

They are more prominent in the carpet bents than in the velvet bents, but in all probability the planting of properly prepared material and the liberal application of good humus top-dressing will entirely correct this difficulty. The second trouble to be feared is the susceptibility of the carpet and velvet bents to the brown-patch disease, a fungous disease which is very prevalent and destructive to putting greens in moist, hot times in the spring and summer."

The first difficulty mentioned (that is, the one from surface runners) has not materialized; the proper use of top-dressing obviates it completely. Brown-patch, however, has proved to be a very serious turf disease; but a careful study of its effects upon vegetatively planted greens and upon greens seeded with bents or fescues, shows little difference in the resistance of one over the other. Furthermore, by systematic and careful use of Bordeaux, either the liquid or the powder, the brown-patch disease can be reasonably well controlled.

The greens planted on the East Potomac Park Public Golf Course in 1918, were the victims of a combination of unfortunate conditions which resulted in their undoing. Those now responsible for the course, however, give assurance that the combination will never occur again, but with all the factors that operated against them, of which brown-patch was one, the greens would be in condition today, if only they had been left alone. As it is, No. 9-A, the first green planted, promises to stage a comeback that will surprise some who thought it successfully dead and buried. It is scarcely an exaggeration to say that the success of No. 9 green at the Columbia Country Club is known wherever golf is played, and it is safe to say that there is not a finer piece of putting turf anywhere in the world. It is now entering into its fourth year in better condition, if such is possible, than at any time in its history.

It is needless to make predictions for the future of the vegetative planting of the bent grasses. The future is so near at hand that it will very soon speak for itself.

Vegetative Planting of Putting Greens

WALTER S. HARBAN

The success we have had at Columbia with the vegetative propagation of the bent grasses has brought forth requests that I give the readers of *THE BULLETIN* some suggestions descriptive of the steps involved in making putting greens, such for example as our No. 9. I shall endeavor, therefore, to describe in simple terms the various steps in the method from the growing of the stolons for the planting of the green to the treatment of the resulting turf.

GROWING THE STOLONS. The soil for the nursery bed should be prepared carefully, especial care being given to seeing that it is thoroughly pulverized. The rows should be laid off from five to six feet apart, the same as if you were going to plant potatoes. For this purpose the use of an ordinary one-horse single-shovel plow is recommended. In the bottom of the rows apply an inch or two of well-rotted manure. Cover this by means of a potato coverer, and with an iron rake smooth the surface, leaving two or more inches of soil over the manure. Bone meal may be applied in addition to the manure. Avoid broadcasting the fertilizers, as this only makes the problem of weeds between the rows more serious. Most of the new stolons or runners develop from the original row, and it is better therefore to concentrate your fertilization at that point.

If runners are to be used for the plantings, a shallow trench made with the handle of a rake is all that is required. In planting, it will be sufficient to lay two runners side by side. These should be covered by hand to a depth of from one-quarter to one-half inch. If the stock used is firm turf taken from a green or fairway, the turf may be cut into plugs one inch square or even smaller, and planted the same as tobacco or cabbage plants, eight to ten inches apart. It is surprising what wonderful growth will develop within a year's time from so small a start. The plugs or stolons should be kept moist in order to insure quick growth.

In the selection of the original stock for propagation purposes, it is advisable to select strains in which the joints or nodes occur close together, as such strains make finer turf and require much less material in planting, inasmuch as it is the joints or nodes which produce the new plants.

PREPARING THE SOIL FOR THE GREEN. Whether for seeding or vegetative planting, after the putting green has been completely formed and the necessary soil structure obtained, it is very desirable to apply an additional layer of soil, known as the seed bed. The soil for this layer should be prepared from two parts of loam (preferably a good, light loam), one part of well-rotted stable manure (or better still, mushroom soil), and one part of sharp sand, and if obtainable one part of black woods earth. If the loam is clayey, use one part of the loam only. Mix thoroughly and screen finely. Apply this soil in a layer one inch thick over the entire surface of the green, and then roll with a roller weighing about 150 pounds to the linear foot so as to produce a firm bed. This layer, aside from providing the best seed and root bed obtainable, furnishes a most desirable springy surface for play.

PREPARING THE STOLONS FOR PLANTING THE GREEN. For best results the stolons should be lifted or prepared only a short time before they are replanted on the green. It is true that they will stand very rough treatment, but under such conditions they will respond more slowly. The mat of stolons should be carefully examined and all foreign grasses or weeds removed. The mat is then pulled apart preparatory to passing it through the cutting box, which should be set to cut in lengths of from one inch to not more than two inches. The material should then be picked apart, prefer-

ably stem by stem. If plenty of time is spent in doing this thoroughly, the sowers will be enabled to do their work more easily; much material will be saved, and a more even planting will be obtained.

PLANTING THE STOLONS. In order to prevent excessive trampling of the turf bed it is advisable to lay a straight line of boards through the middle of the green lengthwise for the men carrying the stolons and soil to walk on. The surface to be covered should be raked lightly just before laying the stolons. The man or men scattering these can cover not more than a strip three feet in width. A wider strip can not be covered, except at the expense of marring the surface by the trampling necessitated. It will be found that the surface is little or not at all disturbed by stepping backward when flat shoes are worn. The number of men employed should be sufficient to prepare the stolons and bring them to the men applying the stolons to the surface as well as to those applying the top soil. The men applying the soil follow fairly closely behind those doing the planting. The men should be cautioned to be careful to lift their feet and not drag them. There is little to be feared, however, from walking on the part of the surface that has been covered. Running a light wooden roller over the stolons immediately after they are strewn and before the soil is applied presses the stolons down so that they may be more readily covered. The stolons should be spread on the surface uniformly; that is, to each square inch of surface there should be at least two or three nodes. Care should be exercised to see that nodes, and not simply blades of grass, are applied to the surface, as it is the node, and not the grass blade, which possesses the power of reproduction. By taking a small handful of the material, held loosely, and using a lateral shaking movement of the hand, the material can be quickly applied. The soil should be applied in the same manner, and only sufficient soil should be applied as will give the stolons a thorough but light covering—never more than one-half inch, while one-quarter of an inch is preferable. The soil can not be applied with a shovel, nor even dashed on with the hand, without greatly disturbing the stolons. A quiet day is most desirable, as a slight gust of wind will blow the stolons away before they can be covered with soil. By covering at first with a very light dressing and then rolling, the stems may be pressed closer to the earth and be more readily covered immediately afterwards with a second dressing. The entire green should then be rolled; the light sectional wooden roller is heavy enough for this purpose. Watering should be begun immediately after the planting. Warmth and moisture are essential for quick and perfect results. The water should be applied with a large rose nozzle attached to a hand hose, and should be gently sprayed, and never dashed on or applied with sprinklers, as at this stage it is not necessary to water more than sufficient to moisten the earth one inch; deeper penetration of the water will not be called for until the roots go beyond that depth. It is, however, essential that the applications of water be continuous for two or three weeks so as not to allow the soil to become dry during that period. By that time the plants will be found to

be strongly and firmly rooted. A plant produced from the node of a stem of grass is far stronger than one produced from a seed.

SUBSEQUENT TREATMENT. As soon as the new stolons reach a length of two or three inches the grass should be cut with a light machine raised to cut at about five-eighths to three-fourths of an inch, and the clippings should not be raked up. It will be found that many of the new clippings will have nodes, and if dressed again in the same manner as was first done these will serve as a secondary planting. If through any mishap thin spots in the turf should be evident, some of the clippings may be gathered by hand and scattered upon the thin places, and then rolled and watered as before. As this is the most important stage in the development of the vegetative planting, precautions should be taken to see that a sufficient amount of plants or runners is available for use. The last dressing should be heavy, from three-eighths to one-half inch, as the growth produced up to this time is that from which the finer shoots will be obtained. It is, therefore, urgent that after a day or two the grass be cut again, and each few days thereafter, each time perceptibly dropping the knives. The grass catcher should be used so that the clippings will not remain on the surface of the green. If at the end of another week there appears a tendency in the stolons to show above the surface, another dressing should be applied, from one-eighth to one-quarter of an inch thick. This dressing may be applied with a shovel, in the hands of an expert spreader, and it can do no harm provided the dressing is not applied in heavy streaks. It is not desirable to use a rake, drag, or brush over the surface, as the aim so far has been to keep the runners beneath the surface of the soil, and the use of any of these instruments would defeat the objective.

A green treated in the manner herein described will call for very little more than close cutting and perhaps occasional light dressings, rollings, and deep watering.

The ninth green at the Columbia Country Club was built in the manner I have described. It was planted, however, late in November, 1919, and made but little if any growth before the middle of April. It was covered and protected all winter to prevent injury. When uncovered in the spring there was not the sign of a blade of grass on the surface. The warmth of a few weeks, however, showed that the stolons were still alive, and the subsequent development was rapid. Everything considered, it would appear that any time from May 1 to September 15 is good for doing this work. If there is any preference, August would seem to be the most desirable month.

THE MAKING OF TURF BEDS. Where the turf on permanent greens is poor and where for any reason it is not feasible to attempt to improve it, we have found it entirely practicable to grow bent sod by the vegetative method and transfer it to the green where needed. In the fall of 1922 an area was prepared as we would prepare a green for planting, and planted with chopped stolons in the way I have described in this article. Early in the

summer a sufficient growth had been made so that the turf was really sufficiently good for play. We desired to make some changes in our No. 3 green, and when these were completed last October we transferred the sod from the sod bed to the new green. The method of transferring the sod was that commonly used and described in various numbers of *THE BULLETIN*. I scarcely need to say that the method was entirely successful and that we now (April, 1923) have perfect turf on our new No. 3 green. The relatively low cost of improving the green this way and the very satisfactory results we have obtained encouraged us to plant a larger sod bed last fall. This we are confident will produce good turf that will enable us to improve some of our greens that are not entirely satisfactory, with the minimum of interference with play.*

Some New Bulletins Valuable to the Greenkeeper

THE USE OF CONCRETE ON THE FARM. Farmers' Bulletin 461. U. S. Department of Agriculture, Washington, D. C.

FOOD OF SOME WELL-KNOWN BIRDS OF FOREST, FARM, AND GARDEN. Farmers' Bulletin 506. U. S. Department of Agriculture, Washington, D. C.

THE DRAINAGE OF IRRIGATED FARMS. Farmers' Bulletin 805. U. S. Department of Agriculture, Washington, D. C.

AMERICAN MOLES. Farmers' Bulletin 1247. U. S. Department of Agriculture, Washington, D. C.

CHOOSING A TRACTOR. Farmers' Bulletin 1300. U. S. Department of Agriculture, Washington, D. C.

PREPARATION OF PEAT COMPOSTS. Department Circular 252. U. S. Department of Agriculture, Washington, D. C.

SUBSTITUTION OF STABLE MANURE BY FERTILIZERS, GREEN MANURES, AND PEAT. Bulletin 188. Agricultural Experiment Station, Kingston, Rhode Island.

THE JAPANESE BEETLE. Circular 46. State Department of Agriculture, Trenton, New Jersey.

GRASSHOPPERS, CUTWORMS, AND ARMY WORMS, AND THEIR CONTROL BY POISONED BRAN. Extension Circular 38. South Dakota State College, Brookings, South Dakota.

* It will be noted that there are some differences in details between the method described by Doctor Harban and that by Lyman Carrier. They represent two ways of doing the work, developed somewhat independently, one using extreme care where time is not a serious factor, the other where a large number of greens have to be planted in a short time, as at a new eighteen-hole course.—(EDITORS.)