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Coming District Green Section Meetings

A meeting of the Philadelphia Green Section will be held on June 23 at the Whitemarsh Valley Country Club, Chestnut Hill, Philadelphia. The meeting is to be very largely a demonstration of equipment of various kinds, to be followed by a short session after the dinner. Further information may be obtained from the Service Bureau, Philadelphia Green Section, 508 Harrison Building, Philadelphia.

The Green Section meeting of the Central Illinois Country Club Association, to be held at Peoria, previously announced for June 22, has been postponed until the afternoon of June 25. Further information may be obtained from Mr. Ross P. Seaton, Country Club of Peoria, Grand View Drive, Peoria.

The regular monthly meeting of the St. Louis District Green Association will be held on June 26 at the St. Clair Country Club, East St. Louis. Further information may be obtained from Mr. W. L. Pfeffer, Superior Manufacturing and Supply Co., 512 Lucas Avenue, St. Louis.

Washington Bent

By C. V. Piper

There has been a great deal of complaint because bent stolons purchased as "Washington bent" have not been true to name, but have proved to be some inferior strain. This is a matter over which unfortunately the Green Section can exercise no supervision. One must rely on the care and the integrity of the dealer. Perhaps the only way out of the difficulty is to demand a guarantee of some sort. At least one dealer in stolons is willing to await payment from each of his customers until he is satisfied.

Some people distributing Washington bent are perhaps under the impression that any strain of bent which has come from Washington is Washington bent. This is erroneous. Washington bent is a particular pure strain which is the best of all creeping bents thus far found.

If you have had unsatisfactory experience with Washington bent, the chances are that you did not have the genuine thing.

The Maintenance of Vegetative Bent Greens

There are only four things important in keeping vegetative greens in perfect condition, namely: (1) topdressing; (2) ammonium sulfate or ammonium phosphate; (3) ample watering; and (4) keeping the grass cut short.

1. Topdressing should begin in spring as soon as the grass starts to grow. Use 1 cubic yard of compost to each 5,000 square feet of turf. Thereafter topdress once each month during the growing season. Not more than one-fifth of the compost should be manure.

2. Use ammonium sulfate or ammonium phosphate mixed in each topdressing. Use 25 pounds to each cubic yard of compost up until the time of warm weather, then reduce to 15 pounds, or in very hot weather to 10 pounds. Thus mixed there is no likelihood of burning the grass. However, it should always be watered in. After a certain degree of acidity is reached, clover and other weeds disappear and worms cease to trouble.

3. Water enough to keep the grass vigorous. In the brown-patch

season, watering before sunrise with a strong stream helps greatly to prevent brown-patch injury.

4. The grass should be kept cut short. It is well to mow every day.

The above are the methods adopted on the experimental plots at Arlington after a great deal of experimenting. Do not do anything else than advised above.

Washington bent is still the best strain.

Acid Soils for Putting Green Grasses*

By R. A. Oakley

Since the subject of acid soils has been brought very prominently to the attention of greenkeepers recently it would appear helpful to discuss it at this time in a very popular way. Farmers and other plant-culturists very generally have the notion that acid soils ("sour soils," as they call them) constitute one of the greatest drawbacks to crop plant production. The following is typical of a very large number of inquiries which reach the Green Section: "The turf on our greens is poor. We think the soil must be sour." It seems to be true that many of our important crop plants thrive better on soils that are neutral or slightly alkaline than they do on acid soils; but it is not correct to generalize from this that all plants prefer soils that are non-acid. As for our cultivated turf grasses, notwithstanding the many years they have been grown and studied it is regrettable but true that their soil relations so far as acidity is concerned have in no case been critically determined. It appears to be true, however, that at least the bents and fescues—that is, the ones that we use in making putting greens—are so constituted as to thrive vigorously on acid soils. When it is said that the soil relations of our turf grasses, so far as acidity is concerned, have not been scientifically determined, it is with full appreciation of the fact that there is almost an overwhelming notion that Kentucky bluegrass is a species that requires a so-called sweet soil for its best growth. Furthermore, it is very generally thought that it requires a soil well supplied with lime. It is not the intention here to attempt to break down this view. It is merely wished to call attention to some points which should be borne in mind. They are these: Largely because Kentucky bluegrass grows so abundantly and well on the limestone soils in the northeastern one-fourth of the United States and under similar conditions elsewhere, it has more or less naturally been assumed that it requires sweet soils with much lime in them for its best development. The fact that these soils are what we call rich soils, for reasons not directly related to their lime content, has not been taken fully into account. There is abundant evidence to indicate that what Kentucky bluegrass requires for its best growth is a rich soil, and some evidence to indicate that such soil need not be sweet in the commonly accepted sense of the term. For example, in certain parts of the Pacific Northwest on soils that are acid and low in lime content, Kentucky bluegrass flourishes abundantly. There is also some experimental evidence to support the view that Kentucky bluegrass can be grown with much success on acid soils if they are rich in what is called available plant food. We hope to get some very definite data on this subject from experiments already under way. This may mean much to us in developing a practice of fertilizing bluegrass fairways with the view to controlling weeds.

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

The writer does not profess to know much of the theory of soil acidity. He is very much of a layman when it comes to the technical features of this phase of soils. But interesting as it may be, we need know little about it for the practical work of greenkeeping. Let us accept the empirical facts and utilize them to the fullest extent possible. We know that when ammonium sulfate or ammonium phosphate is applied to bent turf as it should be applied, and other cultural factors are as they should be, these fertilizers will assist greatly in producing good clean turf. We also know that they will tend to make the soils to which they are applied acid, and their continuous and systematic application will tend to keep these soils so. But our good friend the greenkeeper says, "I have used ammonium sulfate for some time and still I have white clover and other weeds in my greens." Very well, but when we examine his soils we find them to be neutral or even slightly alkaline, regardless of the fact that he has used ammonium sulfate liberally. Probably at some time he has used lime on his greens, or nitrate of soda, or both. Our friend the greenkeeper then wishes to know how he can test his soil so that he may see for himself just how he is progressing in the matter of getting it acid.* Technically the test is one which measures the p^H or hydrogen ion concentration of the soil. But all those making it need to know or do about this technical feature, is to regard p^H , or hydrogen ion concentration, merely as marks on a scale. When a putting green soil shows 6.9 p^H by this test it is not sufficiently acid to keep white clover or crab grass or goose grass or chickweed out of bent greens. It must get to about 4.5 p^H before results in this direction are reasonably to be expected.

For our purpose we may assume that it is the sulfate part of the ammonium sulfate and the phosphate part of the ammonium phosphate that makes soils acid; and we must bear in mind that we must use these fertilizers more or less continuously if we are to keep soils acid once they get into this condition. Soils seem to have a tendency to go back to their original condition when fertilizer treatment is discontinued. Our problem in this regard is how to get soils acid quickly without injuring the turf growing upon them or impairing their value for turf production. In the natural course of events, our fertilizer treatment, if we use ammonium sulfate or ammonium phosphate in conjunction with compost, will keep soils at about the proper acidity.

If you are still troubled with white clover and crab grass on your greens after liberal use of ammonium sulfate or ammonium phosphate, do not think them ineffective in controlling these weeds. Your trouble is probably due to the fact that your soil was high in its lime content when you started. Possibly also you have used alkaline-reacting fertilizers in conjunction with ammonium sulfate or ammonium phosphate. The thing to do is to continue with these fertilizers in the way it has been found best to use them. Desired results are sure to follow.

Don't build your tees too small.—The only way of being assured of constantly having turf from which to tee is to build your tees amply large. Under ordinary conditions 250 square feet should be the minimum space devoted to teeing grounds; if more space is available, so much the better.

* "The Use of Bromocresol Purple in Testing Soil for Acidity." BULLETIN OF THE GREEN SECTION, January, 1925, page 8.

Beautifying the Bunkers

Two views of No. 3 Hole, Burning Tree Golf Club, near Washington, D. C., showing how much more attractive a hole may be made by slight changes in the outline of a bunker.



Before the bunker was changed.



After the outline of the bunker was altered.

The Harmful Barberry—Destroy It

By Lynn D. Hutton

Contribution from the Bureau of Plant Industry, United States Department of Agriculture.

Although nothing adds a more attractive note to the grounds or links than a well-trimmed hedge, the selection or preservation of such a hedge should be made not only with a view of beautifying the grounds but with a consideration of the effect of the hedge upon other plants of the community. It is a well-known fact that many hedge plants are hosts for plant diseases which may and, in many cases, do cause thousands and probably millions of dollars of damage every year.

Especially is this true of the common barberry bush, *Berberis vulgaris* L. (Fig. 1) and its horticultural varieties. This innocent-appearing bush is the alternate host of the black stem rust of small grains, which annually destroys millions of dollars worth of our cereals. Black stem rust in the spring-wheat states does not pass from the small grain stubble of one year to the growing grain of the next year, but, like so many plant diseases, it is so constituted that it must have an alternate stage on some other host before it is able to go back to the former host.

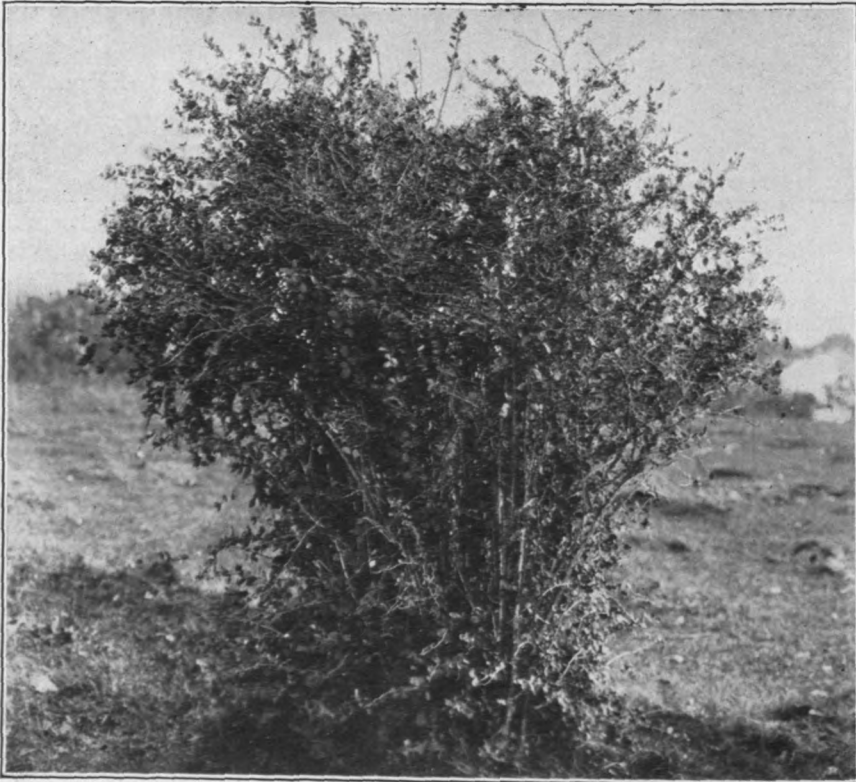


Fig. 1. A common barberry. Destroy this kind.

The alternate host of black stem rust is the common barberry bush. The effect of these barberry bushes when near small grain fields is verified every summer. The barberry is one of the first bushes to bud. Shortly after its leaves have unfolded, little yellow spots appear on them (Fig. 2).

This is the first indication of future trouble for nearby fields of small grain. These yellow spots mean that some rust spores from last year's rusted stubble have blown to the barberry bushes and germinated and are now producing millions of new spores, each of which is capable of producing rust on a stalk of small grain and sapping the life from it (Fig. 3).

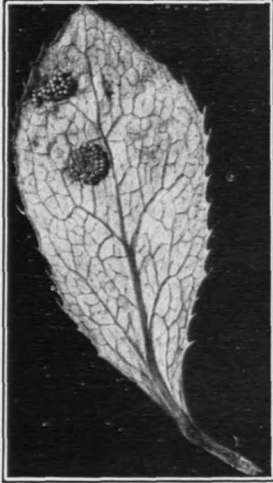


Fig. 2. A common barberry leaf infected with black stem rust.

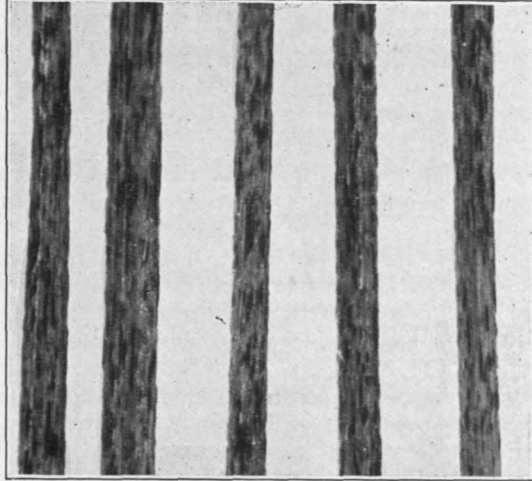


Fig. 3. Black stem rust infection on wheat.

In the northern states of our grain-growing area, this life cycle can be broken by the removal of the common barberry. An attempt is being made in Colorado, Illinois, Indiana, Iowa, Michigan, Minnesota, Montana, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin, and Wyoming to remove every barberry bush from these states. To date, over ten million barberry bushes, sprouting bushes, and seedlings have been removed from this area. It is just as important for the grain growers of many other states not to allow the barberry bush to start black stem rust epidemics in their grain fields.

Do not think that the common barberry is harmless because it is growing in villages and cities. It is just as harmful growing in parks or lawns in cities as in suburban parks or grounds or farms. The wind will carry the rust spores to nearby susceptible grasses and then to the grain. Rust has been traced for a number of miles from a single barberry bush. In Minnesota five barberry plantings started a stem-rust epidemic that covered a whole county. Many similar instances have occurred in other states. Epidemics are often so sharply defined that barberry bushes can be found by the rust that they have spread. For this reason an appeal is being made to the country clubs to see that their properties are free from the shrub and that in the future some harmless bush is used.

The Japanese barberry, *Berberis thunbergii*, is not susceptible to black stem rust and does not spread it. This little bush should meet with the fullest approval of all who desire a beautiful hedge plant for their grounds. Its flowers are not especially conspicuous but its red berries, which remain on the plant well into the winter, make it of value for the touch of color it imparts to the landscape when other bushes are dead and barren. Another feature of the Japanese barberry is that its leaves turn scarlet

in the autumn rather than assuming a yellowish dead appearance. This also adds color to the grounds in the fall when other plants are dead.

Rather than to plant the harmful common barberry which is known to cause the loss of so many million dollars from black stem rust, country clubs are asked to plant the Japanese barberry, which in the end will prove far more satisfactory and beautiful than the common barberry.

Methods of Applying Ammonium Sulfate or Ammonium Phosphate

By O. B. Fitts

There are three methods available for applying ammonium sulfate or ammonium phosphate, and each gives splendid results when properly employed.

1. The first method is to mix the fertilizer thoroughly with compost. Topdress with this mixture, brush the material well down into the turf, and then follow immediately with a thorough watering. By this method both ammonium sulfate and ammonium phosphate have been applied on plots at the Arlington Turf Garden at the rate of $6\frac{1}{2}$ pounds per 1,000 square feet of surface every month during the growing season without the slightest indication of burning, and the results of each application have been excellent. It is, of course, very rarely necessary to make such a heavy application. In fact, it is advised that applications of not more than 5 pounds per 1,000 square feet be used in the cool weather of spring and fall, and not more than 2 pounds in the very hot summer weather. However, in case it is necessary to use heavier applications, it can be done by this method without burning the grass. The fertilizer is absorbed by the compost as it goes into solution when water is applied, and there is very little chance of its sticking to the foliage and burning if sufficient water is employed.

2. Either fertilizer may be applied satisfactorily in the form of a solution provided extreme care is taken to water it in well. Even if a weak solution is left on the grass it becomes stronger as the water evaporates and may then cause burning.

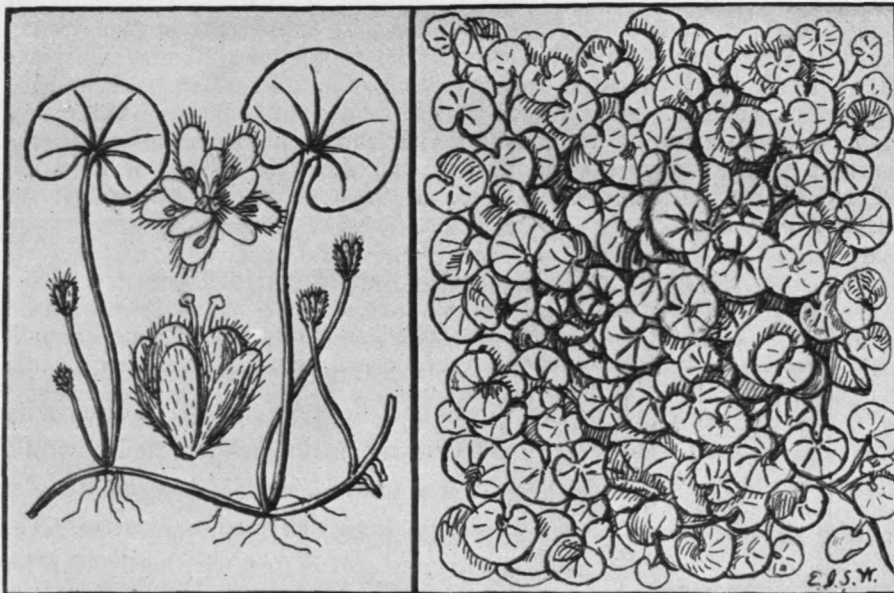
3. Another method is to apply ammonium phosphate or ammonium sulfate in the crystal form, either alone or with just sufficient sand to facilitate uniform distribution. This method, like that of the solution, requires extreme care in watering the fertilizer in, as the sand has very little absorbing capacity and the fertilizers, as they go into solution, may burn the foliage.

Results of the three methods of applying ammonium sulfate or ammonium phosphate, as here described and as conducted in experiments at the Arlington Turf Garden, have indicated throughout the past three years that better and more lasting effects have been obtained from mixing the fertilizers with compost than from either of the other methods. It is the safest method of the three and should be used on golf courses in preference to any of the other methods. However, if it is not convenient to use this method, either of the other methods may be used if extreme care is taken to see that the fertilizers are thoroughly watered into the turf.

Soil analyses.—These are of practically no value. No one living can tell what they mean.

Dichondra—a Weed in Southern Putting Greens

Throughout the southern states from Norfolk, Virginia, to Florida and Texas, there appears as a weed in putting greens the native plant shown in the accompanying illustration. Its scientific name is *Dichondra*



A creeping branch bearing flowers and showing a flower and pod enlarged.

The plant as it appears on a putting green.

Dichondra carolinensis

carolinensis; it bears no common name. Most botanists classify it in the morning-glory family, but others consider that it represents a distinct family of plants. On putting greens it makes turf of about the same quality as white clover. It is however easily identified by the simple kidney-shaped leaves. At the present no means of eradication is known except by cutting it out and replacing with good sod. One plant may spread over an area 2 or 3 feet in diameter. It thrives well in shade and it is sometimes used as a shady lawn plant. Its characters are well shown in the accompanying illustrations.

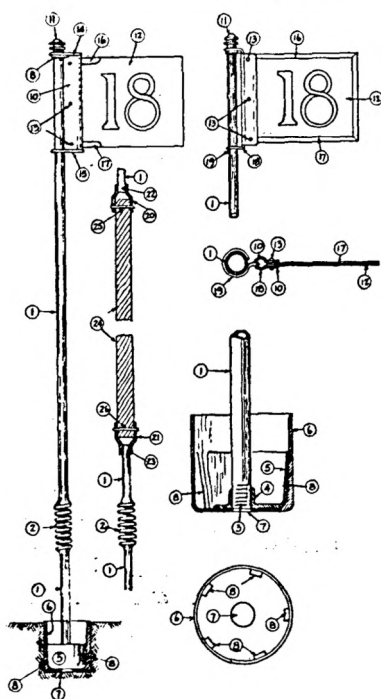
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- Vol. IV (1924). To member clubs only. All numbers except January and March. Price, 35 cents per copy. Index included.

Getting rid of moles with gasoline engine discharge.—“In the BULLETIN, April, 1925, page 90, you published an article on trapping moles, and I thought your readers might be interested in my experience with moles in my lawn. Three years ago I was greatly troubled with moles covering

a large area of the lawn around my house. Having a Moto-Mower for cutting the grass, I thought I might be able to use this to get rid of the moles, and I accordingly removed the muffler and connected our ordinary garden hose to it, inserting the free end of the hose into one of the runs of the holes. I started the gasoline engine, giving it a rather rich mixture so that it would smoke, and I found that the fumes were carried all over the yard through the runs made by the moles, coming out in places forty or fifty feet from the point where the hose was inserted into the runs. The following day I took an ordinary lawn roller and rolled the runs back into place, and I have never seen a mole in my yard since. I think that any gasoline engine or automobile which could run near enough to the location would answer the purpose. I feel sure this method will get rid of moles with the least trouble."—*I. H. Chahoon, Indole Golf Club, Au Sable Forks, N. Y.*

Steel Flag Pole of English Manufacture



The hole tin and stake cone are malleable cast, the former fitted with 5 taper ribs and the latter tapered in conformity to the ribs in the hole tin and having a round base. The stake is a steel tube of $\frac{3}{4}$, $\frac{1}{2}$, or $\frac{3}{8}$ inch outside diameter. The spring is spring steel wire hardened after welding to steel tube. The flag holder is brass. The flag material is self-colored celluloid, red or white, numbered on both sides.

The special features claimed are that the stake is self-centering, the hole edge protected from damage, and the flag with full rotary motion, extended in all weathers, clearly visible at 500 yards, always clean, no frayed edges, and easily renewed.

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

In a medal competition, A holes out leaving his ball in the hole. B putts, holes out, and, of course, as A's ball is in the hole, necessarily B's ball strikes A's. Should B be penalized one stroke under the rule which says, "In medal play, if your putt strikes your fellow player's ball, you are penalized one stroke?"

(Decision) No penalty attaches to B, as A's ball was no longer in play.

In a match play competition, a player playing within 20 yards of the

hole plays his shot without having the flag stick removed and the ball strikes the flag stick. What is the penalty?

(Decision) In a match play, either player may have the flag stick removed at any time. Failure to do this by a player does not penalize his opponent if he should happen to strike the flag stick. Therefore there is no penalty.

Under Rule 12, Section 4, there is a footnote as follows: "A mole-hill or mole-track may be removed from the fair green in any way which will not unnecessarily interfere with the surface of the green." Does this mean that the mole-track may be pressed down level with the fair green by means of the foot? Also, if so, what would the ruling be in case a ball lying on a slope were supported by a mole-track and rolled forward toward the putting green after the track had been pressed down?

(Decision) A mole-hill is a "loose impediment" and can be removed or lifted in accordance with Rule 12 or Rule 28 (1) without penalty as long as the ball is not moved. A mole-hill is however "damage caused to the course by animals," for which it is advisable, where these obstructions are common, to frame a local rule. Under the rules of golf a mole-hill may be removed only by hand, as it is not included among specified "loose impediments" under Rule 28 (2) which may be scraped aside with a club. It is not the custom, in treating a situation of this character, to press down with the foot. Our advice is to cover such cases by having a local rule for dropping the ball without penalty.

White Clover

There is general agreement among golfers that white clover is not a desirable constituent of putting green turf. Fortunately this plant will disappear with the continuous use of ammonium sulfate or ammonium phosphate.

As regards fairways there is no unanimity of opinion on white clover. British tradition is to the effect that white clover mashes under the foot and is slippery. This may be true for Britain, but certainly has little validity in America. It may be that very lush clover is slippery—but such growth on golf courses in America is exceptional at least. More worthy of consideration is the fact that white clover grows more rapidly than grass and gives an uneven appearance to the turf. Furthermore the lie of the ball in clover is not as good as that on grass.

There is another consideration of importance. Even if no white clover seed is sown the plant promptly invades fairways everywhere in the North. This propensity of the plant led the Indians in the early days to call it "white man's foot grass," as they said it sprang up everywhere the white man trod. To control white clover on the fairway as it can be on the putting greens would be decidedly expensive. Furthermore, white clover is certainly at least as much of an asset as a liability on poor soil and especially on sandy soil. Indeed its virtues are such on poor soils that it is desirable to sow some clover seed in the fairway mixture.

British golfers have given white clover a bad name and we have more or less unconsciously accepted their prejudice. The merits of white clover under American conditions need to be evaluated altogether apart from British opinion. A careful study of the plant on American fairways will, we are sure, convince most golfers that its merits far outweigh its faults. In any case we shall always have it with us unless it is kept under check at high expense.

Duties of the Greenkeeper

By Frederic C. Hood

Doubtless the thought has occurred often to readers of the BULLETIN that an outline of the duties and responsibilities of the greenkeeper would be of advantage,—first, in assisting the experienced greenkeeper to define his role in the important and intricate work of golf turf maintenance, and second, in assisting the less experienced greenkeeper to see more clearly the work which is expected of him. With this in view an attempt has been made here to draw up such an outline. The subject is indeed a complex one, and the accompanying outline of duties is in no way complete and final.

It is recognized that with a 9-hole course additional duties well may be included within the scope of tasks of the greenkeeper, and that he should be eager to assist with any task laid before him; while with courses of 18 holes or more it is frequently advantageous to confine his duties and responsibilities within narrower limits. It is hoped nevertheless that the accompanying suggestions may serve in some measure to lay before the minds of our readers at least the essential features of the greenkeeper's position.

The greenkeeper should be responsible directly to only one person, the chairman of the green committee, or the general superintendent if there be one, and thus receive his authority and orders from only one person.

He should have the entire responsibility for the upkeep of the course, for the care of the tools and machines, for the selection and employment of all assistants under him, and for the efficiency, thrift, and intelligence of those employees.

He should keep, or be responsible for the keeping, in the form prescribed, accurate time cards and records of work done. These records will show where money is spent, and from these records it is possible to learn how savings can be made. He should obtain from the chairman reports showing the total costs of the work, so that he may be familiar with the expenses in the same form as they are presented to the chairman and other members of the committee. He should cooperate in carrying out the system of bookkeeping deemed desirable by the treasurer, including the preparation of payroll records, receipts of supplies, and inventories of tools, machines, and supplies on hand.

He should plan to do the work under his charge in an efficient manner and constantly endeavor to improve methods. He should encourage his men to the same ends. He should select men who will have the interests of the work at heart. He should find ways of increasing that interest, and should see that the workmen receive proper wages for their work. He should ascertain from the chairman his wishes and his policies. He should constantly endeavor to increase his own efficiency by study and investigation, reading articles on greenkeeping methods, and occasionally visiting other golf courses, conferring with other greenkeepers, thus educating himself to a degree that will enable him not only to keep the course in a condition that will be the pride of every member but also to prevent the damage that may be done by rodents, insects, fungus, weeds, defective drainage, etc. Indeed, it was to assist the greenkeeper in this respect that the BULLETIN OF THE GREEN SECTION was established, and the duties of the greenkeeper can not be fulfilled unless he studies the BULLETIN assiduously.

Compost heaps of the proper mixtures, located at convenient places

on the course, are the basis of good greenkeeping. Knowledge of the qualities of the soil, the use of fertilizers and topdressings which are free from weed seeds, and the use of the proper seed are the vital elements in efficient turf maintenance. If one general law of turf management is desired, it might well be that turf needs first of all suitable conditions for growth rather than "medicines" to correct the damage resulting from improper conditions. Generally speaking, a resort to "doctoring" for the purpose of correcting damage caused by the numerous enemies of turf, such as weeds, insects, fungous disease, etc., indicates the existence of negligence somewhere. It is a better practice to remove the cause of the damage, and, by adequate fertilizing, and by the use of soils that contain proper plant food, to enable the turf to withstand its enemies, than to resort to "doctoring" after the damage is done.

Planning of work for wet, dry, hot, cold, or sunny weather is essential. The ideal of the greenkeeper should be to train his men to understand turf upkeep in general. It is wise to give each man specific care of some job for which he can be held personally responsible; to pick one or two men for the more difficult jobs that require special judgment; to encourage pride in the work done and sense of personal responsibility; to select the work that is most important, rather than to waste valuable time, money, and energy on work that is of no avail.

The greenkeeper should learn the game, and so familiarize himself with its requirements. It thus will be much easier for him to keep his traps, bunkers, and other hazards in proper condition, because he will realize the necessity. Unless he knows the game, he is working under a handicap. Of course this does not mean that he must be a good player. He should also know the Rules of Golf of the United States Golf Association, and likewise be thoroughly familiar with the local rules. He should have on his desk at all times the current and back numbers of the *BULLETIN OF THE GREEN SECTION*, and he should study their indices.

The greenkeeper should secure the cooperation of the professional and the caddy master, so as to have their help in all matters of keeping the cups and the course in proper condition and making the play a matter of pleasure to the club members.

He should be on the lookout for turf enemies—cutworms, ants, fungus, moles, skunks, crows, the gypsy and browntail moths on the trees, earthworms, brown-patch; and when these enemies begin their work, he must know at once how to combat them.

He should not fail to consult the chairman of the green committee on all problems that arise outside of the general routine.

He should develop initiative, and endeavor to see where improvements are needed before the chairman sees them.

He must meet discouragements cheerfully.

He must be willing to give consideration to new ideas, no matter what their source.

He must know how to take orders, as well as to give orders. He must *learn* his job from every possible source. But, he should take *orders* from only one person.

With regard to his subordinates, he must never forget that intelligent persons, in either high or low positions, like a job they can call their own and in which they can take pride and show results.

To repeat, he should study, perhaps above all things else, his drainage problems. Eternal vigilance should be his watchword.

With these general considerations in mind, it may be well now to call

attention to what are perhaps the details of major importance in green-keeping.

Mowing.—In the spring, grass should be given a chance to recover. In the growing season, grass should be mowed frequently. In the fall, it should be allowed to grow a little taller as a winter protection.

Rolling.—Never roll a green when it is wet. One heavy rolling in the late spring after the grass is well started, *may* be necessary. It is much better, however, to use light rolling only, and that very sparingly. It is much better to fill up the valleys with soil, than to roll down the hills with a roller.

Watering.—This should be done when necessary, and then in the late afternoon or when the sun is not bright.

Drainage.—Lack of drainage is perhaps the cause of most turf troubles, and in the North is certain to result in winterkilling.

Traps.—If the right kind of sand is used in traps, there is no need of raking. Fine sea-sand is best for traps. It is important that the sand in traps should be visible from wherever a shot is played. It is generally best to let the sod extend about six inches over the edges of a trap.

Tees.—A tee should be large enough to render sodding unnecessary. Frequently changing markers will permit grass to sprout from the roots and thus correct any damage.

Divots.—Large divots should be sodded, but when seeded, always with seed of a creeping grass.

Tee boxes.—These should be located not on the tees but in the nearest convenient line between the preceding hole and the tee.

Cups.—The location of the cups should be changed before the green shows wear.

Fairways.—These should be mowed often enough so that the ball will not settle into the grass. Usually the longer and softer the grass, the more divots are made. It is desirable that the fairway grass should be stiff and hardy in order to hold the ball up, which prevents the taking of divots. Coarse turf should be sanded; sparse turf, lightly topdressed.

Rough.—The grass should be kept in condition permitting the easy finding of a ball. Unplayable lies should be corrected.

Outside rough.—This also should be kept clear within a reasonable distance so that a ball may be found, and unplayable lies corrected.

Compost heaps.—These are the bank account and quick capital in the upkeep of a golf course. They should be turned, sifted, and kept free of weeds, and should be located in many parts of the course, easy of access. Compost heaps of better quality should be maintained for topdressing the greens. Constant study should be made of the quality of the compost and its proper ingredients. Watch out that you don't sow weed seeds when you topdress.

Turf gardens.—It is well to have several small turf gardens from which sod may be obtained for repairing damage to greens, tees, and fairways. A turf garden should be maintained for each kind of grass represented on the course, so that uniformity will be maintained in the replacing of turf.

Seeding.—Most re-seeding is simply a waste. If grass is properly fertilized and topdressed there will be little need for re-seeding. Certainly nothing is gained by re-seeding creeping bent; and in a degree this is true for all creeping grasses.

Insecticides and fungicides.—In treating turf for earthworms, grubs, or brown-patch, much is gained by making the applications promptly upon

evidence of the first trace of these enemies. Irreparable damage is likely to result if heroic treatment is attempted when the trouble has reached an acute stage.

Cure of equipment.—A neat and orderly place for keeping tools and equipment is indispensable for maintaining them in good condition. Cutting machines should be kept sharp and well oiled. A running inventory should be kept of all tools and machines. Constant inspection of all equipment is highly essential.

In general, the best preventive for weeds is good turf, and the best preventive for ill health in grass is good drainage,—drainage in the soil itself, drainage in contours, drainage on the turf, in the turf, under the turf, and surrounding the turf.

The Progress of Golf Architecture

Golf architecture involves far more than the laying out of a definite number of holes each of a virtually standardized length. That these lengths are standardized can hardly be questioned, even if the distances are only approximately equal and those decreed by what golfers think best. There is general agreement that the desirable total length of 18 holes should be between 6,000 and 6,500 yards. If one should judge from a large proportion of golf courses, the designer had no other end in view than that stated above, namely a course whose measurements approximate a standard. There is seldom any indication of originality, except of the freaky kind, and rarely any conception of landscape beauty. Apart from the relatively mathematical or mechanical features of golf course building, which any one can learn quickly, there lies the whole art, which will make or break the reputation of every golf architect. Only the sluggish mind of an easily satisfied public has blinded it to the hideousness of most of our golf courses. Sometimes the beauty of the surroundings helps to conceal the ugliness of the artificial work, though the lack of any harmony be only too obvious. Fortunately, perhaps, many architects make their artificial work concealed or half-concealed, such as blind bunkers. Otherwise its unloveliness would be too patent.

This may sound like the writing of one suffering a severe attack of indigestion. It is meant to be the expression of feeling of one who is saddened by the absence of landscape beauty in too much of the artificial constructions on golf courses. A sand bunker can be made a thing of beauty or a hideous gash. Fortunately many of the latter are built "blind." The artificial lines can be curves that fit in with those of the terrain, or they can be angular and jar every sense of harmony. After all, a golf architect worthy of the name must be an artist, painting his ideas on the face of Nature as his canvas. The painter retouches his work again and again. Too many architects make the mechanical plans and leave practically all else to the construction gang. Some indeed work on a cut-and-dried series of models, which are reproduced here, there and yonder regardless of the terrain. When you see one course built by such an architect, you can recognize at once every other course he has built. This is true not in the sense that one can learn to recognize a Corot or a Landseer, but true to actual mechanical details. There is merit in the idea that holes of proven reputation ought to be copied—especially if these replicas apply as to principles but not as to details. If however this idea is embalmed in a set of mechanical models, then there can

obviously be no progress as long as these are followed, neither for the architect himself nor for his art. To be blunt, such an architect is sacrificing his art to present commercial gain.

Perhaps the architect is not so much to blame as is the golfing public. As long as there is no criticism, he may well believe that he is producing meritorious results. A few courses built in recent years are examples of splendid landscape architecture. The influence of these will doubtless stimulate golfers to demand better work from the architects. To build artistic courses will require more of the architect's time than he takes at present. It can not be done, especially in its finishing stages, by a brief visit once a month or so. That is too much like a landscape artist hiring a journeyman painter to paint pictures for him. It can be done, of course, but the results are not inspiring.

Golf architects ought to be the leaders in promoting the progress of golf. They are not. Today many courses are being built by professional golf players that are as good as or better than those made by most professional architects. Except for a few notable exceptions in the profession, the term architect can hardly be used at present as relating to golf architects. There are also a goodly number of amateurs who have done very beautiful work which can truly be called artistic. Every architect owes it both to himself and to the golfing world to strive toward perfection. We believe it will be more profitable to him to build fewer and better courses.

There is progress for the betterment of golf architecture, but it is very slow. It will continue to be slow as long as the artistic sense is sacrificed to immediate commercial gain.

Pearlwort

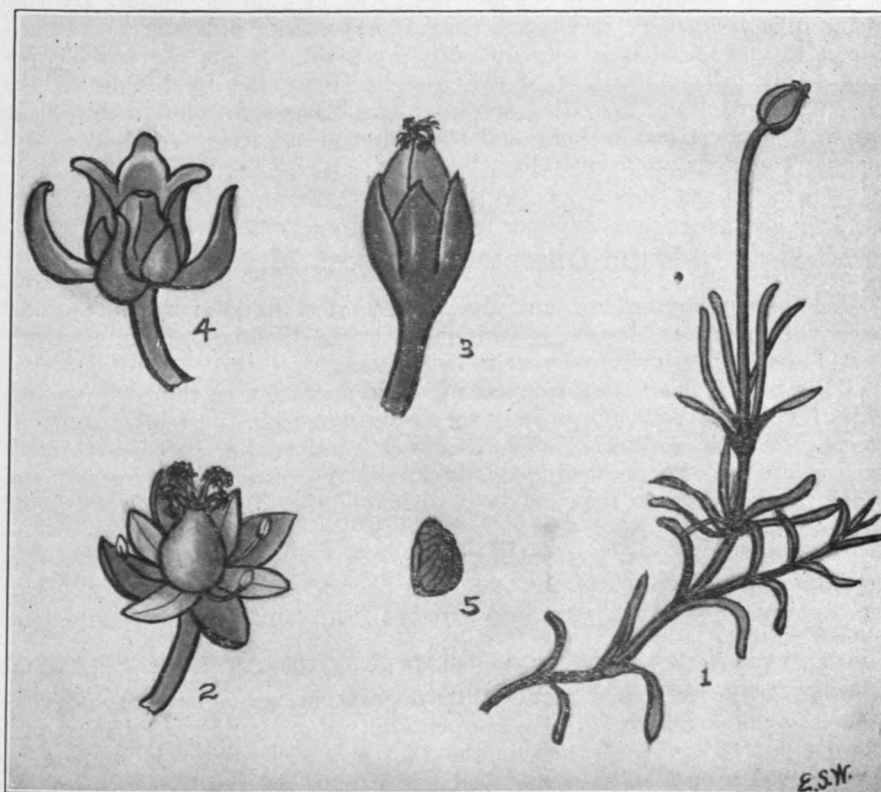
By C. V. Piper

Pearlwort (*Sagina procumbens* L.) is known to occur in America along the Atlantic coast from Newfoundland to Delaware and the District of Columbia. It was recorded from Connecticut and South Carolina nearly one hundred years ago. The South Carolina record is open to doubt. In the interior it occurs at Toledo, Ohio; Detroit, Michigan; and Denver, Colorado. On the Pacific coast it is abundant on putting greens at Victoria, Seattle, Spokane, Portland, San Francisco and Monterey. Wild plants however have been collected in out-of-the-way places as follows: Uyak, Alaska, *Jepson* No. 391 in 1899; Kukak Bay, Alaska, *Saunders* No. 3735 in 1899; near Cowichan Lake, Vancouver Island, *Rosendahl* No. 1758 in 1907; in muck land south of Newport, Oregon, *Lawrence* No. 1562 in 1907; in red woods near Crescent City, California, *Eastwood* No. 12,299 in 1923. These undoubtedly wild plants collected so long ago strongly suggest that the plant is native from Alaska south to California. It is strange that the occurrence of the plant on the Pacific coast has been overlooked by botanists, particularly as it is common on putting greens. But the answer may be that few botanists play golf.

In the writer's experience it is always a perennial, but the books say it may live but one or two years. In very arid soils or in the cracks of brick walks it may die from midsummer heat or drought, but it is very questionable if it ever is truly annual. It is usually easy to identify it from similar species by its peculiar habit and from the fact that the parts of the flower are in fours.



Pearlwort (*Sagina procumbens* L.). Part of a plant, growing on hard soil; about natural size. On putting greens it becomes much denser.



Pearlwort (*Sagina procumbens* L.); much enlarged. (1) A branch bearing a single flower; after blooming, the flower becomes somewhat nodding. (2) A single flower. Note that the parts are in fours. (3) A young pod. (4) A ripened and empty pod. (5) A seed.

Individual plants under favorable conditions are usually about 4 inches in diameter, making a very dense turf. Often they are much larger, and not rarely die in the center. Sometimes an old putting green will become 75 to 100 per cent pearlwort. This condition has been observed near Southampton, Long Island; Portland, Oregon; San Francisco, California; and at Paris, France. Such turf is exceedingly "slow" in the golfer's sense and commonly bumpy.

A pearlwort plant 4 inches in diameter will produce each season from 300 to 500 flowers, each on a short stalk. Every ripe pod contains on an average 60 seeds, or from 20,000 to 30,000 seeds to a plant. These are carried about on the shoes of the players, so that it does not take long for a green to become thoroughly seeded with pearlwort.

The idea seems to prevail that pearlwort is introduced in fine grass seeds. There is no positive evidence for this notion, as pearlwort seed has never been detected in grass seed. Indeed it is difficult to conceive how it could get in grass seeds, as the plants are barely an inch high. The fact however that the plant is more frequent on putting greens than elsewhere justifies the suspicion that it comes in grass seed.

From the available facts the following conclusions seem justified: (1) that pearlwort is native and abundant from Newfoundland south to Long Island, and perhaps farther south especially near the seacoast; (2) that it is sparingly native from Alaska to California; (3) that in general it is an introduced plant in lawns and putting greens, but it is not clear how the seed gets to such places.

Pearlwort should be cut out and destroyed as soon as found. By this means it is easily kept in check. Once it has gained headway by permitting it to make seed it is very difficult to control. When a green has become badly infested with it, it can best be eliminated by lifting all the sod off the green and reseeding or replanting. The sod removed should be put in a compost bed or heap and the material not used for at least two years. The seeds apparently live that long.

Hand-Operated Compost Mixer

The accompanying cut and description of a hand-operated compost mixer, of their own design, is furnished by the Highland Country Club, Fert Thomas, Kentucky, who write as follows:

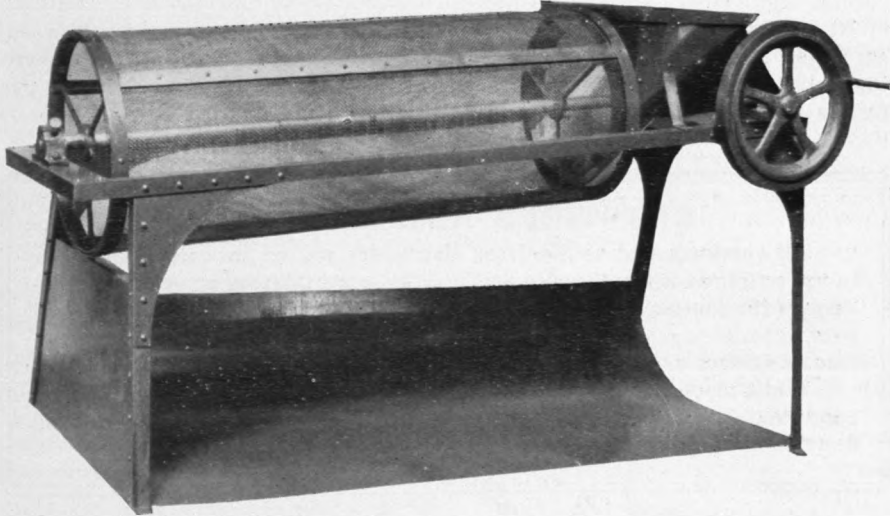
"We placed this rotary compost mixer in operation in the early spring, 1924, for the purpose of properly screening materials for topdressing our greens. We have not only effected a very great saving in labor through its use but are also in position to topdress our greens with screened material far superior to that obtained through the old process of hand screening.

"We built six new greens last year. In the process of construction the mixer was placed adjacent to the greens and easily supplied sufficient topdressing to keep six men busy during the planting of creeping bent stolons.

"The capacity of the mixer, when hand-operated, is 15 cubic yards per day. Two men are required to operate it, one spending his time shoveling the materials into the hopper and the other operating the hand-wheel. An attractive feature is the fact that the design is such as to eliminate all complicated mechanical parts, with the result that there are no adjustments to make. The main shaft is mounted on roller bearings,

thus making it an easy matter for one man to operate continually without tiring. If desired, the apparatus can be equipped with a tight and loose pulley for mechanical operation.

"The machine consists of a heavy rolled steel frame securely cross-braced and riveted. The cylinder is 26 inches in diameter by 6 feet long, and is of $\frac{1}{4}$ -inch mesh No. 16 galvanized wire screen reinforced both



Hand operated compost mixer.

inside and outside with flat steel bars. The screen is mounted on spiders, which in turn are set-screwed to a cold-rolled steel shaft $1\frac{1}{8}$ inches in diameter. The terminal bearings of this shaft are mounted in cast steel blocks and operate on roller bearings. The main shaft is driven through a gear and pinion from a countershaft, upon which is mounted a heavy cast steel fly-wheel of sufficient weight to insure a constant motion as the mixer is put in operation. The receiving hopper is 24 inches square, constructed of No. 16 galvanized blue annealed steel. The cylindrical screen is so arranged that it may be easily replaced. The entire apparatus is built most substantially and the completed weight is 750 pounds."

Converting Red Fescue Fairways Into Bent or Bluegrass Fairways

It is usually the case that fairways which have been sown to red fescue alone produce a cuppy or patchy turf. This is due to the fact that red fescue is under most conditions a bunchy grass, and bare spaces develop between the bunches. Little can be hoped for in the way of improving the turf on such fairways by sowing additional fescue seed, but the turf can readily be converted into bent or bluegrass turf by sowing seed on top of the fescue turf. Whether bent or bluegrass is used for this purpose will depend on how well the grass thrives under fairway conditions in the particular section of the country. In Canada, the New England States, and the Pacific Northwest, bent, as a general rule, will be found to be the best grass for the purpose. Elsewhere in the northern

half of the United States bluegrass will probably be preferred. The new seed should be sown between August 15 and September 15, and the sowing followed with a light topdressing. To the bent or bluegrass seed a quantity of redtop seed should be added. The latter is cheap and will form a turf much sooner than either of the other grasses in the mixture, and will gradually be crowded out by the bent or bluegrass as these latter become established. The bent-redtop mixture should be sown at the rate of 30 pounds of redtop and 10 pounds of South German mixed bent to the acre, and the bluegrass-redtop mixture at the rate of 80 pounds of Kentucky bluegrass and 20 pounds of redtop to the acre. After two years the fairways should be practically pure bent grass or bluegrass.

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. Acidifying alkaline soils with ammonium sulfate or ammonium phosphate in the control of white clover.—We have a number of our greens and tees in creeping bent and have been trying to get them acid by the use of ammonium sulfate but find thus far that the use of it in the quantities recommended gives no results so far as acidity is concerned. Our nursery, on the other hand, is in ground that is naturally acid, and the growth of the bent in our nursery is much stronger than on our greens and tees. Can you suggest a method of getting the soil sufficiently acid without injuring the turf? Is sulfur good for this purpose? Would it be practical, in preparing the beds of new greens for stolons, to treat the beds with a sufficient quantity of ammonium sulfate to make them acid before planting the stolons? (Iowa.)

ANSWER.—With soils originally acid the results of the use of ammonium sulfate or ammonium phosphate appear in a comparatively short time. With soils originally alkaline, a longer time is required. We would suggest that until the stage is reached where white clover disappears, you apply the chemical weekly as follows: 5 pounds per 1,000 square feet from October 1 to March 31; 4 pounds during April and May; 3 pounds during June; and 2 pounds during July, August, and September. You should of course use no other fertilizer along with the chemical, except such as is naturally contained in your topdressings. The applications during the warm months should be followed immediately with watering, to prevent burning of the grass. Do not use sulfur; it is dangerous to use on turf. We are now conducting some experiments in the acidifying of soil before planting. We are of the opinion that the liberal application of ammonium sulfate or ammonium phosphate to soil before planting will help greatly. These chemicals may be applied by broadcasting them dry or mixed with sand or compost, or they may be sprinkled on the turf in solution. The objects gained are two: (1) fertilizing, and (2) acidifying

the soil. When the soil has become sufficiently acid by the use of one of these chemicals, white clover, chickweed, and some other common turf weeds will disappear.

2. **Golf architecture.**—I expect to visit various golf courses in the East primarily to study golf architecture. Which courses would you advise me to visit to see the best architecture? (California.)

ANSWER.—The following courses have features of outstanding excellence and deserve careful study: Merion Cricket Club (East Course), Haverford (near Philadelphia), Pennsylvania; Pine Valley Golf Club, Clementon, New Jersey; Hollywood Golf Club, Deal, New Jersey; Country Club of Atlantic City, Northfield, New Jersey; Essex County Club, Manchester, Massachusetts. Broadly speaking, the architecture of forty per cent of eastern clubs can be called "mediocre" and of another forty per cent "poor." Most of the other twenty per cent contain some excellent architecture.

3. **"Soil bacteria" fertilizers.**—Advertising matter has reached us of a liquid containing in rather condensed form an abundance of the bacteria which soil must necessarily contain in order to promote vigorous plant growth. I believe that it has been completely demonstrated that the growth of plants of any kind is dependent on the activity of certain bacteria in the soil. I should be glad to have your recommendations with regard to the use of such fertilizers in the growing of golf turf. (Massachusetts.)

ANSWER.—Materials similar to the one you mention have been experimented with in connection with plant growth, and except in the case of certain legumes whose success depends on the formation on the roots of nodules developed by certain species of bacteria, these bacterial preparations are found to be without value. It is perfectly true that, in addition to the nodule-forming bacteria which accompany certain leguminous crops, all soils are found to contain in greater or less degree many forms of bacteria which are without doubt necessary for plant growth. The point to bear in mind in this connection however is that unless the soil conditions are favorable to the development of these bacteria it is useless to attempt to add them to the soil; and if the soil conditions are right, the desirable bacteria present in the soil at all times in more or less degree, will develop of their own accord. The best and cheapest way to add desirable bacteria to your soil and to keep them there is to use barnyard manure. Forgetting all about bacteria, however, our best results to date in fertilizing putting green turf have been obtained with the use of ammonium sulfate and ammonium phosphate.

4. **Browning of turf due to poor drainage.**—A few of our putting greens have a peculiar reddish brown or rusty appearance in several places. This is particularly noticeable after a heavy rainfall. Do you think a topdressing of compost and ammonium sulfate would restore the grass to a healthy color? (New York.)

ANSWER.—The condition you describe may be due to a number of causes. It is certain to occur however where there is defective drainage, especially during rainy weather. We would suggest that you examine the drainage conditions of your greens thoroughly and attempt to improve the drainage wherever possible. Topdressings of compost and ammonium

sulfate are of great value in promoting the vigor of turf, but will not remedy the effects of defective drainage.

5. **Cutting bent greens newly planted from stolons.**—My chairman is worried about our new green that we planted with bent stolons. He seems to think that I have cut it too often, which is about three times a week. My experience with other greens indicates that they should be cut every day, which gives them a true putting surface. I myself do not like the looks of the grass, as it has a very wide blade. Kindly tell me if this is the nature of the grass. Will it get finer later in the season? (Missouri.)

ANSWER.—The strains of creeping bent vary in their texture, but all of them are more or less coarse in the beginning, becoming finer as the turf begins to mat. We would advise you to cut your green frequently, keeping the grass down to a length not to exceed one-quarter inch. Under this treatment it thickens more rapidly.

6. **Restoring bent turf burned with ammonium sulfate; spiked rollers.**—We have been applying ammonium sulfate for exterminating chickweed in our putting greens, and used the chemical strong enough to burn the grass. What would you advise to bring these burned spots back to life? Would the use of spiked roller followed by the sowing of bent seed and then by a light topdressing be beneficial? (Pennsylvania.)

ANSWER.—We know of no very successful means of quickly restoring dead spots in putting greens other than sodding. If your dead spots are more than 6 inches in diameter we would suggest that they be resodded, taking the turf from the edge of the green. Seed sown on old turf in midsummer does not as a rule produce satisfactory results. Better results could be obtained by plugging in runners of creeping bent, but even this should be done later in the season. If your spots are not over 6 inches in diameter, a light topdressing might help to restore the turf, depending on how badly it is injured. We would not advise the use of a spiked roller. We have tried various kinds of spiked rollers and other similar implements that puncture or tear the turf, and have concluded that their use is not to be advised.

7. **Treatment for turf that is too soft and heavy.**—We have no complaint to make on the vigor of our bent turf. The fact is, in places it is a little too soft and heavy, having a tendency to slow up the ball in putting. What treatment would you recommend for correcting this? (Pennsylvania.)

ANSWER.—We would suggest a liberal topdressing of well-sifted soil without any fertilizing ingredient.

8. **Making compost.**—We would like to have information as to the best way to make compost. (New York.)

ANSWER.—Our present opinion, based on a lot of experience, is that the best type of compost is a mixture of about 80 per cent loam and 20 per cent manure. If more manure is used you will have more trouble from earthworms and grubs. The loam can be good top soil of a loamy nature; or if that is not available it can be clay loam and sand mixed until you get a soil of the physical texture of loam—that is, something

which when moist and pressed in the hands will break readily apart. This texture is necessary so that the compost when used as a topdressing will filter down into the grass and fill up depressions in the surface. Another common source of loam is well-rotted old sod. In fact, you can use any kind of vegetation in your compost so long as you get a loamy consistency and the manure content is not over 20 per cent. Better results seem to be obtained with a compost bed than with a compost pile. With a pile much hand labor is necessary in turning or stirring the material. With a bed not over 2 or 3 feet in height, the material is spread out so that a harrow, rake, or cultivator can be used on it and much hand labor thus saved. When the work can be done with machinery it is not so apt to be neglected as when the work must be done by hand. Moreover, the material rots more quickly when spread out in a bed than it does when piled up in a heap. The compost should stand preferably for a year before being used.

9. Shavings or chips in manure.—We have a contract with an express company to take their entire output of manure, which amounts to about two loads a day. We allow this manure to rot for about a year, and then use it on our fairways. Some of this manure contains chips, which had been used for bedding in the place of straw. It has been claimed by some that there is tannic acid in these chips, which is injurious to the grass. In our experience, however, the manure with the chips in it has been a benefit to our fairways. Do you think that in time the presence of the chips on the fairways will injure the turf? (Ohio.)

ANSWER.—Manure containing shavings or chips has been used for a long time on grass without injuring it in the least. The only objection to the use of such material is that the shavings become unsightly unless raked up. The rotting of these chips can be speeded up greatly by scattering ammonium sulfate over your manure piles and watering it in, as described in the article in the BULLETIN, Vol. II, 1922, page 36.

10. Sea oats as a grass for sandy locations in the South.—Can you advise us where seed of sea oats may be obtained? (Florida.)

ANSWER.—As far as we know, seed of this grass is not on the market. You would have to arrange to have the seed gathered especially for you. We believe it would be much more satisfactory, however, to have roots of this grass gathered, and plant the roots. It is very abundant in sandy locations in the South, especially at places along the coast of Florida. It is an excellent sand-binding grass, but is very coarse, making "whiskers."

11. The cinder base for putting greens.—Our No. 7 green, which lies in a very low spot and gets quite a little shade, has never been satisfactory. We think the trouble is due to lack of subdrainage. We are planning to rebuild this green and have thought of installing a layer of cinders under the green to improve the drainage. How thick should this cinder base be? (Georgia.)

ANSWER.—Our experience leads us to advise against the use of cinders as a base for putting greens. They are of value only for subdrainage, and yet are not as satisfactory for this purpose as tile. The cinder layer is expensive, and in course of time is sure to clog up by the deposition of silt.

Meditations of a Peripatetic Golfer

The other day several of us discussed golf architecture. We all agreed upon a good many particulars that any good architect should not do or should strive to avoid. Here is the list:

- Blind holes.
- Hidden bunkers.
- Rectangular tees.
- Three-shot holes.
- Courses longer than 6,500 yards.
- A sand bunker back of a long 2-shot hole.
- Mounds at the front corners of greens.
- Fairways too wide or too narrow.
- Putting greens larger than 8,000 square feet.
- Insufficient drainage.
- Sowing greens to red fescue.
- Sowing fairways to red fescue alone.
- Using lime or peat (so-called "humus").
- Using same set of models for every course he builds.
- Having all the bunkers kidney-shaped or clam-shell-shaped.
- Building tee-shot bunkers for the short slicer.
- Making putting greens exactly square or perfectly circular.
- Undulating greens too heavily.
- Ugliness of any sort.
- Recommending dealers who pay him a commission.

The conclusion is, that the man who habitually does any of the above-mentioned things is not a good architect.