

or the rock in the trenches is not disturbed by the dumping of the soil.

After the fill with the topsoil has been finished and a fairly good grade given to the surface it should be given a thorough treading down both ways with the feet close together, to make it settle and firm the top ready to be raked and graded smoothly for the sodding.

Cut sod slightly beveled about 3 ft. long by 1 ft. wide for convenient handling, advised Williamson, who described precision methods for this operation. Cut to an even thickness of about $\frac{3}{4}$ in. and roll for easy laying. Cutting and laying should be coordinated operations for exact fitting. Provide long boards for wheeling sod and men to work on. This preserves grade of green. Start laying in straight line closest to sod pile; even edge of green later. Place boards for workmen on sod, facilitating packing of sod and eliminating necessity of extra rolling and tamping. Finish with necessary small patches and rub in top-dressing with flexible steel mat.

Tee Rebuilding

Tee on natural ground is preferred if drainage is good. Few lines of drain tile 15 ft. or 18 ft. apart usually assure good drainage. Make drainage to back of tee. Fall of 1 ft. in 25 ft. provides good drainage, stance and appearance.

In building elevated tees avoid slopes so steep players have to climb and jump. Provide plenty of tee area in avoiding costly repair work.

Build tees with sides parallel to fairway and fronts square across proper line of shot.

When fill is being made, spread while dumping, in layers 6 in. or 8 in. deep to assure quick, even settling. Spread on layer of topsoil and trod down. In sodding lay sod lengthwise to within 1 ft. of outer edges. By leaving this 1 ft. all around the sod will have a better hold than if joined exactly at the edge of the flat top surface.

Course Maintenance and Budgeting

By JOHN MacGREGOR

Chicago Golf Club

LABELING course maintenance budgeting "a tool which will enable you to reduce outlay materially in the majority of cases without sacrificing playing conditions," Mr. MacGregor commented on timeliness of his subject by impressing greenkeepers with necessity of demonstrating they are "business men capable of conserving employers' money, yet giving results in time of need."

Budgeting, he said, means not only forecasting expenditures but carefully keeping track of costs to see forecasts have not been exceeded. Greenkeepers are fully capable of cost-keeping if given a "simple, efficient set of records whereby, in from 5 to 15 minutes at end of each day, labor and material charges can be properly distributed." He believed many greenkeepers shied from the work because of the wrong idea that it involved complicated accounting.

He drew parallel with clubhouse operations, saying:

Club officials generally recognize that if their club is to continue to operate, maintenance costs both on the golf course and in the clubhouse will have to be materially reduced. This cannot be done by cutting quality of food or the condition of the course, because that would cut down patronage—and we must have two things today—maximum patronage available and minimum operating expenses on all sides.

MacGregor predicted that greenkeepers who have not installed precise, simple sys-

tem of daily costkeeping within 2 years will have difficulty in controlling costs and holding jobs. Budgeting, formerly a loose and approximate operation, the Chicago golf expert remarked, now calls for exact knowledge of daily, weekly, monthly and season costs of each maintenance detail.

To establish a simple cost-keeping system, MacGregor advised first organizing "yourself and your daily work. Have a system in your daily work—just like a factory. Allot to each man a certain task or combination of tasks. Estimate approximately the cost of each job each day."

Said the Wheaton Scot: "I hope never again to have to operate a golf course without my own figures to tell me constantly what I am doing and enable me to control costs." He further described his labor organization and cost-keeping as follows:

When you have done this, you have a foundation upon which to estimate labor costs for each month, and a total for the year. It is relatively simple to estimate how many men are necessary to maintain your course successfully and to allot each man a reasonable amount of work to do and see that the work is done efficiently. In other words, don't watch your men to see that they are working, but watch the men's work to see that it is done properly and in sufficient volume. This solves the problem of the superintendence of men over a widely scattered area to a greater degree than anything I have ever encountered.

This is a far more practical and economical method of operation than working men in gangs or crews. A man who has a certain amount of work to do either does that work on time and properly, or is replaced. It results, too, in the elimination of the unfit and the creating of a picked crew after a season's work.

Now when you have figured and estimated about how much money is necessary for labor, your attention must then be turned to upkeep—to fertilizers, fungicides, vermin eradicators, sand, gasoline, oils, grease, power machinery parts and repairs and other small items classed under miscellaneous. Estimate this approximately and then add to it the cost of labor and upkeep, and that will be your budget for the ensuing year.

Figure Emergencies

However, in view of the uncertainty of weather conditions and the always-present possibility of drought and insect pests, to play safe it is well to ask for \$1,000 reserve fund which, while you don't intend to use it under normal conditions, will be there to prevent you exceeding your budget in case of emergency.

Now when it comes to the distribution of labor and upkeep, this is either a daily job or it is valueless. To accomplish this you keep a diary of your day's operations, and the cost of the different work done. It is surprising how simple it is to keep

the cost of operation if you will carry a diary in your pocket and make your entries from it promptly.

With this diary it is simple to determine the cost of the different items. The next step is to have available a monthly cost sheet, and take the items daily out of your diary and distribute on these cost sheets as concisely as possible and in the proper divisions.

One way of handling the monthly cost sheet is to divide it into eight headings; for instance, green mowing and green sprinkling would be one heading. Enter separately all of your other major operations, including rough cutting, fairway mowing, etc., so each will be allotted a column.

Now if your entries are made daily, it is an easy matter to total from time to time and see how you are running against your budget. You will have this information if your green-chairman should want to know. And if he doesn't want to know, you should know anyway.

At the end of each month a greenkeeper operating under this plan knows from his own notes how much he is over or under his budget to that date. It is hardly necessary to call your attention to the fact that upkeep items are totalled once each month.

At the end of the year the different items in each group are pulled off and compiled on one sheet, and the total yearly operations submitted to the green-chairman.

Soil Structure of Greens

By KENNETH WELTON

USGA Green Section

COMMON practice in greens construction of the past was to put down various layers, such as cinders, sand, gravel and peat, between the topsoil and subsoil. Mr. Welton pointed out that this interferes with the natural rise and fall of soil moisture, prevents natural drainage and elimination of toxic materials from the topsoil. It is better to prepare a deeper topsoil on a sand fill. Where better drainage is desired, "lines of tile quickly carry away excess water and do not interfere with the rise of capillary moisture in the soil."

On the subject of topsoil from the golfer's point of view, the speaker said:

If the soil is as hard as concrete it is almost impossible for the average player to hold the green with a pitch shot. A great cry arises from the indignant players and the greenkeeper is forced to soften the offending greens by pouring water upon them until the soil is saturated and muddy. The players trample the greens while in this condition, the soil becomes more packed, and if allowed to dry is harder

than ever. It is expensive to water greens frequently, but if that were the only disadvantage to keeping greens wet, very few clubs would object.

The truth is, however, that such greens are always going from one extreme to another. The players cannot tell from day to day how different putting greens will act. And more important still is the fact that good turf cannot be kept for long on greens which require such treatment.

The greenkeeper knows that the soil is porous and that these pore spaces should be filled with air since roots require an almost constant supply of oxygen. The greenkeeper also knows that the soil must be loose enough for the roots to grow and forage in search of moisture and plant food. If pore space in the soil is filled with free water for too prolonged a period the roots are affected and the plant sickens and dies. If the soil puddles and packs while wet it becomes a solid mass and the pore space, and hence the oxygen in the soil, is greatly restricted. If the soil becomes as hard as brick when dry the roots