Golf Course Construction
from the
Greenkeeper's Standpoint

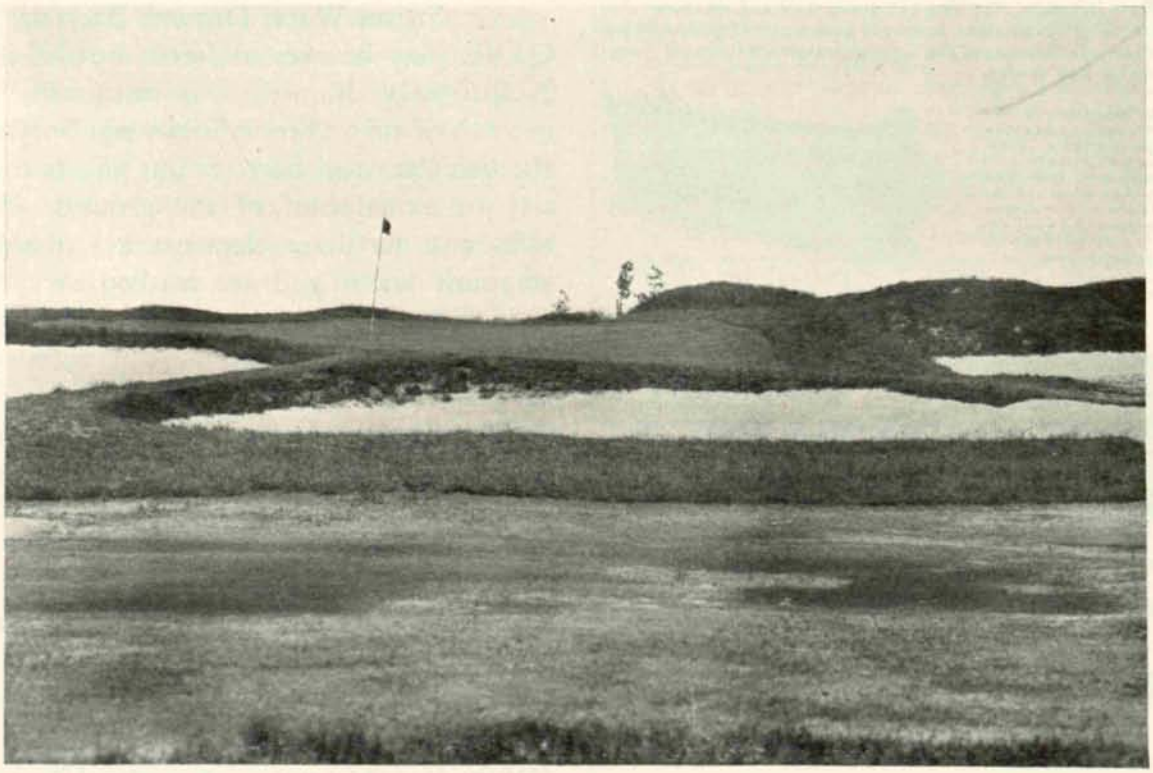
By EDWARD B. DEARIE, JR.
Noted Chicago Greenkeeper and Golf Course Architect

CHAPTER IV—*Drainage on the Golf Course*

SATISFACTORY drainage has much to do with the perfection of an attractive golf course. The importance of adequate drainage to any golf club, which desires a well-kept course and contented members, cannot be overestimated. The wrath of golfers, who are kept off "their" course until the ground has dried after every rain storm usually is quite forceful. Their opinions of the club management, Green chairman and greenkeeper generally are expressed in very plain language.

Standing water and miniature ponds, where the design of the course calls for dry surfaces, are most uninviting. Not only is the dampness unpleasant but the accompanying mud is still worse. Under such conditions it is necessary for the course to be closed to play and for the aggravated golfers to await the pleasure of Old Sol.

While some sections of this country are blessed—or cursed—with rainy seasons during which rain may be anticipated and prepared for, other portions of the country are likely to be visited with rain almost any time. The severity of the downpour, also, is uncontrollable. The "weather man" has an annoying habit of ignoring tournament plans. Often a sudden shower will either postpone a match



BRAE BURN'S NO. 12—163 YARD UPHILL SHOT. THE BUNKERING HERE IS SEVERE

er dampen the ardor of contestants and gallery.

Championship courses, however, are most carefully drained and soon dry after the storm and are ready for play again in a short time. Land, which is improperly drained, may remain water soaked for days or weeks. In the middle of the playing season, when the popularity of the game is at its height, such a condition is intolerable.

Besides the inconvenience of stagnant water and sticky mud to golfers, there is still a more important reason for adequate golf course drainage—its effect upon the turf. Too much water is just as injurious to grass as not enough. When grass cannot breathe properly, it suffocates and soon dies. Turf is not injured by a blanket of snow because it is more or less porous and permits free circulation of air. However, it is likely to be drowned under storm water from fall or winter rains which later freezes and covers it with a coffin of ice. Thawing snows have a tendency to freeze unless the water is quickly drained. Improperly constructed fairways, which are not graded so as to permit the surface water to flow off, and unsatisfactorily drained courses, are not likely to have much well-appearing turf in the springtime.

Storm Water Drowns Bacteria

SOIL may be ever so fertile but, if it is not properly drained, it is unsuitable for the growth of turf. Storm water not only drowns the necessary soil bacteria but affects the porosity or ventilation of the ground. Mineral salts and fertilizer elements are dissolved in stagnant water and are washed away. Such soil changes are highly undesirable for turf growth.

The importance of adequate drainage in satisfactory golf course maintenance is being recognized more and more. There is scarcely a country club which, either willingly or unwillingly, is not obliged to give the subject consideration. Plans for new courses should always include provisions for drainage.

Drainage has a direct effect upon maintenance expenses. Reseedings, refertilizations and other expensive items of cost in many cases may be traced to poor drainage. This relationship is so close that it cannot be ignored. An adequate drainage system is an investment

which will pay dividends in reduced cost of maintenance and in general satisfaction.

Like other investments of magnitude, the installation of a drainage system on a golf course requires the most careful consideration. As each piece of property has its own individual topography and soil characteristics, each site must be studied separately. The best advice can only be given by an engineer well qualified by experience in the particular field of golf course drainage and soil physics.

Drainage has many technical aspects beyond merely providing for the elimination of surplus surface water. If it were merely a problem of laying necessary drainage lines to drain off accumulated water, the laying out of a drainage system would not be so complicated. There are many other things to be considered, none of which should be neglected.

Two Phases of Drainage

THERE are two distinct phases of drainage—surface and underground. Both are equally important. Underground drainage cannot be observed but its effects are soon apparent.

Soil varies greatly in texture and composition. Some types of soil, such as sand, permit free seepage of water without hinderance; other types, like clay, do not permit ready drainage. A knowledge of soil physics can only be obtained from observation. Naturally, such knowledge is possessed by very few.

The flow of water underground depends upon the texture of the soil and other important factors. This direction of underground flow may be vertical, horizontal or obliquely downward. At the surface, capillary action of the soil even draws underground water upwards. The direction and rate of flow of the downward drainage requires the most careful study in order to ascertain the underground lines at which water is likely to accumulate. When these lines have been located, it is comparatively easy to install tile lines at the proper levels and to arrange for the water's disposal.

The drainage of surrounding property also must be considered. In some cases, golf courses drain naturally and satisfactorily into lower areas thru the underground stream. However, such instances are somewhat rare. More common are instances where drainage water from

higher levels flows down upon golf course property either above or below the surface. In the former case, surface drainage can be restrained at will but in the latter case the flow of the underground stream cannot be prohibited and there is no remedy, except provisions to take care of it. These considerations should have been given attention in the selection of the site.

The topography of a golf course with its natural or artificial mounds and hollows is certain to call for surface drainage. The slope of fairways, greens, bunkers and traps determines the direction in which they will drain. Unless their centers contain saucer-like depressions, greens usually may be drained without difficulty. However, care must be taken to prevent storm water from running down the sides and accumulating in the traps or pits.

Locate an Outlet First

ONE of the first things to be done in laying out a drainage system for a golf course is to locate a drainage outlet. A topographical map of the property is of great assistance. A glance at it will reveal which areas are the lowest, and the most suitable of these can be considered for the drainage outlet. In many cases low areas will be found in the central portion of the property which may be converted into an attractive lake or lagoon. This simplifies the problem but does not solve it. Preparations must be made thru dams or weirs to control the excess water and to pump it to a permanent disposal.

Generally, the natural drainage outlet to a golf course is upon neighboring property. Neighbors have a tendency to be very unneighborly when it comes to drainage. Frequently permission to make arrangements for drainage will be denied even when the adjacent property will be injured in no way. Sometimes the most stubborn mulish obstinance will be encountered—usually with the expectation of forcing a cash settlement. This is another possibility that should have been considered in selecting the site. Lawsuits to determine drainage rights are long and costly. Before acquiring property for a golf course it should be inspected by a competent drainage engineer.

If arrangements cannot be made to drain the

property upon the adjacent land, permission must be secured from the city, county or state officials to lay sewer lines along the highways to a satisfactory point of disposal. In some sections of the country storm water may be dumped into open ditches. However, in many places such ditches must be either covered or protected. In some cases the water must be taken a considerable distance to a river or lake, or some definite outlet.

When the drainage outlet has been determined, plans must be made to direct both the surface and underground water to that point as efficiently and economically as possible. Lines of hard burnt shale tile have been found the most satisfactory.

Not Necessary to Seal Joints

IN most soils it is not necessary to seal the joints of the pipe as it is desirable that they should be open to admit more water. In some soils, however, it is necessary to seal the joints with Ric-Wil filter tape. Otherwise, the water will draw too great a quantity of sand or fine soil into the tile line. While it is desirable to backfill the drainage trenches with gravel, which will permit the ready seepage of water, this is not practical except occasionally. However, most soils, except clay, may be used for backfilling, provided a layer of cinders or gravel is placed just above the tile line.

The placing and spacing of the tile lines require the most careful forethought. It is the character of the subsoil, rather than that of the surface soil, which determines the rate at which water moves towards and into the tile drains. Tile lines must be placed at right angles to this underground flow and at such depths that the underground water will not only seep into them but will also flow into them horizontally or obliquely. In order to determine the depth and location of these lines the drainage engineer needs a thoro knowledge of the subsoil and all of its characteristics.

The surface water, too, must be directed into the tile lines. This is accomplished thru the construction of catch basins at strategic spots on the course. These catch the surface water and direct it into the tile lines. These inlets average about three feet in diameter. Their depth varies according to the depth of

the tile line below the surface. In fact, the bottom of the catch basin should be about three feet below the tile line in order to provide a receptacle in which to catch silt, sand or dirt and prevent it from settling into the tile line. These basins should be cleaned out at least every season.

One or More Trunk Lines

THE usual drainage system consists of one or more trunk lines, varying in size from eight to twelve inches in diameter, and a number of four-inch or six-inch laterals. The use of smaller tile than four-inch is not practical as the smaller size would obstruct the flow.

Tile lines must be laid with the greatest care. A slope of two inches to a hundred feet is sufficient for the larger sizes while a slope of three inches to a hundred feet is necessary for the smaller sizes. This grade can be increased to bring the end of the system on a level with the drainage outlet. However, if the end of the system falls below the drainage outlet, a pump must be installed. Grades should be taken every hundred feet and every effort should be made to keep the tile lines at the proper levels.

The expense of installing a drainage system is considerable and it is very important that it should function properly. This means that it must have been properly designed and honestly installed. As nearly all of the work is underground, where it cannot be seen, there is a chance for slovenly, negligent work. Before the backfilling is commenced, all tile lines should be carefully and conscientiously inspected by a competent drainage engineer. The work should not be paid for until the club has some assurance that the system will function.

The growing season, which sometimes limits the golf season, is prolonged by adequate drainage. Drained land is from ten to fifteen degrees warmer than undrained land, which makes the drained soil freeze later and thaw earlier. It is only possible, through drainage to keep an abundance of oxygen in the soil, so indispensable to the life of the turf. This element is necessary before the necessary chemical changes can take place in the soil. Naturally,

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Around the Office Desk

TOURNAMENT SCHEDULE

JULY

8-11 California Junior Championship, Del Monte, Calif.
10-11 Northern California Women's Golf Association Invitational Tournament, Del Monte, Calif.
10-12 National Open, Interlachen C. C., Minneapolis, Minn.
17-19 Fairview Open Championship, Fairview Country Club, Elmsford, N. Y.
28-30 7th Annual Wolf Hollow Amateur Invitation, Wolf Hollow C. C., Delaware Water Gap, Penna.
31 Invitation Tournament for Buckwood Trophy, Shawnee C. C., Shawnee-on-Delaware, Pa.

AUGUST

1-3 Midsummer Tournament, Del Monte, Calif.
5-11 National Public Links Championship, Municipal Golf Course, Jacksonville, Fla.

SEPTEMBER

22-27 National Amateur Championship, Merion Cricket Club, Haverford, Philadelphia, Pa.
30-October 1 Arcola Senior Championship, Arcola Country Club, Arcola, N. J.

OCTOBER

13-18 Women's National Championship, Los Angeles Country Club, Los Angeles, Calif.

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these factors have an important bearing upon the condition and appearance of the turf.

Not only is the duration of the playing season extended by satisfactory drainage but the number of playable days are increased for golfers are not kept off the course after each rain until the soil has dried but are able to play immediately after each storm.

Next Month: Chapter V—Irrigating the Golf Course.

Erich Pahl is Busy

A busy boy these days is Erich W. Pahl, greenkeeper at the Interlachen Country Club, Minneapolis, where the National Open Championship will be held July 10-12. Erich is a N. A. G. A. member and is noted as one of the best greenkeepers in the United States. It goes without saying that Interlachen will be in splendid shape for the tournament.

The course is long, is scientifically trapped, and its fairways and greens are in beautiful condition. Erich has had the hearty cooperation of his Green committee chairman, Charles Van Nest, who is in general charge of the tournament, and has been Chairman of the Green committee for many years. Grasses, greens and fairways always have been his hobby.

A stroke tougher than Oakmont is Jimmie Johnston's appraisal of Interlachen. And who should know better about his home course than the National Amateur Champion? Johnston led the field two rounds in the open at Oakmont in 1927 and but for a mediocre third round might have won the title. Bobby Jones has found Oakmont his one real Waterloo in open competition in the last ten years.

Jimmy further asserted that "Interlachen" is not likely to be burned up by any of the boys. The course calls for a wonderful variety of shots and accuracy will be the principal requirement for scoring. Contestants who have mastery over their long irons will have an advantage, for they will be playing to narrow and small greens—and none of them will get more distance than they earn off the tees, or with their second woods. The fairways, always kept in fine condition by the splendid watering system, will not be baked as are so many courses in midsummer. The greens will be fast and difficult because of the trickery of bent grass."

LOOKING DOWN NO. 1 FAIRWAY AT INTERLACHEN

Send dues and official communications to 1101 Farmers Bank Bldg., Pittsburgh, Pa.

Any correspondence requiring the Secretary's personal attention may be sent to either 1101 Farmers Bank Bldg., Pittsburgh, Pa., or to—

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426 Highland Avenue
West View, Pittsburgh, Penna.

Address all communications relating to the Golf Show at Columbus, Ohio in 1931 to--

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Chairman, Show Committee
405 Caxton Bldg., Cleveland, Ohio