

be greatly improved in the near future. To be effective, Bordeaux must cover the grass blades sufficiently so that the powder is easily discernible without close observation. Bordeaux dust sticks to wet grass leaves better than to the dry leaves, and therefore it should be applied when the dew is on, or if this is not feasible the grass should be sprinkled before dusting. Liquid Bordeaux properly sprayed on the grass may be somewhat more efficacious than the powder because of its greater ability to adhere to the leaves. The powder, however, is much more easily and economically applied. It should be kept clearly in mind that the grass leaves should have Bordeaux in contact with them at all times when conditions are favorable for brown-patch. Excessive use of Bordeaux, however, is regarded as undesirable, since our limited experience indicates that it produces a condition in the soil unfavorable to the growth of grass.

The foregoing conclusions from the experiments at Arlington and from reports that have been received do not add materially to the knowledge of the behavior of brown-patch or its treatment, but they may serve to increase confidence in the ultimate satisfactory solution of the brown-patch problem.

Field observations and reports that have been received by the Green Section suggest that possibly there may be more than one strain of the fungus that causes brown-patch, since the manifestations of the disease are not always the same. Sometimes the grass is injured in small, quite regular spots two to four inches in diameter; sometimes in much larger spots, also quite regular; and sometimes the pattern of the affected turf varies greatly in area and is irregular in outline. This feature of the subject is being studied and will be reported on later. It is a fair assumption, however, that no matter how many strains of the fungus may be involved in the production of brown-patch, the treatment or treatments that prove efficacious for one will likewise prove efficacious for the others.

The Green Section solicits suggestions for the treatment of the brown-patch disease. The facilities at Arlington for conducting investigational work are very inadequate, but worthy suggestions will be tried out there to the extent that space and funds will permit. Already a great many suggestions have been offered, and for these the Green Section is very thankful. Also a great many theories have been advanced as to the cause of the disease. Sometime a page or two of THE BULLETIN may be devoted to them.

The Essentials of Construction and Maintenance of Grass Putting Greens

C. V. PIPER AND R. A. OAKLEY

I. HIGH GRADE GREENS IN THE NORTH.

1. *Soil.* A rich loam, at least the top three inches.
2. *Drainage.* Must be good both for surface and subsoil. Use tile for subdrainage where artificial drainage is necessary. Do not use cinder or other artificial drainage layers.
3. *Grass.* The best grasses for seeding in order of preference are: Sow pure seed, not mixtures. Seed between August 20 and September 10, South German mixed bent, Rhode Island or Colonial bent, Chewings fescue.

using 3 to 5 pounds of bent or 7 pounds of fescue to each 1,000 square feet. See THE BULLETIN, Volume I, page 65.

The vegetative method of planting will give perfectly uniform turf of the highest possible quality. See THE BULLETIN, Volume I, pages 124 to 126.

4. *Mowing*. Mow every day during the period when the grasses are growing vigorously. With daily mowing it is not necessary, but is desirable, to remove the clippings. See THE BULLETIN, Volume II, pages 92 to 96.

5. *Rolling*. Roll greens only enough so that there will be no foot-prints. See THE BULLETIN, Volume II, page 148.

6. *Watering*. Soak the greens whenever necessary to water. Avoid light sprinkling. See THE BULLETIN, Volume II, page 135.

7. *Weeds*. Keep greens thoroughly weeded and pay especial attention in summer to crab-grass and goose-grass. See THE BULLETIN, Volume I, pages 88 to 92, and page 188.

8. *Top-dressings*. Top-dress with rich compost at least twice a season, spring and fall. Monthly light top-dressings are not excessive. Do not use commercial humus (muck or peat) except in compost piles. See THE BULLETIN, Volume I, pages 51 to 57.

9. *Fertilizers*. Apart from the top-dressing, the following are most desirable: bone-meal (a fool-proof fertilizer), nitrate of soda, ammonium sulfate. The last two are best applied dry mixed with sand, at the rate of 3 pounds per 1,000 square feet, and then watered in thoroughly. See THE BULLETIN, Volume I, pages 197 to 205.

10. *Liming*. Do not use lime.

11. *Earthworms*. Remove worms as often as casts become abundant. Use corrosive sublimate. See THE BULLETIN, Volume I, pages 75 to 82, and page 212.

12. *Grubs*. Fight them to the limit if they appear. See THE BULLETIN, Volume I, pages 60 to 63, 174 to 177, 231 to 235, and 252 to 254.

13. *Spiking*. A very doubtful treatment and not necessary if soil conditions are good.

14. *Hole placement*. Move the hole frequently.

15. *Brown-patch*. Watch carefully for its appearance—usually in June. After it appears keep the greens dusted all the time with Bordeaux powder, or sprayed with liquid Bordeaux. See THE BULLETIN, Volume I, pages 111 to 115, and Volume II, pages 109 and 185.

II. CHEAP, EASILY-MAINTAINED GRASS PUTTING GREENS IN THE NORTH.

1. *Soil*. As in I.

2. *Drainage*. As in I.

3. *Grass*. Bluegrass and white clover. Seed in late August or early September. Sow 6 pounds bluegrass and 1 pound white clover to each 1,000 square feet.

4. *Mowing*. As in I.

5. *Rolling*. As in I.

6. *Watering*. As in I.

7. *Weeds.* As in I.
8. *Top-dressings.* As in I.
9. *Fertilizers.* Use bone-meal.
10. *Liming.* Lime may be used, perhaps, to advantage.
11. *Earthworms.* As in I.
12. *Grubs.* As in I.
13. *Spiking.* As in I.
14. *Hole placement.* As in I.
15. *Brown-patch.* Both bluegrass and white clover are immune to brown-patch.

III. BERMUDA PUTTING GREENS IN THE SOUTH.

1. *Soil.* A rich clay loam, at least three inches deep if on top of sand soil. Really good Bermuda turf can not be produced on sandy soil.
2. *Drainage.* As in I.
3. *Grass.* Plant by the vegetative method or "sprigging." Different strains of Bermuda are of very unlike quality. The Atlanta strain is the best known. See THE BULLETIN, Volume II, pages 97 and 151.
4. *Mowing.* As in I. See also THE BULLETIN, Volume II, page 151.
5. *Rolling.* As in I.
6. *Watering.* Use sparingly and only when really necessary. See THE BULLETIN, Volume II, page 151.
7. *Weeds.* Keep the greens always well weeded. Two or three southern weeds are very dangerous on Bermuda greens.
8. *Top-dressings.* Top-dress as often as the surface runners make necessary. Cutting off the runners will reduce the amount of top-dressing. Use a rich loam, preferably clay loam.
9. *Fertilizers.* Use moderately. A rank growth of Bermuda grass encourages runners.
10. *Liming.* Lime appears to be beneficial to Bermuda greens.
11. *Earthworms.* As in I.
12. *Grubs.* As in I.
13. *Spiking.* Regarded by some as beneficial. See THE BULLETIN, Volume II, page 151.
14. *Hole placement.* As in I.
15. *Brown-patch.* Does not attack Bermuda greens.

Treatment for Unwatered Greens

DR. MAYNARD M. METCALF, THE ORCHARD LABORATORY, OBERLIN, OHIO

Before the Country Club at Leland, Michigan, had water on its putting greens, it was troubled in dry weather by their becoming thin and full of small irregularities between the grass tufts, making a very unsatisfactory surface for putting. Several considerations made it necessary to postpone putting water on the course, but meantime temporary measures were taken to improve the surface, and with fair success.

The natural soil of the green was very sandy, with small gravel stones which had to be removed as the frost brought them up, and this process increased the irregularity of the surface.

We adopted the plan of sprinkling sandy loam, a fairly rich soil, over