



Golf Course Construction

from the

Greenkeeper's Standpoint

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

CHAPTER V—*Irrigating the Golf Course*

BEAUTY, the natural beauty of nature, and a velvety carpet of turf upon which a fair shot will go far, are characteristics of the inviting golf course. If the satisfaction of golfers is important, then irrigation is important also.

Water is one of the necessary elements of plant life. To grow grass without water would be as impossible as to grow it without air or sunshine. Hot weather is more injurious to grass than cold weather. Turf often thrives under a blanket of snow but dies quickly under the heat of the summer sun when not properly watered. Scorched dead grass instantly ruins the appearance of any golf links.

Fortunate indeed is the golf course where the rain always falls at the right time and in the right amount. Such localities exist but they are rare in United States. In the Hawaiian islands there is usually a light shower every noon and in the Rockies a short down-pour may be expected every afternoon during the summer.

While it is true that lawns have been sprinkled for many generations, it was not until a couple of decades ago that the first attempts were made to extend sprinkling to such large areas as golf courses. First efforts were confined to watering tees and greens. These experiments bore such fruitful results that the desirability of irrigating the fairways, too, was soon apparent.

California the Pioneer

CALIFORNIA deserves credit for pioneering in fairway irrigation. The absence of rain

during the long dry season there made irrigation for the entire course absolutely necessary. The wonderful transformations of semi-desert land into attractive regions created a most favorable impression upon eastern golfers attending championship matches.

Too often country clubs admit the desirability of fairway irrigation but refuse to consider it seriously because of the cost. Such a viewpoint is looking through the wrong end of the telescope. The real question should be: How much is an irrigation system worth? It is true that the average irrigation system costs from \$15,000 to \$30,000 but such an investment is trivial when compared with the total expenses connected with the establishment of the club.

Economies from the operation of the system will benefit the course for many years. Water is cheaper than grass seed. Sprinkling involves less inconvenience than reseeding. When the cost and value of an irrigation system are weighed together, usually the former will seem insignificant.

There is a tendency to give the subject of irrigation the attention which it deserves and many systems are being installed each year



NOTE THE COMPLETE COVERING EFFECT OF THE TWO "POP-UP" SPRINKLERS ON THIS DOUBLE TEE

on both old and new courses. The adequacy of some of these irrigation systems is questionable. In some cases, it is a mistake to call them "systems" at all as they are only "aggravations." However, there has been much recent improvement in the design and installation of irrigation systems and there is much hope for the future.

Imitate Nature in Watering

IN WATERING turf, the object is to imitate nature as closely as possible. Temperature, humidity and length of time since rainfall are all factors which influence sprinkling. Grass does not get rain every day under normal conditions and, if sprinkled every day, it becomes unhealthy. During the summer months the turf should be sprinkled at intervals of from three to ten days. Best results are obtained by sprinkling at night when the coolness prevents evaporation of the surface water. Incidentally, play is not disturbed.

The amount of water necessary to irrigate a golf course depends upon both general and local conditions. Naturally, the requirements of different courses vary greatly. These conditions should be studied thoroughly by a competent irrigation engineer before any plans are made for an irrigation system. The preferable time to give them consideration is before the site is acquired as irrigation is too important to be ignored in making the initial investment.

The climate of the locality is very important. Accurate information should be obtained of the maximum and minimum temperatures and the mean temperature, maximum and minimum amounts of rainfall and mean amount of rainfall for each month for several years back—in fact, as far back as records are available. Special attention should be paid to the average period of time between rains during the summer and the average precipitation during such storms. Consideration should be given, also, to statistics concerning snowfall and to any climatic peculiarities such as the existence of wet and dry seasons.

Topography Must Be Considered

THE topography of the course cannot be ignored in considering irrigation. The

slope of portions of the land may be such that rain water will flow off without percolating into the soil at all. In such a case, a minimum of benefit can be expected from rains while the drainage problem will be greatly intensified.

To be beneficial to the turf, water either from natural or artificial sources, must be absorbed by the roots of the grass. Water evaporated from the surface of the ground is wasted. Water, which percolates through the soil so rapidly that it cannot be assimilated by the grass is wasted likewise.

The types of soil on the property determine the rates of percolation. Some varieties of soil, such as sand and gravel, permit surface water to pass thru too rapidly while other varieties, such as clay or adobe, are almost impervious to the passage of water. The ideal soil is one which permits surface water to seep thru it at a rate of speed most favorable to assimilation by the plant roots.

A soil chart will be found almost indispensable in planning an irrigation system. Samples of the various surface soil should be

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carefully analyzed by a competent agronomist and the areas which they cover plotted upon a map of the property. Analyses will be made in many cases by your state department of agriculture or the state college of agriculture, when requested.

A desirable rainfall is about one inch and not over this amount of water should be applied at a time artificially. The portion of the average golf course, which requires irrigation, usually is about 55 acres in extent or almost 2,400,000 square feet. To cover this surface with one inch of water requires 200,000 cubic feet or almost 1,500,000 gallons.

Sources of supply, capable of furnishing water in such quantities, are none too plentiful. Few country clubs are close enough to centers of population to tap water mains. When this is possible, there is always the likelihood that the supply of water may not be sufficient in summer—when needed the most. Then too, the cost of piped water thru a meter is usually prohibitive. A site near a large body of water, such as a lake or

a river, is most fortunate. Two major problems of maintenance—irrigation and drainage—are greatly simplified.

Using Wells for Water Supply

WELLS in some localities are the only means of securing an adequate supply of water. Their cost depends upon their depth. Generally water may be obtained less than 500 feet below the surface but sometimes it is necessary to go 1500 feet, depending upon geologic formation. Sand provides the best water but sometimes limestone is much closer to the surface. Sulphur water is often obtainable but is not so desirable.

While the sources of water are being considered the club should have the benefit of the advice of an experienced hydraulic engineer who is familiar with local geologic conditions. He will be able to explain the relative costs of obtaining water from different sources and can plan the general irrigation system. It should be his duty, also, to supervise the sinking of wells, the construction of the pumping plant and all details concerning the laying of the irrigation lines and sprinklers.

If wells are necessary, a drilling contractor should be chosen with care for his experience and reliability. Otherwise, the club treasury is likely to suffer. He should be thoroly familiar with the geology of the locality and should have definite knowledge as to the approximate depth at which water is obtainable. Guesses are exasperatingly expensive. Selection of the drilling contractor should be guided by the advice of the hydraulic or irrigation engineer. The drilling contract should provide for the keeping of a diary, recording the progress of the drill thru the various rock formations and small samples of rock should be taken every day. Sinking a well often takes longer than contemplated and plenty of time should be allowed for the drilling and the facing of the well.

A pumping plant is a necessary installation in almost every case, no matter what the source of the water. If it is drawn from surface sources, it must be pumped to the property; if it comes from wells, it must be

stored until needed. Some very elaborate pumping plants have been installed by some of the most prosperous country clubs. These contain pumps of tremendous capacity and automatic devices to control their operation and to regulate both pressure and volume of water. Ordinarily, one reasonable size pump with a capacity of from 150 to 2000 gallons of water per minute, depending on the type of installation, is sufficient. If possible, the site for the pumping plant should be near the clubhouse so that it may be easily accessible. The building which houses the pumping plant should be of brick or tile and fireproof.

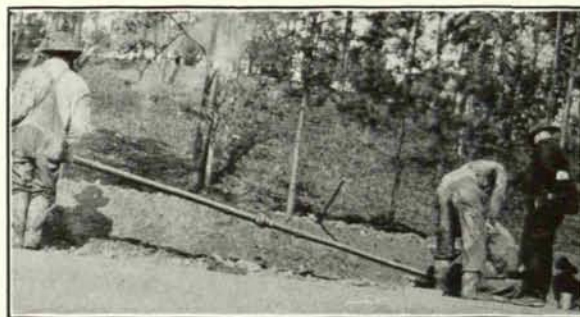
Artistic lakes or lagoons on the course may be included in the design and created artificially. They not only improve the appearance of the property but solve the problem of water storage as provisions may be made to pump water into and out of these so that the water level will not be greatly changed. Lagoons winding through the course makes an excellent water hazard, and improve the landscape.

Two Systems of Fairway Irrigation

THERE are two different systems of fairway irrigation. One consists of installing hydrants at convenient places in the rough to which hose may be attached and the other consists of laying underground pipe in such a way that the use of hose is not necessary. The former arrangement costs less for initial installation but the latter arrangement is more efficient.

The quantity of hose necessary to care for an 18-hole course with taps in the rough depends upon the acreage, topography and amount of water essential. Some clubs use over 7,000 feet of hose and a few as much as 14,000 feet of it. The average life of hose is about three years. Concealed receptacles for it may be placed underground. Here it may be kept coiled and out of the sun to extend its life.

The best hose obtainable is always the cheapest. This does not mean the most expensive but the most durable. Before buying hose, samples should be obtained and carefully compared. Hose of the necessary sizes



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for golf course use usually comes in 50-foot lengths. If 75-foot lengths are necessary, they should be ordered in ample time as couplings often have to be put on at the factory. The economy of using large hose sizes is demonstrated every season. The use of inch hose is being substituted for three-quarter-inch hose wherever possible. When the water pressure will permit the use of inch-and-a-half hose, it is recommended. The faster water can be applied, the lower the labor cost.

The Hoseless System

IN the hoseless system, two main lines of three-inch pipe are laid down the length of the fairway and ground taps are placed at staggered intervals. Where lateral lines are necessary because of the width of the fairway, smaller pipe is used but the size should not be too small on account of friction losses. It is wisdom to install pipe, adequate in size which will not prevent the future expansion of the irrigation system.

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night there is always the possibility that the men may neglect one spot and over-water another spot nearby. The hose itself represents considerable investment and it must be repaired and replaced constantly. In consideration of these economies hoseless systems are being looked upon with more favor every season.

Florida and California courses, which originated the underground pipe systems, are not troubled with frost and it is not necessary to place such lines over a foot below the surface. When pipe is laid so close to the surface in most other sections of the country, provisions must be made to drain the water into the drainage lines at the close of the season. To avoid the frost hazard, pipe must be laid about four feet below the surface. The expense of the deeper ditch is about three times greater. However, this extra cost is more than counterbalanced by the safety of the deeper system.

The market contains a number of golf course sprinklers, some of which are quite efficient. The most popular styles are those

on snap-valves which may be snapped or plugged directly into the water pipe, and those on wheels or roller bases so that they may be easily moved from one spot to another. In the sea-serpent type of sprinkler four or five sprinkler heads are placed at intervals along a 100-foot length of pipe on wheels. This sprinkler is able to water a rectangle about 80 feet by 100 feet at a time.

Large traveling sprinklers, revolving about an axis, will water a circle about 160 feet in diameter. In the pop-up system, sprinklers are kept in concealed underground metal boxes and rise out of the ground when the water is turned on. No labor is required except supervision.

Fifty Pounds Pressure is Best

THE size sprinklers to purchase depends entirely upon the available water pressure. This should average 50 pounds at the connections for best results. Large fairway sprinklers will throw ten gallons of water per minute a distance of seventy feet. Tee sprinklers can be obtained which will quite satisfactorily throw six gallons of water per minute 40 feet. It is unwise to use too large sprinklers on the greens as the excess of water is likely to flood the traps. Water connections should always be placed at the back of the green and not on the approach.

Where water is scarce as in the Southwest, the cost of the water itself is quite an item. In many cases, the annual cost exceeds the total expense of installing the irrigation system. Some courses in California are reported to spend as much as \$30,000 a year for water. Naturally, such an expenditure must be balanced by reduction in other maintenance expenses. In most sections of United States, however, water is fairly plentiful and low in cost, so low that it should not be spared when needed.

The best is always the cheapest in golf course operation. While the cost of installing an underground system is considerable more than a system depending upon hose, it is doubtful if it is any more expensive over a period of years. Pipe scarcely ever needs replacing while hose is continually wearing

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out. Then, the cost of labor is much less with the more efficient system.

An adequate supply of water is important for several reasons. It will protect the clubhouse from fire and supply the showers and provide enough water to take care of the flower beds and landscaping in the vicinity of the clubhouse and on the club grounds.

The designing of the irrigation system should be done by an experienced irrigation engineer familiar with the peculiar technicalities of this field. Pump capacities, pipe sizes and types of sprinklers all require careful consideration. The irrigation engineer should supervise the installation of the system, whenever possible, and the contractor doing the actual work should not be paid unless the inspection is properly approved. The system should be tested for both pressure and capacity thoroughly.

A subject as important as irrigation deserves the most serious consideration by any club contemplating the construction and operation of a golf course. Plans should be made right after the master plan is approved and the subject should not be lightly dismissed as a problem which will take care of itself. There is no greater necessity for the proper maintenance of a golf course than adequate and economical irrigation. An irrigation system, properly designed, installed and operated is a permanent investment and a decisive factor in reducing maintenance expenses and in keeping the course in playable condition.

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