their putting greens, and to be quite careless about the angle of the slopes leading up to them. Having found one they dig a bunker in the right-hand near corner of it, and another to correspond on the left. The result is a handsome spectacle but seldom a good hole. It stands to reason that when play to a hole finishes up-hill the fate of a given shot is in a greater or less degree on the knees of the gods. A ball pitching against a fronting slope may stop practically dead, or run unexpectedly far, from causes entirely outside the control of the striker. Little inequalities in ground sloping away from him do not diminish, rather do they increase, his mastery of his fate. It is a significant fact that the finish of the play to at least twelve of the other seventeen holes on St. Andrews' Old Course is slightly downhill. It is not to be wondered at then that a player is worried by having to play at holes which look about fifty times as fine as they are, and do not in actual play pass the supreme test. This test is to be found in the attitude of mind assumed by a good golfer after he has taken the hole, which is up for judgment, in the par figure. Is he exhilerated by the knowledge that he has done the job himself unaided by any outside agency, that he has put the ball right and it has stayed put? And did he know from the moment it left his club that stay put it would? Within my recollection specimens of these spectacular plateau holes, finishing up more or less steep slopes, have been introduced on a number of first-rate courses—Hoylake, Muirfield, Westward Ho!, Sandwich, to mention only those on which championships are played. I have never heard anybody pick one of them when he has been asked to name the best hole of the round, or even take one of them into consideration. And yet some, for example the sixth at Westward Ho! and the tenth at Sandwich, are awfully good of their kind. The moral is obvious.

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. Spring Work on Northern Fairways.—We should like your advice in regard to improving our fairways. The grass is nearly all Kentucky bluegrass, with here and there patches of Rhode Island bent. We have thought of applying bone meal early in the spring at the rate of about 500 pounds per acre, following this with another application about a month later. We have no compost pile, but are planning to make one in the spring, and the following year to use this compost in the spring as a top-dressing, after seeding, and then to roll, and follow in about a month with an application of bone meal or ammonium sulfate. We prefer to seed in the spring rather than in the fall, as there is almost no play on our course before July 1, and the maximum play is during the fall. Would

it be advisable to add bone meal, ammonium sulfate, or lime to the compost pile? What kind of seed would you advise us to use? What method do you recommend for spreading bone meal and top-dressing?—(New Hampshire.)

ANSWER.—Although fall sowing is much to be preferred, if you decide to sow some seed we would advise you to use German mixed bent, as the bents should make excellent fairways under your conditions. Our experience indicates that it does not pay to sow Kentucky bluegrass seed on established turf. We would advise you also to save your money for fertilizer and compost, rather than to spend it for seed, as more can be accomplished in thickening a stand of grass by top-dressing and fertilizing, than by sowing additional seed. Bone meal would be an excellent fertilizer for you to use. It should be applied at the rate of 300 to 500 pounds per acre. Fertilizers are best applied with a regular fertilizer spreader, although a manure or lime spreader will answer very well. If you do not have these implements, the material can well be applied by hand. We do not think two applications of fertilizer a season are necessary. Excellent results have been obtained by mixing ammonium sulfate with soil and manure in starting compost piles, and we would advise you to use ammonium sulfate in your compost when you start your pile, using it at the rate of 100 pounds per ton of dry vegetable matter in the compost. If you use manure instead of straw or other dry matter, the amount of ammonium sulfate should be decreased per ton of manure, since manure contains considerable moisture and is therefore heavier than an equal bulk of dry matter. Aside from its fertilizing value, the ammonium sulfate materially hastens the decomposition of vegetable matter in a compost pile, thus making it ready for use much sooner than otherwise.

2. EFFECT OF LIME IN ENCOURAGING WHITE CLOVER; APPLYING AMMONIUM SULFATE IN RIDDING GREENS OF WHITE CLOVER.—Kindly inform us as to the best method of ridding greens of white clover. Our greens were limed last winter and fertilized regularly during the past season. (New Jersey.)

ANSWER.—The best way to encourage the growth of clover is to use lime, and there is no doubt but that your applications of lime have resulted in the prevalence of the clover. In fact, the use of any alkaline fertilizer is likely to result in the encouragement of clover as well as various weeds. There is abundant evidence, however, that with the continued use of ammonium sulfate white clover, chickweed, and many other turf weeds will disappear. We would recommend that you give your greens applications of ammonium sulfate at least four times a year, once in early spring, once in late spring, once in midsummer, and once in early fall. For each of the spring and fall applications we would apply it at the rate of 3 to 5 pounds per 1,000 square feet, and for the midsummer application at the rate of 1½ pounds per 1,000 square feet. The ammonium sulfate may be mixed with compost, and the compost thus treated applied at the rate of 1 cubic yard to from 3,000 to 5,000 square feet of putting green surface. In other words, for the spring and fall applications 15 to 25 pounds of ammonium sulfate may be mixed with 1 cubic yard of compost, and for the midsummer application 7 or 8 pounds, and the mixture applied to approximately 5,000 square feet of surface. After the mixture is applied, the greens should be watered thoroughly, to avoid burning the grass. This is particularly important in the case of the midsummer application. Still

better results may be obtained by more frequent, but lighter, applications of ammonium sulfate, provided facilities for the work are available.

3. PREPARATION OF SOIL FOR PUTTING GREENS; TREATMENT OF SOIL WHICH TENDS TO BAKE.—Our soil is a loam with clay subsoil, and our climate rather dry. What would be your recommendations for preparing this soil for putting green construction? We have a fair growth of grass on a number of our greens, but the surface seems to get hard and bake in the heat of the sun unless the turf is kept constantly soaked with water, and even when this is attempted the water does not seem to penetrate the soil. The application of sand to the greens has been recommended, but we are at a loss to understand how to introduce this sand into the soil without destroying the greens. Are there implements suitable for this purpose? How often would you recommend top-dressing, and in what manner? (Saskatoon.)

ANSWER.—We believe you will have no trouble in getting a good seed bed for your greens from your prairie loam soil, provided it is used as top soil. If it is found necessary to fill for the greens, your ordinary subsoil should be entirely satisfactory. There is difference of opinion as to the proper depth of the surface layer of soil, but 4 to 6 inches is certainly ample. The surface of the green, of course, should be well drained, even in a dry climate. The subject of surface soil for putting greens has been treated in the article in THE BULLETIN, Vol. IV (1924), page 141. Our experience of the past few years, gained largely from careful experimentation, indicates that it is not so much the kind of soil upon which the seed is sown or stolons are planted, as the kind of soil that is put on afterward as a top-dressing, which determines the character of the turf. We would not advise you to use pure sand as a top-dressing, as we find it has a tendency to remain in layers and form a hard surface. It also has a tendency to thin out the grass. If, however, sand is mixed with loam and a small percentage of well-rotted manure is added to the mixture and spread on the green at the rate of approximately 1 cubic yard to 3,000 or possibly as high as 5,000 square feet of surface, excellent results will follow. This top-dressing should be applied three or four times a year during the growing season. As for an implement that will break up the surface of the green, we would not recommend this procedure, as our experience advises against it. While turf may survive such treatment, it is rarely benefited by it.

4. SPRING ROLLING OF PUTTING GREENS; VALUE OF TANKAGE AS A FERTILIZER.—We have just gone through a very bad winter and the ground is anything but even, due to the severe cold and warm spells we have had. Is it advisable to roll the greens and fairways? Also has tankage any value as a fertilizer for putting greens? (Ohio.)

ANSWER.—Practically every golf course needs a rolling each spring after the frost is out of the ground. The effect of the freezing and thawing is to heave the soil and leave it very soft. On sandy soils the rolling can be as heavy as one desires. On clay soils some discretion must be used. Do not roll until the top soil is fairly well drained; that is, do not roll it while it is wet and soggy. If the soil of your putting greens is rather clayey in nature, top-dressing with sand is the proper thing, using thin coats at frequent intervals rather than a heavy coat at one application. Tankage is a good fertilizer for putting greens. In general, however, we

advise that the fertilizing of putting greens, for quick results, be accomplished by using ammonium sulfate at the rate of 3 to 5 pounds per 1,000 square feet, in conjunction with top-dressings of good compost. Compost and ammonium sulfate seem to be absolutely reliable in keeping up the turf of putting greens.

5. PIPING GREENS AND FAIRWAYS.—Have you any information or suggestions to offer in connection with piping greens and fairways for water? (Washington.)

ANSWER.—This is a broad subject, but if suggestions in brief would be of value to you we believe that for watering fairways a system of pipes of at least 6 inches in size and capacity of 500 or 600 gallons a minute would be necessary. This would, of course, entail a rather large expense. For greens alone you could probably arrange with 2-inch pipe and 1-inch laterals. If you have a city water system convenient we would advise you to connect with it in case you can make a fair rate for the water to be supplied. Golf pipes need not be laid at a great depth, but can be placed just below the surface, which saves considerable money. They must, however, be so arranged that, through the use of valves at the low levels, all the water can be drained out in the late fall and the pipes left dry so that they will not burst in freezing weather. You should have at least 20 pounds of pressure in order to make your sprinklers operate properly; 30 pounds would be better.

6. FERTILIZING A CREEPING BENT NURSERY TO HASTEN THE DEVELOPMENT OF STOLONS.—We have a 110-foot nursery row of creeping bent and would like to know what we can do to push the growth of it in the spring so as to get stolons for planting greens in May or June. We can obtain here a very fine bone dust and dried blood fertilizer. Would these be effective, or would you advise the use of a chemical fertilizer? (Alberta.)

ANSWER.—The chemical fertilizers, such as ammonium sulfate and sodium nitrate, produce quicker results than the organic fertilizers, such as bone meal and dried blood. The chemical fertilizers, however, are apt to scorch the grass, but you should have no trouble in this respect if you apply them mixed with compost and then water the application in well. The danger from burning is greater in hot weather than in the spring or fall. We would advise you to use 1/3 pound of ammonium sulfate or sodium nitrate to your nursery row of 110 feet, this being at the rate of about 3 pounds to 1,000 square feet of surface. As for bone dust or dried blood, these may be applied without risk of burning. They are good fertilizers, and particularly the latter, which is much quicker in action than is bone dust. Seven to 10 pounds of bone meal, and a somewhat less quantity of dried blood, may be applied to 1,000 square feet of surface with good results.

7. SPRING SEEDING VERSUS FALL SEEDING.—Can we seed our greens this spring and have them ready for play by June 15? (Illinois.)

ANSWER.—In our opinion, it is out of the question to accomplish this result. Late summer seeding is infinitely better than spring seeding in your latitude, and it is unfortunate that you did not get your course seeded last fall. However, it is probably worth while for you to go ahead and seed your greens just as early as possible this spring, as by fertilizing, or preferably top-dressing, and careful attention to watering through the sum-

mer, you ought to secure a good turf by fall. The great trouble with spring seeding is that the young grass is unable to withstand the vigorous onset of weeds. Turf from seed sown in the fall is not subject to the invasion of weeds until the following spring, by which time the young turf is sufficiently vigorous to compete with the weeds.

8. VALUE OF DRAGGING OR HARROWING; TREATING THIN FAIRWAY TURF.—Our fairways are not as smooth as we would like to have them and the grass is more or less in spots or tufts. We were thinking of going over the fairways with a drag or harrow and then rolling. Do you think this is advisable, or will the drag injure the grass? (Minnesota.)

ANSWER.—We doubt that the use of a drag or harrow will improve your thin turf. We would advise you to fertilize your fairways with bone meal applied at the rate of 500 to 600 pounds per acre. Still better results could be expected from applications of well-rotted manure, but the presence of this material is often objectionable, from the players' standpoint, especially in the spring. In addition to these organic fertilizers, we would recommend the application of ammonium sulfate at the rate of 3 pounds to 1,000 square feet, to the thin spots. Rolling the fairways is essential before play begins in the spring, as the action of frost during the winter leaves the surface uneven. The fairways should be rolled when the ground is moist enough to respond to rolling but not so wet that it will pack.

9. SODDING IN SPRING.—Our 17th hole is only about 120 yards long and the green is so large that we have decided to reduce its size. Its turf is excellent. Our 8th green is poor and has never been in a thriving condition, and we have decided to tear it up and rebuild it the first thing in the spring. It has been our intention to seed it, but we are wondering whether there would be any objection to sodding it with turf we remove from No. 17 green. (Ontario.)

ANSWER.—It is perfectly satisfactory to lift and replace putting turf in the spring. We would suggest that the work be done as early as possible. If the work is well done, the returfed green can be played on a very few days after it has been sodded.

10. UNSUITABILITY OF AGRICULTURAL GYPSUM FOR USE ON GOLF TURF.—Agricultural gypsum is recommended to us as a soil fertilizer, as an agency to lighten clay soils and make sandy soils firm, and as a deterrent for earthworms. Have you any information on the value of the material for such purposes? (Illinois.)

ANSWER.—Gypsum is valuable for the production of certain farm crops, particularly red clover, on certain soils at least. We do not favor its use on golf courses, because it encourages white clover, which is regarded as undesirable. It has a tendency to create an alkaline condition of the soil, whereas on putting greens particularly an acid soil is preferable for the bent grasses, since such soil is unfavorable to white clover, crab grass, and many other weeds. We do not advise the use of gypsum on any part of the golf course.

11. CONVERTING REDTOP AND FESCUE GREENS INTO BENT GREENS.—We are desirous of converting our fescue-redtop greens into bent greens. Can this be done this spring by the use of seed or stolons of bent without reconstructing the greens? (Iowa.)

ANSWER.—A green of any kind can be converted into a bent green by sowing German mixed bent seed on top of the old turf at the rate of 3 to 4 pounds per 1,000 square feet, and then lightly top-dressing. September is the best time of the year to do this, but inasmuch as the expense is not great it may be well to try it in the spring, seeding just as soon as the frost is out of the ground. The same results can be obtained by scattering stolons of creeping bent on the old turf and then top-dressing. For success with this method, however, the green should be put out of play for a few weeks until the stolon joints become rooted. Late summer is likewise the best time to do this work.

12. RELATION OF BUNKERING AND SIZE OF PUTTING GREEN TO LENGTH OF HOLE.—As very few of our members had learned to play golf before the organizing of our club, we were advised to lay out our course for the first year without bunkers or traps, so as to learn to hit the ball and get direction without being handicapped. It is our purpose now to construct bunkers on the course. The lengths of our holes are as follows, and it will be appreciated if some suggestions can be given us as to the character of bunkering suitable for the respective holes: Hole No. 8, 178 yards; holes Nos. 1, 3, 5, 6, 7, and 9, 268 to 333 yards each; hole No. 4, 368 yards; hole No. 2, 403 yards. (Washington.)

ANSWER.—Your hole No. 8 is a full midiron hole, and your holes Nos. 4 and 2 are practically drive and midiron holes. On all three of these holes the greens should measure 7,000 to 8,000 square feet. A bunker should be placed to the right and left of each green, so as to permit of a running-up shot and penalize either a hook or a slice. Your other holes are all of the drive-and-pitch type. With holes of this type the putting greens should measure between 4,000 and 6,000 square feet. Such greens are usually severely bunkered, being practically surrounded by bunkers. Certainly with all holes of this type you should have a bunker running across the front of the green, so that the hole should be played by a pitch shot and not by a running-up shot. In this way, what you virtually have is a mashie hole plus a drive.

13. SOUTHERN LIMIT FOR CREEPING BENT GREENS; SEED MIXTURE FOR FAIRWAYS.—We should like to know whether in your opinion creeping bent stolons would be suitable for putting greens in this locality, also whether Chewings' fescue would make a desirable fairway turf. (North Carolina.)

ANSWER.—The altitude of your particular locality in North Carolina would place it just within the southern limit for creeping bent greens. Were it not for your altitude, we would not be inclined to advise you to try creeping bent. We do not regard Chewings' fescue as suitable for either fairways or greens in your region. For your fairways we would advise you to use a mixture of 4 pounds Kentucky bluegrass and 1 pound redtop, seeded at the rate of 150 pounds per acre.

Boost the Green Section