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Do Your Draining Right at Start—It Saves

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DRAINAGE of our property is nothing more nor less than an adaptation to a golf course of the plan of agricultural drainage.

The drainage of farm lands and of golf courses by means of underground tile or pipe might be separated into classes:

1. Drainage of flat or low land.
2. Interception and underground carriage to a suitable outlet of ground or seep water.
3. Collection and underground carriage to a suitable outlet of surface water, by means of storm water sewer pipe with surface inlets.

We have had some little need to employ under-drainage falling under the first class, and have been rewarded with the speedy removal of surface water and of excess soil water, thus making the course dry under foot not only for the players but for the groundkeeper, his mowers and tractors, and effecting a loosening, aeration and sweetening of otherwise sour soil, discouraging the coarse and encouraging the fine texture grasses. This is particularly important in the South, where the coarse carpet grass is encountered.

The second class of sub-soil drainage is perhaps not so common as the first but on our golf course has been more needed.

The topography of our course is rolling and, therefore, ideal for an interesting course, but presenting a problem of seep water which threatened to be more than interesting.

Soil Structure

The natural top soil, where not lost by erosion, as was found to be the case in that part of the property embraced in old cultivated fields, was a loose, sandy loam, underlaid by pervious clay, beneath which was a stratum of water-bearing gravel, in turn underlaid by impervious hard-pan. The rain water readily percolates to the gravel stratum, but at the hardpan its downward course is stopped, and a horizontal flow is started, the water coming to the surface where the hardpan outcrops near the bottom of the slopes, producing "wet-weather springs" and a seepy, boggy soil condition. The resulting ferns and "bosky dell" effect in the woodland rough present a pleasing appeal to the nature-lover, but on the fairway the appeal is far from pleasing to the golfer or groundkeeper.

Curing Seepage

Photo herewith shows drainage work on No. 2 fairway at the time of construction to cure the worst case of seep water on the course. From the photo you will see that in the stump holes on the lower side of this fairway, the ground water stood near the surface. This fairway you will note runs alongside the slope or hill. On the upper side of the fairway where the hard-pan was from two to three feet below the surface, a ditch was dug down through the water-bearing gravel, and slightly into the hard-pan. The ditch was parallel with the fairway, the "swing" in the fairway bringing the center of the ditch lower down the slope than the two ends, thus giving a fall in the bottom of the ditch from the ends to the center.

In this ditch No. 2 grade of regular hard-burned clay sewer pipe was laid, the bells or sockets being left open to admit the water but serving to hold the pipe in alignment. At the center of this line, or the lowest point, another line of underground pipe was connected, and continued at right angles with the first line, directly

The swampy character of the second fairway is indicated by the free-running water in the ditch previous to tiling

down the slope, serving as an outlet into the adjoining lake for the underground water collected by the upper line.

All parts of the second fairway have at all times since this installation been dry and firm and no one except the few of us who were familiar with the condition of the ground before and during construction of the course, would suspect that the pipe is underneath our brassie lie, discharging ground water safely out of our way, for days and in fact weeks after a rain.

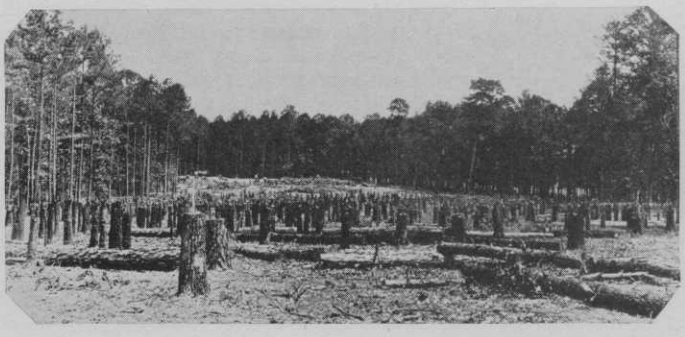
Still at Work

After the course was put in play it was found that there were other seepy points in the fairways, always along the lower side of the slopes, where the ground water coming to the surface rendered play unsatisfactory and machine-mowing impossible for weeks at a time. At some points the out-crop of the hard-pan was on the face of a bunker, producing a chronic "sloppy" condition. Some of these seeps have been cured, and others are now being treated, all by the same method used on No. 2 fairway,—an underground collecting line above the point of outcrop or seep, laid at a right angle to the slope with a discharge or outlet line leading directly down the slope to a natural drain in the rough, safely out of the field of play. Like a roof gutter and downspout, excepting underground.

Top Soil Losses

That part of our course that fell within some old cultivated fields was almost devoid of top soil, due to loss from erosion by surface water. Consequently, the development of a good turf on that part of the course has been very slow. Fertilizer was applied at the time of construction and annually thereafter, but to a great extent it goes the same route as the original top soil; that is, it is carried by the surface rain water from the slopes where it is needed, to the low parts of the course where it is not needed. In fact, much of it passes into our streams and is carried off our property, fertilizing the lower Mississippi Valley, I presume, or perhaps lost in the Gulf of Mexico.

On the woodland part of the course, where timber of several generations' growth was cleared for the fairways, an appreciable part of the loam was carried away by rain, in the interim between cultivation for vegetative planting and final development of matted turf. We have also had loss of soil from bunker slopes and stood the expense of replacement, due to



The matter of clearing the land was a considerable task in itself. Here on the left is a view of one of the fairways, hewn through solid woodlands, after the trees had been chopped down and before the stumps were pulled

the rain water coursing down them. Our gravel service roads, which likewise are used as pleasure drives through the course, and which have not been hard-surfaced due to our wish to preserve the natural effect, have also suffered from erosion.

This has called for the laying of lines of storm water pipe or sewers, and more will be required. These storm sewers are laid with surface inlets, the inlets being outside the area of play and at such frequent intervals that the surface water is collected into these underground channels before it has flowed a sufficient distance to attain a velocity to give a damaging scouring or eroding effect. In some cases it is necessary to direct surface water to a surface inlet by means of flat terraces, designed to blend into the natural topography.

Equipment to place water on a course as needed is known to be absolutely necessary. I believe it is equally important to provide means to keep water off the course when and where not needed.

Right Drainage Great Economy

As I reflect on what erosion has cost us from the time we put the first plow-point into our new course, I am led to the belief that the ultimate cost of a completed, perfect golf course such as we have tried to produce, would be less if with the original plan of the course, a complete and comprehensive system of storm water sewers could be prepared, and this part of the work carried out before the commencement of grading, ground preparation and planting.

Fortunately, golf is now so popular and on such a sound basis financially, that many clubs can complacently face the ultimate cost in the original estimate of a competent golf course architect, resulting in much cheaper courses than were obtained in the old days of evolution from a nine-hole makeshift planned by a "committee," which always remained a makeshift, though extended to eighteen, and remodeled time after time till the memory of man runneth not to the contrary.

Incidentally, my observation has been that the best architect can make only an

This drainage line, on the tenth hole, relieves the fairway of seepages along the hard-pan outcrops

indifferent pudding out of a warmed-over "committee" effort.

I believe a complete system of underground drainage, installed before other construction is commenced, would save perhaps many times its cost in keeping the natural top soil and expensive fertilizer on the course, that it would prevent the washing and consequent refilling of gullies in the fairways, bunker slopes and roads; and that it would reduce the cost of the drains necessary for intercepting seep water, the drains under sand traps, and the drains in low flat places, by providing convenient outlets for such drains, and thus saving the cost of extra ditching

After the course was completed and the fairways contoured and sodded, the same hole appeared as on the right. It is thoroughly underlaid with drainage tile, sufficient to keep the fairway in first class shape

and pipe required to carry each of these individual drain lines (already several score of them in our case) to a separate outlet outside the area of play.

In other words, evolution in the drainage system is costly and expensive, as it is

One of the outlets, showing the amount of water the tile lines will accommodate

in the course itself, and in this day I believe club executives would be wise in urging their associates to include the complete system in the original cost, that the utlimate cost may be lessened.

What a Soil-Tester Will Tell the Greenkeeper

By H. S. CAMPBELL

WOULD it be carrying this 'scientific greenskeeping" business too far by making the following suggestion—

That a record of the acidity or alkalinity of each green be kept through the playing season? A soil test made every week and posted on a chart should be very useful.

We have been told that greens thrive in an acid soil. But how acid? Does anyone know? A soil test of a fine green should answer that question.

One course will have a beautiful, healthy greens while a neighboring course has poor, spotty and apparently ill-nourished greens, notwithstanding the fact that the care and treatment are practically identical on both courses. The following year conditions may be reversed.

And when the misfortune of brown-patch hits one or more greens, would not the exact knowledge of the acid or alkaline content of the soil of the diseased greens, compared with the soil of the unaffected greens, help in avoiding this disease?

We are told that many factors must be considered in placing responsibility for brown-patch. Amount and kind of water and time of day applied, drainage, air circulation, weather and other factors are blamed. Yet you will find greens placed in groves of trees, poorly drained and indifferently cared for, which are absolutely free of brown-patch, while on an adjacent, well-kept course brown-patch will be found on a well-drained green out in the open with no trees and plenty of air circulation.

As Alice said, it is all very confusing.

In the business world, charts and records of the past are recognized for their full value and are of inestimable help in planning the future. And if golf course maintenance is not a business, what is it? Consider the money invested.

Making soil tests and posting results each week would be just one more job for the harried greenkeeper, many of whom are expected to produce $20,000 results on an $8,000 or $10,000 budget. But I'll bet a cookie every one of them would keep this record if they were convinced it would help them to keep their greens in better condition.

Many greenkeepers make a daily visual inspection of each green at an early hour. One day every week he can take with him one of the pocket soil-testers and make an absolutely reliable reading of each green in from two to five minutes. Eighteen times five minutes are ninety minutes plus ten minutes spent back at the barn or office in posting the chart, makes a time expenditure of one hour and forty minutes per week.

The value of such a record would depend upon the individual keeping it, the regularity of the tests and the ability of the greenkeeper to draw conclusions from recorded facts.

One of the soil testing outfits that is being extensively used by some well known greenkeepers is one that is profitably employed in water testing. Tests made of the city water used at the Beverly Country club, Chicago, show an alkaline reaction of 8.0 on the "pH" scale. This necessitates use of a large amount of sulphate of ammonia or other nitrogren fertilizer to overcomethe effect of the alkali in the water.

There is no set figure on the proper acidity figure. Observation of the figure on various greens that are in excellent condition determines an average that affords a safe working basis for the greenkeeper.