In reading these articles it is interesting to note the variations in the use of compost; the materials used, method of handling, rates and time of application. It is also interesting to note the different methods used in applying fertilizer and other chemicals. Even such a simple process as mowing the greens has variations. This great variety is found to exist not only as between different courses but it is shown that methods may vary somewhat for different greens on the same course. We realize that this collection of articles may cause some little concern among those greenkeepers and club officials who still cling to the fetish of "standardized methods" in greenkeeping. Before judgment is passed, however, it would be well to again be reminded that, even though criticism of some of the minor details may be fully justified, the fact remains that in each case the writers have demonstrated that under their own conditions these methods have produced good putting green turf, including the turf on which three of the major national matches were played this season.

Experience with Creeping Bent in Virginia

By George T. Cunningham

The creeping bent turf of the putting greens on the two courses of the Country Club of Virginia, near Richmond, is still, relatively speaking, in its early stage of development. Opportunity has been afforded the writer to witness some features in the conditioning of this turf which may be of interest to readers of THE BULLETIN.

At the James River course the turf is one year old, and at the Westhampton course it is two years old. On both courses the greens were planted with creeping bent stolons. The greens at the James River course, which were planted with Metropolitan bent, are practically pure, notwithstanding the appearance of some crab grass and other summer grasses, including silver crab grass, locally known as "bull grass," and a small amount of Bermuda, all of which have been picked out. In the early spring an enormous quantity of weeds of various kinds appeared, necessitating a tremendous amount of work in cleaning the greens before a solid turf could be secured. A large proportion of these weeds consisted of blueweed, which, under putting green conditions, produces a rosette-like plant somewhat resembling the dandelion. No annual bluegrass (*Poa annua*) was in evidence on the James River greens, but during the winter and early spring approximately 20 per cent of the Virginia bent greens at the Westhampton course was annual bluegrass. Blueweed and all kinds of crab grass have been much more of a problem at Westhampton than at James River, largely owing to the facts that near most of the greens at Westhampton slopes exist from which large quantities of weed seeds are annually washed upon the putting greens, and cultivation was very clean and frequent at the James River course before it was seeded. During the winter it was necessary to remove blueweed from the Virginia bent greens, and this was the only weed evident in the turf at that time of the year. In our attempts to control annual bluegrass the coming season the blades of the mowers will be set high enough to cut the tops off the clumps of the annual bluegrass and leave the dormant creeping bent untouched.

During hot, dry weather the greens were watered daily starting at 6 o'clock in the morning during July and August and 7 o'clock

during other summer months. Some defects in drainage, however, began to be noticed, and in such locations the daily watering was discontinued and experimental work was inaugurated to determine the most judicious watering program. In some cases drainage proved so defective as to necessitate the laying of tile by the middle of July. At the James River course our water system is so efficient that a delivery of approximately 40 gallons a minute can be obtained on a green by hand watering. None of the water pipes on this course are smaller than 1-inch, and the main pipe is 6-inch. One-inch hose is used, connected to shower-bath heads in which the holes have been drilled to a larger size. Each green was watered for about 10 minutes. When, however, the hot, humid weather of summer arrived, it was discovered that this was far beyond the water requirements of the greens and that serious damage was being done to some of the greens under this procedure. The responsibility for watering all the greens was accordingly turned over to one man. After that no green was watered more often than every other day, or less frequently if the amount of rainfall demanded.

Top-dressing a putting green at the Country Club of Virginia

For three months the only fertilizer applied on both courses, except on one green, was sulphate of ammonia, used at the rate of 2 pounds to 1,000 square feet. No sulphate was applied at the same time as top-dressing, but just after at times, and at other times perhaps a week or ten days before or after. Soil analysis of samples taken from the James River course, however, disclosed the complete absence of potash. The State Department of Agriculture, which made the soil analysis, recommended the use of a complete fertilizer. One green on the Westhampton course was not given sulphate of ammonia, but was fertilized with cottonseed meal every two weeks applied at the rate of 4 pounds to 1,000 square feet, in addition to top-dressing. The condition of this green as compared with the others at Westhampton was so satisfactory and its injury from brown-patch so

much less, that after July 15 cottonseed meal was used in place of sulphate of ammonia on that course, and a like change was also made on the James River course. It should be noted, however, that the green treated the entire season with cottonseed meal was severely injured by leaf-spot, as were also all other Virginia bent greens. All fertilizers were applied by hand, being first mixed with sufficient screened soil to insure even distribution. The average area of the greens on both courses is 5,500 square feet. The soil is a stiff clay or silt underlaid with gravel or clay.

The greens are top-dressed once a month with a mixture of mushroom soil and sand in equal proportions applied at the rate of approximately 1½ yards to 5,000 square feet. The top-dressing is applied with shovels and is then rubbed into the turf with leveling boards. On the new greens at the James River course, where a good putting surface has not yet been secured, the small pockets have frequently been top-dressed by hand, the workman carrying a pail of top-dressing material which is rubbed into the low spots and surrounding turf. Unfortunately when planting the stolons on this course no planks were used for the men to walk on, and as a result the greens were full of deep holes which were still evident even after the light rolling given the greens in the spring. The top-dressing material has not been prepared in compost piles but has been mixed after securing the mushroom soil. Another year no top-dressing material except sand will be purchased, unless activated sludge, soil, and sand are mixed together, since sufficient manure has been put into soil beds this year to top-dress both courses next season.

There is an opinion among local greenkeepers that during the summer months there should be a discontinuance of the application of sulphate of ammonia with continuance of top-dressing, and that the bent should be left a little longer. There appears to be some merit in this opinion. It is my understanding, moreover, that such a procedure is followed at another course.

In spring our greens were usually mowed every day, hand mowers being used and the clippings always removed. During July and August it was, however, noticed that the Virginia bent did not require daily mowing and that the Metropolitan bent did not always require it, especially those greens which had been most severely injured by brown-patch or which suffered from defective drainage. The greens are never brushed or poled, but those near pine trees are occasionally swept with a greens sweeper to remove the pine needles. Cups are changed four times a week—Tuesdays, Thursdays, Saturdays, and Sundays, as a routine practice—or daily during periods of especially heavy play, as in tournaments. Weeding has been taken care of as a part of the routine work, but special gangs of workmen have also been employed at three different times to make a complete cleanup on both courses. The control of brown-patch and insects included the use of arsenate of lead and mercury applied in various forms; also the greens were limed about August 1 at the rate of one ton of lime to the acre. The forms of mercury used in the control of brown-patch were bichloride, red oxide, and calomel, the chemical being mixed with soil and broadcast over the green.

Individuality and character in a course are the real tests of a golf architect's worth.