

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.