

which includes redtop and the bents. The writer is indebted to Mr. Tom Vardon, the professional and greenkeeper at the course of the White Bear Yacht Club, near St. Paul, for an explanation of the trouble. Mr. Vardon's observations lead him to the conclusion that the winterkilling is confined mostly to the redtop which has been customarily seeded in the greens every spring. One thing is evident, that if the greens were all covered with the hardy strains of bent which are growing on some of them, there would be no winterkilling under ordinary winter conditions.

On several courses during the past two or three winters the greens have been covered with a layer of brush, which is covered with straw. The evidence is not very conclusive either for or against the practice. Some who covered their greens last year say they will not do so again; others contemplate trying the method further. It is the writer's judgment that the most effective remedies for winterkilling are (1) drainage if needed and (2) creeping bent turf.

How We Tile-Drained at the Columbus Country Club

By WENDELL P. MILLER*

Tile drainage work on established golf courses is usually done during the early spring. This is not because spring is the best time in the year to install tile, but for the reason that the need of any additional drainage is most apparent at that time.

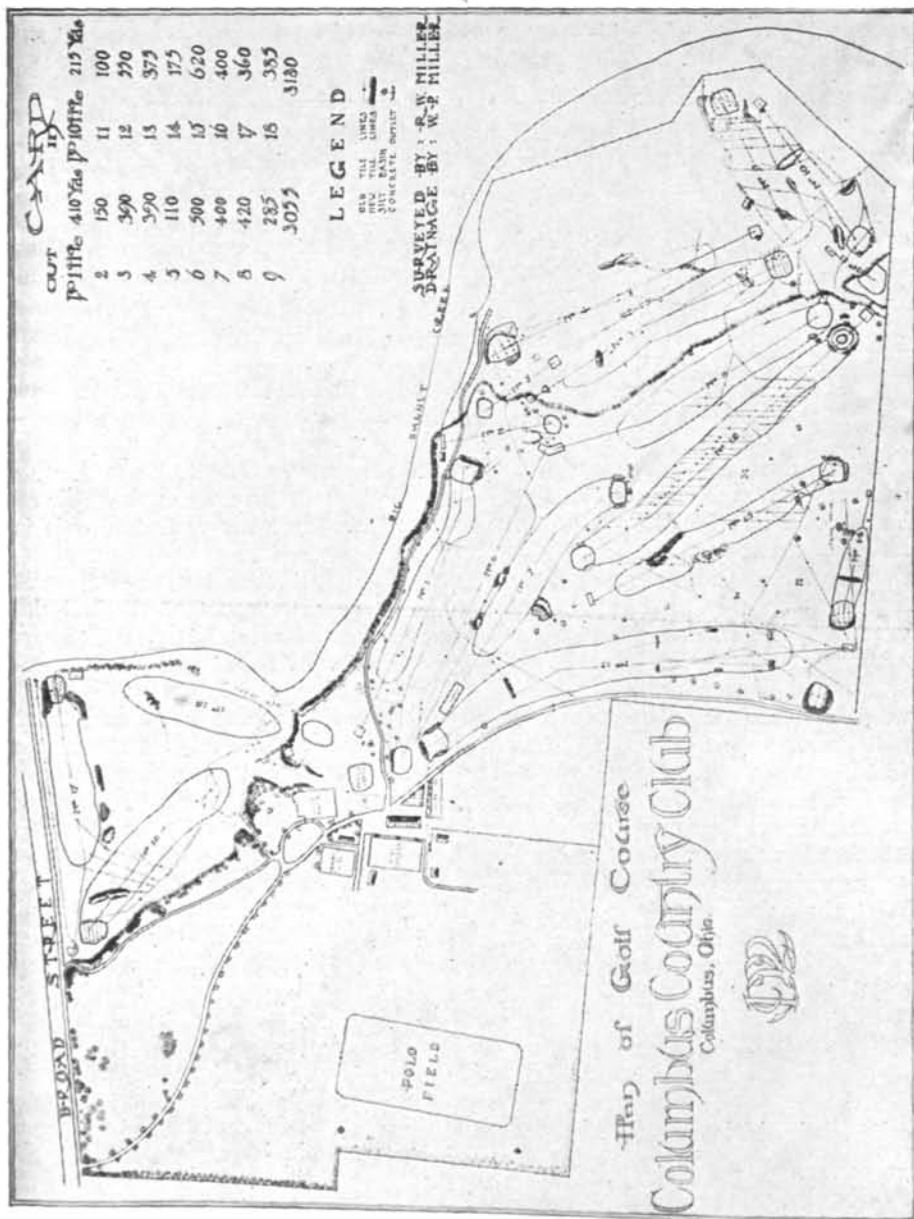
Several reasons why tile drainage work should be done in the late fall rather than early in the spring have come to my attention. In the fall the greenkeeper's work gradually slacks off as the grass quits growing and the amount of play dwindles. This makes an easy solution of the labor problems. The ground is firm enough, so that the tile can be distributed from wagons or trucks without marring the fairways. The fall rains and frost will do more to bring a tile drain into full action than any other single force. Thus late fall drainage will be giving almost full service when it is needed the following spring, enabling the greenkeeper to do many spring jobs on time. Drainage that is installed in the spring is usually mudded in. This means that it will take the frost of two or three winters to undue the damage done in handling the soil from the trench while wet and sticky. With these few reasons for doing drainage work on golf courses in the fall rather than in the spring, I want to tell you about the tile drainage that was installed last fall at Walnut Cliffs, the course of the Columbus Country Club, in Ohio.

The first nine holes were laid out in 1898. From 1898 to the fall of 1921 the course had been growing under the direction of both amateur and professional golf architects and turf experts, without any set policy or well defined program of extension and maintenance. Like nearly every other club did in the "good old days," they had purchased seed, fertilizer, "humus," worm eradicator, etc., in liberal quantities which drained the treasury but not the fairways. From year to year tile drains were installed, but since there was no plan and no record was kept, each succeeding greenkeeper simply added to the tangled network of drainage.

In 1921 the condition of the course convinced the green committee that

* Prof. Miller, of the Agricultural Engineering Department, Ohio State University, Columbus, in addition to his regular college duties has taken a keen interest in golf turf problems, and particularly the engineering features involved. He has assumed the responsibility of turf maintenance on three golf courses, and writes us that during the past ten months has designed and supervised the installation of 360,000 feet of tile on golf courses. We are glad to get this contribution from him describing the tile drainage work at the Columbus Country Club.—Editors.

there was need for a well-defined program of improvement and maintenance. The Agricultural Engineering Department of Ohio State University was invited to make a study of the problems confronting the club.



This study included everything connected in any way with the growing of the proper kinds of grass; the soil, the topography, the climate, the seed, the fertilizer, the labor, the equipment, and the history and the budget of the club. From this study a definite program of action was presented to the club covering the balance of the year 1921 and the years 1922 and 1923.

The program included three objects: to grow grass of proper quality; to spend less than the income on regular maintenance; to install certain permanent improvements with the balance of the golf income.

The program worked so well that in August, 1922, the Green Committee ordered work started on a complete map of the property. Every topographical feature was mapped and the spider-web of about 30,000 feet of tile drainage was plotted as accurately as it could be definitely located. When the map was completed it was easy to explain why some parts of the course dried up a month earlier than others. Some fairways had less than 500 feet of tile while others had 5,000 feet.

With the map as a basis a new system of tile drainage was designed



Laying tile with ditching machine. String the tile 6 feet to the right of the ditch line. Use a shield on the machine to keep the ditch bottom free from crumbs. These factors, plus a tile hook, make it possible for one man to keep up with a machine digging 150 rods per day.

which would give adequate drainage to all parts. The old and the new tile lines are shown on the accompanying map. The new system called for about 32,000 feet of tile, and the estimate of the total cost was \$3,400. This was a low estimate, for there are two good tile plants near the club and a farm ditching contractor was in the neighborhood looking for work. To have installed this much tile by hand would have taken 20 men one month. Hand labor was out of the question, but the thought of having a big excavating machine, plowing down through the fairway was revolutionary. The committee, however, was in full sympathy with the program. On October 16 the Buckeye ditching-machine started to cut the trench, and on November 4 the machine pulled off the ground with the work completed. In just 16 working days the job was done once and for all, and the players hardly realized what had been going on, so quickly was it over with. The tiles were distributed along the line of the trenches just ahead of the

machine by the truck which hauled them from the factory. The backfilling was done by two men with one horse and a slush-board scraper. No trenches were left open more than a few hours. We tried cutting the sod ahead of the machine with a sod cutter, expecting to relay it on the backfill, but gave it up in favor of seeding.

Since the machine mixed top soil with sub-soil, no effort was made to force all the soil back into the trenches. The surplus was hauled away and used to back up some bunkers. Of course the trenches settled over winter, and in early March some good top soil was hauled in and used as a top-dressing on the grass in the trenches to level them with the sides of the trench. By the first of July the grass over the new tile lines was almost as thick as on the old fairway.

The spring of this year (1923) was very wet, and since the first of July it has rained every three or four days, yet not once has play been held up because of soggy grounds. Play started three weeks earlier in the spring than ever before and a month earlier than usual.

Now that the job is all complete everyone thinks that it was a great improvement, but many misgivings were expressed when the big excavator was tearing into the fairways. The work was completed enough under the estimate to build a new green and plant it with creeping bent runners, so there were no assessments last year for new construction.

There are two lessons to be learned from the experience of the Columbus Country Club. The big lesson was that it would have paid a handsome dividend to have had an accurate map made of the grounds on which all underground improvements could have been plotted. Such a map would have saved several greenkeepers from installing tile lines which practically duplicated drainage. The second lesson is that installing a drainage system in fall is cheaper, more accurate, and gives better results immediately than does tile installed while the ground is wet in the spring.

In another issue of *THE BULLETIN* some of the points in the design of golf course drainage will be discussed and illustrated. The design of the drainage system is of the utmost importance if the system is to be lasting and to avoid constant attention to keep it in perfect working order.

How I Build a Golf Course; with Some Remarks on Golf Architecture

By A. GREENE BUTCHER, Golf Architect

There has recently appeared an article which reflects on my reputation as a golf architect, and I therefore request that you publish in your valuable journal my reply, as it bears on golf architecture in general.

My captious critic says my golf architecture resembles the Munyon system of medicines. Let me explain what he means. Dr. Munyon, the celebrated physician, publishes a list of symptoms and for every set of symptoms there is an appropriate medicine, each designated by a number. Thus for "pain in the back and sides," take No. 6; for "coated tongue and bad breath," No. 11; and so on. One misguided patient had symptoms that called for No. 13. The No. 13 was all gone, so he took a dose each of No. 6 and No. 7, with very unfortunate results. But this can by no means be considered an indictment of Dr. Munyon's system.

Now it is perfectly true that I have a set of 20 models for putting greens, many of my own design. Each of these is known by a number, and it is this very superficial resemblance that leads my cavalier to compare my method with that of Dr. Munyon. He even implies that I got