(*Miller photo*)
Fairway view, Country Club of Detroit, showing California hoseless watering system in operation.

Guide Posts to Course Watering Systems and Equipment Outlined

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PART I

The irrigation season has opened early this year, in fact, many eastern courses are fairly "burning up." The conditions that brought on the forest fires in the eastern states proved disastrous to many turfed areas, accentuating the need for general irrigation as insurance against drouth.

Because of the premature irrigation season it is wise to omit all preliminary discussion, particularly arguments for the establishment of sound drainage, soil conditions, and fertilization as prerequisite to successful continued irrigation, and deal directly with actual irrigation practice. First, we shall outline the engineering procedure required in planning and installing fairway and other watering systems, then classify and describe the various types of systems and finally, in some detail, the mechanics and hydraulics involved in the latest and best practices of which we have knowledge.

Golf course engineering practice requires the application of agricultural knowledge and soils technology in determining certain fundamentals of the irrigation system. But many owners will not, or cannot, employ engineers. Other clubs customarily employ competent advisors to safeguard their capital investments; these will continue this policy regardless of anything that is published. Accordingly, in the interests of the clubs which must proceed without engineering services, especially the smaller clubs, this discussion will provide facts, figures, and data which will facilitate these clubs in proceeding with their irrigation plans on an empirical basis.

The First Stage: Water Requirements

First comes a determination of the true water requirements—the sum total of all water losses, including losses by evaporation, transpiration, and percolation to subsoil zones. Different types of soil on the same property must be taken into account; and tees and greens are special problems in themselves. Next, the engi-

neer must learn the quantities of water supplied by Mother Nature according to the records of 20 years or more; also the maximum periods of drouth so far as recorded. From these determinations are figured the water which must be provided daily, and over what periods the maximum demands will obtain. Then it is necessary to investigate the available water supplies and probable cost per thousand gallons from the various sources. This investigation tells whether a continuing adequate supply is available for daily needs, or whether storage must be provided, and to what extent.

Now comes a study of the peculiarities of the various soils, their water holding capacities and the rate of absorption of applied water. From these facts—facts which can be developed only by soil technologists in the laboratory—are determined the necessary frequency of artificial applications, the quantities needed at each application, and the duration (in hours) of each application.

The Greenkeeper and the Budget

Enter now the greenkeeper's daily schedule of operations, the range of possible water pressures, the types of distributing units suitable for the possible pressures and necessary rates of application, the budget allowance for labor and supplies, and a determination of the club's policies as between (1) keeping the course in good condition at lowest possible cost, (2) maintaining the fairways at uniform length (uniform turf consistency) throughout the season, and (3) maintaining the grounds in pink of condition at all times.

Convenience of operation for the greenkeeper—which permits economy of operation—and the funds available for investment and operation are the controlling factors in the design of irrigation systems after all preliminary data has been secured.

So far this discussion is concerned with the information necessary for intelligently planning golf course irrigation. Having available all of the information above indicated it is time to make a tentative piping layout. Frequently it is necessary to prepare alternate plans and estimates to be passed upon by the club. Often the investment factor is strictly controlled by special financing. Green chairmen interested in financing methods are referred to "Financing Club Improvements" appearing in February and March GOLFDOM.

Next, the calculation of the quantities of water to be delivered to each area in the time allotted under the greenkeeper's operating program, how many outlets required for each area, where they must be located, and what sizes of pipe are needed.

Now in order is to "rough in" a piping layout on a layout map of the course. If we are planning a hose system it is usually essential that the system be so arranged that it can be extended into a hoseless system without abandonment of any part of the hose system. Now let us assign the pipe sizes to the tentative layout and, knowing the costs of pipe in the ground, cost of power or water under pressure, estimate the cost of installing and operating several alternative systems, calculating for each the friction losses and the effect on costs and operations of using larger or small pipe sizes.

It is essential that the piping system be looped over the entire property to be irrigated; that water be supplied to each operating area from two or more directions, and that there be no "dead ends" in the system other than the small tee, green, and fairway outlets.

Planning of the water supply comes next; including the estimate of the cost of wells, pumping plants, reservoirs, or whatever is required; often there are alternative plans and estimates, such as city mains versus private wells.

Existing Tee and Green Systems

So far, existing piping has not been mentioned. Occasionally all or part of existing systems can be incorporated with the new system of piping. More often, however, the existing system is abandoned, generally because the golf course was built for a lump sum price, and the steel pipe installed on this basis has rusted out; or it is wholly inadequate. Incidentally, it is usually impossible to obtain a map showing existing drainage, water lines, and electric cables. And finally, it is not often possible to effect much saving by using the existing system because the new system generally reaches the vicinity of the tees and greens.

Outlets must be provided for present and future connections to serve the ascertainable needs of the clubhouse and other areas not a part of the golf course. This is important.

Now it is necessary to coordinate all of the facts and factors so far developed into one comprehensive system. Then

comes modification and compromise between the requirements and finances. Not often is an original plan or alternate plan adopted without modifications occasioned by financial considerations. After modification, approval from the board or committee of a definite plan and estimate is needed. Perhaps they direct that bids on several alternative plans be taken. Where we have not already taken bids the estimates must be correct to within five per cent of the final installed cost.

The Final Stage: Letting Contracts

Finally it is time to prepare detailed plans and write detailed specifications covering every phase of construction conditions, materials, and actual construction and installation. It is customary to select bidders, invite bids, receive sealed proposals with deposits, tabulate the proposals for consideration of the committee, and in conference with the green-chairman select the most promising bidder and confer with him as to details. Usually bids are taken on several different classes of pipe, and on alternate methods of construction. When the board approves the final recommendation of the engineer, he prepares the contracts and sees that they are properly executed, and the contractor proceeds with construction under the direction of a supervising engineer who has full authority to enforce the plans and specifications. Contractors desiring to bid on the work are always provided with: (1) an invitation to bid; (2) complete information to bidders giving an outline of the project and scope of the work, and conditions of the bidding; (3) copy of the surety bond (50% of contract) that is required of the successful bidder; (4) copy of the contract; (5) copy of the specifications; (6) a report form on which the bidder outlines his equipment, experience, responsibility, and references; (7) a complete set of plans (blue prints); and (8) a detailed proposal form providing places to quote lump sum prices as well as unit prices. The lump sum prices for the estimated scope of the work are used for comparison, while the unit prices are used in paying the contractor for the work actually done as shown by final measurements. To prevent indiscriminate distribution of these materials it is customary to require a deposit against the return of the plans and specifications, of $15 to $25. To eliminate irresponsible bidders and to insure that the successful bidder will sign the contract, the specifications require a certified check of $500 or more, to be deposited with each proposal.

We have outlined in detail the consulting engineer's procedure in handling an irrigation project for a turfed area. It sounds like considerable work, and certainly is! But remember that the engineer can take no chances and do no guessing. Procedure of the character outlined is always religiously followed even though the engineer may have ready data in supposedly similar projects.

As we have already stated, it is not practicable for clubs that cannot or will not employ an engineer to follow in its entirety the procedure outlined; hence in developing the mechanics, hydraulics, and detailed planning we shall in a future part of this discussion supply certain empirical facts and data that will enable such clubs, particularly the nine-hole clubs, to proceed with their water systems.

In part II we give a classification of irrigation methods and a practical; brief description of these methods.

Restaurant Business Perilous, Government Report Shows

WHEN golf club officials or members raise the question "why is it that we lose money on meals when there are so many restaurants making big money at lower prices," the manager is inclined to shrug his shoulders, talk about the uncertain load which is never too big at its best, and the high costs of the club standard of food and service.

All that part of the answer is well enough in its way but a government study made of the restaurants in Kansas City, Mo., a typical situation probed at the request of the National Restaurant association, shows restaurant profits are a long way from being satisfactory . . . even if there are any profits.

More than 50% of the 1,084 restaurants licensed during the year studied either changed hands or went out of business that year. The membership in the Kansas City Restaurant association, comprising "the more stable and prosperous owners of the city" showed an "amazingly high" turnover of its membership. Out of 73 of these restaurants belonging to the association in 1925 only 33 were still in business in 1929.

The commercial feeding business is one of perilous profits.