A MONTHLY PERIODICAL TO PROMOTE THE BETTERMENT OF GOLF COURSES

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National Green Section Tournaments Announced for 1925

The encouraging results from the National Green Section Tournament held last October have led the Executive Committee of the United States Golf Association to arrange for similar tournaments in 1925. A tournament for men is announced for Decoration Day, May 30, and a tournament for women will be held some time in June. Any player of any golf club in the United States or Canada who has a club handicap may compete. A silver cup will be awarded the winning players, and in case of a tie additional cups will be awarded. The competition will consist of an 18-hole match play round against the par of the course, the net handicap being based on seven-eighths of the regular stated handicap, the best scores against par being declared the national winners. A player may compete in these tournaments on another course, but the home club handicap must be used against the player's par of the course played upon, and the score returned must be entered on the records of the course visited. The entrance fee will be $1 per player, of which 75 cents is to be remitted to the United States Golf Association for the Green Section Endowment Fund and 25 cents is retained by the local club for a prize or prizes.

Fertilizers in Relation to Quality of Turf and to Weed Control*

By R. A. Oakley

Why do we fertilize putting greens? Broadly speaking, we do so under normal conditions to produce a vigorous growth of grass; under certain abnormal conditions to help grass recover from attacks of diseases and insect pests; and in general we fertilize turf to improve its quality. Let us understand clearly that the fertilizing of a putting green and the fertilizing of a hayfield are quite different propositions. In fertilizing meadows a large growth of hay plants is what is sought; in the case of putting greens it is quality of turf, which involves, in addition to vigor of growth and texture, freedom from weeds. It is important that this difference be fully appreciated.

For many years it has been known that the application of certain fertilizers or certain substances to the soil affects some plants favorably and others unfavorably when these plants are grown together in what we call mixtures or mixed cultures. The reasons for this are not all clear, but the facts seem to be unmistakable. This has led investigators to endeavor to find fertilizers that will favor the plants they wish to favor and at the same time discourage the ones they wish discouraged.

Twenty years ago the Rhode Island Experiment Station started a series of experiments to determine the difference in their effects on the bents and fescues of fertilizers having a tendency to produce an acid condition in the soil and those having a tendency to produce an alkaline condition. Plots of these grasses to which the fertilizers were applied were not kept in putting green condition, but they were kept so as fairly to approximate turf. In brief, the outstanding results of the tests were these: The plots fertilized with acid-reacting fertilizers produced cleaner—that is, more nearly weed-free turfs of the bents and of the fescues, than did those fertilized with alkaline-reacting fertilizers.

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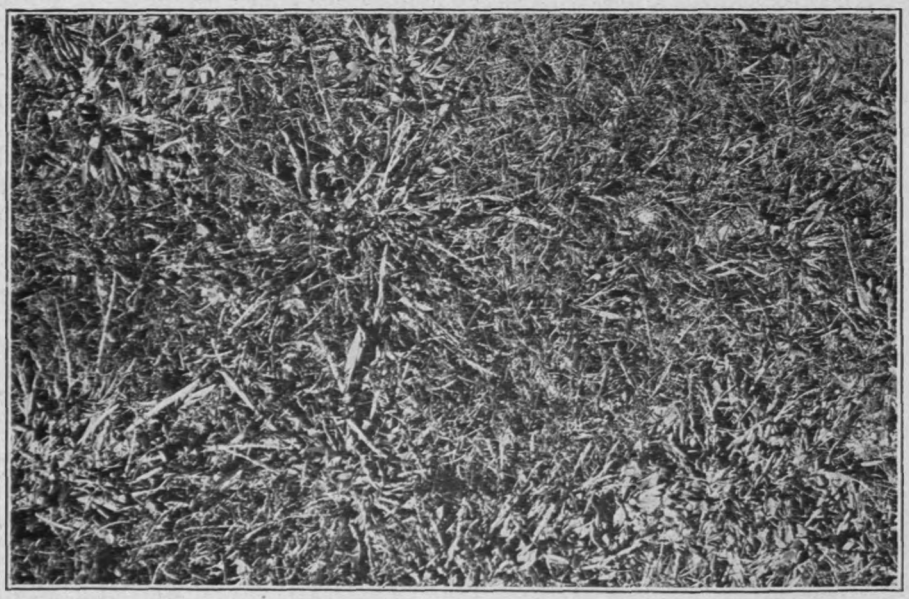
*A part of a paper read at the Annual Meeting of the Green Section, New York City, January 10, 1925.

In greenkeeping it had been shown that by the proper use of ammonium sulfate on bent or fescue greens white clover could be discouraged or eliminated. This fact and the results of the experiments at the Rhode Island Experiment Station and elsewhere led the Department of Agriculture, in cooperation with the Green Section, to conduct some simple experiments with acid- and alkaline-reacting fertilizers on turf kept in putting green condition. In September, 1921, a tract of land at Arlington Farm was prepared and sown with seed of Rhode Island bent. The soil of the tract is a poor stiff clay—really a brick-clay. A very thin but uniform stand of grass was obtained. In April, 1922, the area was laid off in plots 8 feet by 8 feet. Fertilizers were applied to all plots, except to a sufficient number which were left untreated as checks. There were duplicate plots of each fertilizer treatment, to reduce the likelihood of drawing erroneous conclusions from accidental effects. The chief object of the tests was to get more detailed information on the difference in effect between acid-reacting and alkaline-reacting fertilizers on the growth and quality of Rhode Island bent turf in putting green condition and on the incursion of weeds in this turf.

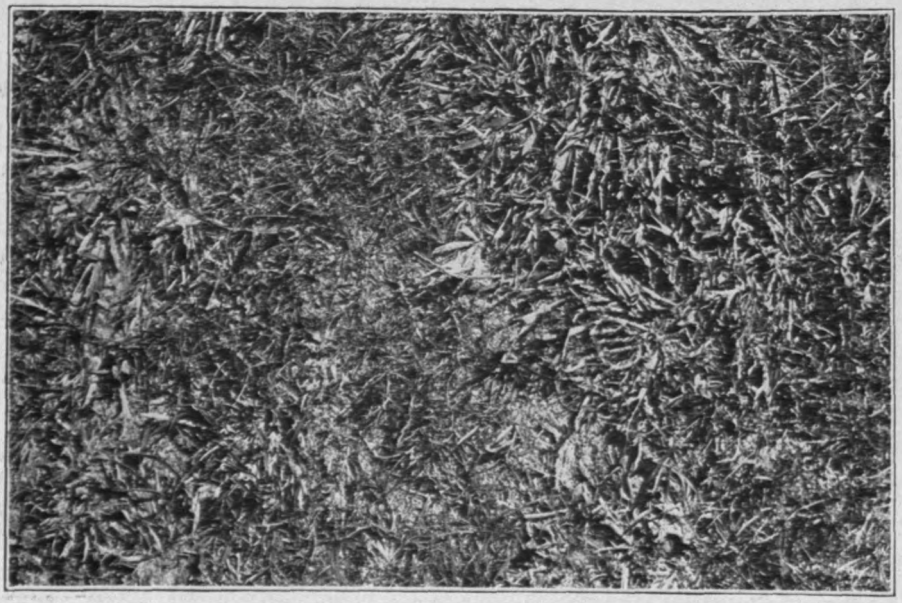
The fertilizers were applied approximately monthly during the growing season at the following rates for a single application to each plot of 64 square feet: ammonium sulfate, 6 ounces; ammonium phosphate, 6 ounces; nitrate of soda, 6 ounces; acid phosphate, 18 ounces; muriate of potash, 6 ounces; calcium cyanamid, 6 ounces; bone meal, 18 ounces; soybean meal, 18 ounces; cottonseed meal, 18 ounces; carbonate of lime, 36 ounces. This means that in the case of ammonium sulfate the total season's application was at the rate of approximately 15 pounds for each 1,000 square feet. Aside from the application of fertilizers, the plots were all treated alike. They were mowed and watered as one would mow and water a putting green. No weeds were removed at any time. The soil at the time the experiments were started was slightly acid.

The first striking development was the fact that the application of fertilizers containing rather quickly available nitrogen thickened the stand of grass greatly and did so in a very short time. This bears out the experience that good nitrogenous fertilizers properly applied will thicken thin stands of grass where reseeding alone will fail. At the present time all of the fertilizer plots with the exception of those having applications of cyanamid and those having lime have a better growth of grass upon them than the unfertilized plots. There is a great difference now between the ammonium sulfate and ammonium phosphate plots on one hand and the nitrate of soda and carbonate of lime plots on the other, in the number of weeds that has invaded them. The first two are nearly weed-free, while the last two are quite weedy. This was noticeable in the first summer (1922); more so in 1923, and still more so in 1924, when it became very striking indeed. There is an interesting difference between the nitrate of soda and the lime plots in the kinds of weeds that have invaded the turf. Goose grass, or silver-crab grass (*Eleusine indica*), is very abundant where nitrate of soda was applied, while the common crab grass (*Syntherisma sanguinale*) is equally abundant where lime was applied. The plots having applications of potash also were invaded by goose grass. There is relatively little white clover on the nitrate of soda plots at the present time, but it is quite abundant on the lime plots. This may be accidental. There is none on the ammonium sulfate or ammonium phosphate plots. There seems to be no accident about this.

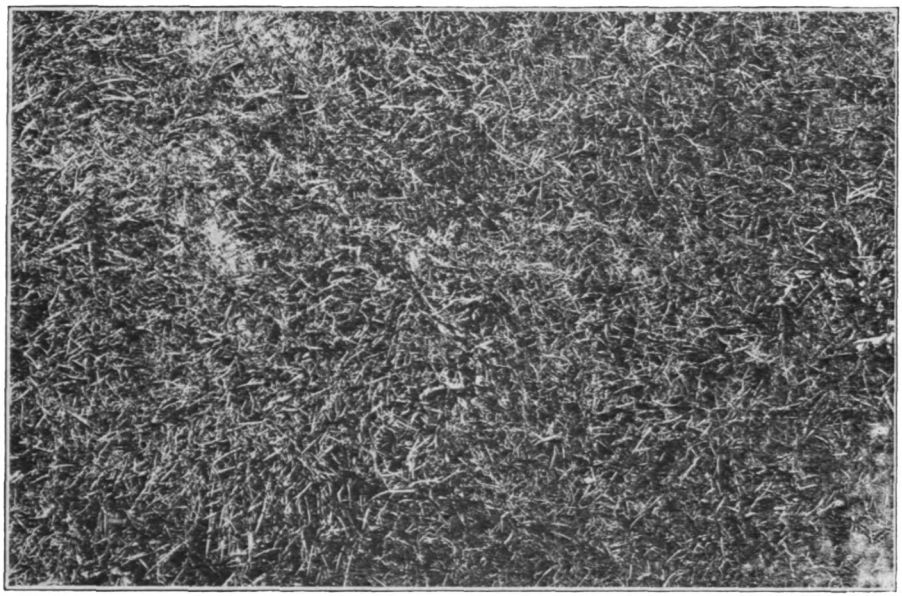
The outstanding results of these tests may be summarized briefly as follows:



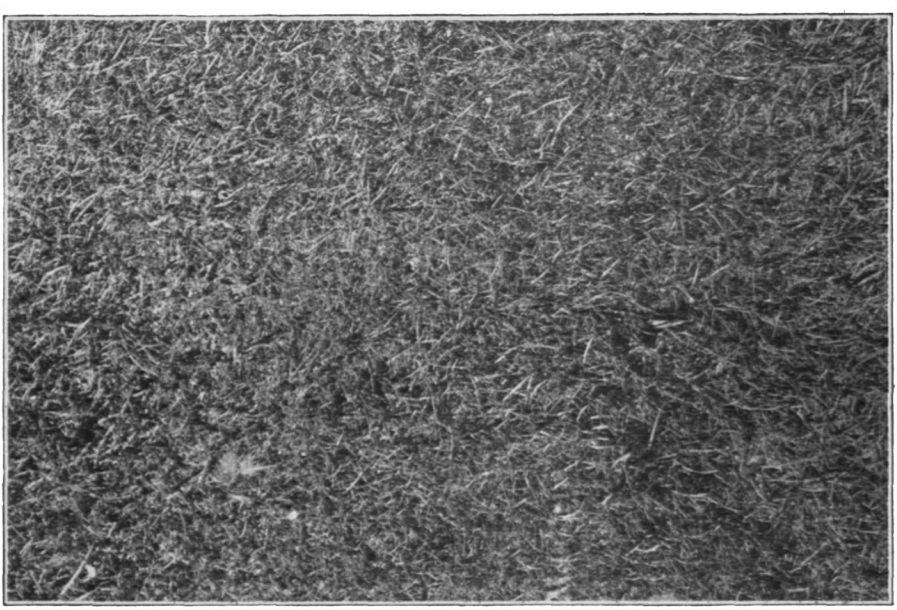
The plot shown in this photograph was treated with carbonate of lime at the approximate rate of 45 pounds to 1,000 square feet. Applications were made annually at this rate from 1922 to 1924 inclusive. It will be noted that the plot is very weedy and that it has much moss. The principal weeds in this plot were crab grass (Syntherisma sanguinale) and white clover.



The plot illustrated in this photograph was treated with nitrate of soda at the rate of approximately 15 pounds per 1,000 square feet annually, in five applications one month apart, from 1922 to 1924 inclusive. It will be noted that the plot is very weedy. The principal weed is goose grass or silver crab grass (Eleusine indica).



The plot shown in this photograph was given ammonium sulfate at the rate of approximately 15 pounds per 1,000 square feet, each year, from 1922 to 1924 inclusive. The fertilizer was applied in five applications, one month apart. Note the relative freedom from weeds as compared with the plot treated with lime and the one treated with nitrate of soda.



The plot shown in this photograph was given ammonium phosphate at the rate of approximately 15 pounds per 1,000 square feet annually in five applications, one month apart, for three years (1922 to 1924 inclusive). The fertilizer produced an acid condition in the soil as great as that produced by ammonium sulfate applied at the same rate. Note the freedom from weeds. This plot was the most nearly weed-free of all the plots in the series.

The turf on the ammonium sulfate and the ammonium phosphate plots is now and has been since the first summer practically weed-free and of good texture and otherwise of good quality.

The turf on the nitrate of soda, lime, and other alkaline-reacting fertilizer plots is now and has been since the first summer (1922) quite weedy, the important weeds being goose grass, crab grass, and white clover. Where lime alone was applied the turf has always been very poor and weedy. There is much moss on the limed plots—contrary to the popular notion that moss is an indication of acid soil and that lime is a panacea for all acid soil troubles.

The turf on the soybean meal and cottonseed meal plots is very good but somewhat weedy.

The addition of either acid phosphate or muriate of potash, or both, to plots treated also with ammonium sulfate or nitrate of soda did not give better turf than ammonium sulfate or nitrate of soda alone—in fact, not so good as ammonium sulfate alone—certainly not nearly so free from weeds. This indicates that in this case at least there is enough available phosphorus and potassium in the soil for the needs of the grass, a very significant point which should be borne in mind.

Another point worthy of mention is that earthworms are not in evidence on the plots where acid-reacting fertilizers were applied, while they are present in considerable numbers on the plots treated with alkaline-reacting fertilizers.

The best plots from the very beginning of the experiments are the plots to which ammonium phosphate was applied. The ammonium sulfate plots are nearly but not quite so good. Both series are remarkably good from the standpoint of vigor and texture of turf, and freedom from weeds.

At the end of the three-year period the soil of the plots to which ammonium sulfate and those to which ammonium phosphate were applied was appreciably more acid than at the beginning of the investigation, while the soil of the plots to which nitrate of soda and to which carbonate of lime were applied was appreciably more nearly alkaline than at the start. Generally speaking, the weediness of the plots in the series at this time is in direct relation to the alkalinity of the plots. In other words, the plots with the soil most highly acid are the ones freest from weeds.

The results of the Arlington experiments leave little doubt that for Rhode Island bent putting greens (and this is almost certain to be true also of creeping bent, velvet bent, and red fescue putting greens) such acid-reacting fertilizers as ammonium sulfate and ammonium phosphate are efficient and economical fertilizers to use, since they help to make vigorous turf of good texture and furthermore go far toward solving the weed problem. The evidence now seems clear that nitrate of soda, very commonly used on bent and fescue putting greens, is no more effective in inducing the growth of the grass than are ammonium sulfate or ammonium phosphate, while nitrate of soda produces conditions favoring some of the most troublesome northern putting green weeds.

The remarkable showing of ammonium phosphate has caused us to regard this fertilizer with considerable enthusiasm. It has performed consistently and well. From the showing it has made at Arlington it must be considered as a competitor of ammonium sulfate for bent or fescue putting greens. The price, of course, will be something of a factor in connection with its use. But leaving this out of consideration for the present,

it appears to be quite probable that on a basis of equivalent quantities of available nitrogen, ammonium phosphate will probably prove to be a better fertilizer for bent or fescue greens than ammonium sulfate. From other evidence it would appear that its superiority is due not to a need for added phosphorus but to the fact that phosphorus as a residue in the soil is better for the grass plants than is sulfur. Ammonium phosphate has not heretofore been available to golf clubs, but it is the understanding of the Green Section that it is now being placed on the market and will be available in ton lots or possibly smaller quantities.

Out of all the field investigations and experience, including that at Arlington and elsewhere, has come what appears to be a very simple course of procedure for the fertilizing of bent and fescue greens. Further studies (and they are being conducted now) may show the conclusions here to be in error, but as the case stands it seems sure that the most satisfactory fertilizer treatment from the standpoint of the turf and economy, involves the combined use of ammonium sulfate or ammonium phosphate, under provisions heretofore expressed regarding the latter, and suitable compost.

Just a few reasons why it is thought this combination is what should be used:

(1) Nitrogen is the outstanding fertilizer element for turf grasses. To be a good grass fertilizer a substance must be rich in nitrogen in a form available to the plant. Ammonium sulfate and ammonium phosphate are high in available nitrogen.

(2) It seems to be amply proved that the use of acid-reacting fertilizers goes far towards reducing the expense of weeding bent and fescue greens. Ammonium sulfate and ammonium phosphate appear to be the best acid-reacting nitrogenous fertilizers now available, price and other factors considered. Not only are they capable of acidifying soils but they promote a growth of grass which is satisfactory alike in vigor and texture.

(3) The addition of phosphorus and potassium does not appear to be at all necessary other than that added by the application of compost, which it is recommended be made in conjunction with ammonium sulfate or ammonium phosphate as included in the formula so often published in THE BULLETIN. The reasons here set forth should be seriously considered.

Attention is called again to the fact that the apparent superiority of ammonium phosphate over ammonium sulfate seems not to be due to the need for additional phosphorus. If nitrogen is the important fertilizer element to be supplied and the creation and maintenance of a rather highly acid condition in the soil is desirable in solving the weed problem, then it would appear that ammonium sulfate and ammonium phosphate are the most effective and economical fertilizers to use.

As for the use of compost, in addition to its many other functions, some of which are well known, it supplies suitable organic matter, which is probably much needed and tends to counteract any evil effect the long-continued use of acid-reacting inorganic fertilizers may have on the soil.

Let this suggestion be made to those who are thinking of buying some other fertilizer, mixed or otherwise, organic or inorganic, or to those who are importuned to buy some special kind, that they ask themselves or the salesmen these questions, provided, of course, they have bent or fescue greens:

Is it high in available nitrogen?

Is the price higher or lower, per unit of available nitrogen, than is that of ammonium sulfate?

Will it create an acid condition in the soil?

The chances are, if they put these questions frankly to themselves or to the salesmen, they will decide to buy ammonium sulfate or ammonium phosphate.

It is realized that there are certain new and apparently excellent fertilizers coming on the market. These may change the situation; but for the present, the course of treatment here outlined seems to be the one to follow. The Green Section has no desire to dogmatize on the subject of fertilizers for putting greens. It is still investigating, and, it is hoped, with an open mind; but it wishes readers of THE BULLETIN to have the benefit of its conclusions based upon work it has done and upon observations it has made.

Kerosene Emulsion in Combating Cutworms

In his letter of September 25, 1924, Mr. L. E. Lavis, superintendent, Timber Point Corporation, Great River, L. I., New York, writes as follows regarding the use of kerosene emulsion in combating cutworms:

"I knew that several of the greens located near the woods were infested with grubs of the common brown May beetles. When I applied the kerosene emulsion I noticed that several of the greens had a rather moth-eaten appearance. Upon applying the kerosene emulsion for the May beetles and upon watering it in very liberally, in many instances large numbers of cutworms came out on the turf, just having life enough left to get out in the sunlight and then die. However, all the cutworms were not dead, but it was a very easy matter to pick them up. Since applying the kerosene emulsion I have had no more trouble with the cutworms, but if I should I am going to use arsenate of lead, and at that time I will give you a comparison of the results."

The Best and Cheapest Way to Put Chemical Fertilizers on Putting Greens

By John J. McNamara, Pittsburgh Field Club, Aspinwall, Pa.

I have used chemical fertilizers, such as nitrate of soda and sulfate of ammonia, on the putting greens in many ways, including spreading them on the greens dry and watering them in, mixing them with sand and with soil in top-dressing, and dissolving them and applying with sprinkling cans. I find the best, cheapest, and safest way is to use a fertilizer distributor. The work is done by the men watering the greens, and it is done either during the day or at night, whenever it is thought that one or more greens need fertilizer. Using a wheelbarrow, the man takes to the green a supply of fertilizer, the fertilizer distributor, and a measure which will contain the quantity of fertilizer that should be applied to the green. If the sprinkler is to be moved twice to cover the green, the man divides into halves the quantity of fertilizer he has been instructed to apply to the green; if the sprinkler has to be moved three times to cover the green, he divides the specified quantity of fertilizer into three equal portions. In this way little time is lost by the men watering, and the green is fertilized and watered at the same time. Often these fertilizers contain many small lumps, which of course have to be put through a screen before they can be used with either sand or soil; but with the fertilizer distributor, no matter how lumpy the material is it can be dissolved in from 10 to 15 minutes. We also use the distributor in fertilizing our lawns and flower beds.

Vest-Pocket Fertilizers

By K. F. Kellerman

Don't spend time and money trying to get results from magic fertilizers. Many kinds have been advertised in recent years and, although they are not all strictly of the "vest-pocket" class, the marvelous claims and the attempt to show that they are very scientific should make it easy to recognize them as part of this general family. The idea of the "vest-pocket" fertilizer, and its nickname, developed nearly thirty years ago as a result of the experiments which were then being made for the stimulation of clovers, beans, peas and other leguminous crops through inoculating them with cultures of nodule-forming bacteria. At about this time it was found that these leguminous crops did not thrive unless the proper strain of nodule-forming bacteria was present on their roots, and it was further found that the addition of a very small bottle of culture of the right kind of bacteria to the seed before planting often made the difference between a successful crop and a complete crop failure. With these striking results on legume crops the experiments naturally were extended with other crops, and many theories were advanced of the direct relation that might exist between specific kinds of bacteria and all kinds of crops. Although numerous and striking claims have been made by experimenters since that time, in no case have there appeared any consistent records of benefit to any crops excepting legume crops. In general, however, a green committee is not interested in growing legumes. Where a new course is being prepared and cowpeas or some other legume for enriching the soil is being grown, the inoculation of these seeds with the proper culture may be advantageous, otherwise it is difficult to see any reason why cultures of nodule-forming bacteria should ever be employed on a golf course.

There may be many reasons for the failure of these bacterial fertilizers to show beneficial results. The following explanation is perhaps the one most generally adopted by soil specialists at the present time. The different groups of soil organisms are very widely distributed in both natural and cultivated soils, so that if satisfactory conditions are maintained in the soil for the growth of bacteria the proper bacteria will develop normally. On the other hand, if the soil conditions are unfavorable to the kinds of bacteria which should be plentiful in good soils, these desirable bacteria can not develop in large numbers, even if additional numbers of bacteria are added. The endorsement of a previous user of a bacterial fertilizer or other type of mysterious scientific material, ordinarily speaking, is of no real significance. In most cases untreated areas of the same kind of soil have not been observed for comparison, and in other cases the experiments have not been continued for a sufficient period to determine whether actual benefit or accidental coincidence is the real explanation of any apparent benefit that might appear. The fertilizer that is really scientific is the one which is sold under a chemical analysis and preferably also carrying a list of the sources and kinds of materials and their percentage in the mixture. Manure, compost, ammonium sulfate, and standard commercial fertilizers at the present time undoubtedly can be depended upon to return a better value for money expended than any of the stimulants, inoculants, or other materials sold under pseudo-scientific theories.

Royal Canadian Golf Association Green Section

The Royal Canadian Golf Association has followed the example set by the United States Golf Association, by establishing a Green Section to serve the Canadian golf clubs. Arrangements have been perfected by which the experimental work is carried on by the Canadian Department of Agriculture, and it is hoped that similar cooperation will be arranged with each provincial department of agriculture. For the present the publication of material will be through the Canadian Golfer.

It is also intended to prepare a hand-book for greenkeepers; to engage a specialist, who will be a whole-time employee of the Royal Canadian Golf Association and who will be available to all clubs belonging to the Royal Canadian Golf Association, to conduct experiments to ascertain the best grasses for use in Canada; to establish and maintain nurseries in eastern and western Canada for the development of the superior forms of grasses; and to cooperate with the agricultural colleges in providing short courses of instruction to practical greenkeepers. It was announced that arrangements have been made for the holding of five-day series of lectures early in March in Toronto and Montreal for all interested in the betterment of golf courses.

We wish our neighbors every measure of success in their new enterprise.

A Preliminary Study of the Root Growth of Fine Grasses under Turf Conditions*

By O. B. Fitts

The results of various studies on the roots of crop plants, trees, shrubs, and other plants have been published from time to time, but until 1921 or 1922 the subject had been given very little consideration with regard to the roots of grass cut to form a short turf. The importance of such knowledge became evident about that time, when the question arose as to whether or not it was wise to incorporate in the soil of putting greens in the course of construction, large quantities of manure and other expensive materials, a practice which was being advocated and followed very extensively in golf course construction. One of the main ideas in incorporating such materials in the greens was that of encouraging deep root growth, which, it was believed, would protect the grass against drouth and insure better turf. This question, of course, brought to surface many differences of opinion. Dr. Piper, Dr. Oakley and Prof. Carrier, who, it seems, were looked upon to settle many controversies involving grasses, golf courses, golf, and golfing conditions, prepared an outline of experiments to be conducted at the Arlington Experimental Turf Garden for the purpose of studying the roots of fine grasses and their relations to turf under various conditions, including different soils, various methods of care, the effects of the different seasons, and other features. The experiments were started and have since been kept under close observation, and the plots have been photographed for record. As a result of these experiments information has been gained which enables one to advise more intelligently regarding problems of root growth.

Before entering upon a detailed discussion of the experiments, it may be stated that the conclusions reached as a result of these and the hundred or more other experiments at the Arlington Turf Garden, are not in accord

*Paper read at the Annual Meeting of the Green Section, January 9, 1925.

with certain theories and traditions on which some methods now practiced on golf courses are based.

The experiments consisted of eight different treatments in duplicate. Sixteen woven wire cages of 1 cubic foot volume were made for the purpose. These cages were numbered from 1 to 16, numbers 1 to 8 constituting one series of treatments, and numbers 9 to 16 the duplicate series. A trench was excavated 8 feet long, 2 feet wide, and 13 inches deep, and the two series of cages were placed side by side in the trench. The object in using the cages was that each might be handled separately and the soil washed out at the conclusion of the experiment with the least possible disturbance of the turf and the roots.

The cages were then filled with soil materials as follows:

Cages 1 and 9; 4 inches of loam at the bottom, 4 inches of sand next above, and 4 inches of compost on top.

Cages 2 and 10; 4 inches of compost at the bottom, 4 inches of loam next above, and 4 inches of sand on top.

Cages 3 and 11; 4 inches of sand at the bottom, 4 inches of compost next above, and 4 inches of loam on top.

Cages 4 and 12; 4 inches of sand at the bottom, 4 inches of compost next above, and 4 inches of soil on top.

Cages 5 and 13; 4 inches of sand at the bottom, 4 inches of loam soil next above, and 4 inches of compost on top.

Cages 6 and 14; filled entirely with ordinary clay loam soil in the natural order in which it was found in the turf garden.

Cages 7 and 15; filled entirely with compost.

Cages 8 and 16; filled entirely with sand.

When these cages were thus filled there still remained a depth of 1 inch to bring the surface to a level with the surrounding surface. One inch of clay loam was accordingly added to each cage, and in this the seed bed was prepared. The purpose of this was to give the young grass an equal chance to get established in each cage. Bent stolons were used in this experiment.

The experiment was begun on April 1, 1923, and throughout its duration all of the cages had the same treatment. They were watered liberally, top-dressed consistently, and kept cut down to putting green length at all times.

The results from all the series were measured in quality of turf. The turf produced on the natural soil was the best of the series. That produced on 4 inches of soil on top was the second best. The poorest turf was on the 12 inches of sand, while the series with 4 inches of sand on top produced very poor turf. The last two series suffered during extreme heat, and at times from lack of sufficient moisture, more than any of the others. The 12 inches of compost, and likewise the cages with 4 inches of compost on top, produced a vigorous growth of grass, but it was too coarse for good turf. The turf on compost showed indication of the need of more water during the summer months than did that on loam. All things considered, the natural soil gave best results. There was very little difference in root growth. The only difference of any consequence in this respect was that on the natural soil the roots and runners seemed to form a denser and more closely woven mat near the surface than they did on the other plots, and this is a very important factor in turf production.

In April, 1924, cages numbers 1 to 8 were lifted, soil, grass, roots, and all; and by playing a fine spray of water over them the soil was washed out, leaving the turf and roots practically undisturbed.

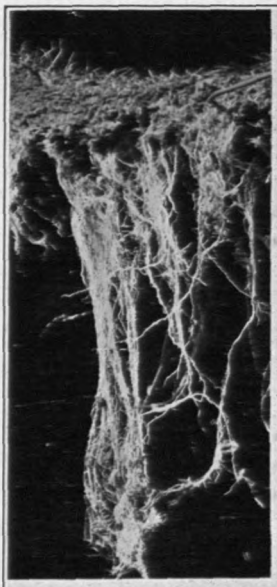


Fig. 1. Winter root growth in 12 inches of sand.

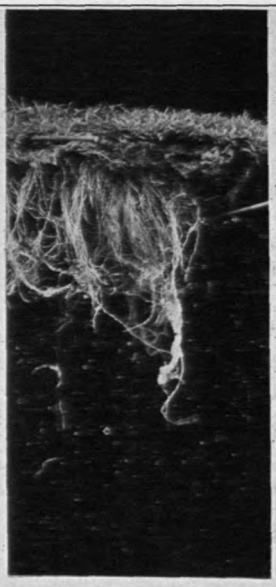


Fig. 2. Winter root growth in 12 inches of loam.

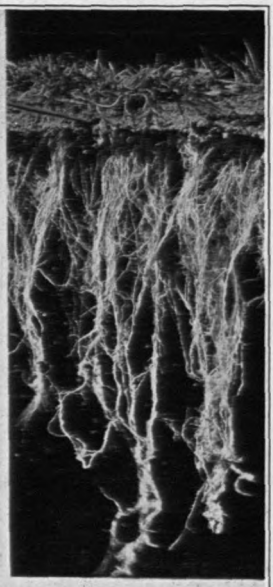


Fig. 3. Winter root growth in 12 inches of compost.

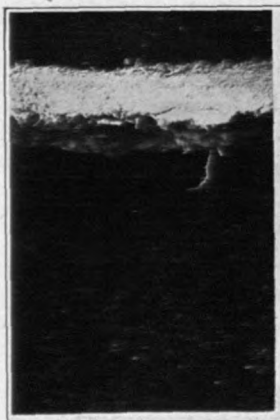


Fig. 4. Summer root growth in 12 inches of sand.

Fig. 5. Summer root growth in 12 inches of loam.

Fig. 6. Summer root growth in 12 inches of compost.

In the accompanying illustrations, figure 1 shows the winter root growth in 12 inches of sand. Figure 2 shows the winter root growth in 12 inches of loam. Figure 3 shows the winter root growth in 12 inches of compost.

In October, 1924, cages numbers 9 to 16, duplicates of the series 1 to 8, were lifted, and washed out in the same manner. The object in lifting these in the fall instead of in the spring was to study the effect of the summer season on root growth as compared with the effect of the winter season. Figure 4 shows the summer root growth in 12 inches of sand. Figure 5 shows the summer root growth in 12 inches of loam. Figure 6 shows the summer root growth in 12 inches of compost.

These results show that during the summer, while the grass is active or growing, there are practically no deep roots developed in any of these

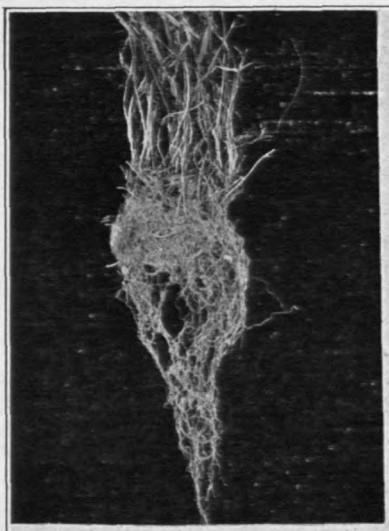


Fig. 7. Tall grass and its correspondingly long roots.

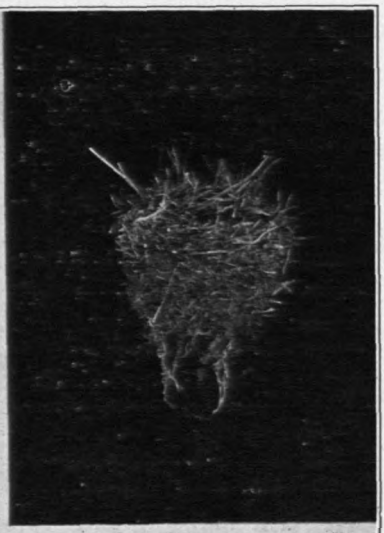


Fig. 8. Closely clipped grass and its short roots.

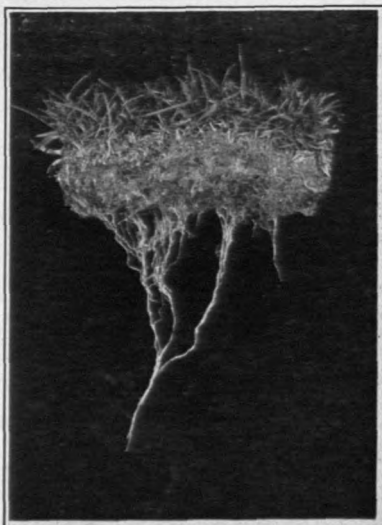


Fig. 9. Good turf. Properly fertilized.

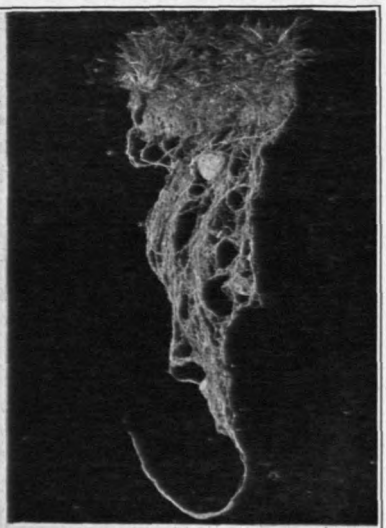


Fig. 10. Poor turf. Starved.

soils, whereas during the winter the portion of grass above the soil surface develops very little growth but the roots go down deep. The results were relatively the same in each of the combinations of soil used in this experiment, which indicates that the different soil combinations have very little effect on root growth.

The turf grasses known as perennials are perennial only as turf. The individual shoots are not perennial. These grasses form and support a perennial turf only by a succession of shoots. As new shoots become established the old ones give way to the new ones and die out. The duration of these individual shoots varies. The extent of the variation is unknown, but indications are that there are only a very few, if any, of the individual shoots of the common turf grasses that live more than one year under turf

conditions, and most of them probably live only a few months. During the growing season there is a constant succession of shoots. During this season the roots, instead of growing down deep in the soil, develop near the surface, aiding materially in making that dense resilient mat which is so desirable in putting green turf. These roots must receive their supply of moisture and food from a limited depth of soil, which is one of the many reasons why it is desirable to water and top-dress turf frequently and liberally during the summer months.

As winter comes on the growth of the shoots is checked by the low temperature. Mowing is discontinued and the succession of shoots stops; that is, the shoots which are present in the late fall exist throughout the winter, and during this period of relative dormancy a deeper root system is developed. In spring, when the new shoots begin growth, the old roots, as well as the old shoots, die, as new ones are produced to take their place.

There are methods of treatment which will influence root growth, but in most cases to effect such an influence is impracticable and the results are undesirable. For instance, if the grass is allowed to grow tall the roots will grow longer and deeper; that is, the length of the root will increase in relative proportion to the height of the grass. Figure 7 shows tall grass and its correspondingly long roots. Figure 8 illustrates closely clipped grass and its short roots. This relation has been studied in Rhode Island bent, creeping bent, Kentucky bluegrass, and red fescue, and the results of such treatment are relatively the same in all cases. In most instances during the summer and fall the roots of these grasses are on the average about equal in length to the individual upright shoots, varying in relative proportion very little except where some other influence is present. During the winter and early spring the roots are much longer than the shoots. Sometimes they measure as much as ten or twelve times the length of the shoots.

Another factor which influences the root growth of these grasses is that of surface fertilization. When grass is fertilized in such a way as to keep the turf in good condition on the surface the root system is composed mainly of short roots which remain near the surface, whereas if the grass is starved, the roots go down deeper but the turf becomes thin and poor. Figure 9 illustrates a piece of good turf, which has been properly fertilized. Figure 10 illustrates a piece of poor turf, which has been starved. Note the longer roots of the latter. These results show that deep roots can be developed—that is, if the quality of turf is disregarded. But to practice such methods on a modern golf course, where water and other facilities are available, is to ignore the principal object of greenkeeping, the production of and the maintenance of the quality of turf best suited to the game of golf.

The results of these experiments indicate clearly that the most practical thing to do in constructing putting greens or preparing seed beds for turf grass, is to build with natural soil, using only such other materials, sand, clay, or organic matter, as may be necessary to bring about the desirable texture (a medium loam type of soil being preferable in most instances). Plant the seeds or stolons, as the case may be, on such a seed bed. Save the bulk of expensive manure, fertilizer, and other material for top-dressing the greens after the grass is established, and by proper care control the growth of the grass by treatment on the surface—and forget all about root growth.

Grasses at the Country Club of Havana

By Frederick Snare

The crossing of the Gulf of Mexico from the United States should be an interesting experience to any traveller—it is, sometimes, to the poor sailor. Here there is a distinctly noticeable change in architecture, people, language, customs, climate, and soil, and conditions generally are quite different. I have noticed, however, that despite these considerable variations from the temperate zone, the golf microbe works just the same in the tropics as elsewhere, encouraged perhaps by the geniality of the climate and the character of the game.

In the development of golf links in Cuba we have been greatly helped by the natural conditions. It has been necessary for us only to discover the grasses obtainable in Cuba which will give the best results, because the years of study and development of grasses in the temperate zone with their fixed conclusions help us but little. We can not grow the fine grasses of the temperate zone successfully in Cuba, nor can cane sugar be produced in the North as it is here.

In Cuba, previously to 1912, there were no links, and very few people in Cuba who knew the game, so that it has been a unique experience to be a pioneer in the development of golf links in a tropical foreign country, consequently quite free from tradition or experience to guide in the important matter of suitable grasses, and incidentally to have practically no scientific knowledge to suggest or guide in that work.

The Country Club of Havana has built links on what was practically a deserted farm land or private estate in the suburbs of Havana, covered at the time of selection with *manigua*, which is a dense growth of tropical brush, so dense in fact that it took two weeks of the time of an ex-greenkeeper of the Englewood Golf Links to cover the 130 acres and make a report as to its possibilities. I recall also taking an hour to make my way through the length, before it was cleared, of what is now a 325-yard hole. This report indicated at least that the soil was rich; one-half of it was alluvial deposit from a stream which flows through the property. What convinced me of the possibilities was not only the character of the soil but a cropped patch of *herba fina*, or Bermuda grass, growing under a tree on the property; and knowing the prolific growth of this grass in Cuba I imagined we would have no difficulty in producing a good fairway and perhaps reasonable greens.

This was twelve years ago and before we had much knowledge of what is now called "vegetative planting." Our information as to that method of planting came from Jamaica from a former English resident of Cuba, but it differed in the respect that they chopped the Bermuda grass and mixed it with wet soil and spread the mush on the area to be developed, and, as far as I know, they probably still adhere to that system of planting of greens, lawns, and the like; but we varied it by a dry mixture soaked on the spot. We used the vegetative system in planting the fairways, but experience has shown that if we had simply cleared the land and been patient the Bermuda in time would have appeared just the same. It is astounding how fast it travels in the favorable season. One hole we did not plant at all. In clearing it we found an old Mauser shell in which the Bermuda had taken root, sprouted, and grown so dense that it required quite an effort to dig it out. With the exception of this one hole we planted all the fairways in Bermuda. To-day there is practically none of it visible;

but we have something better. On our rich alluvial soil, in the river bottom particularly, we were troubled in the dry season with considerable cracking of the fairway.

It is for the experts to say why; but the fact is, that in about six years nature had supplanted this Bermuda with an entirely different product, namely, *cana maza* (mat cane), or what Dr. Piper tells us is Bahia grass. Resulting from this grass, the soil is protected, as the grass really does form a mat. Cracks are little in evidence, lies are perfect, and we pay no attention to divots, as they naturally fill up quickly themselves.

As to the putting greens, we planted a nursery of all the known Northern grasses. These flourished for a moment only. In the nursery we tried Italian rye grass, and have also several times since. It failed. Bermuda became our sole reliance. In a very few months after planting we had greens—thin, fast, wiry, dry—far from ideal. We experimented with various top-dressings, and finally discovered that the refuse of tanneries sifted made an excellent dressing, and we still use that when necessary. We found a real soaking of the greens to be necessary to soften the texture of the grass. So with varying experience we came two years ago to the discovery of a new grass. Dr. Piper states in the November BULLETIN that the grass which he named on his visit to Havana as Acapulco was not reported by the botanists who explored Cuba previously to 1906, and that it therefore is an introduced grass, being indigenous to Acapulco, Mexico. As the sample with which we first experimented came from Belot, across the harbor of Havana from the city on a peninsula occupied by the West Indies Oil Company, which company has vessels plying between Mexico and Cuba, it is possible that the grass arrived in Cuba by that route.

Bermuda in Cuba is hardy. It grows on cinder, sand, and stony soil, but it is not perfect on putting greens at all seasons of the year; and of course we play golf in Cuba twelve months of the year. There are six months of dry weather with only occasional rains, and the other six (May to December) are the rainy season, during which there are torrential downpours. These rains are hard on Bermuda greens; the grass does not grow dense, the greens wash out, and we have had to do considerable top-dressing. Also the rainy season retards the Bermuda, or rather encourages a weedy grass; and during the months of September, October, and November our greens are at their worst.

On the arrival of the winter dry season, the Bermuda takes a fresh start and the weedy grass gradually disappears, when with sprinkling and top-dressings the greens are quite good. Bermuda is fine for several years after a fresh planting, but in our experience after that time it becomes coarse and weeds appear. Another objection to the Bermuda is the wiry nature. The greens must be cut just right. If the grass is too long, accurate putting is interfered with.

The Bermuda in Cuba takes an enormous amount of water. The greens for good putting must be soft, and noticeably so, underfoot, so that in the dry season between the effect of the dry trade-winds and daily sun we need to use as much as 40,000 gallons of water on the greens in 24 hours.

One of our members observed this Acapulco growing at Belot, brought a patch about six inches square to the Club, and had it planted on the clock golf in the corner. This was about seven years ago, and it has spread out over an area of about eight feet square, and it was the result of that experiment which induced us to introduce it on the greens.

We were building a new green two years ago and meanwhile found

the same grass growing a few miles away on the boundaries of Colon cemetery. We gathered and planted from that source, and have had the green constantly in use these two years.

These are the points about the grass: it grows dense and forms a close mat; the tropical rains do not affect it; it does not require much water; worm casts are less in evidence; it responds to ammonium sulfate as well as does Bermuda; it need not be cut close for good putting; it must not be cut close enough to expose the runners; although cut long, it makes a faster green than does Bermuda; there is no wiry condition to overcome; it is not a pretty grass, but turns a brownish cast for a day or two after cutting; it is too strong for the weeds at any season; it even crowds out the Bermuda.

We figure from observation that by inserting 100 square feet of Acapulco sod in distributed patches over any average green of 5,000 square feet, the natural spread will, in three years' time or less, give us Acapulco over the entire green.

We have just completed a promising job which may be of interest. The line of play on seven of our holes crosses a stream. While the stream is not over 10 feet in width and does not have a considerable flow of water, yet the loss of balls and the recovery of them from this stream have been the cause of great annoyance. Torrential downpours and enormous swelling of this stream have barred any mechanical devices which we could conceive which would not be carried away by the floods. But we have done this: at the crossings of the stream we have filled up the pools and other depressions, producing a continuous level about a foot below the normal water-level, with mixed clay and brush filling; this we have topped off or riprapped by a hand-placed and tamped stone layer, resulting from which we now have a rippling stream about six inches deep, and balls are visible and quickly recovered. This work has not been terribly expensive.

Some U. S. Golf Association Decisions on the Rules of Golf

In a handicap golf match held over our course, the rules for the match called for eliminiation play with repairings each day until the field of players was reduced to five participants. These five participants were then to play a round-robin for the finals, on handicap basis. During the round-robin play several of the matches tied. It was then necessary to determine what course should be pursued in determining the winner of the round-robin play. No local rule has been made before the match started to cover the method of deciding ties. We could find no specific United States Golf Association rule covering the method of deciding tie match when play is on handicap basis, and it was accordingly decided by the committee in charge of the match and the participants who had tied, to play another round on the same handicap basis as applied to the round which was tied. Please advise us what our procedure should have been, and give the national rule covering the method of deciding tie rounds on handicap basis and how handicap should apply.

(Decision) Your question is one which arises continually. We have always decided that handicap tie matches should be played over again. We consider that your local committee took the proper action.

A question has arisen in our district regarding handicaps. We are handicapped in accordance with the Calkins system, using our five best cards to obtain the average scores, subtracting the average from par, and

taking four-fifths thereof to determine the handicaps. One of the members of our committee insists that a person winning a tournament (we have local monthly tournaments) should have her handicap cut. I contend that the handicap is based solely on the cards and that unless a person plays down or below the handicap it shall remain where it was before winning. Kindly let me have a ruling in this matter.

(Opinion) It is our opinion, this not being a question under the Rules, that inasmuch as your district has adopted the Calkins system of handicapping, it is obvious that to cut the handicap of a player solely because of running a tournament would be a departure from the regulations of the Calkins system and inconsistent with the object of that system.

Under Rule 15, has a player at any time and under any circumstances the right to move, bend, or break branches of a bush or tree with his hands in taking his stance in addressing the ball?

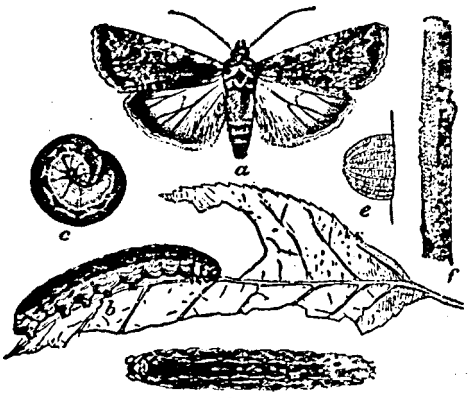
(Decision) A player has not such right.

Is a player permitted to sole his club in a trap when the ball is lying not on the sand but on grass?

(Decision) Grass within the confines of a hazard is part of the hazard, and therefore a club may not be soled if the ball is lying on the green.

Injury to Turf from Cutworms

Reports were received in the late summer of 1924 of injury to putting green turf from cutworms in Pennsylvania and some of the New England states. Although damage to cutworms is confined mostly to cultivated crops, yet serious injury to putting greens is not uncommon.



Variegated cutworm (Peridroma margaritosa): (a) moth; (b) normal form of caterpillar, side view; (c) same in curved position; (d) dark form, view of back; (e) greatly enlarged egg, seen from side; (f) egg mass on twig.

Injury from cutworms occurs in the spring and continues more or less through the summer. The worms feed at night and remain concealed during the day beneath debris or in the soil at a depth of from one-half to one inch. Their activity causes brown patches in the turf, and their presence can be detected by spading the killed turf and carefully examining the soil.

The worms may be killed by spraying or sprinkling the infested turf with a solution of two pounds of powdered arsenate of lead in 50 gallons of water, or by the spreading of poisoned baits prepared in the following manner:

Wheat bran	50 pounds
Paris green or crude arsenic	2 pounds
Blackstrap molasses	2 quarts
Water	2 to 4 gallons or more as needed.

Mix the poison and the bran thoroughly together, in a dry state, add the diluted molasses, and stir vigorously until thoroughly mixed. Distribute this bait over the infested area broadcast. In case bran can not readily be obtained, middlings or alfalfa meal may be successfully substituted.

Where bran or other fillers for poison baits are prohibitively expensive or difficult to obtain in sufficient quantities, they may be diluted with equal parts of fresh hardwood sawdust. The formula for poison bait prepared in this manner is as follows:

Paris green or white arsenic	2 pounds
Fresh hardwood sawdust	25 pounds
Wheat bran	25 pounds
Molasses	2 quarts
Water	4 to 8 quarts
	or more as needed.

This mixture is not quite as efficient as the poison bait containing the entire amount of bran, but it has shown good results and may be used to advantage when necessary. Pine sawdust should not be used, as this seems to repel the insects.

Where only a small quantity of poison bait is required the following formula will be found most convenient:

White arsenic or Paris green	1 pound
Dry bran	1 peck
Molasses	1 pint
Water	2 to 4 quarts
	or more as needed.

It is often advantageous to allow the mash thus obtained to stand for several hours before using; this seems to result in greater effectiveness.

In areas known to be infested the distribution of this bait should be started early in the season so that the cutworms may be eliminated as quickly as possible. During the warm spring months cutworms do most of their feeding at night and burrow into the soil to the depth of an inch or two during the day; the bait will, therefore, usually be more effective if applied during the late afternoon or early evening hours.

Caution.—Poison bait should be distributed thinly. Prevent domestic animals, including fowls, from eating it. Arsenic and Paris green are poisonous to animals.

How to Use Manure

In seeding turf grasses a firm seed bed is first essential. In our opinion you can make much better use of your manure by composting it with top soil in the proportion of one-fifth manure and four-fifths top soil, and applying this compost as top-dressing to your greens after the turf has become established. All the fertilizer necessary in growing fine turf can be applied on the surface, and often more harm than good results from incorporating manure in the soil before seeding, especially since if manure is incorporated into soil in considerable quantities it will attract grubs and other insects injurious to turf. We would advise you to depend entirely for your fertilizing on later applications of top-dressings and ammonium sulfate.

QUESTIONS AND ANSWERS

All questions sent to the Green Committee 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 each month. If your experience leads you to disagree with any answers given in this column, it is your privilege and duty to write to the Green Committee.

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.

1. Texture desired for compost.—We are sending you two samples of soil on which we would appreciate your advice. The sample tied with the black cord represents the texture of our soil from the ninth green; the other, the one with the white cord, is the black dirt with which we have been top-dressing our greens. What we want to know is, do you recommend using sand with the black dirt as a top-dressing for our greens, or would you advise our using it without sand? Should we use something in the form of heavy clay or heavy soil with the black dirt? (Michigan.)

ANSWER.—Your native soil is a silt loam—a fairly desirable type of soil for a golf course. Your top-dressing soil we are not quite able to make out, but we think it would be better if you put in a smaller percentage of sand and perhaps a larger percentage of vegetable material. The vegetable material (leaf mold or well-rotted manure, or both mixed) should never be more than one-fourth of the total constituents, but the whole compost to be of the right texture should be such that it will compress like a ball but break readily apart. Your material looks as if it contains so much sand that it will not hold together when pressed into a ball in the hand. Except for this it looks like good top-dressing material.

2. Spring treatment for improving thin putting green and fairway turf; value and use of top-dressings of compost; value and use of woods soil and cottonseed meal; controlling crab grass; rolling greens.—The soil of our greens consists of four inches or more of rich clay loam containing a little sand from side hill washings, but no additional sand nor any compost were mixed in the soil. On top of this was placed a layer of ½ to 1 inch of leaf-mold obtained from the woods and mixed with sand. The greens were seeded with a mixture of bluegrass, redtop, and fescue. They were top-dressed last year four times with a mixture of two parts of top soil from the woods and one part sand, to which 25 pounds of cottonseed meal were added per green. Early last season the grass on the greens was satisfactory, but toward the end of the season the turf became thin. We have no compost for top-dressing this year but hope to have some ready next year. We still have some of the top soil from the woods available for top-dressing, however. What would you suggest that we mix with it? Would it be advisable to reseed the greens lightly this spring with redtop? Two of our greens were badly infested with crab grass last fall, so badly that if they had been weeded there would have been no grass left. What can you suggest as a remedy for this condition? Would it be advisable for us to take up the sod of these greens and throw it

away and start over again? Is it necessary or advisable to roll greens if they are top-dressed regularly? Is there any advantage in using a spiked roller on greens? The grass on portions of our fairways which are on side hills has not done very well. The soil is clay, and we have more or less trouble from washings. These side hills were fertilized with sheep manure last fall, and this spring we expect to apply additional sheep manure. The grass appears in bunches, probably the result of heavings from frost. (Wisconsin.)

ANSWER.—Most wood soils are good for grass, especially if they can be composted for a short time with manure. We believe that a compost of this kind would be very helpful to your greens. You should get your materials together for a compost pile without delay. Our experience is that excellent results can be obtained by the use of compost and ammonium sulfate as a top-dressing, to be used in place of other fertilizers. As a rule the compost should consist of not to exceed one-fourth organic matter (well-rotted manure or similar materials), and the remainder loam or clay loam and sand. We top-dress our experimental greens at least three times a year, using compost and ammonium sulfate, the latter at the rate of about 3 pounds to 1,000 square feet of surface covered. Ammonium sulfate applied with compost has done more in our experience to thicken the stand of grass than any other treatment we have used. It is certainly much to be preferred to reseeding. We suggest that one application be made in early spring after the grass starts growing nicely, a second application late in spring, and a third application in early fall. Bear in mind that ammonium sulfate will scorch grass if it is applied too heavily. Cottonseed meal seems to be a good fertilizer for grass. While it is not as quick in its action as ammonium sulfate and does not scorch the grass as readily, yet it does scorch grass if applied improperly. The early spring applications of ammonium sulfate would probably not require the use of water to prevent scorching, but water should be used in connection with the late spring and early fall applications. As for reseeding greens, we have obtained little benefit from reseeding, especially in the spring. However, in your part of the country it is possible to thicken thin turf by reseeding with such grasses as redtop and bent. Bent, of course, is preferable to redtop for greens, but for temporary greens redtop will answer well. The indications are also that by scattering clipped runners of creeping bent in thin turf in the fall, and then top-dressing, the stand of grass will be quickly improved; this plan is, however, still in the experimental stage. Regarding crab grass, the essential thing is to pull out the young plants before they have had a chance to grow and spread. If the weeding is done when the crab grass plants are still seedlings, one laborer can weed as large an area in a day as three can in the same time after the plants have started to spread. We are inclined to think it would be well to consider remaking your badly infested crab grass greens. Crab grass is an annual, developing each spring from seed; but where it has been allowed to flourish the soil is sure to be filled with its seed in the spring. As for your fairways, in the absence of well- rotted stable manure, we would suggest that you apply bone meal at the rate of 500 to 600 pounds to the acre. Most sheep manure we have seen in bags for sale seems to have been badly leached out before it was put on the market. As for rolling, we believe that fairways should be rolled once a year, in the spring, after the frost is out of the ground. We do not regard the spiked roller as a useful implement; in fact, in most cases we advise against its use.

3. Bermuda grass and Japan clover (lespedeza) for quick results on fairways.— Our fairways have never been fertilized. The soil is a very heavy clay. For several years the fairways have been gradually getting bare in spots, especially some rather steep inclines. Last December we top-dressed these bare spots with 3 inches of ordinary stable manure. So you may have some idea of the extent of area thus affected I might add that we used for this purpose about 175 loads of manure. It is our intention to rake this manure up with a smooth rake at the beginning of the growing season, about March 1, leaving just sufficient of the manure on the bare spots to be the equivalent of a heavy top-dressing. It is suggested by some that these bare spots then be sown with Bermuda seed. As we are not sure that the sowing of additional seed is called for, I should be glad to have your opinion in the matter. (Tennessee.)

ANSWER.—We would advise you to sow these bare spots with Arizona Bermuda seed, or else plant them with roots or stolons of the Atlanta strain of Bermuda grass. The Arizona Bermuda seed carries only a small percentage of seed of the Atlanta strain. It would be well, therefore, for you to start a nursery of the Atlanta strain of Bermuda grass from runners, in soil entirely free from ordinary Bermuda, in order that you might have pure Atlanta Bermuda for patching purposes. As the planting of the roots or stolons is sometimes somewhat of a nuisance, especially on fairways under use, it might be best for you to seed your bare spots about May 1, or as soon as the summer rains start in. We would also recommend that you sow Japan clover, or lespedeza, along with the Bermuda seed. While Japan clover is an annual, lasting but for one season, it develops rapidly and makes a very satisfactory fairway turf while the Bermuda is getting established.

4. Thickening turf of putting greens; rate of application of compost and ammonium sulfate.— We will hold a tournament on our course during the last week in June and are anxious that our greens be in fine condition at that time. Our greens were seeded to German mixed bent. Two of them are in rather poor condition, and while they are slowly improving we doubt that they will be in perfect condition by the time of the tournament. What treatment would you advise to get quick results? (Nebraska.)

ANSWER.—There are two methods by which you can get quick results in thickening your bent turf. The first is by vigorous fertilizing. We would advise vigorous fertilizing by frequent top-dressings and by frequent applications of ammonium sulfate. The ammonium sulfate should be applied at a rate not to exceed 3 pounds per 1,000 square feet, and at half this rate in hot weather, and should be well watered in to prevent burning. The top-dressings should be of compost to which ammonium sulfate has been added, and should be at the rate of about 1 cubic yard to 5,000 square feet. The second method is by seeding the thin spots with redtop, which germinates quickly and makes rapid growth in its young stages. If your greens are in fair condition we are inclined to think that applications of top-dressing and ammonium sulfate will bring them to a fine condition by the end of June. If, however, the turf is in poor condition, we would advise the application of redtop seed.

5. Architecture of and grasses for tees (northern).—What is the best type of grass for tees in this section of the country? Our tees are well worn, and we want to reseed or reset them, and would like to know what the toughest

grass is that we can put on the tees to withstand the hard wear. (Ontario.)

ANSWER.—First of all, a tee should be constructed on the natural ground level, where that is practicable. A built-up tee is never desirable except for the purpose of securing visibility or drainage. We consider it much easier to obtain good turf, provided the drainage conditions are naturally good, on a natural ground level than on a raised plateau. Furthermore, on a natural ground level you can mow the tees simply with a fairway mower, and you can also make the area relatively larger so as to provide for changing the location of the tee, a practice which is of great help in the avoidance of excessive wear on a single spot of turf. If you have built-up tees on ground of this character we would suggest that you tear them down and use the natural ground level wherever practicable. If, however, you have some raised-up tees or small built tees which can not well be rebuilt with larger areas, we do not think you can do any better in the matter of grasses on these tees than using the redtop-bluegrass mixture (4 pounds of bluegrass to 1 pound of redtop). In the latitude of Washington it is very desirable to have a tree or group of trees on the south side of a tee where possible in order to shade the tee, not only for the benefit of the golfers, but because grass can be maintained much better in the shade than in the open.

6. Effects of manure and ammonium sulfate on the presence of earthworms.—We have used ammonium sulfate with success in bluegrass turf, in the following manner. Up to midsummer, each time a green was weeded it was dusted with 50 pounds of bone meal mixed with 5 pounds of ammonium sulfate, and then well watered so as to wash the ammonium sulfate into the soil. After that there were very few earthworms in the greens, while previous to this treatment the greens were heavily infested with earthworms. Do you think the use of ammonium sulfate has a tendency to discourage the development of earthworms? (Missouri.)

ANSWER.—The use of ammonium sulfate certainly does tend to discourage earthworms. On the other hand, manure has a tendency to increase the number of earthworms in the soil. In other words, organic substances appear to provide food for the worms, while ammonium sulfate and other chemicals discourage them.

7. Cottonseed hull putting surface to withstand excessive blowing.—We have experienced considerable difficulty in keeping sand on our putting surfaces on account of excessive wind which we have at certain seasons of the year. In THE BULLETIN, March 1924, page 77, is an article describing cottonseed hull greens at El Paso, Texas. Do you know whether a cottonseed hull surface will withstand excessive winds, and what the cost of the hulls is? (Wyoming.)

ANSWER.—Reports we have from El Paso indicate that the cottonseed hull surface is successful in withstanding heavy winds. The hulls are said to sell for about $14 a ton in car lots at El Paso. It takes about 2 tons of hulls for a putting green. Best results are secured when the mat of hulls is laid about 1½ inches thick.

Boost the Green Section

Meditations of a Peripatetic Golfer

Did you ever try to thicken the grass on your putting greens by an application of fertilizer? It beats reseeding all hollow.

Filling up the soil with manure, sand, etc. is not the way to get turf that is resilient. If a bent green be top-dressed frequently you can soon get thick turf with all the "bite" you may desire.

The greenkeepers in America are the best in the world, and they are getting better every year. Keep up the good work.

Charcoal sweetens the soil, they say. Maybe it does, but why sweeten the soil?

With such fertilizers as ammonium sulfate and ammonium phosphate available for putting greens, why give the "mysterious" type even courteous consideration?

Did you notice how well the greens looked after the ice sheet melted?

Statistical information: Recent studies show that the lawns of golfers are 47.3 per cent better than those of non-golfers.

If any one advises you to lime your course or to sow red fescue seed—shoot him in the early morning, the earlier the better.

Much of the work of the Green Section has been to educate golf clubs away from foolish things. Some of the things to let alone are lime, red fescue, humus, sowing seed on well-established turf, charcoal, salesmen who offer commissions, sowing seed in spring.

Don't be selfish if you have a good thing. Share it with your fellow-clubs. Induce each to become a member of the Green Section.