

Finally, as he was about to don the coveted mantle of the Presidency of the United States Golf Association, a distinction of which he had dreamed in his anxiety to render service, he was compelled to don the shroud instead.

But in his last hours in his home in Tennessee, in those dreams that preceded the parting of the final curtain on the last scene of life, he was happy in the thought that his contemporaries had virtually bestowed upon him the cherished mantle of honor and authority that comes to the few who attain the highest honors in American golf.

Sand Pits in Deep Clay Soil

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At Springhaven, in the Philadelphia district, we have an unusually flat course for an inland area. We also have a very deep and compact clay subsoil, so that drainage of sand bunkers offers a serious problem. At least it did prior to the fall of 1924. The best proof that it offered difficulties was evidenced by the fact that we had no real sand hazards. Instead, we had mounds and large cross bunkers that stood out like great welts and bruises, obstructing what view was available, presenting a most unnatural appearance, and serving as hazards in more than one sense. Quite a number of our greens had no sand traps at all, and none of them had any except very shallow surface traps that were most unpleasant to get into and out of in wet weather, and especially in the spring of the year, because of the mud.

During the summer of 1924, we had made a survey of our grounds and with this we consulted one of our most popular golf course architects to see what could be done to our course to make it more nearly like a modern golf course. We were not greatly surprised to hear his first recommendation, which was that we sell this property and buy other and more suitable grounds. One of his reasons for this recommendation was the difficulty of draining properly constructed hazards. But it did not suit us to make so radical a change. We wanted to make the present course suit our purposes.

The architect's next recommendation was that we buy some additional adjoining property and change the entire lay-out. This did not suit us because it called for an outlay of a large sum of money and interference with play for at least one whole season. Instead, we wanted him to rebuild a green here and there, and give us some modern hazards, whether they were to be water hazards part of the time or not. This he did not want to do, and so, to avoid causing him any embarrassment, we asked him to suggest a lay-out for one hole. Our thought in this was that, if the members were given one real modern par four hole, they might be willing to authorize a radical change to meet the second recommendation of the architect.

When the sand pits for this hole were completed, it was evident that we would have no luck with them unless we could provide definite drainage. We drained one by means of tile leading to a near-by roadway. The rest did not lend themselves to such a procedure, so we decided to dig a well in the lowest point of each of the others.

Fortunately, we struck a fairly thick layer of sandy soil at a depth of about 5 feet. These wells we filled with stones and cinders, and this was covered with two layers of sod, the grass side downward. We were so delighted with the results that we decided to rebuild another green and set of hazards at once. This was a par three hole and our first effort to lay out a hole unaided by an architect. We felt that the traps were to be the most important feature because there never had been any at this hole, so we decided to have large traps and fairly deep ones. Again we dug wells and were fortunate to find the sand layer.

Instead of making drawings to show the shape and contour of the green, we made a model of it out of modeling clay, and altogether got a result that has been satisfactory in at least three respects. First, the sand traps have been drained well; second, they have punished many a good player who has been a little careless on the tee; and third, this particular putting green has had one of the most perfect putting surfaces that I have ever seen.

The following fall, we, the Green Committee, were pressed by the other officials and members to make more changes. Up to the present we have rebuilt nine holes. In some areas we didn't find the sand layer in the wells we dug to drain the sand pits at the same level as in the former areas. Instead, we met with an unusually dense and thick layer of clay. It was so hard that we could hardly dig into it. We finally made holes here and there to a depth of about 18 inches and loaded them with dynamite. In this manner we finally reached a sand layer at a depth of about 9 feet. At this depth we then drilled another hole several feet deep and put in a light charge of dynamite. The result of the explosion was to loosen up the sand layer and the ground to even greater depth. In one of these wells we used nearly all fairly large stones for filling, while in another we used nearly all cinders. We feel that the cinders are better than stones and that the top two or more feet should be fairly fine cinders. They seem to hold the sod and sand better than larger cinders or large stones.

All but one of the new sand traps have been draining very satisfactorily. This exceptional one has not done well in spite of the fact that we dug three fairly large wells in it. I have come to the conclusion that this trap is fairly close to a spring area and that the wells are possibly a little too deep. We intend to run a tile drain from this trap to a distance of about 200 yards where we can pick up a larger drain that drains our swimming pool.

In several instances, where the first well has reached a fair strata of sand, we have connected other near-by pits to the one containing the well by means of tile. In other instances, we have run a drain from a new pit to a drainage line in an adjacent fairway or to a slope near the pit. The water has left these tile-drained traps very quickly, but then, too, a good quantity of sand has also gone down the pipe. We have been able to recover practically all of this sand, but we hope to have fair control of this by means of heavy burlap being fastened over the intake end of the pipe.

The past season has furnished a very severe test of drainage anywhere, and we are pleased with the manner in which our sand pits behaved.

In one course we wanted a very large area of sand hazard. We required an elevation of at least 4 feet to provide proper visibility. There was at this point a large bunker about 7 feet high and about 20 feet long. This mound was all top soil, so we carted it to the compost pile to be used for topdressing, and then we dug up enough of the surrounding area to make a round mound about 6 feet in diameter and about 4 feet high. The crown of this was made fairly flat and sodded. The sides were sloped enough so that sand could be kept up to the edge of the sod. An area around this mound to the extent of about 2,000 square feet was dug just deep enough to retain a fairly thick layer of sand. Scattered over this area we made numerous small mounds which were completely covered by sand. The drainage from this hazard was entirely a surface matter and, fortunately, one side was a little lower than the other and we have had no trouble at all with it. It has also turned out well from the viewpoint of play.

This brief communication is given from one inexperienced person to those of you who are equally inexperienced with the hope that you may profit by our mistakes as well as our successes.

Physical Soil Factors Affecting Turf Growth

By O. J. Noer

Neglect to investigate thoroughly physical soil relationships preliminary to improving poor turf by fertilizer or other means may lead to failure. Unfavorable soil conditions frequently overshadow everything else, and until corrected defeat any program of improvement. Several years ago an otherwise excellent course possessed two very poor greens. When fertilizer failed to effect improvement, excessive shade was held responsible. Investigation, however, revealed faulty construction to be the major cause. The seed bed consisted of a 2-inch layer of peat superimposed upon 4 inches of beach sand. Fortunately the underlying soil was excellent, so deep plowing to thoroughly incorporate the sand and peat with the deeper soil corrected the difficulty and, today, these greens are the equal of any on the course. While this is admittedly an extreme case, there is great need for more careful consideration of physical soil characteristics, particularly on greens. The use of too heavy top soil during construction often retards and, occasionally, prevents the establishment of good turf. Consolidation takes place and prevents the free entrance of air and water into the soil.

Besides a multitude of small mineral particles and organic matter, soil contains water and air, all of which are essential to normal turf growth. Each cubic foot of good surface soil consists of approximately 50 per cent solid matter, 25 per cent air and 25 per cent moisture or water. The organic matter rarely constitutes more than 5 per cent of the solid soil substance. Turf plants anchor themselves to the soil by means of an extensive root system, and depend upon it for water and mineral food elements. Insoluble plant food elements dissolve in the soil water and both are then imbibed by the minute root hairs. Without energy life is impossible, a rule to which roots are no exception. They breathe to obtain oxygen and release