

monium sulphate will burn grass quite as readily as does sodium nitrate. It is recommended that it be used at the maximum rate of five pounds to each 1000 square feet. It may be applied by pulverizing thoroughly and mixing with ten times its bulk of sand. After scattering the material, the green should be watered thoroughly. Or the ammonium sulphate may be dissolved at the rate of one pound to ten gallons of water and sprinkled on the green, but this should be succeeded by a thorough watering afterwards. Such applications can be made at frequent intervals, if desired.

Ammonium sulphate has long been used in England to a much greater extent than in this country. Many English writers have commented on its tendency to make soils acid, and various English authorities claim that its continued use will eradicate white clover. It is noteworthy that there was practically no white clover on the acid plots at Rhode Island, while it promptly invaded those treated with alkaline fertilizers. Experiments at Arlington indicate clearly that eradication of white clover in a neutral soil is not to be secured in a single season by numerous surface applications of ammonium sulphate, but it is very likely that in time such a result will ensue.

The one conclusion that stands out most prominently from the Rhode Island experiments is to avoid the use of lime or any other alkaline fertilizer for bents or fescues, as this tends to encourage the invasion of undesirable plants. Both bent and fescue can be grown on soils heavily limed and make good turf. Such greens composed of bent are illustrated by the Taylor greens at Sunnybrook and at Columbia, and by the beautiful fescue fairways and greens at the Links. But there are numerous examples on various courses of equally good greens on which lime has never been used. There is actually no good evidence pointing to the use of lime having improved the turf of bents or fescues. The weed factor alone is an excellent reason to avoid using lime, at least for these grasses.

Green-Building in Midwinter at Washington, D. C.

DR. WALTER S. HARBAN

The building of a putting green in the midwinter in this latitude stands as a novel achievement. The long, mild dry spell of weather in February prompted the green committee of the Columbia Country Club to make the attempt, and accordingly on Monday, February 14, grading was started, and by the following Saturday the last piece of sod was put in place. The entire work was conducted under most favorable weather conditions and the results promise to be eminently successful. It may be of interest to describe the methods employed in the construction of this green as well as many others heretofore built on the course that have proved to be satisfactory and more or less economical.

GRADING

When much grading is to be done, as was the case in this instance, an ample compact force is desirable. In the grading of this green we use one plow-team, four-wheel scoops, and two snap-teams—in all, seven

teams, or fourteen horses, manned by twelve men under one foreman. In two days' time the rough grading was completed and this force was laid off. The wheel-scoops, especially where the earth has to be brought some distance, are most expeditious in handling the work. When fully loaded by the assistance of the snap-teams, one-half a yard of earth is put in place with each load; and besides the trampling of the horses and the wheels of the scoops constantly passing over the new dump, pack the soil more thoroughly than any other means. The rough-finishing work was accomplished with one team and two men. First the grades and undulations were established by means of a drag-scoop, a spike-tooth harrow, and a wooden drag. The entire surface was then deeply worked up by means of a 7-tooth garden expansion cultivator drawn by one horse, worked many ways across the green. This work required one and one-half days and the green was then ready for top soil and fertilizer. It will be noted that no cinders, stone, or tile were put under the green. Occasionally, when hill-seepage may require it, we use tile set two feet deep all around that part of the green, giving a free outlet, but we never separate the upper soil from the lower by the introduction of a foreign layer.

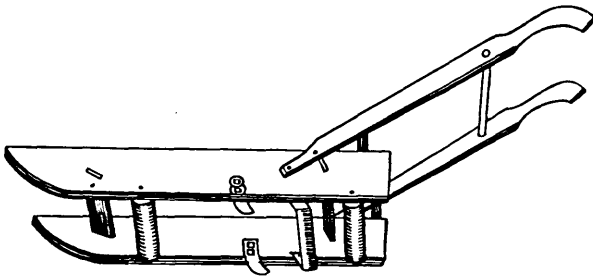


Fig. 1

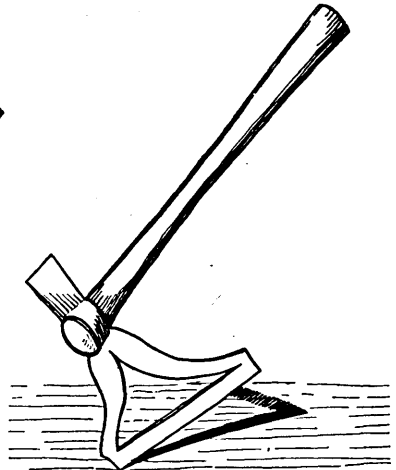


Fig. 2

Our natural soil is a fine quality of reddish clay, and when well broken up with sand and manure forms as desirable a soil for a green as can be imagined, possessing both the quality to let the water into the ground and capacity of holding moisture, as well as the humus introduced to sustain the turf for many years.

Ten dump-wagon loads of sharp sand and a like amount of well pulverized mushroom soil were now spread on the surface. By means of the cultivator and harrow the manure and sand was well incorporated in the soil. After repeated harrowings, draggings and rollings, the surface was raked carefully to make it smooth, and rolled and raked until true and firm. Before applying the sod, a dressing composed of two parts of sand and one of coal soot was spread lightly over the finished surface, and 400 pounds of bone meal were sown broadcast. After a final gentle raking the green was ready for the sod.

LIFTING THE SOD

As the turf to be lifted was on a nearly flat surface, the horse sod-cutter (Fig. 1) was used. The blade was set to cut 12 inches wide and 2 inches deep. It was drawn by means of a horse attached to a long rope, so that the sod was lifted in ribbons the entire length of the green without trampling or injury. By means of an implement made for this purpose, the ribbons were chopped into one-foot lengths for easy handling (Fig. 2). The sod, being cut regularly at 2 inches in thickness, was uniform and did not require trimming.

LAYING THE SOD.

Care should be taken not to disturb the smooth surface of the new green. Therefore a line of boards should be laid for the wheelbarrows, as well as for the men to walk upon. A rope or cord is stretched across the green, in order that the first strip of sods may be laid straight, the two straight sides of sod cut by the machine should be parallel to the rope. If the sod has been cut carefully the squares should be the same width and lie in even strips. The chopped end will necessarily be on the bevel, and care should be taken that the sods are laid as they are lifted and carefully lapped so as not to leave any exposed surfaces. Work in straight lines all the way across the green. Two or more men can work on the same walk. Each man can conveniently lay two or more rows. The sods should be laid without special care; that is, no attempt should be made to have them close together. Spaces of from one-eighth to one-quarter of an inch will be found ideal, as they leave room for the sod to spread under packing and rolling without danger of buckling later. Should any narrow gaps remain, they will be filled by the final dressing. Ten men lifted, handled, and laid in one day the sod for this green, which is 85 by 100 feet. It can literally be said that "the next day it snowed," as the following morning six inches of snow covered the ground, and it remained for one week, much to the satisfaction and delight of the committee.

Two weeks later, when the soil was sufficiently dry to permit of rolling, the turves were pressed down to a true surface by means of a heavy roller, 34 inches in length and weighing 1400 pounds, drawn slowly by man-power so as not to push or disturb the turves, as the new roots had already grown to a depth of one inch or more. A heavy dressing composed of one part of mushroom soil, one of sand, and one of coal soot was then spread upon the surface and after several hours, when thoroughly dried by the wind and sun, was dragged in all directions with a brush made of three ordinary hickory stable-brooms spliced together, two broom handles set into them like shafts. This implement will be found useful and more efficacious than the ordinary birch brush in spreading all dressing. By March 11 the grass on this green had grown to such length that it had to be cut to preserve the texture; it was then rolled with a large sectional roller weighing less than 500 pounds.

Care should be taken not to roll turf when the ground is wet, and this is especially true in spring and summer. After a green has been trued by heavy rolling once or twice in early spring, a light wooden roller is all that is needed thereafter. A newly turfed green should be dressed or brushed several times and never allowed to become completely dry in summer or before the roots have penetrated deeply.

A green built and finished as above applies only where the turf is to be laid. When it is to be seeded or vegetatively planted an entirely different seed surface should be laid—which, however, is another story.

Cost

The cost amounted to \$424.75. The rough grading alone cost \$265.00, or nearly two-thirds of the entire expense.

Rough-grading (2 days).....	\$265.00
Mushroom soil	37.50
Sand	11.25
Bone meal	15.00
Labor, including use of our own team.....	96.00
	<hr/>
	\$424.75

Rolling the Turf

C. V. PIPER AND R. A. OAKLEY

Ten years ago rolling was used on most golf courses to excess. Perhaps in consequence of bad results that ensued on some courses, the tendency in recent years has been not to use the roller enough. Every northern golf course requires a good rolling early in the spring as soon as the ground is fairly dry and the grass has begun to grow. This is to compact the surface soil, which has become very loose as a result of freezing and thawing, as well as to smooth out the unevenness. The loosening or heaving effect of freezing and thawing is much more pronounced on clayey soils than on sandy soils.

Generally speaking, excess of rolling is practically impossible on sandy or sandy loam soils, provided the rolling be done when the ground is not actually wet. On clay soils and even on clay loams it is possible to compact the soils too much for the best growth of grasses. Particularly is this liable to be the case if the roller is used when the ground is wet.

A safe rule to follow is, never use a roller when the ground is wet. This does not mean use it when the ground is dry. The best time is when the soil is just slightly moist.

Where the fairways are well turfed, damage from rolling, even on clay soils, is rare. It can occur if a heavy roller be used when the ground is wet; but it is doubtful if it ever occurs on sandy soils.

On putting greens nice judgment is necessary, depending on the soil texture, on the degree of moistness, and on the density of the turf. A heavy rolling in spring is nearly always necessary. Thereafter rather frequent light rollings are better than occasional heavy rollings.