



# Golf Course Construction *from the* Greenkeeper's Standpoint

By Edward B. Dearie, Jr.  
*Noted Chicago Greenkeeper and Golf Course Architect*

## CHAPTER II—Designing the Course

DESIGNING a golf course has only one object—to assist Nature in producing the most satisfactory golf course under the limitations imposed by the site and the financial resources of the club. The purpose of golf course architecture is not so much to remodel the terrain as to cooperate to the fullest extent with Nature.

Nature is the Great Architect. The perfect symmetry and harmony of color and proportion which her handiwork reveals, results in natural beauty which can only be imitated by true artistic vision.

The most satisfactory golf course design is one which cooperates with Nature to produce an arrangement of holes, which will prove a



—International News Photo

18TH HOLE AT LA GORCE COUNTRY CLUB, MIAMI, FLA.  
Photo shows the gallery watching "Wild" Bill Melhorn finishing one stroke over Horton Smith



real test of skill and an artistic landscape, providing both an irresistible attraction and a wholesome inspiration.

A golf links is not merely sufficient acreage for the playing of an increasingly popular game, more than that, it is a place for inspiration. Such inspiration should be obtained from the artistic beauty of the landscape. To visit a golf course should always be a pleasure, regardless of whether or not it is possible to tee-off.

Artificiality in the appearance of a course has a strong tendency to spoil the harmony of environment. Construction should be done so skillfully that the result will seem natural. To obtain this effect considerable experience and imagination are required.

Proper planning not only produces a more satisfactory course in shorter terms but it also reduces the cost of construction, because it enables all necessary work to be done at one time with efficient apparatus and under modern methods. Such foresight will always prove more economical.

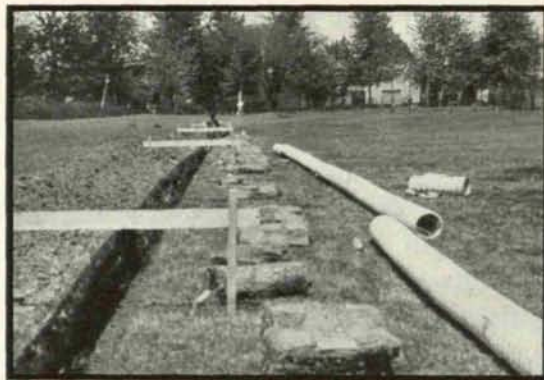
The more forethought before the commencement of actual construction work, the more accurate the estimate in regard to its probable cost. This knowledge is often quite an asset. How sad is the club which gets half thru a remodeling or construction program—only to run out of funds! Without adequate planning such work always costs more than estimated. A case, where the reverse might be true, could be classed as a miracle.

#### Clubhouse Site Is Major Consideration

THE selection of the site for the clubhouse is one of the first major considerations. As the play radiates from this point, it is necessary that its location should be definitely determined before the course is laid out. Even though a club may not desire to build a clubhouse at the outset, its ultimate location must be borne in mind. Many courses have been ruined, through no fault of the designer, because a change was made in the clubhouse site.

Frequently, the point at which the most traveled highway enters the grounds decides the approximate location. Are additional highways likely to be developed in the vicinity? If so, the clubhouse may eventually be at the back instead of the front of the property.

## *This Perforated Pipe of* **ARMCO** *Pure Iron*



## *Keeps the Course* **RIGHT!**

NOT just today, this season and next, but for many trouble-free years, Armco Perforated Iron Pipe—just under the surface—unaffected by rollers and trucks—will keep your course right for par play. No more casual water where this Nature-tested and proved product has been installed. No more “heavy” ground.

Armco Perforated Iron Pipe keeps the turf dry and firm... and ready for play earlier in the year. As rain falls, Armco Perforated Pipe carries it off, preventing soggy ground or standing pools.

Armco Corrugated Iron Pipe holds the record as the longest-lasting corrugated metal drainage product in use—24 years under all conditions of soil, water and pressure. It is logically the right—and the most economical—product for your course. Send for new data compiled at Drainage Headquarters by the Armco staff of engineers specializing in drainage. No charge; no obligation.

Armco culverts and drains are manufactured from the Armco Ingot Iron of The American Rolling Mill Company and always bear its brand.

**Armco Culvert Manufacturers Association**  
Middletown, Ohio





The most suitable clubhouse site is usually obvious to the experienced observer. Sometimes a fortunate natural elevation makes an ideal location. However, before placing the clubhouse in the center of the property, careful consideration must be given to the possibility of its interfering with the best lay-out of the course. It must be remembered that it is desirable, in fact almost essential, to locate certain features of the country club near the clubhouse and that all of them take up considerable space.

Adequate parking provisions are necessary and wide roads, which may be kept free from congestion when the premises are crowded. An acre is required to park two hundred automobiles. Within a decade or two some of the more prosperous clubs may have their own flying fields.

The practice greens and the driving field should be located in the vicinity of the "pro" shop as they are usually under the control of the club professional. The former require about two acres and the latter about three acres. These auxiliaries may be made as at-

tractive as any other portion of the course. Altogether about twelve acres may be set aside in the vicinity of the clubhouse to advantage. The approaches and surroundings provide a marvelous opportunity for beautiful landscaping.

The basis on which a satisfactory course is designed, is complete and adequate knowledge of the existing conditions on the property. Topography of the surface, type of soil, and all natural features must be studied in detail.

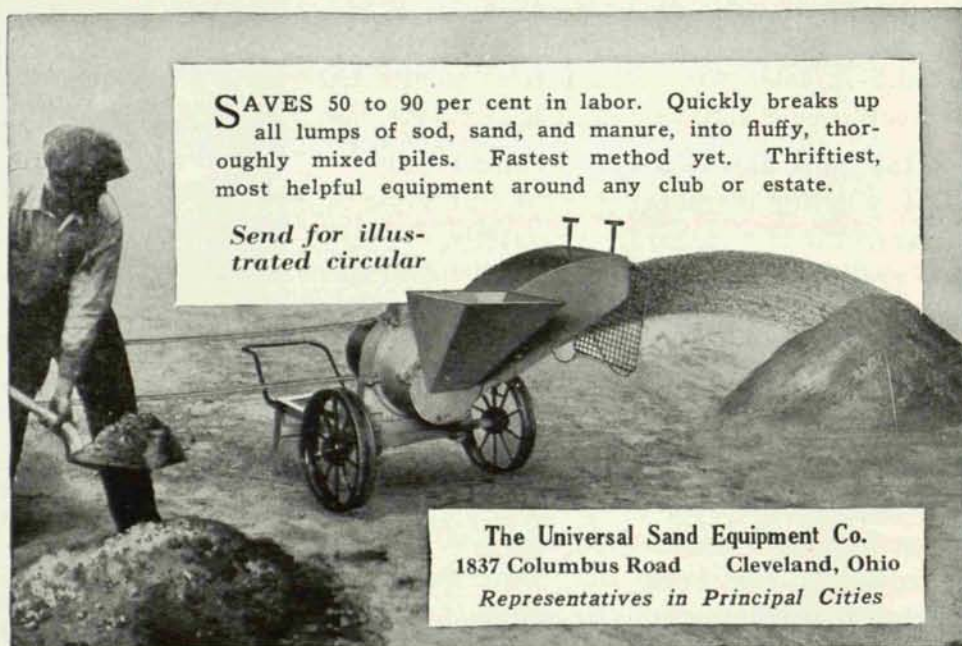
An aerial photograph of the property, if obtainable at reasonable cost, is often desirable. While this would show the contours of the surface and its features, it would not indicate the exact degrees of elevation and depression of the high and low spots. However, such a photograph might often be referred to with advantage by the architect and frequently provide him with inspiration.

#### Topographical Survey is Needed

ONE of the best means of obtaining the necessary knowledge of the site—if not the very best way—is through the medium of a topographical survey, followed by the making

# UNIVERSAL

THE  
NEW  
QUICKER  
BETTER



SAVES 50 to 90 per cent in labor. Quickly breaks up all lumps of sod, sand, and manure, into fluffy, thoroughly mixed piles. Fastest method yet. Thriftiest, most helpful equipment around any club or estate.

*Send for illustrated circular*

The Universal Sand Equipment Co.  
1837 Columbus Road Cleveland, Ohio  
Representatives in Principal Cities

# COMPOST MIXER



of a topographical map. Usually, the topography of the surface is shown on this by lines indicating every two-foot change of level on flat land and every five-foot change of level on hilly land.

The property is carefully surveyed in 400-foot cross sections coordinated numerically and alphabetically in order to provide reference points for the triangulation of tees, angles and greens while contours are taken in stadia to show ground levels. Features of the land, such as wooded areas or lakes and streams, and fence lines or the location of existing structures may be plotted in as much detail as desired. To the person experienced in golf course architecture such a map is as vivid as a picture and far more useful.

A soil chart of the property, also, is extremely valuable. Analyses should be made of the types of surface soil and their existence plotted upon a map of the land. Wherever possible analysis should be made of the subsoils at various depths within reason at strategic points. Such information will be found invaluable not only for the preparation of the

land for the growth of turf but also for the solution of irrigation and drainage problems.

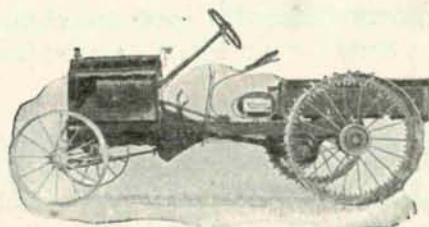
### Greens Laid Out First

WHILE the game of golf is played from tee to green, the course is laid out from green to tee because the green area is larger and more important. While the green itself is not more than about 150 feet square, the accompanying traps are always designed at the same time to effect economies of construction and the combination green-trap area usually requires from 10,000 to 20,000 square feet. To make the putt more interesting the surface of the green should not all be level but warped and each green should possess its own originality.

From the topographical map and inspection of the property twenty or thirty possible green sites should be noted tentatively. Attention must be given to the question of possible invisibility and the likelihood that a player might be obliged to face the west and the dazzling setting sun. The relative advantage of each green site should be carefully considered. By the process of elimination the best eighteen of



Low  
Cost



## Power-Speed-Endurance

The Staude Golf Course Tractor is remarkably efficient. It is giving the best of satisfaction to more than 1000 golf clubs because it is doing all the work required of it.

# STAUDE GOLF COURSE TRACTOR

Model A  
\$655  
F. O. B.  
ST. PAUL

The Staude is the world's lowest priced golf course tractor. It is light—yet powerful. It is efficient—yet economical. Its cost is low and it is sold on a money-back guarantee.

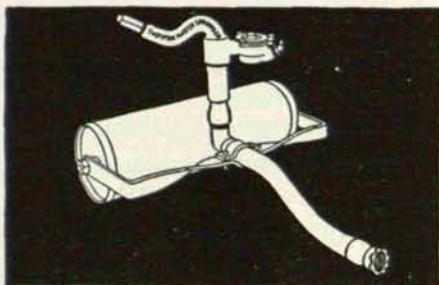
Write for Information and Easy Terms

Model T  
\$475  
F. O. B.  
ST. PAUL

E. G. STAUDE MAK-A-TRACTOR CO. 2630 University Avenue  
ST. PAUL, MINN.



# And MORE Economical!



The Thompson Master Sprinkler was built to do two specific things; first a thoroughly efficient job in keeping the fairways green, secondly to do that job MORE economically!

The Master Sprinkler has been scientifically designed to throw a spray of water that gives FULL coverage of moisture to every blade of grass within its radius. No soggy puddles—no dry rings.

*Labor is saved because fewer moves are required!* The Master runs efficiently on operating pressures of 20 pounds or more. For example: With pressure of 45 pounds an entire acre is covered with only eight moves!

And for permanent underground installations the Thompson Quick-Coupler and Quick-Coupling Valve allows unusually easy attachment of the Sprinkler. Send for our FREE catalog for complete information.

## **CHECK** *these features found only in the Thompson Master Sprinkler!*

1. Master Sprinkler gives greater uniform coverage without wasting water.
2. Operates on pressure as low as 20 lb.; with an average of 45 lb. pressure it will cover an entire acre with only 8 moves.
3. Low center of gravity, does not tip over easily.
4. Offers less of a play and wind hazard.
5. Three-year *absolute* guarantee.
6. Light in weight—9 pounds including roller base—easy to move. Saves money on labor bills.

**Thompson**  
Sprinkling Systems



THOMPSON MANUFACTURING CO.  
2251 E. 7TH ST., LOS ANGELES, CALIF.

(NGK-530)

I should like very much to see your catalog.

Name .....

Address .....

them may be chosen. The reasonableness of this judgment often decides whether or not the lay-out will be satisfactory.

After the suggested green sites have been indicated upon the map and marked roughly upon the land, one of the most puzzling problems of the whole design is presented. That is the routing of the holes. It is an accepted custom to place the first and tenth tees in the vicinity of the clubhouse, which is thus made the radiating point of the design. Wherever possible it is desirable to place the third tee near the clubhouse, also for convenience to players and galleries of extra-hole matches. Too often such contests end at the other end of the course from the locker room.

## Yardage Varies From 6200 to 7000 Yards

THE average course yardage varies from approximately 6200 to 7000 yards. This must be divided among 18 holes. The distance between holes varies between 130 and 575 yards. In general practice many courses have found the following combinations of holes satisfactory.

First nine, three long two-shot holes and three short two-shot holes, two one-shot holes and one three-shot hole.

Second nine, four long two-shot holes and two short two-shot holes, one three shot hole and two one-shot holes.

No definite rules should ever specify the distance between holes in sequence or the actual combinations of shots necessary. To standardize golf would be to spoil it. Diversity is one of the charms of the game.

There are two contrary opinions in regard to the relative importance of the first and last halves of the course. Some golfers maintain that the hardest test should come on the first nine while the player is fresh and that the second nine should be easier and a reward for having overcome the first half of the course. Others believe that the game should become progressively more difficult. This latter attitude seems more becoming to real sportsmen.

The more attractive championship courses have no two shots alike because of differences of terrain or conditions, and are laid out so as to call for the use of driver, brassie, spoon, driving iron, mid-iron, mashie iron, mashie, niblic, spade mashie and putter—in fact, every club in the bag. Parallel shots are not desirable



but to enable every shot to be made over different topography makes more acreage necessary.

No two shots should be in direct line as a matter of safety. Holes should be balanced for interest and the utmost attention should be paid to originality as this is one of the features of the game. All of these factors must be carefully considered in the routing of the holes.

Only through experience is the golf course architect able to pass judgment upon the relative importance of undeveloped green sites. When the sequence of the holes has been decided, the distance between them should be "chained off" over the undulating surface of the ground so that it may be checked under probable conditions of play.

The tee sites may now be determined. Their irregular outlined level surfaces should be about 45 feet wide by from 60 to 90 feet long. Formerly it was the custom to terrace these up but they were found too difficult to maintain properly.

Bearing in mind the shots from tee to angle and from angle to green, the fairways may be marked out. The average size of these is about three acres and the average width is from 150 to 180 feet. Care should be taken to see that they are not unnecessarily wide and consequently too expensive to maintain.

#### Bunkers and Hazards

CONTRARY to the opinion held by many, the real purpose of bunkers and hazards is not so much to penalize the player as to orient or direct the line of play and call forth great shots. The number of them depends upon the terrain. Advantage is always taken wherever possible of natural features, otherwise they must be created at appropriate places. A few courses have a great many; others have few which may require more skill to play.

Deep traps should never be placed on the drive; they belong on the second shot to the hole. Great judgment is required in the placing of traps and bunkers and the architect should thoroughly understand the game of golf.

After making a preliminary lay-out of the course, the problem of irrigation and drainage must be considered carefully as these are subjects of the utmost importance. In giving

## "Milorganize" Your Course with



#### Analysis:

NITROGEN (equivalent to ammonia) . . . . .	6.0 - 6.5%
PHOSPHORIC ACID ( $P_2O_5$ ) . . . . .	2.5 - 3.0%
POTASH ( $K_2O$ ) . . . . .	0.25 - 0.5%
MOISTURE . . . . .	less than 5.0%

The Nitrogen in Milorganite  
is

**ALL ORGANIC  
WATER INSOLUBLE  
HIGHLY AVAILABLE**

Perfect Mechanical Condition  
Best Carrier for Lead Arsenate

OUR SERVICE BUREAU and  
LABORATORIES are at your Service.

**Milwaukee Sewerage  
Commission**  
Milwaukee, Wisconsin



# Cut the GREENS with a JACOBSEN and SAVE Club Funds

The Jacobsen Power Putting Green Mower is outstanding in its capacities for cutting, brushing, working in top-dressing and rolling the greens with perfect results with less labor and less cost. America's foremost power mower engineers have endowed it with improvements found on no other mower. It is a tested and proven product.

A brush attachment gives it a distinctive advantage as a means of keeping the grass from matting, in aerating the soil, working in top-dressing and keeping the green in perfect putting condition.

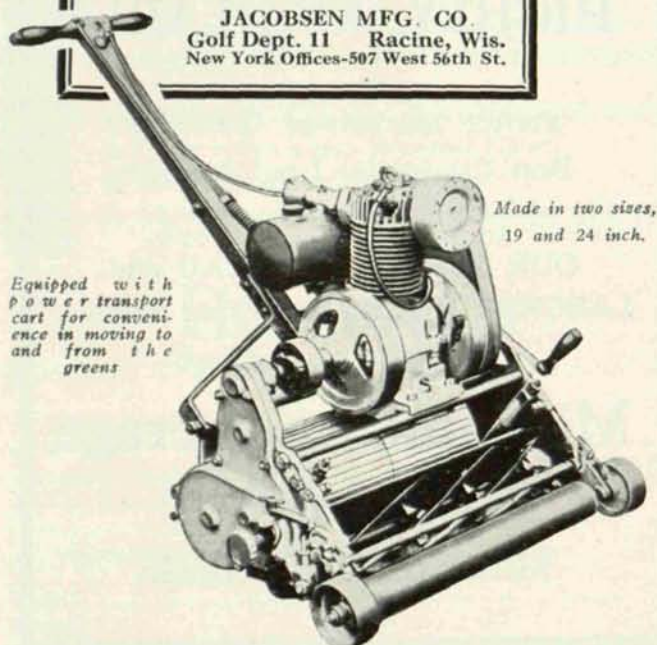
Other improvements include auto-type differential, separate clutch control for traction and seven-blade high speed cutting unit, self-sharpening reel, Timken roller bearings, enclosed gear drive, powerful motor. All working parts of a simplicity and standardization that assure uninterrupted service under all conditions.

Write today for our free guide to green maintenance and list of users.

JACOBSEN MFG. CO.  
Golf Dept. 11 Racine, Wis.  
New York Offices-507 West 56th St.

## Used By--

Jackson Masonic  
Country Club  
Jackson, Michigan  
Broadmoor Golf  
Club  
Shreveport, La.  
Binghamton  
Country Club  
Binghamton, N. Y.  
Oakland Municipal  
Golf Course  
Oakland, Calif.  
Lincolnshire Country  
Club  
Crete, Illinois  
Biltmore Forest  
Country Club  
Biltmore, N. C.  
Oakwood Country  
Club  
Cleveland Hgts., O.  
Kahwa Country  
Club  
Erie, Penn.  
Interlachen Country  
Club  
Minneapolis, Minn.  
Lakeside Golf &  
Country Club  
Oklahoma City,  
Oklahoma  
—and hundreds of  
others.



Equipped with  
power transport  
cart for conveni-  
ence in moving to  
and from the  
greens

Made in two sizes,  
19 and 24 inch.

them attention both the soil chart and the topographical map will be found of the greatest value.

Traps, pits and bunkers must slope to one end and drain properly. Many clubs are now sprinkling fairways as well as greens and tees and the possible expansion of the irrigation system must be borne in mind. Often it will be found that practical economies can be affected in drainage and irrigation thru slight modification of the preliminary design.

## Developing Greens Most Exacting

THE development of the green sites is one of the most exacting phases of golf course architecture. Each green area is surveyed in 20-foot cross sections and attention is paid to all surface contours. Sometimes as many as a hundred stakes are necessary to properly mark each green for preliminary grading. Negligence in such details is likely to spoil the possibility of the green.

Master plans submitted to the club for approval will indicate the locations of greens, tees, fairways, bunkers, traps, pits, hazards, lagoons, lakes and streams and the characteristics of each. The location of irrigation and drainage lines will also be shown. Note will be made of the actual yardages between holes. Specifications will estimate the quantity of dirt to be moved, the amount of land to be cleared or drained, and other facts of importance to the club treasury.

The principles of engineering are being applied more and more to golf course design and construction. Hasty ill-considered plans are anything but economical. Properly prepared plans and specifications are not only an investment but also a protection. Blue prints of the master plan may easily be submitted to various contractors for bids. Such a wise practice is a protection against the misuse of judgment.

Championship courses are the result of the most careful planning, usually requiring more time than the actual construction. Very seldom is any remodeling necessary. Patchwork effects may be eliminated by designing the course carefully as a whole and giving adequate consideration to the various factors which make for perfection.