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SUMMARY OF PROCEEDINGS
ANNUAL CONFERENCE OF THE
MID-ATLANTIC ASSOCIATION OF GOLF COURSE SUPERINTENDENTS

Under the Auspices
of the
Extension Service
University of Maryland

Lord Baltimore Hotel
Baltimore, Maryland
January 7 and 8, 1963

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With over 150 in attendance, the annual conference of the Mid-Atlantic Association of Golf Course Superintendents was called to order by Dr. George S. Langford, State Entomologist, University of Maryland, College Park, Md. In opening the Conference he said, "It gives me a great deal of pleasure to call this conference to order." He commended L. R. Shields, Frank J. Haske, Barclay L. Whetsell and Bradley J. Struth, of the program committee, for an effective job in organizing and bringing together a most worthwhile program. The program, he said, should appeal to many interests.

Presiding over the meeting was the Association's President, George C. Gumm, of the Ocean City Golf and Yacht Club, Berlin, Maryland. He did a grand job of keeping the program moving smoothly and made everyone feel welcome and at ease. After words of Greetings he introduced the program chairman, L. R. Shields, Woodmont Country Club, Rockville. Mr. Shields extended a warm word of welcome to all. Following his welcome, he showed the Superintendents airviews of many of the golf courses in the area. These pictures were made by Mr. Shields and enabled the superintendents to get interesting and unusual views of golf courses as seen by a flier. The superintendents were asked to identify their own golf courses, and as might be expected, a number failed to recognize their course pictured from the air. There were many views of Woodmont Country Club, Bob's home course, showing U-3 Bermuda grass in summer and winter. Also shown were aerial views of the Washingtonian Country Club while it was under construction.

A highlight of the meeting was an address at the evening banquet by Dr. Albin O. Kuhn, Executive Vice President of the University of Maryland. He showed a series of slides depicting the growth of the University from a small agricultural college to an institution of more than 20,000 students.

Prior to the evening banquet, the superintendents were privileged to enjoy a social hour with F. W. Bolgiano & Co., Washington, D. C.; G. L. Cornell Co., Bethesda; Gustin's Baltimore Toro, Inc., Baltimore and National Capital Toro, Inc., Silver Spring, Maryland, as hosts.

Mr. George F. Strutt, of Towson, Maryland, an authorized Dale Carnegie Institute Course Instructor, addressed the Conference on "Effective Speaking and Human Relations." Mr. Strutt's address covered many of the "human relation" problems with which the golf course superintendents are confronted from day to day.

RESEARCH DEVELOPMENTS AND TURFGRASS PRODUCTION

Dr. Ralph E. Engel
Rutgers University
New Brunswick, New Jersey

The source of better techniques for turf growing rests with turfgrass research and trial work by those in turfgrass production. As demands on turf are becoming greater and more specialized, it is important that we find new methods and take advantage of them. Space does not permit a report on all activities at New Jersey. Some of those which are of greatest interest are given.

Pre-emergence crabgrass control studies conducted since 1955 have lead to the following conclusions. Dacthal and zytron can be recommended in New Jersey for established Kentucky bluegrass turf. Calcium arsenate and chlordan are effective in some situations. Calcium arsenate gives long-term control, but its action and safety varies greatly with soil conditions. Turf injury with chlordan occurred in the droughty 1962 season from treatments made in 1958 and 1959. Also increased clover content has been observed with dacthal and zytron. Thus, our greatest concern for pre-emergence crabgrass control is safety to the turfgrasses. Use of pre-emergence on bentgrass type fairways is not recommended for New Jersey because of concern for turf injury.

In 1962 tests, bandane and diphenatril at rates of 45 to 60 pounds per acre were shown more effective than the previously used 30 pounds per acre. Diphenatril has always appeared to be one of the safer materials. More should be known about the safety of bandane.

Goosegrass control has been attempted with pre-emergence treatment during seven different seasons. Chlordan was reported promising in 1957 and 1958 and some claim practical results with this chemical. In 1960, 1961 and 1962 the newer pre-emergence herbicides have been used. Most of these can reduce goosegrass stands, but nearly all appear too severe on annual bluegrass-bentgrass type turf.

Three years of treatment with commercial ureaform and various fractions of urea-formaldehyde fertilizers have shown that single large applications can give intense stimulation in summer periods. It is suggested to those in New Jersey, who might use these fertilizer materials, that smaller and more frequent applications give safer and more uniform growth. An application of $3/4$ - 1 pound of nitrogen every three to five weeks might be a logical benchmark for bentgrass greens.

A series of maintenance treatments have been studied for their effect on thatch development in bentgrass turf. Topdressing, cultivation and annual liming appear to discourage thatch accumulation. High nitrogen and wetting agent appear to encourage thatch accumulation.

Zoysia fertilization study has shown June is a more efficient month for application of nitrogen in New Jersey on a loam soil than April or August. April appears essentially as good as August. May and July are considered efficient months for zoysia fertilization. Fertilization in September and October nearly eliminated zoysia on a loam soil. Zoysia remained dominant on a very sandy soil regardless of fertilizer treatment.

Several nitrogen carriers at varied rates and months of application have hindered the ability of bentgrass to survive in hot dry periods. The very small and more frequent nitrogen applications are safer than the same quantity in one large application.

SOURCES OF WEATHER INFORMATION AVAILABLE FOR GOLF COURSE USE

D. Ray Booker
The Pennsylvania State University

It seems hardly worth saying that the weather affects everyone, but the truth is that few of us really realize just how true this is. For a construction boss, the weather determines whether he works today or waits until next week.

The load dispatcher in a power plant knows that the temperature and humidity determines how many air conditioners will be in use and therefore determines how much generating capacity to keep in reserve. The forecast can determine whether a department store should advertise raincoats or lawn furniture for the coming sale. To a New York bakery, the type of day determines whether the bread should be distributed downtown or in the suburbs. Perhaps more important to us here, the weather determines, to a large extent whether we will go golfing.

Given a need for weather information, where is the best place to get it and how do we use it? Actually, there are several sources of good information available to each of us. Television is the most obvious source. A good weathercaster by using both audio and video techniques can clearly present the best and most up-to-date information available. Unfortunately many, if not most weather programs are conducted by people who have little or no weather training and therefore can give little or no useable information. However, the number of well-qualified meteorologists who conduct these programs is increasing rapidly and hopefully. In the near future, we will all be able to tune to a station which employs competent professional meteorologists. I believe this will vastly improve both the quantity and quality of the information we can get from TV weather programs.

Most of us live close enough to a Weather Bureau Station to be able to get the latest weather information when we need it simply by picking up the phone. All stations are equipped with up-to-date information from a multitude of sources and usually have competent personnel on hand to evaluate these data. The larger stations are equipped with weather radar and can give information about showers which have already formed.

The last few years have seen a rapid rise of private weather corporations which endeavor to serve individual concerns with a tailor-made weather service. These firms determine what your specific needs are and convert the "partly cloudy with scattered showers" forecast to specific recommendations which are directly useable by the client. I believe there are applications for the services of these weather consultants with many of you who are gathered at this conference.

Those who would use weather information to the best advantage might find a weather radar to be a good investment. I will present films which should demonstrate the usefulness of a weather radar. A light airborne-type radar which requires little space and usually requires a minimum of maintenance can usually be obtained at a reasonable price.

Although my project at Penn State University has six weather radars of various kinds, I frequently gather the information I need about thunderstorms from a simple device which each of you must have at least one -- that is an AM radio. The "static" which is usually considered objectionable is a good source of information about thunderstorms. Various devices are on the market which are designed to warn of an approaching storm by measuring the amount of "static" and sounding an alarm when it reaches a certain level. The price tag may run from a few tens of dollars to many thousands. However, it is very hard to improve on a simple, very

directional transistor radio and some practice. A golfer on a wide-open golf course is a very good target for lightning. This makes it very important to have some information about the danger of lightning while golfers are on the course.

In summary, the profound effect of weather upon each individual and the potential hazard in some cases makes it important to find good sources of weather information and learn how to apply it.

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HOW NOT TO APPLY CHEMICALS

Dr. Charles G. Wilson
Milwaukee Sewerage Commission
Milwaukee, Wisconsin

Dr. Wilson in this talk reviewed some of the pitfalls involved in applying chemicals, and he used reverse psychology for effect. In summation, the following are the pitfalls he outlined in the right context

1. Apply the right chemical for the job. Few materials are all-purpose.
2. Apply the right amount making certain your equipment is properly adjusted to do this.
3. Use the proper concentration. Remember that coverage is all important.
4. Make sure you have properly diagnosed the problem before selecting the chemical.
5. Remember that chemicals won't solve all turf problems. They should only be thought of as tools.
6. Don't apply every chemical at one time. In the long run this will cost more money, will be less efficient and may even kill the grass.
7. The cheapest chemical is seldom the best. A Chevy is not a bargain Cadillac - only a cheaper and more poorly built car.
8. Follow the manufacturer's recommendations in applying chemicals. The directions on each container are there for a purpose.

WE OPEN A NEW GOLF COURSE
(A Panel Discussion)

Moderator:

Dr. Fred V. Grau,
Agronomist
Hercules Powder Co.
College Park, Md.

It is a distinct honor, and a privilege, to be chosen to lead a panel discussion on this very important topic. The selection of this subject exemplifies the leadership displayed by your program committee. It is constructive to study the problems and difficulties encountered in the design and construction of a new golf course. It is appropriate here to quote from an anonymous philosopher who said, "Always try to learn from the mistakes of others. You haven't got time to make them all yourself."

Inasmuch as we are dealing constantly with a complex dynamic biological system it is inevitable that mistakes will be made in the building of a course or in getting it ready for play on opening day. We are particularly fortunate to be able to share with our discussion leaders Whetsell, Carlson and Hallowell the problems that they have encountered so that we can profit from their experience in solving them. Each man has a different and interesting story to tell. They will be peculiarly their own stories since they have had little or no guidance from your moderator. We regret that Richard Trevarthan could not join us.

Barclay (Buck) Whetsell has been superintendent at Tantallon-on-the-Potomac since March 1962. I saw the course with him in May and I wondered then if they ever could solve some of their fill and disposal problems. Prior to that he was at Westbriar Country Club for 8 years, and at Goose Creek Country Club before that. He graduated from Kingwood High School in Kingwood, W. Va., in 1952 and studied agriculture at West Virginia University. Buck is an ardent exponent of modern methods and techniques and is a first-rate photographer. He is working with Penn-cross greens and seeded Bermudagrass fairways. His movies and slides will tell better than words the story of his troubles.

From the banks of the Potomac we go now to a totally different terrain, soil and climate, to the shale hills of Berks County, Pennsylvania where natural drainage is so good that they try to devise ways to slow it down. Harry Carlson comes to us as a representative of the Moselem Development Co., Reading, Pa. Harry is the new superintendent of the new course being built near Moselem Springs with Penn-cross greens and Merian bluegrass fairways. It is just a stone's throw from the shale hill where I discovered Penngift crownvetch in 1935, not far from Virginville. Harry is president of the Philadelphia Association of Golf Course Superintendents, now in his second term. In DuBois, Pennsylvania, he lived next to a golf course and was practically raised on it. He sort of worked his way across the state holding responsible positions at a number of courses and, for the past 7 years, has been superintendent at the Country Club of Northampton County. He still lives in Easton with his family and commutes to the club. Harry will show a number of slides taken by John Guenther, one of the developers.

It is difficult to introduce a man as well known to you as Charles Hallowell. It was my privilege first to know Charles in 1935 when I started turf extension work at Penn State. At that time he had been for several years one of the two county agents who knew or did anything about turf work. His Lawn Schools were informative and well attended. He worked shoulder to shoulder for many years on weed control,

golf course management and other projects. Several years ago he retired from county agent work and became affiliated with the USGA Green Section. He retired from that and now is busier than ever making his tremendous experience available to folks thru consulting work. During 1961-62 he worked with at least five new courses including Lower Cascades at Hot Springs, Virginia, and the course that Harry Carlson represents. Always it is a pleasure to have Charles on the program.

* * * * *

(Discussion Leaders)

Barclay L. Whetsell
Tantallon-on-the-Potomac
Washington, D. C.

Mr. chairman, members of the panel, superintendents and guests. When Dr. Grau called me on the telephone and asked me if I would present a talk on the construction of Tantallon Country Club and the problems that Mr. Thompson and I were faced with, I accepted with the aid of Jim, who is President of the Club and also the Golf Course Architect.

The heavy equipment moved over 500,000 cu. yards of dirt and approximately 100,000 trees of all sizes. The trees were knocked down with bull dozers and piled with cranes so that burning would be made easier. We spent \$5,000 in fuel oil for burning and the remaining trash was buried along the edges of the fairways.

The seed bed. for the fairways was prepared in the latter part of May, consisting of three tons ground limestone, 1,000 lbs. of 10-10-10 agrico and 1,000 lbs. of Super Phosphate per acre. The fairways and tees were seeded in the first week of June with 80% common Arizona Bermuda and 20% annual rye grass. Following four weeks of growth, I applied 350 lbs. of Blue Chip Nitroform per acre. The course was open for play on August 20, 1962. In September, I applied 350 lbs. of 16-8-8- agrico per acre.

The greens seed bed consists of 75% concrete sand, 5% Michigan Peat, 5% Turface and 15% top soil. Prior to sodding the greens on the back nine, I worked into the soil 50 lbs. of ground limestone and 15 lbs. of 10-6-4 U. F. per 1,000 sq. ft. of agrico. The program for fertilization on the newly sodded greens consisted of 15 lbs. of Powder Blue over a three-months period. I also applied three applications of 6-10-4 and 10-6-4 agrico at the rate of 20 lbs. per 1,000 sq. ft. The type of grass used on greens was Penncross. The greens averaged 10,000 sq. ft. The greens on the front nine at Tantallon Country Club were hydraulically seeded with a John Bean Sprayer. I used 1/2 lb. of Penncross per 1,000 sq. ft. I cut the pressure on the spray barrel to 100 lbs. I added 20 lbs. of Powder Blue to 100 gallons of water and a mild detergent. The Powder Blue gives you an outline to follow and the detergent acted as a lubricant to get the seed through the spray rig. I got germination in four to five days.

In building and maintaining a golf course, each architect and superintendent has a different approach to the problems in the area where the course is built and maintained. Therefore, by showing the slides and film, I feel the pictures will show more to you than I can explain in words.

I thank you for your kind attention and I hope everyone in the Turf field has a good year in 1963.

Charles K. Hallowell
Huntingdon Valley, Pa.

1. Thorough examination of site to determine soil variations, lack of adequate drainage, percentage of stone in top 10-12 inches of soil, and cover supported.

2. Collection of soil tests to determine requirements for lime, phosphorus and potash.

3. Thorough preparation of soil such as plowing eight to ten weeks prior to seeding.

Limestone and phosphorous potash fertilizer after plowing operation usually 0-20-20 or 0-12-24 applied at 500-600 lbs. per acre. Important to have a liberal amount of three elements three or four inches below soil surface.

Light harrowings following a liberal rainfall usually ideal for obtaining desired grade and a fine firm seed bed.

Fertilization prior to seeding - a minimum of 10 lbs. of ureaform nitrogen per 1,000 sq. ft., higher amount of impoverished soil and on disturbed soil (this includes tees and greens.)

4. Green Constructions

Off site mixing important and different materials run through at mechanical mixer such as a Royer once

Components usually -
Sharp Sand 50 to 60%
Soil 25 to 35%
Peat material 15%

Drainage under green essential -

Stone 3/4 to 1 inch with tile in subbase stone covered with gravel, chip or coarse sand prior to applying 10 to 12 inches of soil. Caution - soil moved to site usually settles 25%.

Tees: Necessary to improve top 4 to 6 inches of soil.

5. Mid-September ideal time to seed or establish seed or stolon, but if delayed, advisable to continue seeding as late as practical to work soil.

Grasses:

Greens - Arlington, Congressional Cohansey, (three leading creeping bents). Pennecross for seed rate: 3 bushels stolons per 1,000 sq. ft. sufficient if started with a mulch such as turf fiber; seed never more than 1 lb. per 1000 square feet.

Tees:

Arlington bent is improved strain of Bermuda. In some instances fairway mixture may be seeded.

Fairway:

Where Kentucky blue grass thrives, seed a mixture of Merion blue grass 50% Kentucky blue grass 20%; Pennlawn fescue 30% rate 100 lbs. per acre.

If bent grass fairways desired, include Kentucky blue grass and Penn-lawn fescue with at least two strains of Colonial bent.

Rough:

Ky 31 fescue with Pennlawn fescue ideal - advisable to include Ky blue grass 15 to 20 lbs. per acre in blue grass country.

Following Seeding:

Use furrows run on contour to check possible erosion on slope or hillside.

Soil set has a place at steep embankments

Turfiber ideal to insure uniform cover on severe slopes and in starting intensive area such as greens since it reduces amount of watering necessary.

* * * * *

Harry Carlson
Moselem Springs Country Club
Easton, Pa.

It is indeed a privilege and honor to serve on this distinguished panel, and I would like to express my thanks to the Mid-Atlantic Association for the invitation to be a part of this fine conference. I would like to share with you some of my views on the construction of the course at Moselem. Covering the areas which I believe will be most beneficial to me as the Superintendent.

Starting with the greens, which are the highlights of the course, ours have been well designed, and well placed, to form a pleasing picture and still present a fair test of golf. With the green site selected, the area was stripped of top soil, trees, etc. and then graded to drain in three directions. Sub drainage was taken care of with shale, which served a dual purpose, by using the same material to rough grade the greens. All greens being contoured to have surface drainage in two or three directions. The shale being carried well out into the aprons in order to carry any excess water away from the green. I feel sure this will give us the desired drainage, as rains of two or more inches were no problem.

With the greens rough graded, and drainage taken care of, the green site was staked, in order to maintain the original design. The top mix was then trucked to the green site, backed on the green and dumped. Using a tractor with a scraper attached to the three point hitch, the material was leveled to a depth of 12 to 14 inches. Then adding a board to the scraper, the greens were smoothed and packed to a ten-inch minimum depth. All the time maintaining the original design.

Our top mix consisted of two parts of good top soil, two parts coarse sand and one part good humus. The material was thoroughly mixed with a front end loader, and then put thru a paul bunyan. This eliminated the stones and gave us a uniform mixture throughout the eighteen greens.

Before applying the top mix to the greens, percolation tests were taken, with good results. With good shale sub drainage, and good surface drainage, I don't

anticipate any serious problems in this area of construction. Next the banks and approaches were top soiled to a depth of 8 to 10 inches, this allowed the greens and surrounding area to be raked in one operation. I should mention here the banks were well drawn out, to facilitate mowing with power equipment.

With this finished, 50 lbs. of lime and 20 lbs. of 0-25-25 were applied to 1,000 sq. ft., and rototilled to a depth of 4 inches. The putting surface was then finished by hand raking, and just before the final grading, 15 lbs. 10-5-5, containing 75% ureaform was applied per 1,000 square feet. The greens were then cross seeded, using a Scott drill, and applying 1 pound penncross per 1000 sq. ft. Seeding was started the first week in September. The first seedings have been mowed five times, the others, two or three times according to time of seeding. The first seedings are so much superior to late seedings, that anyone doing construction should make every effort to get the seed in the ground early in September.

The tees received the same construction as the greens, except we only used 4 inches of top mix for the seed bed. In place of one large tee, we have two or three smaller ones in order to vary the shot to the green. All other areas that were plowed or disturbed in any way, received one ton of lime and 600 lbs. 0-25-25 per acre, worked into the top 6 inches of soil.

Following this the area was thoroughly worked with a spring tooth harrow, this leveled the soil and brought up the stones which we wanted to get rid of. We began stone picking using a stone picker, which worked fine while the soil was dry, but once the soil was wet we had to resort to hand picking. And we will be picking stones next summer. I should mention here we are on a two-year program, and will be able to eliminate most of these problems before opening to a membership.

After stone picking, the fairways were fertilized with 500 lbs. 10-5-5, containing 75% ureaform per acre and the rough 100 lbs. 45% urea per acre.

The final seedbed was then prepared by using the spring tooth harrow set light, followed by the cultipacker. All areas were cross seeded using a billion seeder and followed by a final packing with the cultipacker. Our fairways are seeded to Merion blue, and the rough is seeded to fescue.

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ANIMAL DAMAGE PROBLEMS ON GOLF COURSES

John C. Jones and F. Nelson Swink, Jr.
Animal Control Biologists, U. S. Dept. of the Interior,
Washington, D. C. and Harrisonburg, Virginia

Golf courses provide an attractive habitat for a number of forms of wildlife, some of which become nuisances and some cause severe damage. Prevention of damage requires a knowledge of the animals present and their habits, and techniques that are available. Alertness to note signs of trouble, and prompt action to keep losses to a minimum are essential. Common animal pests, damage they cause, and control techniques are outlined below.

1. Moles. Tunnel in fairways and greens seeking live animal food. Traps preferred for small areas, except for star-nosed moles. Thallium-treated peanuts often well accepted. Soil treatment of perimeters effective for areas subject to constant re-invasion.

2. Groundhog or Woodchuck. The groundhog or woodchuck is a serious economic pest in the eastern United States. The damage it causes may amount to several million dollars each year. This animal may be controlled by several methods. Groundhog hunting is rapidly becoming a sport, but has not proven adequate to control the population. Den gassing during the spring months is the most popular and effective method now in current use. The technique is relatively simple and is safe. Effectiveness is related to the proper use of the gas cartridge and thoroughness with which an area is covered. The control efforts are an annual operation, for reinvasion of the area is often rapidly accomplished following control.

3. Meadow Mice. Girdle shrubs and trees at surface of ground, make surface trails in grass, particularly damaging under snow cover. Bait with zinc phosphide on apple, oats, or cracked corn in fall; repeat in late winter if necessary.

4. Pine Mice. Live underground and girdle roots of trees and shrubs, eat bulbs; may use old mole tunnels. Bait with zinc phosphide on apple cubes in runways in fall; endrin effective as ground spray, but hazardous.

5. Rabbits. Girdle or cut shrubs and tree plantings. Thiram (tetramethyl thiuram disulfide) or improved Z.I.P. (zinc dimethyl dithiocarbamate-cyclohexylamine) Apply repellents in fall; repeat as needed.

6. Squirrels. Dig holes in turf, destroy bulbs, and cut shrubs and trees. Live trapping and removal preferred.

7. Skunks. Dig extensively in sod cover for soil insects. Soil treatment, as with moles, trapping, or shooting recommended. Use Neutroleum alpha to control odor. (Note: Nos. 5, 6 and 7 are game or fur animals in most states; check with local game wardens for legal requirements).

8. Rats and House Mice. Infest buildings and adjacent areas. Maintain sanitary conditions, handling of food storage, garbage and refuse. Bait with anti-coagulants, gas outdoor burrows.

Basic instructions that apply to all activities include:

1. Read labels and follow directions.
2. Use no more toxicant than required. You cannot kill an animal twice as dead by doubling dosages.
3. Avoid use of toxic chemicals that may be carried into streams or ponds by surface run-off.

Information for the control of animals damaging golf courses may be obtained by writing:-

F. Nelson Swink, Jr.
District Agent
Branch of Predator & Rodent Control
Bureau of Sport Fisheries & Wildlife
Harrisonburg, Va.

GOLF COURSE IRRIGATION -- 1963

Edward Shoemaker
Rainy Sprinkler Sales
Peoria, Illinois

During the next few years the pressure on the golf course superintendent is going to increase considerably. 1962 performances will not be good enough for 1963 or 1964. In this age of television we have been taught to expect the kind of perfection we have witnessed from our John Glenns, our Paul Hornungs and our Arnold Palmers.

The interest in golf is continuing to grow rapidly. Even our week-end golfers are traveling and playing many different golf courses during the year. As a result of this they are demanding better greens, better fairways and better tees for "their golf course."

Assuming you have done your home work well and you are up to date on all the latest proven practices of good golf course maintenance, you will be very hard pressed for the time during the season to put all these good practices into operation.

Now, for the good news - Within five years all the leading golf courses in the United States will have completely automatic irrigation systems. This was an opinion expressed to me about 60 days ago by a leading golf course superintendent in the Southwest. This superintendent had just witnessed the completion of an era in golf course irrigation since his club had just completed the installation of a completely automatic fairway, green, and tee system and he could still remember the first quick coupling system that was installed in his area. He was employed as a laborer on a course that put in the first quick coupling system in the Southwest part of the United States many years ago.

If you are doubting his claim that all leading courses will have automatic watering in five years - stop for a minute and take a look around you. Look at your dish washers, water softeners, garage doors, even remote control tuning to change the channel on your television set. Visit a modern manufacturing plant, that is making a profit, and you will see an advanced stage of automation.

Before we move forward on the subject of automatic golf course watering I think it is necessary for us to define some of the terminology we use in golf course irrigation.

What are the different methods now used to water golf course greens? From a mechanical standpoint there are four basic methods now used to water greens. Method number one is, "single quick coupling valve - portable sprinkler method." This method requires a quick coupling valve at the edge of the green, 50 to 100 ft. of hose, and a sprinkler on a portable base. If an adequate volume of water and pressure is available you may be able to cover the entire green from one setting in the center of the green. More often it is necessary to move the sprinkler several times to cover the entire green.

The second method of greens watering is the "Center of the Green - Sod Cup Method." This method utilizes a quick coupling valve in the center of the green which is protected by a heavy brass casing and hidden from the golfers view by a cup filled with sod. The sod cup is removed and a sprinkler with a long shank quick coupling key is inserted directly into the valve. This allows watering of the complete green from the center location. Here again if you have adequate pressure and volume of water it is sometimes possible to water the entire green as well as the immediate area surrounding the green. With good maintenance this method can be very

satisfactory. A high percentage of the golf courses in the Chicago area use this method.

A third method which has gained favor very rapidly during the last few years is the "Perimeter watering method" utilizing several quick coupling valves spaced at equal intervals around the green. Either part circle or full circle sprinklers on a quick coupling key can be inserted directly into the valves. This eliminates the need for hose and allows you to not only water the complete green, but also the difficult to maintain area immediately surrounding the green.

The fourth and latest method for watering greens is the "Perimeter watering - Rotor Pop-up method." Rotor pop-ups are spaced equi-distance around the perimeter of the green and can be controlled by a manual valve or automatically controlled by a remote control valve. This method is being used on a very high percentage of the new golf courses being designed at the present time.

In the past practically all tees have been watered directly from a quick coupling valve in the center of the tee, or from a hose outlet at the side of the tee. Most new courses are now going in with rotor pop-ups down the center of the tees and these pop-ups can be either controlled by a manual valve or a remote control valve.

Fairway watering has actually changed very little since the practice was first started until the last three years. The conventional fairway watering system in the Midwest and Eastern United States has been a quick coupling valve located in the middle of the fairway and spaced at approximately 90 foot intervals. On western golf courses where there is very little rainfall there are many two and three row quick coupling systems. With the coming of automation we now have the choice of a single row of large rotor pop-ups, a double row of smaller pop-ups or a three row system, such as used on most western golf courses.

We also have a choice of method of control of our remote control valves, either electrically or hydraulically. These choices require more careful engineering and more consideration of all of your local conditions than was necessary for the conventional quick coupling system.

If you are planning a new golf course or planning to modernize or rebuild part of your present course, you should take a very careful look at automatic watering. Be sure the system you select will not be obsolete in 3 or 4 years. It is very easy to design a system to fit your budget, but you want to make a careful analysis of your present construction budget as compared to your long term operating budget. Automatic watering cuts your laboring costs to an absolute minimum but even more important it puts you, the superintendent, in full command of your watering schedule. You can schedule an exact amount of time for each of the fairway sprinklers and also for each of the greens and then you can rest well knowing that you will have done a good job when morning arrives. The superintendent who does a top job of maintenance will be more secure and better paid in the future.

This talk was illustrated with slides.

POND CONSTRUCTION AND MANAGEMENT

Charles P. Merrick
University of Maryland
Denton, Maryland

One of the first things to consider when thinking about a pond is if there is a water supply sufficient to keep it filled. Dry ponds are unsightly. The most common water supplies for ponds are streams, springs, run-off from rainfall or water may be pumped from deep wells. When considering run-off a rule of thumb is that ten acres of pasture or crop land is needed for each one-acre of pond and thirty acres of woodland is needed per acre of pond surface.

There are three types of ponds: the dugout, pond made with a dam and the part dugout and part dam pond. In the coastal plain area the dugout pond is very simple. Just dig a hole in a low area ten feet to twelve feet deep and it will be filled by subsurface springs. There is no problem of the dam washing out in times of heavy rainfall with the dugout pond.

The pond made with a dam is most common in hilly or rolling terrain. The dam is usually placed across a stream with an overflow which can add beauty to the area.

Important items in dam construction:

1. Remove all brush, grass or roots from proposed site.
2. Provide a core of impervious material at least ten feet wide and key the core into the soil at a depth of one and a half to two feet.
3. Base of dam should be 5 times the height, plus the top width.
4. The inside or water side of the dam should have a three to one slope and the outside surface should have a two to one slope.
5. Allow one foot for each ten feet in height for settling.
6. The settled height of the dam should be three feet above the proposed water level.

The edges of the pond should be curved rather than straight to add to the beauty. The side slopes at the edges of the pond should be about one to one rather than a flatter slope to discourage the growth of cattails, willows and other undesirable weedy growth.

Dry ponds are unsightly. Therefore, unless there is provided a water supply for dry periods the pond should have sufficient depth to carry it through dry periods. A small portion should have a depth of at least six feet and the remainder of the pond about three feet deep. During the summer months from May to September in Maryland there is a surface evaporation of 45 inches. This means that on a hot day with light to heavy winds there is a loss of about one-fourth inch of water. A rule of thumb to calculate the amount of water in a pond is the surface area times 0.4 times one-half the depth of the water at the deepest point (this will give the cubic feet of water). To get the water in gallons multiply the cubic feet by 7.5.

To seal a leaking pond Bentonite may be used at the rate of one pound per square foot of area or just dump common clay in the pond.

If a pond is muddy Gypsum may be applied at a rate of 12 pounds for each 100 cubic feet of water or 700 pounds for a half acre pond of six feet ave. depth.

Algae on a pond is objectionable and in warm weather may cause an odor or bad taste in the water. There are a number of chemicals on the market recommended to control this condition. Copper sulfate may be used at a rate of one pound per 163,000 gallons of water. This rate will not be harmful to fish. If fish are not considered, a larger amount may be used.

Methods used in applying copper sulfate:

1. Drag a small cotton bag across the pond with long strings.
2. Drag a bag behind a boat.
3. Spread the crystals on the surface.
4. Mix with water and spray on the surface.

Such chemicals as Phygon-xl, A guathol sodium arsenite and copper sulfate are being sold for the purpose of controlling weeds in ponds. If there are fish present they should be used with caution.

When it is desirable to produce fish in a pond fertilization is recommended. Fertilize several times a year at the rate of 100 to 200 pounds of 10-10-5 per acre. The first application should be made early in the spring.

The pond may be used as storage for water irrigation. Without a good water supply there may be very little available for irrigation during a dry period. Most authorities agree that storage of one acre-foot of water (320,000 gallons) for each acre of land to be irrigated may be used as a basis for estimating. This is the equivalent of 12 inches of water on one acre.

State laws vary and permits are required when dealing with large ponds in some states. Small ponds of the type generally found on golf courses, used for water hazards, are not required to have permits before construction.

HOW WE DO IT (A PANEL DISCUSSION)

A. M. Radko, Eastern Director
Greens Section, U. S. Golf Association
Highland Park, N. J.

GREEN RE-CONSTRUCTION AND DRAINAGE

George C. Gumm, Supt. Ocean City Golf & Yacht Club
Berlin, Maryland

Proper drainage of soils is the keynote to success in the art of growing putting green grasses. Today, with the hurried expansion of building new golf courses, it has even gone to the point of a race to see who can build the most. To build a green with speed is very easy to do, if proper sub-surface drainage is eliminated. Proper mixture of the top soil is as equally important if you are to have a fine putting surface and less compaction and disease.

The following is a picture story of rebuilding the #15 green at Ocean City Golf and Yacht Club. This green was built of a tight soil, the sub-surface area was built of material out of a low salt marsh area, and the soluble salts on this green have always been high with a concentration of 1500 PPM this past season. This work started on October 24, and was completed by November 21. All work except the removal of sod, digging and installing of the tile field and resodding, was contracted to outside agencies on an hourly rate. This proved to be an excellent way to do the work without interrupting our regular work. The procedure was to remove the sod, remove the top 6" to 8" of soil using the hydraulic shovel or Gradall and dump trucks and haul to our area for mixing top soil. It was then mixed with sand and humus to give us a 50% sand, 35% soil and 15% humus. The remaining soil and sub-surface was cut to 24" and the spoil discarded.

The digging and installation of tile was next. Tile laterals were dug 12" X 12" with 12' between laterals, so that water would not have to go more than 6' to a lateral. In the trench a 2" layer of slag was laid, then the orangeburg 4" perforated tile was laid and covered to a total depth of 12" with slag. For the sub-surface fill, coarse washed sand was used and this was 12" in depth and sub-contoured to the finished green contour.

Top soil was added at a 12" depth to bring the green up to grade. The green was rough graded with a tractor and blade and then a leveling drag followed with a chain link fence to blend out the slopes. The necessary amounts of lime, N,K, and K were added. The green was disced in and then reshaped. Prior to laying of sod the soil was sprayed with 8 oz. of Aqua Gro to 1,000 sq. ft. and watered in.

In sodding of the greens, we used the sod that was removed from the green. All men worked on 1" X 12" rough pine boards so as not to leave marks on the sod. The area is then rolled and watered, and due to the late completion it was decided to wait until spring to top dress.

The total cost was \$2,753.84 completed. The breakdown is: Excavation of top and subsoil \$384.00; 373 ton Sand Fill \$933.65; 141 ton sand for top dressing \$354.21; tile \$206.58; slag 21 ton \$126.00; mix top soil, spread sand, dig runoff tile and grade \$424.00; - labor to remove sod, dig tile fields, lay tile, finish grade and lay sod 217 hours @ \$1.50 - \$325.50.

Sand was used as a subsurface fill instead of stone or slag due to the cost of obtaining in our area. The use of the gradall is to eliminate the tearing up of the surrounding areas. When tileing greens we also tile our sand traps.

HOW WE PLANT AND MANAGE U-3 BERMUDA AT THE WASHINGTONIAN COUNTRY CLUB

Frank J. Haske
Washingtonian Country Club
Gaithersburg, Maryland

The Washingtonian Country Club was one of the first in the metropolitan area of Washington to go all out on a U-3 program for tees and fairways at the time of construction. How it was planted, encouraged and is being developed into a useful and beautiful playing surface is the subject of this talk.

Before getting into how we plant U-3 Bermuda in existing Fairways, I thought it best to give you the over-all picture from the time of construction. The construction commenced in August of 1959 and it was not until the first of June 1960 that the fairways and tees were under preparation. The type of equipment used for preparing the said areas were a D-6 Caterpillar Tractor and a Rome Disc Plow. The fairways were harrowed to a depth of 6 - 8 inches several ways. We followed the same procedure with an off-set disc harrow with a farm tractor.

After this operation was completed and the fairways were tilled properly, fertilizer was applied. 5-10-5 was used at the rate of 1000 lbs. per acre and ground limestone at the rate of 2000 lbs. per acre. This was springtoothed in several directions to a depth of 2 - 3 inches. The final step in this operation before planting was to use an Olson Grader with a 14-foot float board to level and float out the fairways and tees.

The actual planting of the prepared areas got under way late in July. This was due to the lack of power to operate our irrigation system which delayed the whole planting schedule. As we all know, water and plenty of it, is critical at this time of the operation. On the fairways and tees the U-3 stolons were applied by hand at the rate of about 80 bushel per acre. As soon as the stolons were spread, a disc harrow set straight - and the stolons - were cut in several ways. This was done to a depth of about 2 inches. In place of a fairway type roller a Brillion Seeder was used to roll the planted surface and to further stabilize the stolons. This did an exceptionally fine job.

Immediately after planting, the fairways and tees were watered and kept moist for a period of about two weeks. After this, watering was curtailed considerably. Planting continued as well as could be expected, but delays came up, such as a sewer line running through 6 fairways and a water line running across 4 fairways. This made the planting run as late as October. This late date of completion caused concern for the owners and so it was decided to over seed the fairways and tees with a cool season mixture. This was necessary to insure a good playing surface by opening day, May 30. The rate of application was 60 lbs. of seed per acre.

The result of this planting was excellent and it was not until the middle of May that I observed any U-3 Bermuda, and only the fairways and tees which were planted in July and August. At this time we made our first application of 10-10-10 at the rate of 500 lbs. per acre with hopes of really pushing the U-3. Due to a cool spell about this time, nothing seemed to move until we were welcomed by three days of rain and high temperatures. The results were explosive - the cool season grasses took over and our troubles began. With every available piece of equipment we had - including hay rakes - it took several weeks to get our fairways and tees under control. We then set our fairway mowers to a $\frac{1}{2}$ inch and maintained this height for the rest of the season so as to encourage the U-3.

It was obvious at this time that the cool season grasses had held up the progress of the Bermuda and I would not recommend over seeding unless it is absolutely

necessary. By mid-June we were able to determine which fairways and tees had the best coverage and which needed attention. So the Club officials and myself decided to take full advantage of the growing season and start in with our planting program. Our second application of 10-10-10 was made at the same rate as the first with hopes of furthering the growth of the U-3.

To prepare an existing fairway we irrigated to a point where the soil was moist enough so that the mechanical equipment would penetrate properly. These areas were usually done the night before. We were interested in getting the job done as economically and fast as possible so we purchased our Aero Thatch fairway model machine. The machine was actually purchased with several operations in mind, such as harvesting planting material; preparing the soil by making $\frac{1}{4}$ " slits in the fairway without disturbing the existing surface; and for further thatch removal on our fairways and tees. The best fairways were chosen for planting material, which was either raked up by hand or the use of a Giant Vac sweeper. We have since observed that the fairways used for planting material actually seemed to thrive on the method. They came back vigorously.

Our planting program had to be done in conjunction with our regular maintenance program, which made it a slow process. The stolons were broadcast by hand over the area that was Aero thatched, at the rate of about 5 bu. per 1000 sq. ft. We followed this with a modified Brillion Seeder which was run in the same direction of the Aero Thatch so as to press stolons into the slits made by this machine. We felt that regardless of the material used, if we were able to get a catch every 6 inches or foot, we would be ahead of the game with the Aero Thatch than if we used a single row planter.

The modified Brillion Seeder I spoke of was conceived by Russell Roberts and myself. We took 16 straight colters and spaced them on the rear roller of the seeder to correspond with the spacing of the Aero Thatch blades. The colters were slightly larger than the roller on the Brillion which gave us about a 3-inch penetration into the slit made by the Aero Thatch. We also ran the Brillion perpendicular to the Aero Thatch slits to insure better penetration of the stolons. Immediately following the operation the area was well irrigated for at least two weeks. It is important that the stolons are never allowed to dry out because this will decide whether you get a good catch or not. Three men worked on the program and they planted approximately 2 acres a day.

By August, we had a reasonably good catch of all areas planted. I would judge it to be better than 60%. In mid-August we gave the fairways and tees another application of fertilizer. This time we used Nu Green 45% urea which was applied at the rate of 100 lbs. per acre. On the front nine we made the application with the use of our 150 gal. sprayer with a 20 ft. boom. The results were grave for at least a week as we got the severest burn I ever saw. So the back nine was applied dry with the use of the Lely spreader and watered in good. After a week the U-3 became very dark in color and the growth for the rest of the season was most gratifying.

By mid-September we made our last and final application of 10-10-10 at the rate of 500 lbs. per acre. This gave us an over-all total of 195 lbs. of actual nitrogen for our fairways and tees for the first season.

Starting off our second season, this year, it was about the 15th of April that we noticed some of our U-3 beginning to green up. The most amazing thing was our #3 fairway which faces northwest and north. This was our first fairway to come in. By late May all of our Bermuda was beginning to grow and we commenced with our fertilizing program again. This year we used 16-8-8 granular type and our

applications were 300 lbs. in May; 300 lbs. in June; 100 lbs. NuGreen in July and August; and another 300 lbs. in September to wind up the season. This gave a total of 234 lbs. of actual nitrogen for the second season.

Our fairways were mowed at least three times a week, sometimes 4 for special events. We maintained a 1/2" cut all season. I noticed we were confronted with more clippings this season by mid-July. To solve this problem we rigged up a piece of chain link fence about 10 ft. square and dragged the fairways after the clippings had dried out. This broke up the clippings pretty well, but I am afraid this will become a bigger problem as the fairways become thicker. We have been studying machinery that may help solve this problem.

In June we built several new tees in U-3. We like our tees to be at least 3000 square feet or larger where possible. After grading the sub-beds we hauled in about 6 in. of prepared top soil with about 75% sand mixed in it. After the final grading and shaping we broadcast the stolons by hand and followed the same procedure that we used on our fairways. In about 5 weeks we were mowing these new tees. All of our tees are mowed 3 times a week at 1/2" catching the clippings.

In July we started once again on our planting program following the same procedure. In some cases where we had very little top soil in the fairway or approaches, the above method is not practical so we sodded or plugged these areas. The sod was stripped out of the best areas - usually in front of the tees - and the cuts were filled with top soil and recovery was made in 6 or 7 weeks.

During August we were pretty well in our drought period and of course we were watering constantly. Tees were watered about twice a week and our fairways got watered at least once a week. It takes us about 4 nights to water our fairways. By late August or the first of September our main pond was down to about 8 feet and getting critically low. At this time I noticed our fairways were taking on a sickly color, losing the vibrant green we had earlier in the season. Growth also seemed to be impaired, in spite of the fact that we had made 4 applications of fertilizer. Obviously I became concerned, because my greens were affected too, so I started re-tracking my progress and could not see how this could be happening. I decided it had to be something in the water because after a few light showers the condition decreased somewhat. This continued through September and October and still I had done nothing about having our water tested, or seeing the problem through. I later found an overflow pipe hidden behind our 18th green which was coming from the Club House air conditioning unit. The material flowing out of this pipe was making its way into our main water supply. It was discovered later than this material was Sodium Bichromate, a water conditioner used in the air conditioning system and its output was 500 - 800 gals. a day. Since our main pond was extremely low we were obviously getting a very high concentration of this toxic material. We are now studying the situation and remedial steps must be taken before the coming season. So let this be a word of caution to you men. It may be wise to check your club house systems and see where these materials are being drained. When we finally got rain the color in our greens and fairways came back, but the growth was impaired.

So, in conclusion, I will say this: Our members are extremely happy with our U-3 fairways and tees, particularly when they have grass to play on during July, August and September. I am very pleased with the progress of this program and I can't wait until we have a 100% coverage and run into new problems. Finally, the man who pays the fertilizer bills is most enthusiastic and as far as I am concerned, he is the man who counts.

Thomas A. Doerer, Jr.
Fort Belvoir Golf Club
Fort Belvoir, Va.

I have been asked to comment on this program as to how we do it. It would be more appropriate for me to comment on how we try to do it. In my opinion golf has changed in the past fifteen years from a 100% sport or game to a 50% sport or game and the remaining 50% business, real estate ventures, etc. The days of genuine country clubs as we knew them 25 to 30 years ago are in the minority. Most new enterprises today are, or should be called golf clubs because there has been since 1947, a tremendous change and growth in courses, players, and members. This change in the approach to the game has caused a volume of changes in our operation as superintendents. There was a time when a superintendent was responsible for the maintenance only of his club. He did not set up his budgets, nor was he a recognized individual in the operation or overall plan of his club. Invitations to Board meetings, social functions, etc. were in the minority. Today his duties have been transformed into a multitude of items; bookkeeping, planning construction, technical information, public relations, management etc. In some cases your advice is sought to help in some of the clubs internal problems. This brings me to my favorite subject Management.

No. 1. Do you all realize that you spend more of your time on your job than you spend in your homes or with your families or friends?

No. 2. Do you realize the close and long daily associations you have with your employees or associates; namely pro-manager etc. Since you devote all this time to your home away from home, it would be prudent to keep your work quarters or areas in the same fashion as you keep your homes, clean and orderly and business like. Since you devote all this time in associating and working with your employees, it would be wise to train or educate them in all phases of your operations. This can be done by having meetings with them such as we are attending here today. We have tried this and it has helped our over all personnel problems. During the winter months (weather permitting) we show slides to our men, slides taken on their work before, during, and after an operation. This not only gives them a rest for an afternoon, but builds up their morale. Everyone of us likes a pat on the back once in a while; this also helps make a reprimand more pleasant when the occasion arises.

We have instituted in our Club, in the past few years, incentive plans, promotions within the ranks, hospital benefits and insurance, yearly wage increases where necessary, and for their convenience we have installed shower baths, toilets, lighted working areas and other innovations to make our men feel like they are part of our organization or our team. This has paid dividends in loss of man hours, attitude toward their work, also respect for authority as any superintendent should demand at all times. We have boosted the pay scale on several occasions in order to assist the employee in living up to the standards we ask of them. This, in my opinion is the first step in promoting better turf.

Our second step in promoting better turf is the securing of better and more efficient machinery. This is done by preparing a budget to satisfy our needs and also the pocketbooks of our employers. We do not ask for all of these requirements at one time, but try to plan these over a 3 to 5 year program of expenditures, taking priorities as to their importance. Once this machinery is obtained we institute a care program, and make this known to our chairman or employer by asking him to make periodical visits of inspection to our maintenance areas. This has helped us tremendously.

Our third approach to a better turf program is the planning of our daily, weekly and seasonal work sheets. Spelling out these sheets so that at no time can an

employee or foreman say he didn't have anything to do. Eliminate the doubt by planning his work, taking into consideration once again first things first.

Our fourth approach to a better turf program is a technical nature where and how to apply our various seeding, fertilizing, spraying and cutting responsibilities. We do this by our associations at national and local conferences such as we are attending today. Seeking advice from men who have devoted their lives in an attempt to solve some of mother natures stubbornness when we think we know, we experiment. When we don't know we ask; first, our fellow superintendents, second, such men as Dr. Gray, Charles Corley, Al Radko, Dr. Langford, Dr. Juska, Dr. Schmidt, and many others in our immediate area; namely the Middle Atlantic Sections. We also feel that by attending the Middle Atlantic Supt. Ass'n., the Greater Washington Supt. Ass'n. and the National Supt. Ass'n., is a form of education that is most valuable in the promotion of better turf.

Our fifth approach to better turf is machinery. When it requires machinery we seek the advices and help from Associations such as George Cornell Company, National Capital Toro Company, Baltimore Toro, F. W. Bolgiano Company, American Agricultural Company, and many other suppliers in our area who we feel are reliable and competent to help solve some of our problems.

In closing I wish to thank the program committee for having asked me to participate.

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PRACTICAL ASPECTS IN INSTALLING A FAIRWAY IRRIGATION SYSTEM
COUPLED WITH DRAINAGE WORK

Sherwood Moore
Winged Foot Golf Club
Mamaroneck, New York

In order to give you a better understanding of the work that we have been doing at Winged Foot these past two falls in regard to our fairway irrigation system, I think it would be wise to dwell a few minutes on what I encountered when I accepted the position as Superintendent at Winged Foot and a little about our soil conditions in our area.

You know, Winged Foot has quite a reputation - its East and West Courses are well known and very popular - but I never heard anyone bragging about its watering system. When I went there in 1958 all of its greens and tees were watered by means of 3/4" hose and sprinklers, and its fairways with traveling sprinklers. This required a lot of manpower and labor hours to set up and move sprinklers and hose on thirty-six greens, tees, and fairways, besides the practice greens, nurseries, lawns etc. For instance three men were required to water tees which would take them four to six hours each. The first year there we started installing snap valves down the center of our tees and now have them all completed with the exception of two, which we are planning to enlarge, and two men can now water these tees in two to three hrs.

Our 25,000 sq. ft. practice green used to be watered with a traveling sprinkler and naturally either got too much or not enough. We even installed a snap valve system in that - and what a relief now to water that green!

The inefficient fairways watering system that greeted me at Winged Foot was mains installed in 1954 in the rough between parallel fairways with snap valves located every 300 or more feet, and from these you had to drag out at least 200 feet of hose to a traveling sprinkler. The initial saving was paid over many times

in labor and equipment.

Well, enough about what I inherited! Oh yes, the Soil! Winged Foot's courses are located on heavy clay soil with numerous rocks and ledges throughout the area. Need I say more! When we receive too much rain, we bog down and what drainage problems - and then when we dry out the soil becomes hard as a rock and even cracks open.

After one summer I started moaning to my chairman and committee about the fairway watering system and requesting that we go into a center-line fairway watering system. Several reports were written in regard to this, but at first it was like batting your head against a stone wall. "Why do you need that?" "We have a system for watering fairways." "What did we spend over \$50,000 for only five years previous?" "It will cost too much money." "Our courses will be torn up and show scars for years." Etc. Etc. It was only after answering all these questions time and time again with the emphasis placed on proper and efficient watering, and also the fact that I finally got a new greens chairman with a more sympathetic ear, that we embarked on a fairway watering system.

In order for this to pass the Board we decided to make it a long range program of six years, - by doing six fairways a year and thus spread the cost over a long period of time. Eight to ten thousand a year sounds a lot better to a Board member than a whopping \$50,000 to \$60,000. We planned to do this work with our own crew and equipment during the late fall months and thus have the advantages of least disturbance to the golfing member, a saving in contractors fee, the job will be done right, and we could tie in a lot of much needed drainage work along with the water lines.

Previous to requesting this money from the Board, engineers from two different sprinkler companies were called in and consulted. They each were given maps of the courses, told what we wanted, went over the property with them, and they in turn submitted plans for a fairway irrigation system. Thus we have had a good plan to start with - and one that we have only had to change slightly in the field. Also by it, we were able to figure very closely the cost for the system.

To begin this undertaking we decided to do five holes the first year so an appropriation of \$8,000 was requested and approved by the Board.

Now I will show you some slides and tell you the story of our progress.