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# Do Your Draining Right at Start—It Saves

By G. R. PAYNE President, Texarkana Country Club

D RAINAGE 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, h e w n through solid woodlands, after the trees had been chopped down and before the stumps were pulled