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CONTENTS

Turf Experiments at the Florida Experiment Station. C. V. Piper.....	98
Vegetative Planting. Lyman Carrier.....	102
New Member Clubs of the Green Section.....	113
Vegetative Planting of Bent Grasses: an Historical Sketch. R. A. Oakley.....	114
Vegetative Planting of Putting Greens. Walter S. Harban.....	119
Some New Bulletins Valuable to the Greenkeeper.....	123
A Wonderful Turf Walk.....	124
Some U. S. Golf Association Decisions on the Rules of Golf.....	124
Questions and Answers.....	125
Meditations of a Peripatetic Golfer.....	128

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Turf Experiments of the Florida Experiment Station, Gainesville, Fla.

C. V. PIPER

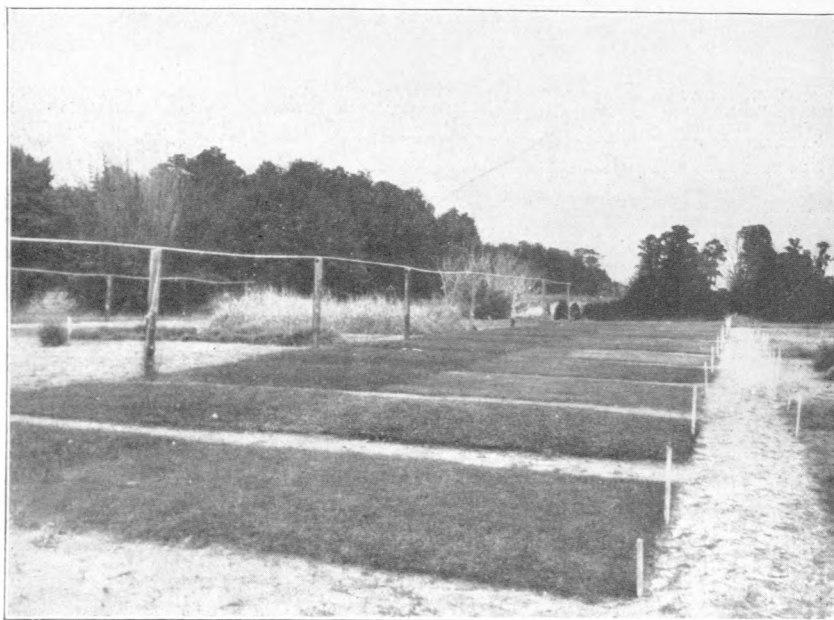
At the Florida Experiment Station there is a series of turf plots that should be of great interest and importance to all golf clubs in Florida and in the states along the Gulf Coast. The grasses being tested include several tropical and subtropical species new to the United States, mostly introduced by the United States Department of Agriculture. The illustrations give a general view of the grass plots and also close-up views of a few of the more interesting grasses. In addition, there is a series of plots to show the relative values of the different winter grasses sown on the perennial grass. Some of the grasses are primarily of value for fairways, others for putting greens.

Some of the newer and more interesting grasses are the following:

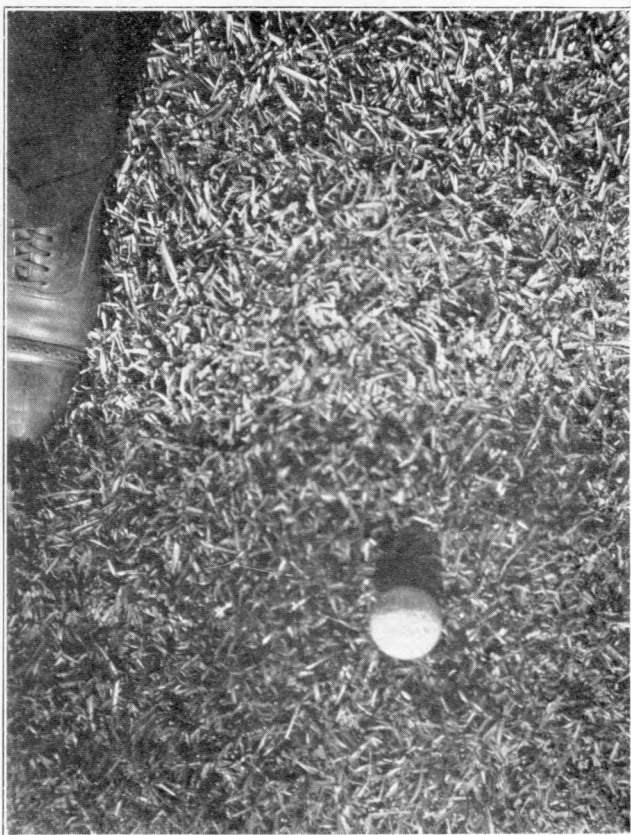
Centipede grass (*Eremochloa ophiuroides*).—This is a grass with surface creeping runners, not greatly unlike carpet grass. It is a native of China and makes up the bulk of the pastures of that region. It is a splendid fairway grass even in loose sandy soil, and not a bad putting green grass if kept well rolled. It is easily propagated vegetatively, which method must be employed for propagation until a seed supply is available.

Bahia grass (*Paspalum notatum*).—This is the common grass of western Cuba and forms the fairways at the Havana Country Club. It makes a very firm turf even on loose sand. It is easily propagated vegetatively, but the seed does not germinate very well.

Blue couch-grass (*Digitaria didactyla*).—This is an Australian grass much like Bermuda grass, but decidedly blue in color. It grows very well even in sand and makes a fine dense turf fit for putting greens. As yet no



Golf Grass Plots at the Florida Experiment Station



Centipede Grass



Bahia Grass



Atlanta Bermuda Grass



Giant Bermuda Grass

seed supplies are available, so the vegetative method of propagation must be resorted to.

Bermuda grass.—The plots include Giant Bermuda; St. Lucie grass, a fine variety without rootstocks; ordinary Bermuda; and Atlanta Bermuda. A comparison of these four is very instructive. The first is fit only for fairways, but some South Florida courses have it on their putting greens; the last is best of all for putting greens.

St. Augustine grass (*Stenotaphrum secundatum*).—Not at all a bad grass for fairways, but too coarse for putting greens. Will grow on the seashore where covered by high tide, and is therefore desirable where ocean spray is a factor.

Giant carpet grass (*Axonopus furcatus*).—A native southern grass and splendid for fairways. There is much at the New Orleans Country Club and other courses in the south.

Korean grass (*Osterdamia japonica*).—A splendid grass for tees and fairways. Large patches occur on the fairways of the Palm Beach Country Club and of the Miami Country Club. At both of these clubs it is being used for tees. Seed is produced in Japan, but it is always infested with an ergot and therefore not permitted to enter the trade.

The experiments at Gainesville are in charge of Prof. J. M. Scott and Mr. W. E. Stokes, and are being conducted in cooperation with the Green Section. Everyone interested is invited to visit the plots, and any Green Section club can, upon application, secure any of the new grasses for experimental trial. At the present time these trials will have to be by the vegetative method, as no seed supplies are available.



Giant Carpet Grass

Vegetative Planting

LYMAN CARRIER

It would seem that the vegetative method of planting grass has been described sufficiently in detail so that every reader of THE BULLETIN should understand it clearly. Nevertheless, after sending a correspondent our circulars on vegetative planting, we often get by return mail the question, "Where can I buy seed of this grass and how much is it a pound?" Such inquiries are the excuse for treating the whole matter again.

First of all, *vegetative planting is not seeding*. The creeping bents, which are planted by this method, seldom produce viable seed. There is no pure seed of them on the market and no good prospects of there being any in the near future. There is usually a very little creeping bent seed in the German mixed bent. Plants of creeping bent can nearly always be found on courses where the German seed has been used in the past.

Creeping bent has an efficient means of spreading. It sends out long, jointed runners, known as *stolons*, which can take root at each joint and thus form new plants, much the same as do strawberry vines. The seaside strain of creeping bent produces both seed and stolons; so there is a possibility of getting seed from that variety, but there is none on the market now.

Grass stems are always jointed. These joints (or *nodes*, as botanists call them) are in some grasses very close together; in others they may be several inches apart, as in corn, sorghum, or bamboo. The part between two nodes is called an *internode*. At each joint there is imbedded in the stem under the base of the leaf a bud. Botanists have a big word for these buds; but *bud* is clear enough for our purpose. In most grasses these buds on the erect stems do not grow unless the plant meets with an accident, as for instance, if the tip of the stem is cut off. In that case the buds develop into branches. A grass that seeds freely has little need to use these buds. In grasses with creeping stems, like creeping bent, Bermuda grass, crab grass, and quack grass, these side buds may start to grow at any time the joint comes in contact with continual moisture in the presence of air. In other words, whenever the stem gets down on moist earth the bud begins to develop into a branch. Just as soon as the bud starts to burst, roots begin to grow out of the joint and penetrate down into the soil. So far as known, no roots or other growth can be produced from any growing part of a grass plant except the joints.

Vegetative planting is as old as written history. The sugar-cane crop has been planted by this method for centuries. The point should be kept in mind, however, that there are only a few grasses which are suited to vegetative planting. Any grass may be transplanted—that is, a tuft of the grass with roots attached may be put in a new location, as in sodding; but that is not vegetative planting in the sense that the term has in connection with the vegetative method of planting creeping bent. *Joint* or *node planting* would be a more definite term than the one in use. In an experiment, we have trimmed the stem of creeping bent, leaving only the node with

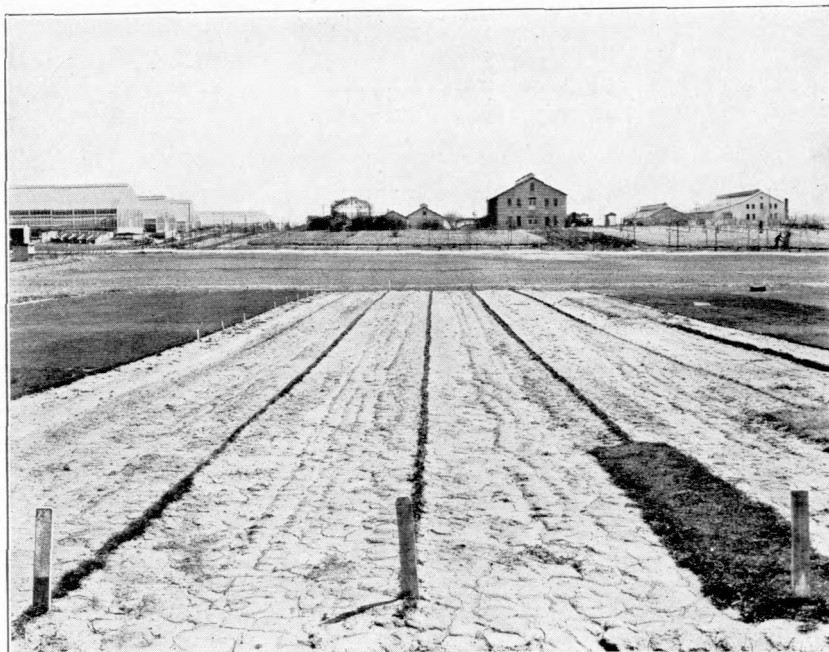


Fig. 1. Nursery rows of creeping bent planted September, 1922. The wide side strip at the right represents the growth made the preceding season. Picture was taken in April, 1923, at Arlington Farm, Va.

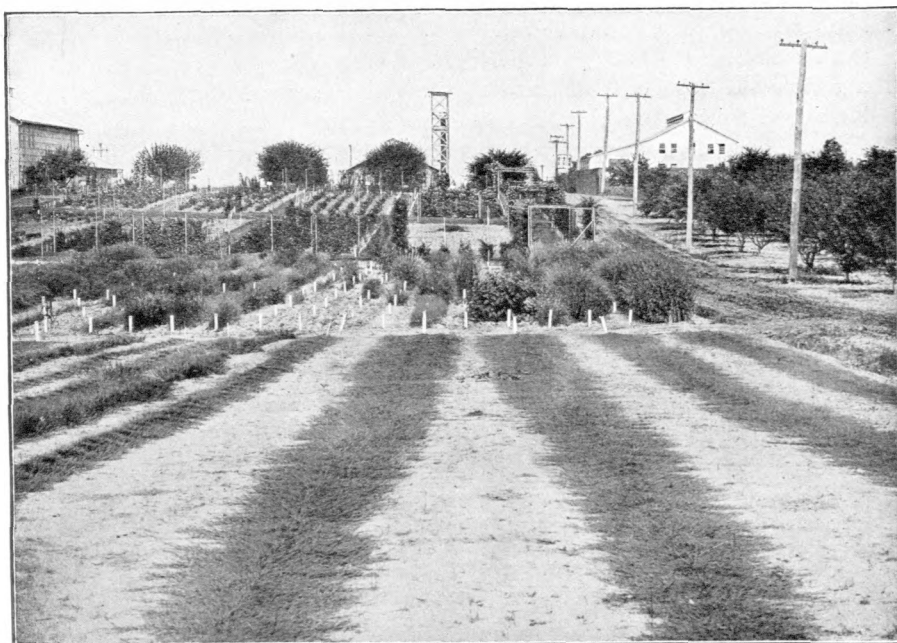


Fig. 2. Rows of carpet bent at Arlington Farm, Va. Photograph taken in June, 1919. The rows were planted the previous October and when planted each consisted of a single row of runners; the following June these rows were 3 feet wide, and by the first of October 6 feet wide.

the bud attached, and have had it grow like seed. Let us make this point clear: It is not necessary to have roots on the creeping bent joints when they are planted, in order to have them grow. If the stolons are alive the buds will grow whenever the conditions are favorable.

GEOGRAPHIC DISTRIBUTION OF CREEPING BENT

Creeping bent is a northern grass and thrives only under humid conditions. There appears to be no reason why it can not be grown anywhere in the northern part of the United States if water is supplied when the rainfall is insufficient. It is not a dry-land grass, and no attempt should be made to grow it under arid or semi-arid conditions unless plenty of water is available for irrigation. In fact, we do not advise any one to attempt this method of planting putting greens unless a watering system is available so that the grass can be watered; nevertheless, we have grown several plots successfully without any artificial watering. At present we can not say how far south the grass can be successfully grown. We have no definite information in regard to its success south of Richmond, Virginia. It is worth trying as an experiment throughout the South wherever it can be kept well watered during the summer.

TIME OF PLANTING

Creeping bent can be planted at any time the ground is in condition to be worked. We have made plantings from early April till late in November. The late plantings make very little growth during the winter, but they start off earlier in the spring and grow faster than spring plantings. Plantings made in midsummer have made excellent turf in a remarkably short time when kept well watered. We rather prefer late summer plantings, in order to take advantage of the good grass-growing weather of September. Judging from our experience and much observation, it is safe to plant creeping bent by the vegetative method any time. I would not hesitate to plant in midwinter if there were any good reason for doing so. While the grass would not grow at that time of the year, the stolons would not rot and they would give an account of themselves when growing time came.

NURSERY

The first thing necessary in vegetative planting is to get the stems, with their all-important joints, to plant. These have to be grown just as a crop of seed has to be grown. There has been much confusion between nursery planting and planting for turf. These are two separate and distinct features of the method. Nursery planting is done in rows kept cultivated and free from weeds, the same as is done with any row crop, like corn, beans, or potatoes (see figures 1 and 2). Any soil which will grow tame grasses in the region indicated above is suitable for growing bent in nurseries. Bent thrives under a great variety of conditions. Moist clay loams will give the most abundant growth, but a nursery on a sandhill at the Sylvania course, Toledo, Ohio, where there was little other vegetation, gave an excellent crop of creeping bent stolons. A hard clay hilltop is the

most unsuitable location to select, but good grass can be grown even under such conditions if given an occasional watering.

The land should be free from other turf grasses. Sod land should be plowed some time before planting a bent nursery. It is a good plan to prepare the nursery at least six months before it is to be planted, if cultivated land is not available. Ordinary tall-growing weeds are easily taken care of after the nursery is planted, but white clover, bluegrass, quack grass, and redtop cause a lot of trouble if they are present.

After the ground is plowed, harrowed, and raked to give a fine seed bed, the rows should be laid off five to six feet apart. The grass is planted in trenches not over one inch deep. It is a good plan to stretch a string to locate the trenches in order to get them regular and straight. The trench may be made with a sharp-pointed hoe, point of a pick, or a sharp stick. The sod for planting is next torn apart and spread in a continuous row down the trench and covered immediately with not over one-half inch of soil. Single stolons end to end in the trench are sufficient to give a good stand. Ordinarily, however, we stretch three or four along side by side. But the line had best be continuous, not in hills. One square foot of stolons as they grow naturally without being cut, will plant 100 linear feet of nursery row. If nursery material one year old or less is used, the stolons separate easily. If, however, one uses old turf, say a selection from an unusually good patch formed by a single plant, this should be cut or torn into very small pieces and these pieces planted 4 inches apart in rows. A square foot of old sod will not plant as long a row as a square foot of nursery stolons. Hereinafter, the term *sod* refers to a piece of old turf; *nursery sod* to pieces of nursery rows. If some of the green leaves are left exposed, so much the better. The row should then be watered. A sprinkling pot without the nozzle is handy for this. While creeping bent sod with a little dirt adhering may be shipped long distances, the stolons when torn apart should not be exposed to the drying effect of the sun any longer than it is possible to avoid. Remember, no one has yet succeeded in restoring life to hay.

After the nursery is planted it is necessary to weed it continually and to cultivate it occasionally in order to keep the soil loose between the rows. Artificial watering for the nursery, while not imperative in a humid climate, is very helpful. A few applications of ammonium sulfate or any other quick-acting nitrogenous fertilizer will make the runners grow faster. It is safer to scatter the fertilizer alongside the row than to put it directly on the grass, as it is an easy matter to apply enough to burn. The stolons grow out from each side of the row in a tangled mass which becomes from two to three inches thick. The length to which they will grow in one year depends on the richness of the soil. Ours on very poor soil usually grow two to three feet on each side, making rows four to six feet in width; on rich soil they grow much larger. In order to get good growth it is necessary to give continual attention. If you plant the nursery and neglect it for several weeks or months you need not expect to have a good crop of stolons. The growth

is continuous throughout the summer, provided the moisture conditions are satisfactory.

No attempt is made by the grass to send up seed-stalks the first season after planting; but if left undisturbed there will be a large number of seed-heads formed the second year while the stolons continue to spread vegetatively from the outer margins of the row. As previously stated, there is very little viable seed produced.

When a row of stolons is taken up, the place it occupied should be planted with fresh stolons. A row one year old cut back to the original planting will not spread like a new planting. Why this is so we are unable to explain.

PLANTING PUTTING GREENS

Some mistaken notions have arisen in regard to the method used for planting the stolons where turf is desired. Some greenkeepers have confused *nursery planting* with *turf planting* and have the idea that a few stolons planted here and there will mat together and form turf; some have tried to combine vegetative planting with seeding; and some have simply made a mess of it and quit. No claim is made for perfection in the following suggestions. They have developed from the writer's experience gained from numerous experiments conducted during the past five years at the Arlington Experimental Farm and from supervising the planting of twenty-five putting greens in the fall of 1922.

PREPARING THE GREEN. The preparation given a putting green which is to be planted by the vegetative method does not differ from what is needed for a good seed bed; that is, the soil should be firm beneath, with a fine, loose layer on the surface. There should be available a pile of top-dressing sufficient to cover the entire green from three-eighths to one-half inch in depth, located conveniently with reference to the green. It requires about 10 cubic yards of top-dressing for 6,000 square feet of surface. As additional applications of top-dressing will be needed after the grass begins to grow, it is advisable to have an ample supply on hand. The top-dressing should be screened, and it should be friable—that is, it should be of materials which do not run together and bake into a crust. The ordinary top-dressing mixture of one-third loam, one-third sand, and one-third manure is excellent. But it is not always necessary to go to the trouble of making compost for this purpose. Good loam with an addition of 25 to 50 per cent of sand will usually answer. Swamp soil or woods earth are also good for top-dressing if they have sufficient body so that they will not dry out on the surface and blow away. To put the whole thing in a few words, one should make up the best top-dressing he can from the materials which are available, and if he can not do any better, screen ordinary top soil and use that.

No quick-acting fertilizers, such as sodium nitrate or ammonium sulfate, should be used before planting, nor after planting, until the grass is well rooted and growing vigorously. Stable manure, bone meal, and similar

materials may be used in the preparation of the green, but it is an easy matter to get too large a quantity of soluble salts in the soil moisture for young grasses.

Moisture is the important thing in vegetative planting. If it is a dry period it is a good practice to water the greens thoroughly a few hours before the work is started; this insures having plenty of moisture in the soil, but the surface should be allowed to dry before planting, so that it is not sticky when the planting is being done.

PREPARING THE STOLONS. If the nursery is on the course where the planting is to be done, it is not necessary nor desirable to take up any appreciable amount of dirt with the stolons; they may be cut off at the surface with a sharp hoe, spade, or edging tool. But if you do not take up dirt with the stolons, remember that you must use additional precautions to keep them from drying. It is a good plan to wrap them immediately in wet burlap or put them in wet bags. They may be stored in a pile in the shade if kept wet. It is not advisable to take up at any one time in this way more than will be used in a few hours.

The stolons should be run through a chopping box or fodder cutter with the knives adjusted to cut at $1\frac{1}{2}$ - to 2-inch intervals. With most of the hand machines it is necessary to take off all but one knife from the revolving cutter. It is sometimes necessary to run the material a second time through



Fig. 3. Separating the stolons preparatory to running them through the fodder cutter. The nursery sods may be run through the cutter first and the pieces picked apart afterwards.

the cutting box in order to get it cut finely enough to spread easily. This rough treatment does no harm. Nothing is likely to hurt the joints except drying, so the work should be done in the shade as much as possible and the material must be kept moist. (Figure 3.)

STOLONS SHIPPED FROM AWAY. When stolons are to be shipped for some distance it is necessary to take up about one inch of soil so that they will keep alive. In this condition they can be shipped anywhere in the United States. We have had stolons shipped from Sweden to Washington, and they came through alive. Very frequently pieces of turf sent to us from the Pacific Coast for identification come to us through the mail in first-class condition. These nursery sods should be handled in much the same way as is described above. If it is not possible to plant immediately, the sods should be spread out in a shady place, green side up, and watered. Treated in this way there is no danger of losing any of the material. If the nursery sod is dry when shipped there may be some heating. But even if the leaves have turned brown, the stolons are all right for use; the leaves are not essential to the success of vegetative planting.

The sods should be torn apart as much as possible and much of the dirt shaken off before running the stolons through the cutting box. After a sod has been cut into chunks, these should be picked apart. This has been the most tedious part of the whole operation. It would seem feasible to have a machine to do this picking and save a large amount of hand labor, but so far no one has produced such a machine.



Fig. 4. Scattering the pieces of stolons for sod. The top-dressing has been spread in the background but not rolled.

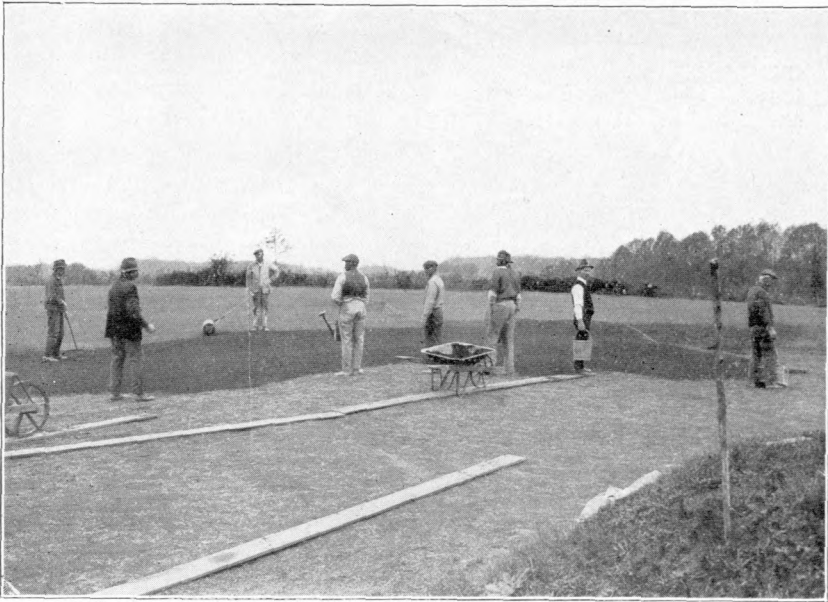


Fig. 5. Covering the cut runners with top-dressing. Picture taken at the planting of No. 9 green at the Columbia Country Club in November, 1919.

PLANTING THE JOINTS. The cut material is best handled in ten-quart pails. The sower carries the pail of material in one hand and spreads the cut stolons with the other hand. It is a good practice to plant in strips, allowing a five-foot strip to each planter, and move across the green in the same direction each time. There should not be more than two men spreading the stolons on a single green; this allows for covering evenly, and some pieces are not left uncovered longer than others. The cut pieces should be spread evenly. There should be no spots of ground larger than one square inch in size which do not have a piece of stolon after the planting is done. One square foot of stolons will plant about ten square feet of green, depending on the thickness of the nursery material and the care taken in planting. It is better to put on more joints than are absolutely needed than to use too few. A thick planting not only gives turf fit for play in less time than a sparse one, but the subsequent expense and care is less. It is poor economy to scrimp in the use of stolons in planting. (Figure 4.)

If there is a strong wind blowing when the planting is going on, it is necessary to protect the workers with a windbreak while they are scattering the joints, as otherwise the cut pieces will be blown about and a poor, unsatisfactory stand will result. A strip of muslin four feet wide, on a movable frame with large, flat feet, makes a good windbreak.

COVERING THE JOINTS. The top-dressing must be put on immediately after the joints are scattered. Do not wait until the green is planted, or



Fig. 6. Watering after the green has been planted, top-dressed, and rolled.

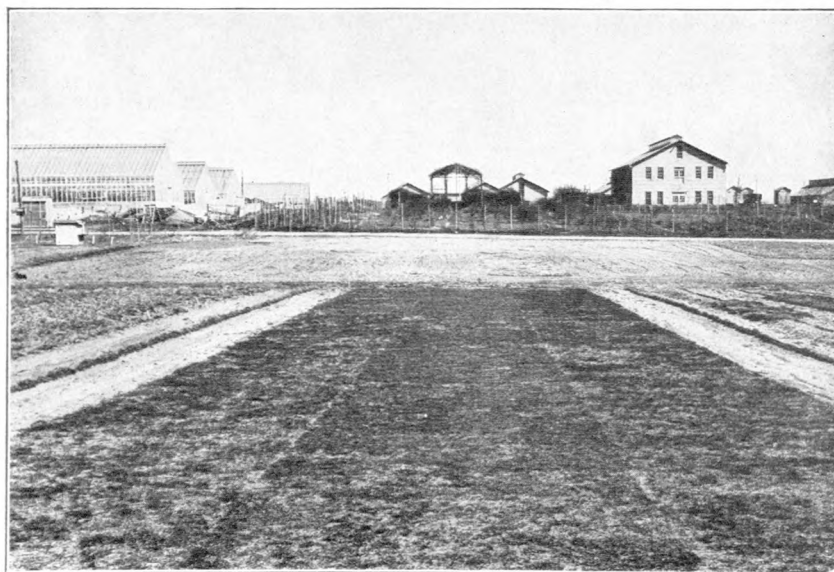


Fig. 7. Middle strip, creeping bent; side strips, velvet bent; planted by the vegetative method in late October, 1921. Picture taken in April, 1922 at Arlington Farm, Va.

half planted, or even one-fourth planted, but start the covering at once, and make the top-dressers keep up with the sowers. This top-dressing can not be spread satisfactorily with a shovel; such a procedure drives the pieces into waves, leaving bare places (figure 5). The method which the writer has used is to take the top-dressing to the green in a wheelbarrow and spread it by hand. The first strip of planting is covered from the outside margin of the green. This is then rolled and a line of planks laid on it to wheel on in order to cover the pieces of grass. Three-eighths of an inch is ordinarily thick enough for a layer. In a very dry period, or if there is any trouble with the water supply, the layer should be thicker. Heavy top-dressings, up to one inch in thickness, will not smother the grass, but they delay the sprouting very decidedly and ordinarily should be avoided.

A method worked out by Mr. H. C. Toomey last fall for spreading top-dressing appears to be an improvement over hand spreading. He constructed a box about 2 feet wide and 3 feet long and 6 inches deep. The sides of the box projected beyond the ends and were cut down to serve as handles. The bottom of the box was covered with three-eighths-inch-mesh wire screening. In use the box was filled at the pile of top-dressing and carried onto the green by two men, who shook it over the scattered grass until they had the material sufficiently covered.

WATERING. After the green is about one-third to one-half planted, top-dressed, and rolled, the watering should be started. This is best done with a hose with a rose nozzle. The pressure should be cut down so as to avoid any washing. One man or boy should be set to the task of holding the nozzle, and another to holding the hose so that it does not drag the top-dressing and misplace the pieces of grass, as it will do if drawn about the

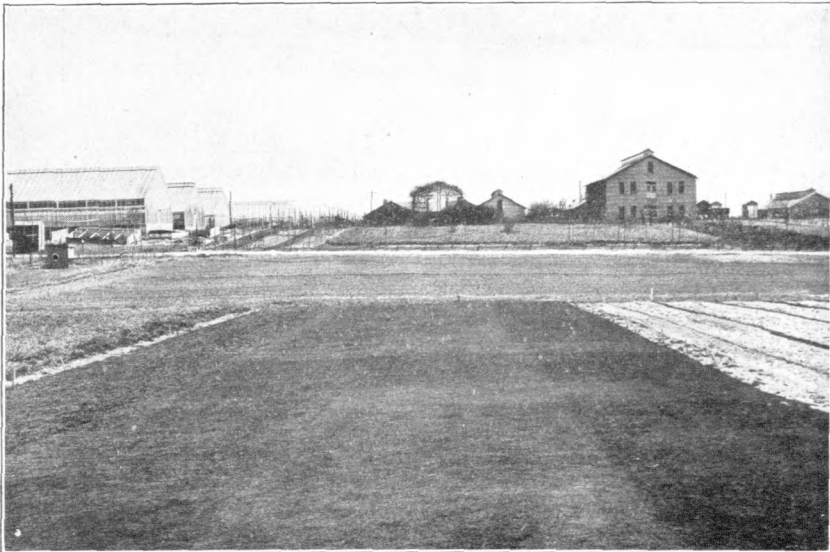


Fig. 8. Same view as in figure 7 but taken one year later

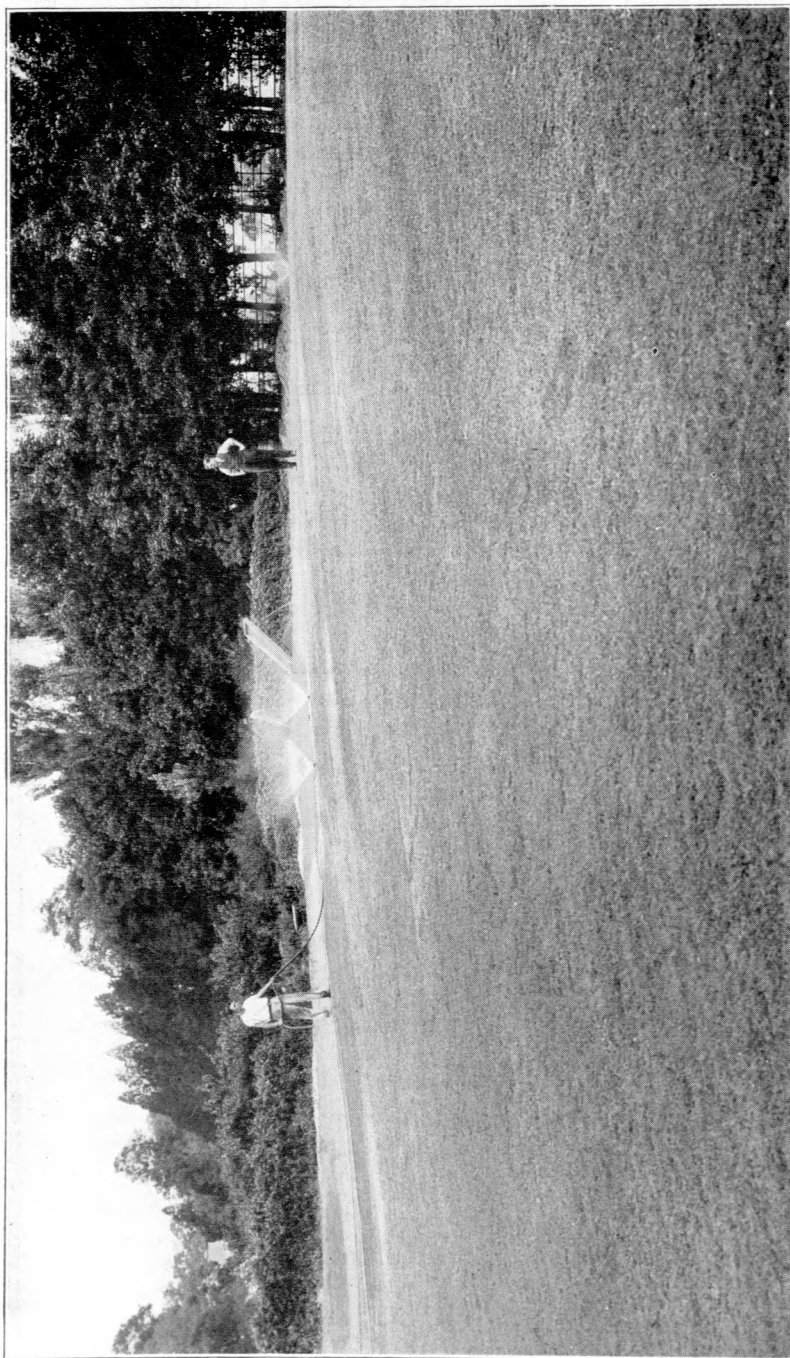


Fig. 9. An acre of creeping bent turf, Friendship Golf Course, Washington, D. C. Planted by the vegetative method in May, 1922. Picture taken two months after planting.

green by one person. Automatic sprinkling devices are not good for this purpose before the grass is well rooted and they have only served to damage the plantings where they have been tried. (Figure 6.)

SIZE OF CREW. The work of cutting up the stolons, picking the pieces apart, sowing the pieces on the green, covering with top-dressing, rolling, and watering should go along simultaneously. It is poor economy to work short-handed. A crew of about the right size consists of a foreman, one man to operate the cutting box, six men or boys to pick the grass apart, two men to scatter the cut pieces, two men to spread top-dressing, and two men to water, or fourteen in all. Caddy boys can sometimes be used for a few hours a day picking the grass apart. The foreman can look after the rolling, as that is not a very strenuous job. Such a crew should plant from 1,500 to 2,000 square feet of green an hour.

CARE AFTER PLANTING. The surface of the green should not be allowed to become dry after it is planted, until the grass has covered the green. It should be watered twice a day during dry weather for the first ten days or two weeks. After that, watering thoroughly once a day will suffice. The grass begins to send up green shoots in four or five days. In about three weeks it is usually far enough advanced to need a light top-dressing (about one-eighth of an inch) and a rolling. A week later it should have its first cutting. The clippings may be allowed to fall on the ground, and if the stand is thin they may be covered with a little top-dressing, as the clippings will take root and grow. The grass should be kept cut down to putting condition, and whenever loose runners appear a light top-dressing should be applied. With such care as has been indicated above the green should be in condition to play on after six weeks of good growing weather from the time of planting. (See figures 7, 8, and 9.)

Volume I of The Bulletin (1921) has been reprinted and may be obtained in one cover for \$2.25.

New Member Clubs of the Green Section.

Edge Hill Golf Club, Edge Hill, Pa.
Hamilton Country Club, Olean, N. Y.
Myopia Country Club, South Hamilton, Mass.
Lookout Point Country Club, Welland, Ontario.
Plymouth Country Club, Norristown, Pa.
Richmond County Country Club, Staten Island, N. Y.
Hempstead Country Club, Hempstead, N. Y.
Mankato Golf Club, Mankato, Minn.

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Vegetative Planting of Bent Grasses: An Historical Sketch

R. A. OAKLEY

At this time, when a very general interest is manifested in the vegetative planting of the bent grasses, it seems worth while to tell the story of how the method came to be used for the making of putting greens. It has been told before, but not fully in *THE BULLETIN*; therefore, it will be recorded here for the interest it may have for the readers of today and for its historical value for the future.

Let it be clearly understood at the outset that the propagation of grasses by their vegetative parts is an agricultural and horticultural practice of very long standing. The most common example of this method is found in the propagation of Bermuda grass in our southern states. Bermuda grass is propagated very extensively by runners or pieces of sod. This is done by the farmers as a field practice without the refinements that attend the making and rooting of cuttings, as done by the horticulturists. Such field methods can only be used in connection with plants that are quite aggressive. That is why Bermuda grass lends itself so well to planting by runners and sod.

Grass may be propagated vegetatively by pieces of the crown or clump, botanically known as *clones*, by rootstocks (which are underground creeping stems), or by stolons or runners (which are above-ground creeping stems), though not all grasses possess these last two vegetative organs. In their work with the fine turf grasses, Mr. J. B. Olcott, of Manchester, Connecticut, and Mr. Fred W. Taylor, of Philadelphia, both propagated plots of turf by setting out small pieces of sod at close intervals. In practice this is essentially the setting out of pieces of the crowns or clumps of the grass. While these men appreciated many of the advantages of growing fine turf by vegetative propagation, neither of them thought of propagating the bent grasses by runners as they are propagated today. There is a very great difference between this method and the setting out of small pieces of sod or turf, albeit from a botanical standpoint they are very much alike.

It may be worth while to digress here sufficiently to explain briefly how it is possible to propagate grasses by their vegetative parts. No matter what vegetative part of the grass plant is used for propagation, the important organ is the joint, technically known as the *node*. The stems of all grasses, whether they be underground stems or above-ground stems, possess joints. They are usually observed as small swellings on the stems. Sometimes they are several inches apart. Other times, as in the case of young plants, they are very close together. The piece of stem between the joints or nodes is called the *internode*. Each joint is capable of producing a bud, just one, no more, and this bud is capable of producing a new plant. In thick, closely clipped turf of the bents or the fescues, the joints can be found only by tearing the small individual plants apart and carefully stripping back the leaves. When this is done the joints will be found very close together at the base of the small plant. During the growing season

new shoots are continuously developing from the buds at these almost invisible joints. When the plants grow in the open, that is, when they have a chance to spread, the stems and joints become plainly visible. In the case of some of the bents, the stems may become very long. Those who are not familiar with the turf-forming habits of the grasses will find the subject an interesting field for study. A general understanding of these habits will give one a much greater appreciation of what good turf and its maintenance really means.

Getting back to the story, the propagation of the bent grasses by runners may be said to owe its start, primarily, to a small matter of curiosity. For many years the United States Department of Agriculture has conducted investigations with fine turf grasses. In the course of these investigations Dr. C. V. Piper and his assistants, including Prof. Lyman Carrier and the writer, became much interested in the patches of uniform and excellent turf that are found on all putting greens sown with seed of German mixed bent. Everyone who has carefully observed putting greens in the northeastern quarter of the United States knows what these patches are like. They range from a few inches to several feet in diameter, and are very distinct in outline. In color they range from pale apple-green, to dark blue-green. Curiosity on the part of the aforementioned group of investigators to know what grasses made these distinct areas of superb turf, led to the starting of a systematic study in the summer of 1916 to solve the mystery.



A bit of ancient history in the vegetative method of making bent grass putting greens. This is the way creeping bent runners were chopped for the first greens planted at East Potomac Park in October, 1916.

Almost at the outset of these investigations it became evident that the patches in each case resulted from the spreading of a single bent plant. The problem then, for the time being, resolved itself into the discovery of how many species of bent grass were involved and to the acquiring of an intimate knowledge of their vegetative and seed habits. The first step in the investigation was to get small plugs from as many differently appearing patches as could well be studied. The grounds of the Department of Agriculture and the greens of many golf courses, including those of the Columbia Country Club, the Merion Cricket Club, the Washington Golf and Country Club, and the Ekwanok Club, contributed a large amount of valuable material for study. The plugs, some no more than two inches in diameter, and some cut to fit the ordinary cigar box or golf ball box, the usual shipping containers, were pulled apart and the pieces planted 4 inches apart in rows $3\frac{1}{2}$ feet wide.

At the Arlington Experimental Farm a veritable botanical circus resulted when the grasses, given a real chance to grow uncrowded, began to show what they could do. Some selections produced an abundance of rapidly growing runners which rooted at the joints; some grew more nearly upright and spread slowly. Among the former were such coarse-growing strains that no one without having seen them under turf conditions would ever suspect them of being capable of making fine turf. In general, the more rapidly spreading strains were darker in color and somewhat coarser than the more slowly spreading strains. To the first group the descriptive name *carpet bent* was applied; later these grasses were found to be true creeping bent, which name is now regarded as preferable. To the second group, that is, to the fine, light-colored, slow-spreading strains, the name *velvet bent* was given.

Botanists from the time of Linnaeus, who started our present system of botanical naming, known as the binomial or two-name system, which gave us the name of *Poa annua* and the like, have tried to classify the various bents according to their relationships. For one reason or another they failed to do so satisfactorily. The growing of the selections at Arlington made it possible to clear up the botanical names of the common bents. The botanical name *Agrostis stolonifera* was given to the strains called creeping bent, and *Agrostis canina* to those called velvet bent.

It should be mentioned here that pieces of the sod that make up the bent turf on greens between the distinct patches of creeping bent and velvet bent were planted in rows and studied in the same way as were plugs of these bents. A study of the vegetative and seed habits of these pieces of turf showed them to be of one kind of bent, which a later study by Dr. Piper proved conclusively to be the same as the Rhode Island bent of New England. To this species was assigned the botanical name *Agrostis vulgaris*. Formerly botanists had used the name *Agrostis canina* for Rhode Island bent, but careful study of the characters of true Rhode Island bent disclosed the error in applying the botanical name of *Agrostis canina* to it. Just about this time Mr. F. H. Hillman, of the Seed Laboratory of the

Bureau of Plant Industry, discovered how to identify seeds of each of the various species of bent and redtop. This helped immensely not only in clearing up the botanical tangle, but in enabling the investigators to determine from examination of a sample of German bent seed (commercially known as creeping bent seed) just what species it contains. In brief, it was found that the German bent seed on a redtop-seed, chaff, and weed-seed-free basis, is composed of approximately 85 per cent of seed of *Agrostis vulgaris*, which is commonly known as Rhode Island bent, approximately 15 per cent of seed of *Agrostis canina*, to which the name velvet bent has been given, and a mere trace of seed of *Agrostis stolonifera*, or true creeping bent. Rhode Island bent does not produce runners and spread in the manner of creeping bent or velvet bent and, therefore, does not lend itself well to vegetation propagation as do these species. However, it makes an excellent putting green turf from seed, as those who have tried it are well aware. Seed now on the market under the name of *Colonial bent* is that of *Agrostis vulgaris*, or Rhode Island bent, but produced in New Zealand.

It was not enough to grow rows of the various strains of bents that make excellent turf and to study their turf-forming and specific botanical characters, but an effort was called for to make practical use of the best of the strains for putting greens. The possibilities of producing seed of them on anything like a sufficient scale to be useful were quite remote. The only other means of utilizing them was by vegetative propagation. In addition to making row plantings at Arlington in the fall of 1916, plugs of turf were set out in plots approximately four inches apart each way to see how long it would take to get close, continuous turf by this method. The grass spread from the plugs and ultimately covered the ground completely, but the turf was uneven, owing to the high, hard spots caused by the original plantings. While this experience was quite discouraging, the long rooting runners of the more spreading strains brought to mind Bermuda grass and how it is commonly propagated in the South. It will be remembered that about this time the supply of bent seed had been reduced to practically nothing because of war conditions. This was likewise an incentive to propagate the bents vegetatively.

In September, 1917, plots 8x8 feet in the grass garden at Arlington were prepared as for seeding, and runners of some of the best strains of both creeping bent and velvet bent were spread thinly but uniformly over the beds. They were then covered with about one-half inch of good compost, composed largely of top soil, and rolled and watered carefully. The runners thus planted rooted quickly and sent up new plants from the joints. While the whole runners were used for the first plot plantings, the idea of cutting them in three-inch lengths suggested itself in the interest of economy of material and ease of its distribution. In a few weeks the experiment gave sufficient promise to justify the planting of long rows in a nursery to furnish runners for more extensive tests in 1918. These nursery rows were planted in October, 1917. They were 8 rods long and approximately 6 feet apart. By September, 1918, the most rapidly spreading strains of creep-

ing bent had covered a width of 4 to 6 feet; therefore, abundance of planting material was available for continuing the turf experiments started the fall previously.

The most notable plantings of the fall of 1918 were made on the greens of the East Potomac Park Public Golf Course; in all, five greens were planted on this course between the dates of October 2 and 12. These were the first putting greens to be planted with bent runners and gave added evidence of the feasibility and advantages of the vegetative method. Plots of many different strains of both creeping bent and velvet bent were planted at Arlington, so that a good opportunity was afforded for studying the possibilities of the new way of getting putting green turf.

Additional nursery rows were planted at Arlington in September, 1918, and Dr. Walter S. Harban started a nursery at the Columbia Country Club later that fall. This was the first bent grass nursery to be established on a golf course. From this nursery the 9th green of the Columbia course was planted in the fall of 1919. This green attracted so much attention that it virtually "sold" the vegetative method to the golfing fraternity.

At first clubs were somewhat slow to take up the new method of making greens, largely because of lack of available material for planting. Last fall (1922) for the first time bent runners were available from commercial sources, and as the result upward of 125 greens were planted. With commercial concerns establishing large bent nurseries, and golf clubs starting small ones, it is practically certain that bent runners will be plentiful in the future. Those who have seen a good vegetatively planted bent green, such as No. 9 at Columbia, are not happy until they get greens of this character on their home course. In no other way is it possible to get fine bent turf, uniform in color and texture.

In New England and doubtless other parts of the North, it will be easily possible to make excellent greens by planting velvet bent runners. Velvet bent is the putting green turf par excellence where it can be maintained with reasonable care; however, the best strains of creeping bent, although a trifle coarser, are likewise most excellent. They will spread faster and will withstand the wear and tear under most conditions better than the velvet bents, and for this reason they are generally more satisfactory.

Vegetatively planted bent greens are by no means an extravagance. The cost of making them is not excessive, in fact it is relatively low; and the cost of maintaining them, considering the state of perfection it is possible to attain, is lower than the average cost of maintaining the much less desirable greens produced from sowing seed.

In reading an article written in December, 1918, by Piper and Oakley, the writer came across the following statement with regard to the making of bent putting greens by the vegetative method:

"But there are two things that may make trouble. First, there may be some difficulty resulting from the surface runners that develop after planting and which really are responsible for the closeness of the turf.

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.)



A wonderful turf walk.—The walk in the center of the illustration is built of coquina rock, the shell limestone of South Florida. On it is planted Mascarene grass (*Osterdamia tenuifolia*), which makes a fine, dense turf much like Axminster carpet under the feet. The walk is exceedingly attractive, and plans have been made by various persons to make similar walks. It is believed that tees built on this plan would be ideal. The grass never grows over half an inch high.

Some U. S. Golf Association Decisions on the Rules of Golf

Question.—In a team match competition, A and B were all square after holing out in the 16th green. Playing the 17th, A lost his ball on the drive and B claimed the hole, to which A agreed. Going to the 18th tee, B's caddy found A's ball and A asked B if he could play it, to which B assented. The 17th was halved and also the 18th. A won the 19th and the match. The captain of B team claimed the match because B had properly claimed the 17th hole and also that A had conceded the claim. What is the ruling in a dispute like this?

Answer.—Both players were disqualified, as they agreed to waive the operation of the rule relating to a lost ball. See Rule 3, Special Rules for Match Play Competition.

Question.—Can a competitor after qualifying in a weekly club competition held each Saturday play or practice on any of the putting greens, or play any of the holes before starting in his match on each Saturday?

Answer.—There is no rule prohibiting a competitor practicing putting or approaching to a green prior to his match if the contest is at match play. See Rule 4, for Stroke Competitions.

QUESTIONS AND ANSWERS

All questions sent to the Green Committee will be answered as promptly as possible in a letter to the writer. 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 answer 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.

Question.—According to our score card, all ditches are water hazards and the hazard is defined as from margin to margin. After a player has found his ball lying in the grass in such a water hazard, has he the right to touch the grass before he makes his stroke?

Answer.—Yes, the player has the right to touch the grass in addressing the ball, or in a forward or backward swing, but he must not sole his club on the ground. Rule 25 covers this point.

1. PREPARING A BENT TURF BED TO BE PLANTED FROM SEED.—We intend to start a small turf bed, using creeping bent seed, and should be glad to have your suggestions on proper procedure. (Ohio.)

We would advise the same preparation as for seeding a putting green. It is not necessary, however, to incorporate so much manure or other fertilizer in the soil, but the soil should be well-worked and level and free from stones for at least three inches below the surface in order that the turf may be lifted without trouble. You should seed to creeping bent at the rate of three to five pounds of seed per 1,000 square feet. The smaller amount is ample with seed of high purity. The grass should be kept cut as soon as it becomes an inch or an inch and a half high, just as in the case of a putting green. By fall (if planted in March or April) it should be in first-class condition for relaying wherever needed. Such a turf bed is an excellent thing to have in case of rebuilding a green or in case of necessity for replacing inferior turf with good turf. We know of instances where greens have been resodded after this method without putting them out of play for more than two or three weeks.

2. VEGETATIVE PLANTING OF BENT GREENS.—Can we depend on commercial supplies of bent stolons for vegetative propagation, or should we start our own nursery to take care of our requirements? What kind of machine is used for cutting the stolons? How many square yards of new green will a bushel of stolons cover and be adequate to form a solid green in a short space of time? Approximately what percentage of rooted stolons can be had from a bushel? We have an offer from a grower to supply stolons of pure creeping bent at . . . per bushel in sixty-bushel lots. Is this price excessive? or rather, is the price good value? (Minnesota.)

We are inclined to think that the propagation of creeping bent stolons will be largely a commercial enterprise; that is, there will be those who will grow the stolons and sell them to the clubs that are needing them. There

is no reason, however, why a club should not develop its own nursery if it desires to do so, and several clubs are doing that. One club grew enough material during last summer for planting seven greens in the fall and has a sufficient supply of stolons on hand for planting three or four greens this coming spring.

We have used an ordinary hand fodder-cutter for chopping up the stolons. This is a machine that the farmers use for cutting up corn stalks and similar coarse forage.

A bushel of the stolons, if there is no more dirt attached than is necessary to keep the stolons alive for shipping, will plant about 100 square feet of green. It would, therefore, take about sixty bushels to an average green of 6,000 square feet.

It is not necessary that a joint be rooting at the time it is planted, as the grass grows from every joint. Each bud will start to grow and produce a plant if it is planted in moist soil and kept watered.

We do not consider the price of . . . per bushel as excessive. Each club can grow its own material cheaper than this if it desires to do so, but it has been our experience that few clubs will take the trouble to care for a nursery as it should be cared for in order to get results. If a club is not willing to plant the stolons and care for them according to the directions, it had better buy the material from somebody who is making a business of growing it.

3. HOW TO DISTINGUISH BETWEEN CREEPING BENT AND VELVET BENT; RELATIVE VALUE OF THE TWO.—Will you please advise me if there is any characteristic difference that can be readily recognized between velvet bent and creeping bent? Are there different strains of velvet bent, as is the case with creeping bent? Do you think that velvet bent would be adapted to this latitude? (Indiana.)

When one becomes familiar with both velvet bent and creeping bent there is usually no difficulty in distinguishing the one from the other, although it is difficult to point out just what the differences are. The chief distinguishing character is the stolons. Creeping bent (or "carpet bent") sends out runners which are sometimes two or three feet long. Velvet bent does not have these extended runners, but sends out short stolons, which usually end in a tuft of leaves. Velvet bent will spread scarcely more than a foot during an entire growing season. There are several varieties of velvet bent, but on the whole it is a more uniform species than is creeping bent. You perhaps have quite a quantity of velvet bent on your course at the present time. It has been found on nearly all of the golf courses in the corn-belt. It usually appears in circular spots of very fine texture, these spots being one or two feet in diameter. While velvet bent makes an excellent turf, we would not advise you to spend much time working with it, as it is much slower in spreading than is creeping bent, and will not stand as much wear. There is really not sufficient difference in the quality of the turf of the two grasses to justify the extra expense in establishing velvet bent turf.

4. PREPARING FOR A BENT NURSERY.—Kindly give me specifications for the building of the seed bed and the proper method of seeding for a putting green nursery. (New Jersey.)

We would suggest that you prepare your ground as you would prepare a vegetable garden. It is not as necessary to have the planting bed as thoroughly prepared nor as rich as in the case of a putting green, but if possible an area should be selected that is relatively free from weeds, as otherwise the matter of weeding will be rather important. If you do not have a soil that approximates a good garden loam it will be well to work in a little manure or good compost to which is added some bone meal. An application approximating 1,000 pounds to 45,000 square feet should be made. As for planting, bent stolons or runners should be used, not seed. These stolons should be put in rows approximately six feet apart and covered lightly, not to exceed one-half inch, and kept moist until growth has made a good start. A square foot of runners as taken from a nursery will plant 100 running feet of row. The runners should be laid end to end, not more than two or three runners being placed side by side; more, of course, is not objectionable, but it is not economical to use more where the scarcity of material is a factor.

5. *POA ANNUA* IN PUTTING GREENS; RENOVATING BENT GREENS.—Our usually beautiful putting greens have suffered the last two years, and this year particularly, from *Poa annua* when it dies out during the hot weather. I particularly noticed on some greens that its blossoming was very plentiful in the spring, and on those same greens the dead blotches, considered by some to be blight, have appeared, but already are disappearing from the coming fall growth. It seems a crime where the better grasses grow so prolifically to see perfectly wonderful greens materially damaged by such a secondary grass as *Poa annua*. (Connecticut.)

The condition you describe is similar to that we noticed at a golf course in New York. There the greens, on about two-thirds of their surface, were covered with circles of bent grass and in the spaces between was *Poa annua*, which in the summer is very thin. There was, however, no more *Poa annua* on those greens than there is on other greens which may be entirely covered with bent. The way out of the difficulty is to get your greens completely covered with bent. At Columbia Country Club, near Washington, the greens look as if they are practically pure *Poa annua* from late fall until June, but as the *Poa annua* disappears in early summer the greens become pure bent. In other words, *Poa annua* is an annual grass which for part of the year conceals the bent, but which never destroys it. Therefore, when you have a complete covering of bent the thin spots will not appear as the *Poa annua* dies out. In order to get your greens covered with solid bent we would recommend good treatment of the greens. Proper feeding will always bring it about, and this includes top-dressing as well as occasional applications of ammonium sulfate. Another method which is likely to hasten the process is to take plugs of good bent and insert them in the places in the greens where there is no bent. These plugs increase in size from the margin and will speed up the covering of the greens with bent. Putting additional seed on top of the greens is, in our judgment, largely a waste of seed. The plugging method properly followed will prove very effective.

Meditations of a Peripatetic Golfer

In the springtime one itches to worry the soil and plant the seed. So far as grass seed is concerned, see if you can't restrain the itch and plant the seed at the best time—that is, in late summer.

Corrosive sublimate is a perfectly reliable worm killer. It **DOES NOT** injure the soil unless used excessively and is much cheaper than any commercially advertised worm killer.

“Clipped grass, if allowed to rot on the green, will cause a toxic condition.” The fellow who wrote this gives an example of pure “rot” or, if you prefer, “bunk.”

Don't hesitate to mow old putting greens in spring as soon as necessary. It is folly to let the grass grow two inches high before mowing.

The ideal tee is a large area of turf on the ground level but well drained. On such the turf is much more easily maintained; besides, if the area is large enough the plates can be moved every day. A raised tee is never defensible except to secure visibility.

Buy your supply of bent seed now. You may not be able to get it later in time to sow between August 15 and September 15.

Now is a good time to observe grass sown last fall, to see how much of a start it already has over that sown this spring.

The idea that a banker must be a hole in the ground is an illusion. It may just as well be an area of loose sand on top of the ground level or even a patch of rough grass. Where sand is expensive and drainage poor, the rough grass patches are very effective.

If the advertisements of some new and wonderful thing in regard to grass excite your interest, try it by all means, but only in a small experiment.

It is unfortunate that many greenkeepers incline to be secretive. Greenkeeping, like everything else, will advance with the spread of knowledge and not by keeping “the light under a bushel.”

If you are going to build a new golf course in the north, plan the work so the seeding can be done between August 15 and September 15.

A hazard that is too severe is apt to defeat its object. The players purposely avoid taking the chance.

It is well to be suspicious of the seedsmen who advise spring seeding of turf grasses in the north. The conditions are exceptional where spring seeding is justifiable.

Before you try anything new in the way of greenkeeping except as a small experiment, better get the opinion of the Green Section. It may save you some money that might better be used otherwise.