

# Cost Factors In Fairway Watering Installations

By WENDELL MILLER

**N**EARLY 100 clubs east of the Rockies now enjoy the advantages of fairway watering. Droughts which have seriously affected large sections of the Eastern states during the past three years have served to force fairway watering on clubs. Competition between neighboring clubs has also been a factor in bringing fairway irrigation to the status of a necessity.

The introduction of fairway irrigation causes adjustments in many maintenance items, increasing some, decreasing others. The net result will depend, at each course, upon the importance and weight of numerous factors. The most important of the factors are:

(a) How much has been spent annually prior to installation of irrigation for fairway seed, topdressing, weed eradication and fertilizer.

(b) How much will the water cost per 1,000 gallons.

(c) How much will the power for pumping to proper pressure cost, and

(d) How much will the labor of irrigation application cost.

## Water Rates from Public Sources

Many golf courses in metropolitan centers are, or can obtain the necessary water for irrigation from the public water supply mains. Whether this source of supply will prove the most economical depends upon three factors:

(a) The initial cost per 1,000 gallons.

(b) The cost of the electric power required for boosting the pressure to the point required for satisfactory sprinkler operation.

(c) The cost of developing the same amount of water supply at the same pressure from surface or sub-surface sources.

Representative rates for some of the larger golfing centers are:

New York City (5 boros)	\$ .123 per 1,000 gal.
Chicago	.068 per 1,000 gal.
New York suburban	.16 to .35 per 1,000 gal.
Chicago suburban	.18 to .25 per 1,000 gal.
Cleveland Metropol.	.18 to per 1,000 gal.

Very few of the smaller cities have rates below 15c per 1,000 gals. and most public

sources charge more than 20c per 1,000 gals.

Pressure obtained from the public mains will vary from 20 lbs. to 70 lbs., with a few rare cases in which pressures either lower or higher than these limits will be encountered. The relatively low pressure supplied by the public water mains usually makes it necessary to install booster pumping plants capable of pumping 400 to 500 gals. per minute and increasing the pressure in the irrigation mains to a residual pressure at the irrigation outlets of from 75 to 100 lbs.

Table I shows the quantity of water consumed by seven clubs during the past three or four years, together with the power cost for pumping from well, river or reservoir or booster pumping from the public water mains.

## Water Required for Turf

Most authorities have agreed that one inch of water per week from May 1st to October 1st is required for proper turf maintenance in the bluegrass and bent grass territory. This average requirement will be increased or decreased locally by abnormal weather conditions, but in developing plans for golf course irrigation this rate of application should be provided for by the source of supply. One inch of water covering one acre equals 27,000 gals. The average 18-hole golf course will have 45 acres of fairways, 7 acres of tees and greens and 3 acres of lawns, nurseries and flower gardens, or a total of 50 acres to irrigate.

From a study of the operating records for four years at 20 Eastern clubs it appears that the irrigation system will be operated on an average of 14 weeks per year, a minimum of 8 weeks and a maximum of 18 weeks. Based on the application of 14 inches of irrigation water, the club with exactly 50 acres to irrigate, would require 18,900,000 gals. of water per season. From a study of Table I it will be seen that most of the clubs, for which total consumption is given, are closely ap-

TABLE I

CLUB	Year	Total Water in Gallons Consumption	Cost of Water Purchased	Cost of Elec. Power for Pumping	Cost Labor
A.....	1930	16,400,000	Well and Pond	\$1,128.83	\$1,651.36
	1931	15,225,000	Well and Pond	1,065.73	808.96
	1932	15,440,000	Well and Pond	1,080.92	642.80
	1933	13,600,000	Well and Pond	956.63	690.80
B.....	1931	19,000,000	River	517.00	215.00
	1932	21,500,000	River	575.00	220.00
	1933	20,000,000	River	540.00	185.00
C.....	1931	6,000,000	Lake	1,400.00	480.00
	1932	6,000,000	Lake	1,511.53	360.00
	1933	6,000,000	Lake	972.15	316.00
D.....	1932	20,000,000	River	1,500.00	420.00
	1933	18,000,000	River	1,400.00	360.00
E.....	1932	31,000,000	2,100.00	1,300.00	940.00
	1933	32,350,000	2,200.00	1,200.00	765.00
F.....	1930	18,494,000	2,467.90	847.40	800.00
	1931	9,014,520	1,228.10	709.40	470.00
	1932	21,352,750	2,793.00	890.00	935.00
	1933	13,613,000	1,035.30	616.00	396.00
G.....	1931	9,550,000	1,270.15	382.00	315.00
	1932	17,250,000	2,294.50	690.00	425.00
	1933	6,000,000	794.00	310.00	170.00

A—Chicago C. C.; B—Columbus C. C.; C—South Bend C. C., 8 holes only; D—Oak Park C. C.; E—Ridgemoor C. C.; F—Pomonok C. C.; G—Bayside Links.

proximating the above theoretical requirement.

### Irrigation Systems

There are four types of irrigation piping systems, two of which are common to the states west of the Rockies and two to the Eastern states.

The California hoseless quick-coupling portable sprinkler type of piping system consists of mains between pairs of fairways with branching laterals extending to two or more lines of outlet valves in the fairways. In the Eastern states this type of system will be found only at the North Shore CC and Long Beach CC in Chicago; the South Bend (Ind.) CC and The Country Club of Detroit. The large amount of pipe required for this type of system has restricted its general adoption by Eastern clubs.

In the past three years a large number of West Coast clubs have gone directly from hose systems to the complete underground pop-up sprinkler system. The almost complete abandonment of hose fairway irrigation by West Coast golf clubs has been due to the necessity for utmost economy in water and labor expenditures.

In the Eastern states more than half of the new fairway irrigation systems installed during the past three years have been of the type known as the one-man hoseless system. This type of system differs from the California hoseless system in two respects, only one line of outlets

is located along the center of the fairway and the operating pressure at the sprinkler nozzle is higher.

The hose type of fairway system is still preferred by some clubs in the Eastern states on the theory that the operator of the system is better able to allow for variation in wind direction or because it is still possible to install the hose type system for approximately \$1,000 less than the cost of the hoseless system.

The difference in labor cost of irrigation application between the hose and hoseless types of system is illustrated in Table I. Clubs A, E and F have high pressure hose irrigation systems. Club C has a California hoseless type system and Clubs B, D and G have the "one-man" hoseless system. Club A changed their sprinkler equipment in 1931 from fire hose and large capacity low pressure small area sprinklers to one-inch hose and high pressure large area sprinklers thereby reducing the sprinkler crew from 6 men during the daytime hours to two men working at night.

### Effect on Other Budget Items

It is difficult to get before and after figures on all of the items of the golf course maintenance budget which are affected by the introduction of fairway irrigation. Some clubs knowing that it was useless to throw grass seed on the ground unless the proper water supply could be assured did not spend money for fairway seed

while other clubs spent thousands year after year for fairway seed without results until they installed an irrigation system.

The following figures are, however, indicative of some of the changes that may be expected:

Club A has never spent a cent for fairway seed since irrigation system was installed in 1922; no money has been spent on fairway top dressing; the same amount (500 lbs. per acre) of fertilizer has been applied every year. Fairways are mowed regularly three times per week throughout the season. Club B reports an average decrease since installation of fairway irrigation of \$200 per year in expenditure for fairway seed and seeding labor; an average decrease of \$250 per year in expenditure for fairway topdressing and a decrease of \$450 per year in fertilizer expenditure. The writer personally knows that this club spent heavily for fairway fertilizer for eight years previous to the installation of fairway irrigation. Club C gives the following figures covering cost of fairway seed, fertilizer and top dressing with separate figures for the labor cost of application:

Before Installation of Irrigation		
Year	Materials	Labor
1929.....	\$3,237.67	\$738.00
1930.....	3,369.66	460.00
After Installation of Irrigation		
1931.....	\$1,429.73	\$206.00
1932.....	433.45	58.00
1933.....	340.45	46.00

The turf on this course has improved until it is the finest in Northern Indiana. There has been an 80 per cent decrease in the dandelion and weed population on the course.

Club D reports a net decrease in total golf course budget of \$3,500 per year since the installation of fairway irrigation.

Club E reports a net decrease in total golf course budget of \$2,000 per year since the installation of fairway irrigation.

### Cost Irrigation Systems

Forecasting cost of installing irrigation systems is dangerous ground because no two golf courses ever have exactly the same problem to solve in installing irrigation. There are no less than 60 variables which effect the total cost of a given job as compared to the composite average cost of a dozen jobs.

Only when an experienced irrigation engineer has developed all the facts concerning the problems of a particular prop-

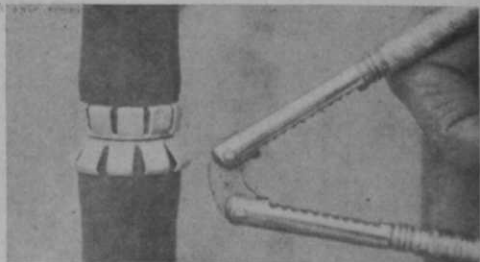
erty can a safe estimate of cost be made for the project.

If extension of city mains are necessary, the cost may be anything from \$100 to \$5,000. Wells may cost from \$500 to \$20,000. Storage reservoirs range in cost from \$500 to \$10,000. Pumping plants may cost only \$2,000 or the cost may of necessity be \$5,000 or \$6,000.

The cost of the fairway piping system will not vary so widely, because the average 18-hole golf course will require about 13,000 feet of pipe for a hose irrigation system and between 15,000 and 16,000 feet for a hoseless piping system. The new investment required for the installation of complete fairway irrigation will depend in large measure upon the value of those parts of the original tee and green irrigation system which will be useful in the fairway system. The ten new systems which have come under the writer's observation in 1933 have cost between \$10,000 and \$30,000 per 18-holes with the average cost, including all power wiring, pumping plants and other items connected with placing the systems in operation, being about \$18,000.

### Nut Cracker Is Handy Tool for Applying Hose Menders

**H**OSE MENDERS are unhandy and inconvenient to get snugly in place when they must be worked with, often in the center of a long piece of hose. Tapping them down uniformly is not always read-



ily done. It is hard to hit one set of prongs lightly without hitting others and still keep the hose end up snugly.

Jam them both in place, hold the hose in any convenient position and simply use an old nut cracker. You do not work against yourself; the cracker is easy to move around the hose and work with while you close the prongs slowly and uniformly. No danger of bulging or squeezing an old hose in spots which allows it to start leaking again.

# The big swing is to Shell



**Jerry Glynn**  
Professional Olympia Fields C.C.  
says: "It has everything"



Most pros have to win national championships to get big publicity but a guy with an idea can still get by with publicity. The Shell Company used \$128,000 of billboard display space and the pan of Jerry Glynn, pro at Olympia Fields C.C. It's a shining example of what a fellow can do to make himself known if he gets his eyes open for opportunities.

## Park Golf Officials Criticize Low Price Competition

**O**WNERS OF first class daily-fee golf courses who have complained of municipal course cut-price competition heard some municipal course executives censuring the price scale of fee-courses during the annual convention of the American Institute of Park Executives.

Well managed and soundly planned municipal golf plants such as those at Portland, Ore. are experiencing difficulty in keeping up to schedule on their amortization due to loss of play to cut-price privately owned courses. In Oregon the state supreme court has held that municipal golf courses are public utilities. Despite usual handicaps of politics the Portland municipal courses have been able to operate on a basis permitting financial aid to other municipal recreation facilities out of golf course earnings.

Several prominent municipal golf course authorities at the A.I.P.E. convention expressed themselves in favor of a pay-as-you-play code involving minimum price schedules, but expressed general belief that no such arrangement could be effected due to inability of fee-course owners to get together.

Consensus of park golf officials' opinion at Chicago was that lack of foresight and unity was dooming many of the smaller fee operators, but that such elimination would be a good thing for pay-as-you-play golf in the long run.

## A. C. LINK RETURNS TO WILSON-WESTERN ORGANIZATION

Chicago, Ill.—A. C. (Al) Link has returned to the Wilson-Western Sporting Goods Co. in an executive capacity. Announcement of his connection with Wilson made by L. B. Icelly, president of the organization, will be received with lively interest by the golf field where Link is one of the best known manufacturing figures.

Some years ago Link was with Wilson-Western and first established his reputation as a designer and builder of quality golf goods. During the intervening years he developed this reputation internationally and has been conspicuous as a worker for quality standards in golf merchandise.

Icelly advises that Link will be occupied with the management of a large group of Wilson-Western professional branches as one phase of his activities. His design and construction genius and his knowledge of pro and public requirements also will be utilized extensively by Wilson-Western.

## GREEN KEY IS ROSEMAN'S NEW TURF CONDITIONER.

Evanston, Ill.—Roseman Tractor Mower Co., 800 Davis street, is distributing Green Key, a turf conditioner that is put forth as a soil sterilizing agent, brown-patch eliminator, worm eradicator and fertilizer. Green Key is a combination of liquid and powder which is mixed, put into water solution and applied to the turf.

It has been extensively and successfully applied by practical greenkeepers over a period of some years and now is being placed on the market.





Olympia Fields installs two traps adjacent to its clubhouse each fall. When the golf season opens in the spring, the traps are removed to a farther location on the grounds.

# Keep 'Em Coming to the Club Is Sound Winter Policy

By JACK FULTON, JR.

**O**NE ADMITTED weakness of country club organization is the fact that the plant, representing considerable investment in land, buildings and facilities, is patronized at capacity only during the late spring, the summer and the early fall half of the year. During the balance of the year carrying charges and other overhead items continue full force, but not enough departmental business is done to pay for them. Whatever profits the club is able to make during the active season must be drawn on to pay the freight through the winter.

Many clubs have discovered it pays to keep the plant open the year around and install sufficient attractions to lure their members into frequent winter visits. Few clubs can close down tight anyway. Certain hardy members insist upon playing golf whenever the course is bare of snow and the weather reasonably mild, and for these members certain clubhouse facilities must be provided. They will expect the building to be heated and they will consider themselves abused if provision is not made to feed them after their exercise on the wind-swept links.

All of this means that at least a skeleton crew of employees must be held on the pay-

roll through the winter months, whether a full day's work can be found for them all the time or not. The clubhouse is supposedly closed for the winter, but is actually operating on a restricted—and incidentally money-losing—plane.

Clubs have discovered that golf as the sole winter attraction is not enough. Only a small portion of the membership will patronize the establishment in winter for golf's sake. Other outdoor features must be provided, such as trap-shooting, skeet, tobogganing, archery-golf, skating, and skiing; and indoor attractions must be planned, such as brige parties, ping-pong, dinner dances and keno games.

All of these attractions can be made profitable ventures, because each of them requires either the purchase or rental equipment or patronage of the club's regular departments in a substantial way.

## TRAPSHOOTING

**H**UNDREDS of country clubs offer trap-shooting facilities during the months when golf is least active. Enthusiasts of the sport appear at the club in good numbers every week-end and in some districts the interest in trapshooting is so keen that week-day play is not unusual.

The lure of the sport lies in the univer-

sal human delight to "bust something" with a gun. And when this urge to "bust" is surrounded by conditions that make the sport comfortable, active and competitive, few shooters can resist it.

From the viewpoint of the golf club, trapshooting is a sport well worth promoting. Primarily, clubs are interested because the sport offers them an opportunity to make direct profit through sale of shells and targets. In addition, a shooter remains at the club for most of the day if he indulges in the sport, and there is a fine volume of departmental business to be expected.

### Installing Traps.

Trapshooting requires little in the way of equipment. First and foremost a trap to throw the targets must be installed, but the club need not buy the most expensive equipment at first, proceeding rather in a modest way with a moderately priced trap. Once the sport is firmly established, additional traps can be bought. They vary in price from \$10 to \$60 and higher.

It is advisable to locate the trap reasonably near the clubhouse, so that shooters in the winter time waiting their turn at the traps will have a place to keep warm. The shooting area should be free of buildings, trees and other obstructions and the background should be a level field or body of water, against which it is easy to follow the flight of the targets, even on dark days. The sun is least annoying if the trap faces north-east.

A trap-house, blueprints and specifications for which can be obtained on request from the manufacturers of ammunition and traps, is essential to protect the boy who loads the traps. It is located some 25 yards in front of the shooting stations. The cost of an adequate trap-house should not exceed \$75.

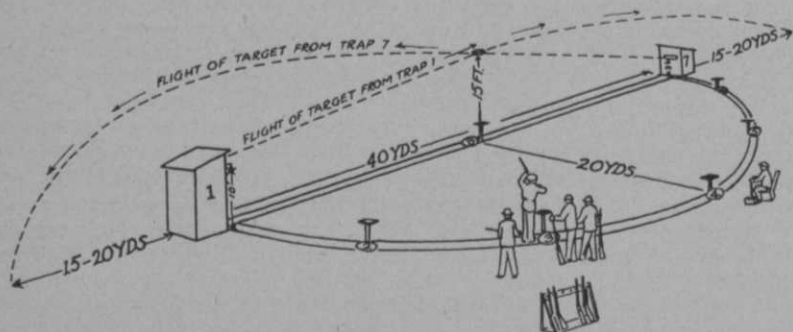
Where trapshooting is well established at clubs, a few shotguns are generally owned by the club and loaned to members on request. These guns can be purchased from local sporting goods stores and it is possible to pick up some fine second-hand bargains most of the time. By having guns available, more members can be interested in the sport and attendance boosted.

The customary charge for trapshooting is \$1.25 per round of 25 shots. For this the shooter is furnished a box of shells with proper loads for trapshooting, and enough money is left over to cover the cost of the clay targets, pay the trap boys, and leave a small profit to wipe out the original investment in traps, trap-house and so on. With reasonable play, a club can cover its investment the first season.

### SKREET SHOOTING.

ABOUT EIGHT years ago a variety of trapshooting known as "skeet" was invented and developed by W. H. Foster of Boston. The game is the nearest to field conditions of any form of clay bird shooting. About 600 organized skeet clubs are now registered with the National Skeet Association, not to mention many private skeet layouts installed as part of the recreational equipment of sportsmen on private estates.

Reference to the diagram will make plain the arrangement of a skeet field. Two traps are used, facing one another 40 yards apart so as to throw targets toward each other with a maximum elevation of 15 ft. at the center. The left-hand trap is placed on a platform not less than 10 ft. from the ground. The other trap is placed at ground level with the target door not more than 3 ft. from the ground. Seven shooting positions equidistant from each other are



Here is a sketch which gives an excellent idea of the layout for skeet shooting. Note trap puller near station 4.

then marked around the arc of a semi-circle 20 yds. from the eighth shooting position, which is located on a straight line exactly between the two traps.

Shooters start at No. 1 position, guns held in an informal "field" position and at their call of "Mark," a target is thrown any time within three seconds thereafter. The first target comes from the high trap and then another from the low trap. The shooters continue around the stations in rotation, shooting at two targets from each position. The final part of the event consists of four pairs of doubles, two targets thrown simultaneously to be shot at from stations 1, 2, 6 and 7 and an optional target, the 25th, which is one from either trap the shooter may designate, shot from any station he selects.

Targets are released by a trap-puller located back of station 4. Electric skeet trap releasing devices have been developed so that the targets are released without human control at any time within the three second limit after the shooter has called "Mark." This rule of skeet shooting, making release of target variable within three seconds, tends among other things to simulate the uncertainty of field shooting.

### Nearest Sport to Hunting.

Skeet is a somewhat more difficult sport than straight trapshooting since the targets must be broken almost immediately after they have left the trap house and before they have sailed beyond the legal limits which is the opposite trap. Nevertheless, it is a sport that will appeal strongly to golf club members since in addition to having all the elements which attract men to hunting, a round of skeet lasts somewhat longer than the same number of shots at straight trapshooting and therefore is not so expensive.

To those clubs interested in laying out a skeet shooting field on their grounds, the following publications will prove valuable:

*When Skeet Birds Fly*, The Chamberlin Cartridge & Target Co., 1459 West Sixth Street, Cleveland, Ohio (free); *Skeet*, The Official Handbook of the National Skeet Shooting Assn., 108 Massachusetts Avenue, Boston, Mass. (25c); *The Trapshooting and Skeet Handbook*, The Du Pont Skeet Hand Book and Hints to Beginners in Skeet Shooting, E. I. du Pont de Nemours & Co., Sporting Powder Division, Wilmington, Delaware (free); *Better Trapshooting*, Larry Smith (\$5.00), E. P. Dutton, Publisher; *Western Skeet Equipment*, Western Cartridge Co., East Alton, Ill. (free).

## Claims Excess Watering Costs S. Calif. Clubs \$100,000

**D**R. JOHN MONTEITH of the USGA Green Section, speaking before the Greenkeepers' Assn. of Southern California and the Southern California Golf Assn., estimated the average annual waste of water on Southern California greens and fairways to be in excess of 15 per cent annually.

Monteith censured watering practice because of damage to turf as well as because of expense, but claimed greenkeepers were not at fault primarily. Excess watering results from the demand of players that greens should be soft enough so a shot will almost imbed itself. Inability of many pros and hot-shot amateurs to play a biting shot properly has been followed by alibing about condition of the greens. Greenkeeper, to keep his job, soaks the greens. The shots can't help but stick, the water bill goes up and the standard of the putting surface goes down.

Darsie L. Darsie, golf writer for Los Angeles *Herald-Express*, commenting on the Monteith criticism, estimates that the 15 per cent annual watering excess may run as high as \$100,000 on Southern California courses.

Granting the accuracy of the Darsie estimate and considering the widespread extent of the condition responsible for overwatering of greens, it is reasonable to assume that the waste from this cause must run well over \$1,000,000 annually in the United States. Many greenkeepers recognize the folly of this practice, attention having been called to it frequently by the Green Section and by GOLFDOM, but are helpless to curtail watering because of player demands for soft greens.

## Park Association Holds Equipment Exhibit During Convention

**C**ONSIDERABLE equipment of interest to golf clubs was demonstrated at Thatcher Woods forest preserve, River Forest, Ill., September 21 during the annual convention of the American Institute of Park Executives.

Fairway mowers were demonstrated by Toro, Worthington, Roseman and Ideal and power greens mowers by Worthington, Toro, Jacobsen and Ideal. The Toro Park Special mower also was demonstrated. Goodyear and Firestone tractor tires on Worthington and Toro tractors aroused interest.

# Survey of 1933 Maintenance Gives Economy Lessons

By KENNETH WELTON

IF A DIARY of weather conditions in general, with their effect on putting green turf, had been kept in the golfing districts of the United States for the past six summers, it would read somewhat as follows:

1928. Hot weather with high humidity; much loss of turf.

1929. Normal summer. Little turf injury.

1930. Heat records made all over country; low humidity and rainfall. Little turf injury.

1931. Not as hot as 1930, but wide distribution of high humidity. Considerable loss of turf, especially in Middle West. A great deal of injury from sod webworms and cutworms.

1932. Normal summer. Little turf injury.

1933. Low rainfall in the Middle West with comparatively little turf injury. Several periods of continued heavy rainfall and high humidity in the East, with bad turf injury. More or less sod webworm and cutworm injury throughout the country.

It seems evident from the above observations on weather conditions and injured turf that periods of high humidity accompanied with hot weather are the most disastrous on putting green turf. During these periods it is always noticeable that poorly drained putting greens are most badly injured. Turf is often killed entirely on the lowest or worst drained portions of the greens. If turf is sufficiently lacking in proper drainage even the hardiest of grasses will die, but it is quite evident that at these times annual bluegrass (*Poa annua*) is the worst sufferer. A beautiful grass and good grower in the spring and fall, *Poa annua* is not a good hot weather grass and requires very careful attention throughout the summer. If it is subjected to high humidity in hot weather, it becomes very weak and sickly and the poorly drained areas are almost certain to die.

Another contributing cause to the loss of both *Poa annua* and bent grass on put-

ting greens during periods of extreme humidity and heat is over-fertilizing. Apparently fast growing and lush turf, such as may be caused by heavy nitrogen feeding, is so weakened that the sudden combination of high humidity and heat is too much for it.

As mentioned above the country was pretty well split as to weather conditions in the past summer. It was dry through the Middle West and it was easy to control the moisture on the greens; hence there was little trouble from high humidity. In the East however two periods of excessive humidity and heat were felt, one early in the summer and another more than a month later. Both of these periods brought grief to greenkeepers.

Although the country was divided as to general weather conditions, it is understood that there have been local weather disturbances in the West this summer which have brought to these particular localities the more general weather conditions reported in the East and likewise some small sections of the East may rightfully claim, for part of the summer at least, conditions similar to those reported in the West. Then there are always golf courses upon which, no matter how dry the weather, the turf is made to suffer from an excess of water artificially applied. There are also courses upon which putting greens have suffered from lack of water, even though the weather reports in that section show high rainfall. Therefore the following comments on the turf ills of 1933, causes, and suggestions for prevention or cure, should in one point or another be of interest to greenkeepers East or West.

## Brown-patch Active.

Periods of heavy rainfall in the East followed by hot weather made fungus diseases active and greenkeepers were put to considerable worry and trouble to keep the attacks of disease under control. At such times both dollar-spot (small brown-patch) and brown-patch (large brown-patch) became very active. Many greens had been



**T**HE discrimination and high standard which the selection of BUCKNER irrigation equipment assuredly implies, explains the widespread acceptance of BUCKNER WATERING SYSTEMS in country clubs such as these:

Representative  
**HOSELESS SYSTEMS**  
(Completely BUCKNER  
equipped)  
**MILLER ONE-MAN TYPE**

The Country Club, Brookline.  
Pinehurst, Inc. (No. 2)\*, N. C.  
Augusta National G. C., Augusta,  
White Sulphur Springs, Inc.,  
W. Va. (36 holes)  
Saranac Inn, Saranac Inn, N. Y.  
Charles River C. C., Boston.  
St. Andrews G. C., Westchester  
Boca Raton G. C. (36 H.)\*, Fla.  
Fresh Meadow C. C., Long Island  
Hudson River C. C., Westchester  
Albany C. C., Albany, N. Y.  
Deepdale C. C., Long Island  
Columbus C. C., Columbus, O.  
Lakeville C. C.,\* Long Island  
Churchill Valley G. C., Pittsb'gh  
Queens Valley G. C., Long Island  
Oak Park C. C., Chicago, Ill.  
Women's National G. & T. C.,  
Long Island  
Arcola C. C., New Jersey  
Bayside Links,\* Long Island  
Forest Hills Field Club, N. J.  
Scarsdale C. C., Westchester Co.  
Metropolis C. C., Westchester

Indicates commercial enterprises where efficiency and operating economy are paramount.

**ROTARY POP-UP TYPE—  
HOSELESS**

Hollywood C. C., Calif.  
Agua Caliente C. C.,\* Mexico  
Pasadena Municipal, Calif.  
San Diego Municipal, Calif.  
Will Rogers Ranch Course, Calif.  
Castlewood C. C., Calif.  
Redlands C. C., Redlands, Calif.  
San Bernardino C. C., Calif.  
San Mateo Municipal, San Mateo.  
Claremont C. C., Oakland, Calif.  
Montana Land Co. Course,\* Calif.  
Warner Bros. Course, Calif.

**CALIFORNIA TYPE—  
HOSELESS**

C. C. of Detroit, Mich.  
Stanford Univ. Course, Calif.  
Jockey Club (36 H.), Buenos  
Aires  
North Shore G. C., Glenview, Ill.  
Burlingame C. C., Calif.  
Lido C. C.,\* Long Island  
Pebble Beach C. C., Calif.  
Long Beach C. C., Indiana  
Fox Hills C. C. (36 H.), Calif.  
South Bend C. C., Indiana  
Berkeley C. C., Berkeley, Calif.  
Meadow Club, Fairfax, Calif.

**QUICK-COUPLING HOSE  
SYSTEMS**

Onwentsia C. C., Lake Forest, Ill.  
Pomonoak C. C., Long Island,  
Cascade Hills C. C., Grand Rapids,  
Mich.  
Wakonda C. C., Des Moines, Ia.  
Del Monte G. C., Del Monte, Cal.  
Exmoor C. C., Highland Pk., Ill.  
Kalamazoo C. C., Kalamazoo,  
Muskegon C. C., Muskegon, Mich.  
Univ. of Michigan, Ann Arbor  
Midlothian G. C., Chicago  
Baltusrol G. C., N. J.  
Riverside G. C., Chicago



THERE IS NO SUBSTITUTE FOR QUALITY—AND NO EQUAL IN PRESTIGE. AMONG WELL-INFORMED GOLFERS THE USE OF BUCKNER IRRIGATION EQUIPMENT IS TAKEN FOR GRANTED.

## Practical Experience

counts most in

# Fairway Irrigation

Experimentation has proved costly in golf course irrigation. With BUCKNER'S experience available, there is no need to make your course a proving ground to verify principles, methods or equipment.

### W. A. BUCKNER invented Hoseless Fairway Irrigation . . .

at Del Monte—in 1913—and since then, the BUCKNER staff has invented, pioneered, and developed to successful proved operation, every worthwhile, practical improvement in golf course irrigation.

WITH 20 YEARS OF GOLF COURSE IRRIGATION EXPERIENCE AND OVER 300 BUCKNER FAIRWAY SYSTEMS IN SUCCESSFUL, ECONOMICAL OPERATION:

1. Experimenting has years since been concluded.
2. BUCKNER systems, methods and equipment are definitely proved according to the highest standards of engineering science.
3. Satisfaction of owners of BUCKNER golf course irrigation systems is complete.

Experience is your most reliable guide in choosing golf course irrigation equipment. Let BUCKNER, backed by many years' experience in developing golf course irrigation equipment, guide you to completely satisfactory results. WRITE . . . .

## BUCKNER MANUFACTURING CO.

FRESNO, CALIF.

33 West 60th St., New York, N. Y.  
P. L. Baldock, 2240 Casitas St., Pasadena, Calif.

Use GOLFDOM'S advertising pages as your safe buying guide.

*Get the*

# RIGHT ANSWERS

to *all* of these questions

Are you guessing—or do you actually know what you are doing? Will your proposed system do everything expected? What should it properly cost? What will it cost to operate? How much water? When? Are you making any fundamental mistakes?

. . . *before* you spend a cent on

## FAIRWAY IRRIGATION

WITH experience that covers more than 50 of the 100 fairway installations east of the Rockies, the Miller Organization can work out for you the RIGHT answers to the above questions.

Today there is no question of the VITAL need of fairway irrigation. The only question that concerns you is how to go about getting the right fairway irrigation for your requirements. THE MILLER SYSTEM OF FAIRWAY WATERING solves that.

You must KNOW before your fairway irrigation installation is made what its performance will be and that the costs of correct operation shall be at a *minimum*.

Most, if not all, of the dissatisfaction experienced by those whose irrigation systems do not function properly or whose operating costs are excessive, is due to inexperienced engineering advice.

*Write today for the facts about a fairway watering system  
for your club. No obligation whatever.*

### WENDELL P. MILLER & ASSOCIATES

33 W. 60th St., New York City  
Room 1303, 333 N. Michigan Ave., Chicago, Ill.

Eastern Engineering Representatives of Buckner Mfg. Co., Fresno, Calif.

---

CONSULTING ENGINEERS . . . SOIL TECHNOLOGISTS

---

The latest golf devices are always advertised first in GOLFDOM.