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A MONTHLY PERIODICAL TO PROMOTE THE BETTERMENT OF GOLF COURSES

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The editors are always glad to receive notes of interest for publication in "The Bulletin." Contributions from greenkeepers and greencommitteemen are always welcomed.

Standards in Course Architecture

A prominent golf architect recently embodied some charming sentiment and excellent advice in a letter to a friend. His words are as follows:

"I rarely hear any criticism from the average class of players about courses being too hard; they are not, generally. We have a few which offer a supreme test, but that is quite proper. We must have a standard in golf as we have in music. How often we hear people say that the finest operas are beyond them, but they all want to go; they are the standard of music and never grow tiresome or common. So it is with golf and other things. And it is undoubtedly true that the courses offering the best and fairest test of golf, other things being equal, are the most popular. The only thing which ought to be shunned on any golf course is having it too hilly. Bunkers and hazards mean nothing to the average players, but they all rightly despise hill elimbing and rough sections where balls are apt to be lost."

Winterkilling of Turf

By Lyman Carrier

This is the season of the year when many of the northern greenkeepers are confronted with the matter of preparing their greens for winter. On some of the northern courses putting greens come through the winter in bad condition. Often much of the grass is dead, necessitating reseeding. The writer visited the Minneapolis-St. Paul district early last spring for the purpose of studying the subject of winterkilling of turf. In previous seasons New York and New England courses have been visited. One thing seems to be clear: bluegrass, the bents, and fescue are not killed by cold weather anywhere in this country if the soil conditions are right for their growth.

As previously stated in THE BULLETIN,* most of the winterkilling is due to faulty dramage. This was clearly evident on a number of the greens studied. In a few cases the killing was confined to depressions in the surface from which the water could not escape so long as the soil beneath was frozen. A great many of the greens that have winterkilling are built in side hills and the greens are water-logged with seepage from below. No protective measure will save the turf on poorly drained greens except drainage. In some cases this means a relocation or rebuilding of the green.

There was some winterkilling in the Twin City district which could not be charged to faulty drainage. Some greens had dead spots, definite in outline, indicating that weak plants had succumbed. Often adjoining these dead areas were perfectly healthy patches of velvet, creeping, and Rhode Island bents. It is not easy to identify the species of grass which make up dead turf on a putting green. There were sufficient remains, however, to show that the dead grass was mostly of the *Agrostis* genus,

*THE BULLETIN, 1922 Volume, pages 84 and 162.

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which includes redtop and the bents. The writer is indebted to Mr. Tom Vardon, the professional and greenkeeper at the course of the White Bear Yacht Club, near St. Paul, for an explanation of the trouble. Mr. Vardon's observations lead him to the conclusion that the winterkilling is confined mostly to the redtop which has been customarily seeded in the greens every spring. One thing is evident, that if the greens were all covered with the hardy strains of bent which are growing on some of them, there would be no winterkilling under ordinary winter conditions.

On several courses during the past two or three winters the greens have been covered with a layer of brush, which is covered with straw. The evidence is not very conclusive either for or against the practice. Some who covered their greens last year say they will not do so again; others contemplate trying the method further. It is the writer's judgment that the most effective remedies for winterkilling are (1) drainage if needed and (2) creeping bent turf.

How We Tile-Drained at the Columbus Country Club

By WENDELL P. MILLER*

Tile drainage work on established golf courses is usually done during the early spring. This is not because spring is the best time in the year to install tile, but for the reason that the need of any additional drainage is most apparent at that time.

Several reasons why tile drainage work should be done in the late fall rather than early in the spring have come to my attention. In the fall the greenkeeper's work gradually slacks off as the grass quits growing and the amount of play dwindles. This makes an easy solution of the labor problems. The ground is firm enough, so that the tile can be distributed from wagons or trucks without marring the fairways. The fall rains and frost will do more to bring a tile drain into full action than any other single force. Thus late fall drainage will be giving almost full service when it is needed the following spring, enabling the greenkeeper to do many spring jobs on time. Drainage that is installed in the spring is usually mudded in. This means that it will take the frost of two or three winters to undue the damage done in handling the soil from the trench while wet and sticky. With these few reasons for doing drainage work on golf courses in the fall rather than in the spring, I want to tell you about the tile drainage that was installed last fall at Walnut Cliffs, the course of the Columbus Country Club. in Ohio.

The first nine holes were laid out in 1898. From 1898 to the fall of 1921 the course had been growing under the direction of both amateur and professional golf architects and turf experts, without any set policy or well defined program of extension and maintenance. Like nearly every other club did in the "good old days," they had purchased seed, fertilizer, "humus," worm eradicator, etc., in liberal quantities which drained the treasury but not the fairways. From year to year tile drains were installed, but since there was no plan and no record was kept. each succeeding greenkeeper simply added to the tangled network of drainage.

In 1921 the condition of the course convinced the green committee that

^{*} Prof. Miller, of the Agricultural Engineering Department. Ohio State University. Columbus, in addition to his regular college duties has taken a keen interest in golf turf problems, and particularly the engineering features involved. He has assumed the responsibility of turf maintenance on three golf courses. and writes us that during the past ten months has designed and supervised the installation of 360.000 feet of tile on golf courses. We are glad to get this contribution from him describing the tile drainage work at the Columbus Country Club.—Editors.

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there was need for a well-defined program of improvement and maintenance. The Agricultural Engineering Department of Ohio State University was invited to make a study of the problems confronting the club.



This study included everything connected in any way with the growing of the proper kinds of grass; the soil, the topography, the climate, the seed, the fertilizer, the labor, the equipment, and the history and the budget of the club. From this study a definite program of action was presented to the club covering the balance of the year 1921 and the years 1922 and 1923.

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The program included three objects: to grow grass of proper quality; to spend less than the income on regular maintenance; to install certain permanent improvements with the balance of the golf income.

The program worked so well that in August, 1922, the Green Committee ordered work started on a complete map of the property. Every topographical feature was mapped and the spider-web of about 30,000 feet of tile drainage was plotted as accurately as it could be definitely located. When the map was completed it was easy to explain why some parts of the course dried up a month earlier than others. Some fairways had less than 500 feet of tile while others had 5,000 feet.

With the map as a basis a new system of tile drainage was designed



Laying tile with ditching machine. String the tile 6 feet to the right of the ditch line. Use a shield on the machine to keep the ditch bottom free from crumbs. These factors, plus a tile hook, make it possible for one man to keep up with a machine digging 150 rods per day.

which would give adequate drainage to all parts. The old and the new tile lines are shown on the accompanying map. The new system called for about 32,000 feet of tile, and the estimate of the total cost was \$3,400. This was a low estimate, for there are two good tile plants near the club and a farm ditching contractor was in the neighborhood looking for work. To have installed this much tile by hand would have taken 20 men one month. Hand labor was out of the question, but the thought of having a big excavating machine, plowing down through the fairway was revolutionary. The committee, however, was in full sympathy with the program. On October 16 the Buckeye ditching-machine started to cut the trench, and on November 4 the machine pulled off the ground with the work completed. In just 16 working days the job was done once and for all, and the players hardly realized what had been going on, so quickly was it over with. The tiles were distributed along the line of the trenches just ahead of the machine by the truck which hauled them from the factory. The backfilling was done by two men with one horse and a slush-board scraper. No trenches were left open more than a few hours. We tried cutting the sod ahead of the machine with a sod cutter, expecting to relay it on the backfill, but gave it up in favor of seeding.

Since the machine mixed top soil with sub-soil, no effort was made to force all the soil back into the trenches. The surplus was hauled away and used to back up some bunkers. Of course the trenches settled over winter, and in early March some good top soil was hauled in and used as a topdressing on the grass in the trenches to level them with the sides of the trench. By the first of July the grass over the new tile lines was almost as thick as on the old fairway.

The spring of this year (1923) was very wet, and since the first of July it has rained every three or four days, yet not once has play been held up because of soggy grounds. Play started three weeks earlier in the spring than ever before and a month earlier than usual.

Now that the job is all complete everyone thinks that it was a great improvement, but many misgivings were expressed when the big excavator was tearing into the fairways. The work was completed enough under the estimate to build a new green and plant it with creeping bent runners, so there were no assessments last year for new construction.

There are two lessons to be learned from the experience of the Columbus Country Club. The big lesson was that it would have paid a handsome dividend to have had an accurate map made of the grounds on which all underground improvements could have been plotted. Such a map would have saved several greenkeepers from installing tile lines which practically duplicated drainage. The second lesson is that installing a drainage system in fall is cheaper, more accurate, and gives better results immediately than does tile installed while the ground is wet in the spring.

In another issue of THE BULLETIN some of the points in the design of golf course drainage will be discussed and illustrated. The design of the drainage system is of the utmost importance if the system is to be lasting and to avoid constant attention to keep it in perfect working order.

How I Build a Golf Course; with Some Remarks on Golf Architecture

By A. GREENE BUTCHER, Golf Architect

There has recently appeared an article which reflects on my reputation as a golf architect, and I therefore request that you publish in your valuable journal my reply, as it bears on golf architecture in general.

My captious critic says my golf architecture resembles the Munyon system of medicines. Let me explain what he means. Dr. Munyon, the celebrated physician, publishes a list of symptoms and for every set of symptoms there is an appropriate medicine, each designated by a number. Thus for "pain in the back and sides," take No. 6; for "coated tongue and bad breath," No. 11; and so on. One misguided patient had symptoms that called for No. 13. The No. 13 was all gone, so he took a dose each of No. 6 and No. 7, with very unfortunate results. But this can by no means be considered an indictment of Dr. Munyon's system.

Now it is perfectly true that I have a set of 20 models for putting greens, many of my own design. Each of these is known by a number, and it is this very superficial resemblance that leads my caviler to compare my method with that of Dr. Munyon. He even implies that I got confused with the symptoms—no, I mean topography—and put No. 8 model where No. 11 would have been more appropriate, etc. He also says that I use my models so much that he can name the architect as soon as he sees one green, implying, of course, that I have no originality. My models, however, I regard as so perfect that I rarely depart from them in the least.

Permit me to explain in some detail my methods and I am sure every golfer will see that they merit only praise. Incidentally the explanation of the motives and the principles which influence my art will, I am sure, show the shallowness of my censor's inanities.

Naturally, in laying out a hole, I begin with the tee. This I always make rectangular and elevated. Of course, such a tee looks artificial and unattractive, costs something to build, makes it hard to grow and maintain turf on the top, and requires that it be mowed by hand instead of by the tractor. But this type of tee has long been the custom, and without these rectangular tees few men would realize that they were on a golf course. Besides, a certain amount of sacredness attaches to custom and tradition, and my reputation is such that I can not afford to be called an iconoclast. Therefore, I stick to the tried and true square tee of the fathers of golf architecture.

Having located the tee site, I next decide on the type of hole to use. In this case my artistic instinct decides for a mashie hole of 130 yards. When I build a mashie hole I am always in a quandary whether to use Model 5 or 8, both of them equally superb. These two models of holes are now so well known that players assure me that when they come across one it is like meeting an old friend from home. Is not that a triumph that any architect may well be proud of?

For midiron holes I have three regular models, Numbers 2, 7 and 16. The last model has a long oblique mound at each front corner and a ridge all around the back. Players tell me they like this model as the ball can't possibly get off the green. Besides, they say that every now and then the mounds convert a poor shot into a good one, deflecting the ball toward the hole. Much of my success I ascribe to a keen realization of the mental processes of the dubb golfer, and I pay little heed to the claque of highbrow critics of golf architecture. On one course which I designed I made all the greens bowl-shaped. It is very popular, because if a ball is on the green at all it is near the hole—that is, if the hole is in the center, where it should be.

Now and then I build a green on an entirely novel plan. One of these has four quadrants each on a different level, like the 14th on the Ardnamurchan course. Some scurrilous critic has called this piece of art a Sears-Roebuck green, saying it must have been bought ready-made and the parts misplaced in putting it down. Such criticisms deserve scorn. They are like the ignoramus who thought Turner's famous picture, "Fire at Sea," was meant to represent a tortoise-shell cat having a fit in a bowl of tomato soup.

One of my architectural triumphs is the half-globe type of green, fashioned after the 15th at Finnan Haddie, but improved by me by making the surface extremely convex. It is very amusing to watch the golfers putt on this green. If the putt is short, the ball rolls back to the bottom; if a little too vigorous, then the ball rolls down the other side of the mound. In 1921 only three players made the 7th in par at Bally Hoo. built on this model. Some players took as many as twenty putts. During the past season some very unsportsmanlike golfers have used flat-sided golf balls to play this hole. The United States Golf Association should pass a stringent rule absolutely forbidding the use of any but a perfectly spherical ball. As it is, my masterpiece is made a sort of laughing stock.

Of all my courses I regard Haggis-by-the-Sea as the best and most varied. On this course I employed all of the construction devices which have made me notorious, besides using an idea that I felt sure would be popular. The commonest failing of all golfers is slicing. Therefore I built all the bunkers to penalize hooks and pulls, none to bother slices or shies. As I anticipated, all the slicers are boosters for the course, but the other fellows call it a "slice course." I always try to provide the greatest good to the greatest number of players, and to this I ascribe the large measure of my success.

I am also noted for my ability to make holes deceptive, one of the highest phases of the art, in my judgment. I like to make the easy way appear difficult and the difficult way seem easy. In this art blind or concealed bunkers are very effective. The player thinks he has made a fine shot—but finds his ball in a bunker. Blind greens are also very effective. Some pinheaded critic has said that such construction fools only the man new to the course—which indeed may be true; but it makes that fellow remember the course even if he does curse the architect. After all, there is not much difference between fame and infamy; the idea is, to be remembered. My traducer also intimates that no sane golfer will play one of my courses a second time—but who ever heard of a sane golfer ?

I have acquired no little fame from my construction of bunkers, which I always build twice as deep as does any other architect. I like them about ten feet deep, with vertical banks. It is highly entertaining to watch the desperate golfer strive to get his ball out of one of these abysses. Unfortunately such performances can not be witnessed by ladies, as the language used by the golfer would shock them immeasurably. This type of bunker will always determine whether or not a man has the proper playing temperament. One of the kind who has not the right temperament said he took eleven strokes "in that — bunker." The dashes are unprintable.

These brief comments will, I am sure, show to the sagacious that the strictures of my self-appointed critic are both fatuous and imbecile, not to say asinine. Artists, among whom are to be included the golf architects, are born, not made, and I regard it as presumptuous and insolent for any mere golfer to criticize their work. Any restrictions on the genius of artists are bound to lead to a made-in-the-factory type of golf courses. I am sure this danger will be appreciated by all true lovers of the sport.

Fertilizing Value of Waste Product from Cotton Mills

Mr. C. G. Holland, of the Danville Golf Club, Danville, Virginia, writes as follows:

"I am sending you under separate cover a sample of material we are planning to use extensively at the Danville Golf Club, Danville, Va. We can secure an abundance of this material from the local cotton mills at the expense of hauling it. It is what is known at our local cotton mills as 'picker seed,' and is a waste product derived from the cleaning of raw cotton before it is combed and spun. It consists principally of dirty cotton fiber, immature fibers, and all of the trash that comes out of a bale of cotton, being almost pure vegetable matter. We put it in a pile and wet it as thoroughly as we can with a hose. As you can imagine,

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it requires a great quantity of water to wet it thoroughly. Two or three days after being wet it heats to such an extent that one can not hold his hand six inches from the surface of the pile, and in a few months it reaches the condition of the sample being sent you. It does not give off any vapor as barnyard manure does when it heats after being wet. It is full of the seed of weeds and coarse grasses, but the heating process thoroughly sterilizes it as to seed.

"We have used some of this material in an experimental way and found it very satisfactory. For instance, we planted Bermuda seed in a box of this material with a check box of good top soil. The seed planted in this material germinated ten days earlier than the seed in the top soil, and m six weeks it was four times as high as the seed planted in the top soil, and the germination seemed to be about 50 per cent better.

"We are preparing a large quantity of it for top-dressing our Bermuda greens, as it seems to us to be ideal for this purpose, it being almost entirely free of pebbles and after drying it breaks up very fine upon being rolled, and it will absorb quantities of water and hold the moisture almost indefinitely. We have a pile of this material screened, and during an exceedingly dry spell this summer it was found to be damp about one inch from the surface, the pile having been out in the sun a month without rain.

"This material can be had by a great many golf courses throughout the South and East near cotton mills, and it appears to us to be ideal for topdressing purposes for putting greens. As it contains some fragments of cottonseed hulls it must have some fertilizing value aside from its humus content."

Golf courses in the cotton district will be very glad to obtain this information which Mr. Holland has so thoughtfully furnished.

Inexpensive tee boxes.—The Oberlin Golf Club has used for sand boxes at its tees, chimney flue lining tile 8 inches by 12 inches in cross section. These come 2 feet in length, and placed on end are of a convenient height. We purchased for 25 cents apiece tiles slightly broken at one end, which end we placed 6 inches into the ground. Painted white each with a maroon strip around the top, they make an attractive appearance. The sand does not dry out in the tile as it does in a wooden box. They seem better and much less expensive than ordinary sand boxes. We supply water at the tees by faucet and thus do away with water pails.—Maynard M. Metcalf, Oberlin, Ohio.

Rate of seeding.—In an advertising pamphlet put out by a seedsman appears the following: "It has been demonstrated so often that it is almost unnecessary to repeat it, that the way to get golfing turf quickly is to sow plenty of seed." He does not define what he means by "plenty." The article in the June, 1923, BULLETIN should be your guide as to kind of seeds to use and the proper rates of seeding. If you use more seed than there indicated, you are wasting money.

Vegetative propagation in Ontario.—The Toronto Golf Club. Long Branch, Ontario, Canada, informs us that they have planted out this year from a small nursery planted last year $1\frac{1}{4}$ acres of creeping bent in rows. This is going some.

The Japanese Beetle; Its Life-History and Control in Golf Greens

By B. R. LEACH and J. P. JOHNSON¹

The larva or grub of the Japanese beetle (*Popillia japonica* Newm.) has become a serious pest in golf greens. The experience of two local country clubs, both located in the oldest and most heavily infested area, indicates clearly that it will be quite impossible to maintain putting greens with this insect present without resorting to annual insecticidal treatment. Under the circumstances, and in view of the general alarm occasioned by the insect, the Japanese beetle laboratory has considered it expedient at this time to present the pertinent facts regarding the life-history and habits of the insect from the golf-course standpoint, and in addition, to report in detail the results of experiments carried on during the past two years resulting in a satisfactory method of control for the insect in greens. A diagrammatic illustration of the life-cycle of the Japanese beetle is given in Plate I.



Plate I. Diagrammatic illustration of the life-cycle of the Japanese Beetle.

The golf course, with its broad expanse of turf, furnishes an attractive breeding ground for this insect. The rich soil and heavy turf of the greens and select spots in the fairways attract the beetles, and eggs are deposited in enormous numbers during June, July, and August. Under these circumstances, the turf suffers from the destructive grub attack, and the killing of the grass is quick and pronounced. Since the putting greens are the choicest portions of turf on the course, it follows that they will be most heavily infested and suffer proportionate injury.

During summers of normal rainfall, when the grass throughout the course retains its green color, there will be a general and fairly even infestation in the fairways and rough and a heavier infestation in the greens. In dry summers the infestation will be largely confined to the moist portions of the fairways and rough and will be heavily centralized in the greens.

The story of the insect's depredations on local golf courses is as follows: It was first definitely observed injuring grass roots in the spring of

¹ Contribution from the Japanese Beetle Laboratory, Bureau of Entomology, U. S. Department of Agriculture, Riverton, N. J.

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1921. During that summer the infestation in the greens of the Riverton Country Club, Riverton, N. J., was light (about 100 to the square yard) and the injury was confined to the edges of the green which had not been properly watered. In 1922 the infestation in these same greens was heavier (about 300 grubs to the square yard) and injury to certain of the greens was pronounced. At the same time the Moorestown Field Club, four miles distant, on the edge of the heavy infestation, was undergoing the 1921 experience of the Riverton club. During the present year (1923) the turf of the greens on the Riverton course, in some instances, has been ruined. The infestation in the greens is running as high as 1,000 grubs to the square yard. The situation on the Moorestown course is virtually the same as at Riverton, while the Torresdale Golf Club, in Pennsylvania, is now undergoing the 1921 experience of the Riverton club.

The observations of this laboratory indicate that the well-kept turf of golf greens is capable of supporting without injury an infestation by 100 or less grubs per square yard. Any added numbers will be evidenced by injury in proportion to the density of infestation. The beetle varies to some extent from year to year in the date of its emergence and subsequent egg-laying and larval development. Similarly the period when turf injury may be looked for varies with the above seasonal variation of the insect. In view of these facts it seems advisable for the clubs now infested or in danger of infestation in the near future, to cooperate with this laboratory in the handling of this new problem, since no specific statements can be made at this time capable of serving as a guide for general information.

The writers recently gave an account¹ of experiments conducted during 1922 which resulted in the finding of a method of control for this grub with negligible injury to the turf. The method in brief consisted in emulsi-



Figure 1. A desirable type of churn for use in the preparation of carbon disulfid emulsion.

fying carbon disulfid with soap, diluting with water, and applying the mixture to the turf of the green by means of hose and special nozzles.

Since the publication of that paper the experimental work has been continued, with special attention to large-scale treatments under the usual

^{1 &}quot;A control for Japanese Beetle Larvæ in Golf Greens," Bulletin of the Green Section of the U. S. G lf Association, June 21, 1923.

golf course conditions. The results of this year's work have corroborated last year's conclusions and indicate that the method as now used will control any infestation of Japanese beetle grubs, May beetle grubs, ants, etc., in the greens. Since the recent experimental work has indicated the advisability of certain changes in methods and materials, it seems expedient at this time to give as complete a report of the work as is possible, for the benefit of those who may wish to try out the method.

Preparation of the insecticide.—UTENSILS.—The wooden butter churn, as shown in Figure 1, has proved to be the best means of emulsifying the carbon disulfid. An ice-cream freezer is also a very satisfactory utensil for this purpose.

INGREDIENTS.—One part by volume of Good's rosin fish-oil soap No. 9, 3 parts by volume of water, and 10 parts by volume of carbon disulfid.

METHOD OF PREPARATION.—(1) Place the soap and water in the churn and turn handle for a few moments in order to obtain an even mixture (Plate II). (2) Add the carbon disulfid to the mixture of soap and water in the churn and turn the handle for about two minutes, until the mixture emulsifies as indicated by the change in color and the cream-like consistency of the liquid. One quart of this emulsion is stirred into 50 gallons of water and the resulting mixture applied at the rate of 3 pints per square foot of turf.

CAUTION.—Carbon disulfid is extremely inflammable and explosive, and it must be handled with as great care as is gasoline.



Plate II. Preparing carbon disulfid emulsion in practice.



Plate III. Outfit used in experimental work.



Plate IV. Applying the liquid to the green.



Plate V. Special nozzle in operation.

Treating the green.-EQUIPMENT.-The method in general is indicated by the accompanying illustrations. The outfit employed in this work is shown in Plate III and consists of a motor truck upon which is mounted a power sprayer equipped with a 450-gallon tank. The main supply hose from the tank leads to a pipe, as shown, from which four leads of $\frac{3}{4}$ -inch hose (each with a cut-off valve) carry the liquid to the green, as shown in Plate IV. At the end of each line of 3/4-inch hose is a special nozzle devised by this laboratory for the specific purpose of properly flowing the liquid upon the turf (Plate V and Figure 2). In other words, the liquid is not sprayed upon the green under pressure; it is poured or flowed onto the turf, as indicated in Plate V. Under these circumstances the portable outfit for this sort of work should consist essentially of a 400 to 600 gallon tank, with paddle agitator geared to engine, and with pump and engine capable of delivering 40 to 60 gallons of water per minute when working under a very low head of pressure. The hose employed should preferably be of wide-bore fabric, with no rubber present, since the insecticide employed in the treatment slowly reacts, chemically, upon any rubber present in the outfit.

PREPARATION OF THE GREEN FOR TREATMENT.—The turf of the green should be maintained in a moist condition for ten days prior to the application of the insecticide. This is highly essential: for if the turf is allowed to become dry the grubs leave the dry surface soil and go down to a depth of two to four inches, where they escape the action of the toxic liquid at the time of the treatment. When the green is subsequently watered these grubs again come to the surface soil and renew their attack upon the grass roots at the crown of the individual plant. In addition, the green should nct be mowed for two days prior to the treatment.

LAYING OUT THE GREEN FOR TREATMENT.-Since the tank employed as above has a capacity of 450 gallons and the liquid is applied at the rate of three pints per square foot of turf, it follows that each tank of liquid will treat 1,200 square feet of turf. In practice, therefore, beginning at one side of the green, three strips of turf the length of the green, each comprising an area of 800 square feet, are laid out and marked by lines of coarse twine, and a line of hose, with nozzle attached, is then laid the length of each of the three strips, as shown in Plate IV. Everything is now in readiness to apply two successive tanks of liquid to the 2,400 square feet of the green marked out as above.



Figure 2. Working drawing (half size) of the special nozzle for treating golf greens.

APPLYING THE LIQUID TO THE TURF .-- Under the above arrangement 2,400 square feet the area of turf is divided into three equal parts. Each part is treated 300 gallons with of liquid by a workman who confines his efforts to his own strip of turf, as shown in Plate IV. this method the Bv liquid is applied in an orderly and systematic fashion and the chance of uneven distribution of the liquid is reduced to the minimum. Furthermore, any faulty work on the part of the individual workman resulting subsequently in poor grub kill or burning of the turf, can be corrected

MANIPULATION OF THE NOZZLE .- The special nozzle devised by this laboratory is shown in operation in Plate V. It will be observed that the liquid flows from the nozzle at the rate of about 10 gallons per minute, in a fan-like stream, and that the nozzle is held about a foot from the ground. The operator, beginning at one end, slowly moves over his strip of turf, from side to side, covering the ground with a layer or coat of liquid, avoiding puddling or excessive run-off, and taking care not to leave any untreated streaks. The experimental work has indicated that in applying the liquid at the rate of three pints per square foot of turf it is advisable so to regulate the speed of application that the workman will have gone over the strip once and have covered one-half of the strip a second time when the first of the two tanks of liquid is emptied. While the tank is being refilled the turf will have absorbed the liquid already applied sufficiently so that the second tank can be applied in the same way as above without excessive run-off or puddling. In this respect the writers can not emphasize too strongly the danger from applying another layer of liquid before the previous one has been absorbed by the turf. Severe burning will result if care is not taken in this respect. For this reason one should gauge the area to be treated with two successive tanks so that by the time the workmen have reached the end of their respective strips the turf at the starting point will have absorbed the coat of liquid and be in an ideal condition to receive the next coat.¹

On the other hand, while too heavy and frequent coating of the turf must be avoided, the operator must not swing to the opposite extreme and apply several light coatings. There will be no burning under the latter conditions, but the grub kill will be unsatisfactory. Under the circumstances, it seems advisable to strike a happy medium by applying the three pints per square foot in three even coats.

When this system is followed, providing the turf is in good condition, the injury to the grass will be confined to low spots on the green where puddling is unavoidable and to thin streaks caused by the rubbing of the hose upon the wet turf. Turf which has been partially or severely injured by disease or grub attack is proportionately less resistant to the effect of the treatment. It should be reseeded a few days after the treatment.

The experimental work this year has included the treatment of clover, crab grass,² redtop, and various bents, including German mixed bent and carpet or creeping bent. When properly applied, the injury caused by the treatment has been negligible and within ten days the turf has responded with a luxuriant growth of rich green. The results indicate clearly, as stated in the report of last year's work, that the material has a pronounced stimulating effect upon the turf.

Ten days after treatment, in the case of carpet or creeping bent greens, where 50 per cent of the surface of the green was brown, due to grub attack, the recovery of the turf was pronounced and the brown spots were rapidly filling in with new growth.

The grub kill.—When properly applied, the treatment will give a 95 per cent grub kill, and the grubs remaining alive after the treatment will have but a negligible effect upon the turf providing it is not allowed to dry out. In fact, good turf properly cared for is capable of supporting an infestation of 100 grubs per square yard without marked injury to its growth. In other words, with not more than this proportion of grubs present the turf can make sufficient root growth and still support the grubs. Heavier infestations result in proportionate injury to the turf up to the point where the entire green is killed outright.

Cost of the treatment.—MATERIAL.—The soap costs 6 cents per pound and the carbon disulfid from 7 to 9 cents per pound. A quart of emulsion therefore costs about 17 cents. Nine quarts of emulsion will treat 1,200 square feet of turf at a cost of \$1.53. Depending on the size of the green, the material will cost from \$4.50 to \$10 per green.

LABOR.—Four men, with conditions properly arranged, can treat from two to four greens in nine working hours, the work required depending again on the size of the greens.

Care of the green after treatment.—The green should not be watered for 36 hours after treatment, nor disturbed by raking, rolling, mowing, etc., since these operations may interfere with the grub kill and the speedy recovery of the turf.

¹ To test the turf as to whether it is in condition to receive another coating of liquid, press the foot upon the turf; if liquid oozes out under the pressure of the foot, the turf shuld be allowed to drain until this condition no longer exists. 2 The treatment is extremely severe on crab grass.

Some U. S. Golf Association Decisions on the Rules of Golf

Question.—Four men are playing a best-ball four-ball match, A and B being partners and C and D being partners. A and C have holed out in 5 and B has putted for a 3 and hangs on the lip of the cup. D is about 10 feet away with a putt for a $4\frac{1}{2}$. He steps forward and picks up B's ball, conceding the putt, stating that he had a right to do so because he was afraid it would fall in the hole. The other side claims that he could request the ball to be picked up but he had no right to touch the ball of either of his opponents under penalty for so doing. There is no question as to the willingness of the opposing parties to concede such putts to each other, the argument being wholly as to the rights in the matter.

Answer.—D is wrong under Rule 1 of rules for three-ball, four-ball, and best-ball matches. D requests B to either lift or hole out his ball if he thought B's ball would interfere with his putt. Rule 7 under the same rules for four-ball matches states in part, "If a player's ball be moved by an opponent, the opponent's side shall lose the hole." Technically C and D would lose the hole by moving B's ball.

Question.—In a four-ball match one of the players who was "away" was about to make a putt. His partner's ball was beyond and close to the hole on the green. In the opinion of one of his opponents this ball would serve as a mark for the hole, and this opponent asked the player to putt or lift his ball before his partner played. To this action the player who was "away" and about to putt objected and asked that his partner leave his ball where it was. Is the player compelled to lift as requested?

Answer.—The player is compelled to lift as requested. Rule 1 for three-ball, best-ball, and four-ball matches.

Question.—A and B are on the putting green. A has played 3 and is 18 inches from the cup. B has played 2 and is 12 feet from the cup, completely stymied by A's ball. B says to A, "If I give you your putt I can knock your ball away and putt for a 3, can't I?" A replies that it is all right with him. and pieks up his ball, which B has knocked to him. B putts and misses the 3, taking 4 and halving the hole. Is either player subject to any penalty? Are both subject to any penalty? The incident happened in a championship event during the second round.

Answer.—Both players are disqualified under special rules for matchplay competition, for the reason that they agreed to violate the rules of golf. This decision is sustained by the ruling of the R. and A. No. 199-293.

Ruling on corrugated, grooved, slotted, or punched clubs.—At a meeting of the Executive Committee of the United States Golf Association held at the Flossmoor Country Club Friday evening, September 21, 1923, the following ruling was adopted with respect to corrugated, grooved, slotted, or punched clubs, effective January 1, 1924:

"Club faces shall not bear any lines, dots, or other markings made for the obvious purpose of putting a cut on the ball, nor shall they be stamped or cut with lines exceeding 1/16 inch in width, nor less than 3/32 inch apart, measured on their inside edges. Both line and dot markings may be used, either alone or in combination within the above limitations, provided all rough or raised edges are removed." New Member Clubs of the Green Section.—San Andres Golf Club, Buenos Aires, Argentina. Spring Brook Country Club, Morristown, N. J. Walloon Lake Country Club, Walloon Lake, Mich. Urbana Country Club, Urbana, Ohio. Tacoma Country and Golf Club, Tacoma, Wash. Tualatin Country Club, Portland, Oregon. Willow Brook Country Club, Tyler, Texas.

New Member Clubs of the United States Golf Association.—ACTIVE.— Olympic Club, San Francisco; Antlers Club, Amsterdam, N. Y.; Briergate Golf Club, Deerfield, Ill.; North Hills Country Club, Normandy, Mo.; Newton Country Club, Newton, Iowa; Utica Golf and Country Club, New York Mills, N. Y.; Lake Merced Golf and Country Club, San Francisco; Rancho Golf Club, Los Angeles.

ALLIED.—Androscoggin Valley Country Club, Shelburne, N. H.; Quincy Country Club, Quincy, Ill.; Needham Golf Club, Needham, Mass.; Dover Bay Country Club, Rocky River, Ohio; Briarcliff Country Club, Briarcliff Manor, N. Y.; Michiwaukee Golf Club, Milwaukee.

Volume I of "The Bulletin" (1921) has been reprinted and may be obtained in one cover for \$2.25.

Instructive Golf Holes IV

No. 4. Hollywood Golf Club, Deal, New Jersey. 130 to 165 Yards

A one-shot hole of striking character, the length of which can be varied from 130 to 165 vards. Even at the shortest length it is a trying shot for the average golfer. The green is nestled between two large mounds in the face of which are sand bunkers, and the mounds themselves are so shaped and so rough that there is practically no chance of a ball hitting the mounds to be deflected to the green. Behind the mounds on each side are other bunkers. The most impressive feature is the huge sand-pit in front of the green, which instils ample "mental hazard" in the player. The putting green is about 4,500 square feet in area, approximately 60 by 75 feet, and about 15 feet higher than the tee.







Hole No. 4, Hollywood. View from Tee.

BULLETIN OF GREEN SECTION OF THE Vol. III, No. 10



Hole No. 4, Hollywood. Close-up View of Putting Green.

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QUESTIONS AND ANSWERS

All questions sent to the Green Committee will be answered promptly as possible in a letter to the writer. The more interesting of these questions, with concise answers, will appear in this column each month. If your experience leads you to disagree with any answer given in this column, it is your privilege and duty to write to the Green Committee. While most of the answers are of general application, please bear in mind that each recommendation is intended specifically for the locality designated at the end of the question.

1. Converting redtop and fescue greens into bent greens.—Redtop seems to thrive here better than any grass we have sown. Would it be advisable to sow in redtop and next spring or fall sow bluegrass? Our greens are fescue and redtop. The grass is very thick, and we keep it short. We top-dress the grass with good rich soil two or three times during May and June and two or three times again in September and October, and seed each time we apply top-dressing. We understand that bent grasses are better and so have started a nursery. Is it advisable on our old greens that are not to be changed as the new course is laid out, to sow Rhode Island bent? Can we do better than continue seeding with fescue and redtop? (Indiana.)

In regard to your putting greens, we would have to see them to determine just what you have on the greens. Redtop is useful as an emergency grass. It usually does not live over two or three years on the putting green, and by the second year it becomes coarse. It is very rare indeed that you can maintain fescue on a green where it is mixed with redtop or any other grass, as the other grasses crowd out the fescue. Certainly there can be no doubt that the bents make the best of all greens. On your fescue and redtop greens it is useless, in our opinion, to put on additional fescue seed, as we have never succeeded in getting fescue to grow on top of old turf. While you are maintaining these as redtop and perhaps fescue greens, restrict your seeding to redtop. As a matter of fact, ordinarily you can get much better results with fertilizer than with reseeding. Redtop is probably an exception to this, as it is short-lived on putting greens. You can, however, gradually change your redtop and fescue greens to bent greens by seeding in the early fall-say September first-with bent seed, either Rhode Island bent, or preferably German mixed bent, and top-dressing after you seed. The bents will catch in the turf of all other grasses, and any other kind of a green can be changed to a bent green by this method. Bent seed, however, is scarce and expensive, and we would not advise you to plant it on your putting greens as late as the latter half of September.

2. Preservation of hose — We have in use on our golf course about 2,000 feet of hose for watering greens. What is the best way of preserving such hose? Should it be kept on rollers or hung up near the greens on trees? (Ontario.)

It has been our observation that the most rapid deterioration of watering hose comes through getting sharp bends in the hose which break the outside coating of rubber, which is usually of very low grade, lacking elasticity and resilience. If in using, rolling, and unrolling the hose, no sharp bends or kinks are permitted to occur, the life of the hose should be greatly extended. For this reason it is believed such hose is best kept on large rollers and when in use kept in straight lines or on wide, gradual curves and never bent at sharp angles. Furthermore, the hose when not in use is best kept in a shady, cool, and rather damp place. It is best, however, to empty it thoroughly before rolling up. Of course, none of these procedures will do anything to prevent the destruction of the fabric of the hose by mold growing in the interior, and to prevent this we have no suggestion other than the effort on the part of the manufacturer to so treat the fabric as to render it mildew-resistant. While wire-wrapped hose is of course less liable to sharp breaking bends than is plain hose, it is considerably more costly.

3. Bee hills in turf.—We are mailing you several specimens of bees which have made a habitation of our club-house lawns. These bees burrow under the ground and leave large piles of sand, much higher than the small piles of sand left by the red ant. They have so infested the lawns that it is impossible to step on the grass in some places without tramping on several of these bee hills. How can we exterminate these pests? (Pennsylvania.)

The specimens are one of the common species of short-tongued bees. Among the more common short-tongued bees are some that make their nests in the ground, and on this account are termed mining bees. The nest of a mining bee's house consists of a tunnel more or less branched. each branch leading to a single cell. The walls of these cells are glazed, appearing like the surface of earthenware. In each cell there is stored a quantity of pollen and nectar paste. An egg is laid with this food and the cell is then closed up. Still other species of these bees build their nests in grassy fields, sinking a perpendicular shaft with branches leading sidewise to the cells. The main shaft sometimes extends to a depth of more than one foot. These bees frequently build their nests near together, forming a large village. Sometimes a village of this kind, covering only one square-rod of ground, will include several thousand nests. We are rather surprised that these insects have become present in your lawns in such numbers as to become a nuisance. In the event, however, that they have become a real nuisance in the lawns, it would be quite easy to get rid of them by drenching the nests with boiling water or injecting a small quantity of kerosene or coal oil, and a similar treatment will apply to nests between or beneath naving stones. Another simple means of destroying bees in lawns of small extent is to spray the lawns with kerosene emulsion, or with a very strong soap wash, prepared by dissolving any common laundry soap in water at the rate of from half a pound to a pound of soap to the gallon of water. An effective control method for larger colonies is to inject into the nest a quantity of carbon disulfid. This substance can be placed in the nest with an oil can or small syringe, the quantity varying from half an ounce for a very tiny nest to 2 or 3 ounces or more, depending on the size of the nest. An oil can or syringe with a long spout is convenient for this purpose, as this can be inserted into the nests and the liquid injected without its being too near the operator's nose. To facilitate entrance of the chemical, the hole can be enlarged with a sharp stick or iron rod. The depth of the injection will depend on the size of the nest-from an inch or two to greater depths. After injection of the carbon disulfid the entrance opening should be closed by pressure of the foot to retain the disulfid, which will then penetrate slowly throughout the underground channels of the nest and kill the inmates. The efficiency of this remedy is increased by covering the nest immediately after the injection with a wet blanket or other heavy cloth, to better retain the fumes of the chemical. Carbon disulfid has a very disagreeable odor, but its fumes are not poisonous to higher animals.

It should be kept away from fire, as its fumes are inflammable and may explode if ignited, much like gasoline vapor.

4. Refrigeration as a means of killing crab grass.—Do you know of any experiments having been made at any time to bring about an artificial result similar to frost with a view to killing crab grass? It seems to us that while it might be rather expensive, such a condition could be created and the crab grass killed off before it had a chance to seed. (Ohio.)

As for the killing of crab grass by refrigeration means, we have tried the effect of low temperatures, but unfortunately it is exceedingly difficult to get a sufficiently low temperature on the surface of the soil materially to affect the crab grass. In a preliminary way we tried galvanized iron boxes packed with an ice and salt mixture. It is an easy matter to get a very low temperature within the box, but an insulation of ice forms on the outside of the box and makes it impossible to get a really low temperature on the surface of the grass itself. Mechanical refrigeration devices, we understand, have been used, but so far with very poor results. Theoretically the idea is a good one and possibly some time some one will bring it to a successful conclusion. The only practicable means of keeping crab grass in check, so far as we know, is to pull out the young plants as soon as they are visible.

5. Peat, humus, and other materials as soil moisture retainers.—During our long dry seasons our soil bakes badly and it is evident that there is need of adding to the soil something in the way of a water retainer in order to produce satisfactory greens. Is there anything quite equal to peat for this purpose? We are aware that it is generally conceded that peat has no fertilizer value, but would it not help materially in holding the moisture if added to our sandy soil? Our sandy soils get extremely hard at times and almost impervious to moisture. (California.)

In our judgment peat is of very low value for any purpose in the soil, except possibly for lightening a stiff clay. Dry peat is worse than useless, for when peat is once dried it becomes very impervious to moisture. Furthermore, some peats are toxic to grass, and when used are necessarily injurious to the turf. In this connection we would invite your attention to the last paragraph on page 149 of the May, 1923, and to the note on page 243 of the September, 1923, numbers of THE BULLETIN. The results of the investigations conducted by the California Agricultural Experiment Station uphold the views regarding peat which have been presented in THE BULLETIN. The best water retainer we can recommend for your soil is humus, and well-rotted barnyard manure is the best form of humus to use. Leaf-mold is next best. If you use peat at all we believe it would be best to use it for composting with stable manure and sand or sandy top soil for a period of several months before using.

6. Trees to plant along fairways.-What would be your idea of quickly growing trees to plant as a dividing line between fairways? (New York.)

In regard to quickly growing trees, you would have the choice of the following: Any of the poplars, soft maple, and tulip tree. We would suggest in planting trees for the purpose you mention, that you also plant with them slower-growing, longer-lived trees, so that eventually as the short-lived, quickly growing trees die out you can cut them out and leave the longer-lived trees standing. Trees or larger shrubs that produce fruit for the winter birds are also very desirable; among such are hollies, mountain ash or rowan tree, wild hawthorns, junipers, hackberry, sumach, and bayberry.

Meditations of a Peripatetic Golfer

As examples of artistic landscaping, 90 per cent of American golf courses are mediocre, to say the least.

According to Bob the greenkeeper, the main difference between the dubb and the crack is that the former takes more divots but the latter bigger ones.

Straight-cop bunkers are relics of barbarism.

Don't forget that poor drainage is responsible for more trouble with putting greens than all other factors combined.

Do not put off any treatment necessary to keep up your putting greens. Let something else be delayed.

In Canada and along our northern border, "Poa trivialis" will make superb putting greens.

An "expert" employed by a seed firm recommends sowing in spring and using much seed. Fine business! About 90 per cent of such seed is thus thrown away and so this practice helps the seedsman to sell more seed.

Bunkers all alike. There is no rule that makes it necessary to have every bunker kidney-shaped.

In laying out a golf course, do not fight the topography. Try to go with it.

Let us erect a monument to the man who invented the lawn mower. Did you ever stop to think what the lawn mower means to golf?

Pressing the foot lightly on a divot is useless. Teach your caddies and players to stamp them in as hard as they can.

The best of all straight-away golf holes photograph well. If you want to see how a hole really looks, use a camera along the line of play from the tee to the green.

Every tee on the course mowed by the fairway mower, even those that are elevated. The fellow who manages the course is a real Efficiency Edgar. Why waste labor using hand mowers on the tees?

A dense growth of crab grass on a new bent green; a mighty fine way to get rid of the bent.

Hell is said to be paved with good intentions, just as the bottom of a water hazard is paved with golf balls.

A hole so artfully built that it appears to be the work of nature. Whole courses thus built would be ideal landscaping.

The type of greenkeeper who thinks he has secret methods is not yet extinct.

To lay out the best golf course on a piece of rolling land requires long study. No one can do it in a day.

The open way—that is, the area clear of trees, etc.—of a two-shot hole should be at least seventy yards wide. Forty to fifty yards is the desirable width of the fairway. A fifty-yard fairway bordered by forest is very pretty, but is not an ideal condition for any hole.

A theory in greenkeeping, as in science, is a very valuable servant but often an extremely poor master.