Bulletin *of the* Green Section *of the* U. S. Golf Association

Vol. II Washington, D. C., May 17, 1922 No. 5

A MONTHLY PERIODICAL TO PROMOTE THE BETTERMENT OF GOLF COURSES

CONTENTS

Published by the Green Committee of the United States Golf Association, 456 Louisiana Avenue, Washington, D. C.

Subscription price: To golf clubs that are members of the Green Section of the U. S. Golf Association, $4.00 per year (included in membership fee).

Entered as second-class matter December 16, 1921, at the post office at Washington, D. C., under the Act of March 3, 1879.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, OF THE BULLETIN OF THE GREEN SECTION OF THE U. S. GOLF ASSOCIATION, PUBLISHED MONTHLY, AT WASHINGTON, D. C., FOR APRIL 1, 1922.

District of Columbia, ss.:

Before me, a notary public in and for the District of Columbia, personally appeared R. A. Oakley, who, having been duly sworn according to law, deposes and says that he is the business manager of the Bulletin of the Green Section of the U. S. Golf Association, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business manager are:

Publisher, Green Committee of the U. S. Golf Association, 456 Louisiana Avenue, Washington, D. C.

Editors, C. V. Piper and R. A. Oakley, P. O. Box 313, Pennsylvania Avenue Station, Washington, D. C.

Managing editor: none.

Business manager, R. A. Oakley, 456 Louisiana Avenue, Washington, D. C.

2. That the owners are the United States Golf Association, a mutual organization of golf clubs. President, J. Frederic Byers, Pittsburgh, Pa.; vice-presidents, Robert A. Gardner, Chicago, Ill., and Wynant D. Vanderpool, Newark, N. J.; secretary, Cornelius S. Lee, Tuxedo Park, N. Y.; treasurer, Edward S. Moore, 14 Wall Street, New York, N. Y.

3. That the Association has issued no bonds, stock, mortgages, or other securities.

(Signed) R. A. OAKLEY, Business Manager.

Sworn to and subscribed before me this 3d day of April, 1922.

(Signed) VICTOR H. SEHORN.

My commission expires October 7, 1926.

Work of the Green Section Appreciated

FORT LEAVENWORTH OFFICERS' CLUB

Fort Leavenworth, Kansas, April 5, 1922.

The following resolution adopted by the Board of Governors of the Club at its meeting on March 14, 1922, is published for the information of all Club members:

"Resolved, That a vote of thanks and appreciation be extended to Major J. L. Topham, Jr., Quartermaster Corps, for the time, study and energy he has spent upon construction and maintenance of the club's golf course, which in itself is a monument to his efforts while Golf Director of the club, from October 1, 1920, to March 14, 1922."

BY DIRECTION OF THE BOARD OF GOVERNORS.
(Signed) J. A. STEVENS,
Major, Infantry (D. O. L.), Secretary-Treasurer.

Memorandum for the Secretary, Green Section, U. S. G. A.

The Green Section of the U. S. Golf Association is almost entirely responsible for my success. I would have been seriously handicapped without the Green Section Bulletins, and desire to share the achievement with the U. S. G. A. Green Committee, which has so materially aided me.

(Signed) J. L. TOPHAM,
Major, Q. M. Corps, U. S. A.

Maintenance Costs

E. J. MARSHALL

Greenkeepers as well as green committees should be keenly interested in this subject, the discussion of which was started in Mr. Seubert's article in the April BULLETIN.

The only figures now available for comparison are total annual expenditures, and even these are not reliable, because the figures of one club may include all manner of work on club-house grounds while the figures of another may include little or nothing for such work but a great deal for new construction. It always happens that the watch-dog of the treasury visits some course in another city at a time when it is looking its best and on a day when his putts are dropping in the cups to

his profit and satisfaction. He is sure to come home full of praise for the other course and loaded with figures. He is sure to say, "Why, our course looks like a cow pasture alongside that one, and they only spend two-thirds as much as we do." The Lord only knows what the true explanation of the difference is, but it is certain that the thing would practically explain itself if the costs were kept on the same basis.

We are aiming at a cost system so simple and practical that it will be applicable to every club and be workable by anyone who is fit to be a greenkeeper. Suggestions and questions are solicited. We shall be pleased to receive letters from greenkeepers giving their views and experiences.

The Club Members and the Green Committee

The chairman of the green committee of any club has a very difficult position to fill. He is the natural recipient of every complaint regarding the condition of the course, and it is rare, indeed, that he is accorded any appreciation or thanks. The other members of the committee escape, perhaps because the chairman is the logical target. It is probably true that ninety per cent of the complaints are made by players who have little knowledge of golf course problems and perhaps none in regard to the limitations under which the green committee is working. Most commonly complaints are endured by the chairman; but occasionally he is taunted to irascible retorts. We have often wondered whether it is not possible to guide the faculty of players to find faults so that it will be an asset to the green committee and to the club. Why not extend an earnest invitation to every member who plays to point out faults and deficiencies, but with the proviso that every such criticism must be accompanied by a constructive suggestion? Wisdom may come out of the mouths even of babes. The effect on the members should be to divert their attentions to the problems themselves and thus soothe their irritated feelings. From the chairman they will learn of difficulties they had not known, which, in turn, should lead them to devise ways and means to help his committee. In short, it should help build up a morale among the players and make them a source of strength to the green committee instead of a lot of carping critics. Incidentally it will greatly broaden the knowledge of the players on a lot of things about a golf course of which they had not dreamed. The plan suggested will require more time than the much-heralded one of telling the players to go to a decidedly warmer climate; but we believe in the end results will more than justify the effort.

Here's the sign to put up:

Every member of this club who uses the course is invited and urged by the Chairman of the Green Committee to make complaints to him whenever he finds anything unsatisfactory on the course. The complaint may be verbal or in writing. This condition is, however, attached: the complainant must prepare a constructive suggestion that will make for correction of the fault or for provision of the need.

Straining at the Gnat

R. A. Oakley

There is an unmistakable tendency nowadays to look upon the prices asked for seed of the fine turf grasses as being excessively high. Especially is this true in the case of the fine bents. The seeds of these grasses are

selling today at $1.50 a pound and upward—a high price, to be sure. Truly it is enough to frighten the inexperienced purchaser. In fact, some of our readers refuse to become reconciled to the present price situation, and it is evident that many of them have purchased seeds of less desirable species for their greens either because they have regarded it as a matter of necessary economy or because they did not want to be held up. This attitude comes about mostly from lack of information on several phases of the subject. Few, indeed, appreciate what it costs to harvest and prepare seed of the bents and fescues for market. They are continually comparing the bents with redtop, a seed cheaply grown and easily harvested and cleaned. Furthermore, they are lacking in their appreciation of what modern methods of sowing have done to reduce the quantity of seed necessary for a satisfactory stand, and what poor economy it is to sow less desirable seeds on putting-greens when, after all, if intelligence is used, the seed item is only a very small one compared with the other items of cost incident to the making of a golf course.

Whatever our individual opinions may be on the price of seed of the bents and fescues, we might just as well make up our minds that until something agronomic or economic develops greatly to increase the supply of these seeds or materially to lessen the cost of putting them on the market, the prices will not appreciably be revised downward. The situation is a natural one; there is nothing artificial about it. If anyone thinks he can get acceptable mixed bent seed from Germany, or Colonial bent or Chewings fescue from New Zealand or Australia, and sell it in this country at prices appreciably lower than those obtaining today, let him try it; or if he has even a vague idea that he can harvest pure Rhode Island bent seed and market it at anything like redtop prices, let him play his hunch. A real jolt is surely due him.

Naturally there is a feeling of sympathy for those who accept the present seed prices with reservations. These prices admittedly are high. But the grim humor of the whole situation is that some of the individuals who are making the loudest protests now, bought seed in the good old days of the special putting-green mixtures without batting an eye. For curiosity's sake, let us compare the present with the past.

As late as 1919, special putting-green mixtures were the rule rather than the exception. Here is the make-up by actual analysis of a fair average of the best of them:

Red fescue	36% by weight
Kentucky bluegrass	24% by weight
Redtop	20% by weight
Crested dog's-tail	6% by weight
Weed seed and inert matter	14% by weight

The average price at which a mixture of this kind sold was 40 cents per pound, which was in excess of the price of each of the constituents taken separately. Green committees seemed to worry little about the price or what the mixtures contained; and as further evidence of their liberality, they bought these special mixtures in quantity sufficient to sow them at the rate of 20 pounds for each 1,000 square feet of green. This meant an outlay of $42 for seed for a green of 6,000 square feet. It was certainly an excessive outlay for the kind of turf that resulted.

Today we know that if intelligent methods are used an excellent stand of grass can be obtained by the use of 5 to 7 pounds of the fescues, or 3 to 5 pounds of the bents, for each 1,000 square feet. In brief, the seed bill today for a 6,000-foot green is approximately $27 if the fescues are used, and approximately $36 if the green is sown with the bents. Furthermore, when the seeding is accomplished, if it is done properly and at the right time of the year, the club has something to show for its money.

Economy is commendable; but it should not be practiced at the expense of the greens. Good greens are priceless. Economize by using seed intelligently. Do not waste it in reseeding old turf or sowing it at the wrong season of the year. Real economy is possible by passing up the "fool's gold" that is offered in bags, cans, bottles, and crates. Too commonly it is bought with almost unbelievable credulity. Better be thankful that genuine bent and fescue seed is available. The price may seem high and hard to accept philosophically; but everything considered, the situation now as compared with that of a few years ago is as the gnat to the camel.

What Constitutes Standard Maintenance?

E. J. MARSHALL

The green committee of the U. S. Golf Association is besieged with questions in one form or another as to what is a fair and reasonable amount of money to spend in a year on the maintenance of a golf course. At this time it is quite as impossible intelligently to answer these inquiries as it would be to say what a man should spend a year properly to support his family. So much depends on the unknown or variable factors —soil or climatic conditions to be met, the money available, the treatment required to get on a proper basis, and, lastly but most important, the tastes and desires of the players.

The players on nine-hole courses such as Hillsdale, Michigan, and Lebanon, Ohio, are pleased and satisfied, though they might prefer something better, with maintenance that costs from fifteen hundred to eighteen hundred dollars a year. On the other hand the players on some of the courses near the big cities demand a perfect course every day of the season and do not complain when the cost mounts to from twenty to twenty-five thousand dollars a year.

Obviously it will always cost more, and perhaps an unreasonable amount, to keep a course in tournament condition every day than to keep it up to a practical playable standard. The problem is to determine when a course is maintained up to a practical playable standard and what that sort of maintenance should cost.

Neither the green committee of the U. S. Golf Association nor anyone else can answer the questions as to proper cost of maintenance until by common consent of players a standard of maintenance is agreed upon as good enough for practical purposes, nor until a comparison of maintenance costs on many golf courses can be compiled.

The committee is convinced that a great deal of waste and extravagance can be eliminated when there is more information available on these points. How is this to be brought about? The obvious answer is by getting the clubs throughout the country, or those interested in sensible

economy, to adopt the same system of keeping accounts, so that costs can be fairly compared. This applies more to costs of labor than of materials, for labor is the most important item of expense; but all costs should be classified properly, and there should be a careful distribution of expenses to the various items.

When golf-course accounts can be put side by side and compared item by item exactly as railroad statements may be compared, a start will have been made towards establishing a common sense or practical standard of maintenance, and not before.

Then if one course spends so many hours of labor or dollars cutting and caring for greens, or mowing fairways or the rough, or taking care of bunkers or the like, and another course spends more or less, it will not be difficult for those who know the two courses and have observed their condition to determine with fair accuracy which was on the right basis of maintenance and which cost was too high or too low.

The uncontrollable factors, such as character of construction, soil, climate, and the like will always have to be considered in comparison of cost, but it is certain that only by this means will we ever be able to fix or agree upon a fair practical standard of maintenance or a fair average cost.

If the courses around Boston, New York, Philadelphia, Chicago, Detroit, and other cities were distributing their labor and other costs on exactly the same system, economical as well as extravagant maintenance would be apparent from the figures. Those who knew the courses could then see why one was not so well kept as another and why more or less money was spent on one than on the other. The course or courses that were always in good, practical condition at reasonable expense would become what we might call standard maintenance courses.

The Story of the Portsmouth Country Club, Portsmouth, N. H.

R. D. McDonough

The idea that golf is a rich man's game, and that a golf club is an expensive luxury, has been thoroughly exploded by the success of many golf clubs in cities of from 10,000 to 20,000 inhabitants. The Portsmouth Country Club, in the twenty years of its existence, has lived down the theory that a man has to have a large income to belong to a club to play the game. At this club during the first fifteen years of its existence the head of the family has paid the large sum of $10 a year for a membership, which enabled him to play over an excellently planned and well kept nine-hole course, granted him and his family the use of the four tennis courts, allowed him (if he so desired) to have a cottage on the grounds, permitted him to shoot over the clay pigeon traps, and invited him to enjoy the social life which centers around the club.

War and the high prices of labor and materials have had their effects on this club as in all other matters of life, and reluctantly the dues were raised to $15 and then to $20, where they will probably remain; but this is a sum that does not wreck the accuracy of the opening paragraph. Some will say they "must have a whale of a membership"; but this is not so,

as we have never had 200 members, and these include a good many naval officers who are in a special membership class.

What has been done in this club can be duplicated in any city or town in the country, and at no greater cost, provided there are men (and it needs only a few) who have the interest of the club enough at heart to sacrifice some of their time and thought to working out the problems of the club instead of wasting a lot of money securing and following the advice of the so-called experts. Neither can the small club "ape" the schedule of the large clubs, with overpriced professionals, cafes, etc., but they can have just as good a time and develop just as good golf as the high priced clubs.

I have always maintained that any ordinary golfer, who is willing to spend a little time and study on the problems of his club, treatment of its soil, the efficiency of its labor, etc., can in a few years develop as good if not better putting greens and fairways as the so-called expert, and far more cheaply. Every golf course has its special problems, and the man on the job will soon find, if he experiments intelligently, what is best for the course. The whole matter has been greatly simplified by THE BULLETIN OF THE GREEN SECTION, with its excellent advice and friendly help from men who have given their time and thought to the building up of golf courses, for the love they have of the game alone. Construction and upkeep of golf courses have been very costly to many clubs in this country, and any member of a small club who does not take advantage of the mistakes made by others is unworthy to be called a golf fan or have a place on a green committee.

The method used in establishing our club is one that is adaptable to any small town. We started by forming within the club a land company, which took up the shares, which were set at $10 each. These shares paid 4 per cent. Every owner of a share was a member of the club, this having been made one of the provisions. With the money thus raised we purchased a more or less abandoned farm of 165 acres, a good part of which is woodland. A nine-hole course was laid out, two tennis courts built, and a small club-house constructed, to which was added later a separate locker room for the men. The club-house is large enough to hold all of the social affairs of the club, and the upkeep is small; in fact, the success of any small club will depend on its ability to keep down the overhead. The first year a pipe line was laid to all of the greens, and this has been of small expense ever since.

After the club gets under way, a certain number of shares may be retired each year until in time the lands company goes out of existence and the property is in the name of the club. We have two men employed from April until November, and hire a horse to draw our triplex mowers for cutting the fairway. As a rule the horse is the property of one of the men employed. During certain busy parts of the season one or two additional men are taken on for a week or two, but the two men do about all of the work. Our labor bill for the past four years has averaged $2,000 a year, including horse hire. We pay our men $25 a week, whereas in the first years of the club $12 a week was sufficient.

The writer, who is a charter member of the club, has in the past eight years been more or less active in the management of the club as a president and member of the green committee. We soon learned that we could

buy a similar grade of seed from our local dealers for from 22 cents to 28 cents a pound that the seed houses sold us for 50 cents and 75 cents; and when we bought redtop we got redtop, and this applied also to creeping bent and Rhode Island bent. In this state we have a pure seed law, and every state dealer must attach to every bushel of seed an analysis giving the name of the seed, its purity and germination. If we doubted the dealer's honesty, we sent some of the seed to the State College and soon learned the real facts. The same is true of fertilizers—we found what was needed for our light, sandy soil and stuck to that, and as a result our greens, we are told, are as good as one can find in the state, and our fairways show improvements yearly. We have had our problems and upsets; but there are no problems of any small club that a good committee of golfers can't solve if they give it the time.

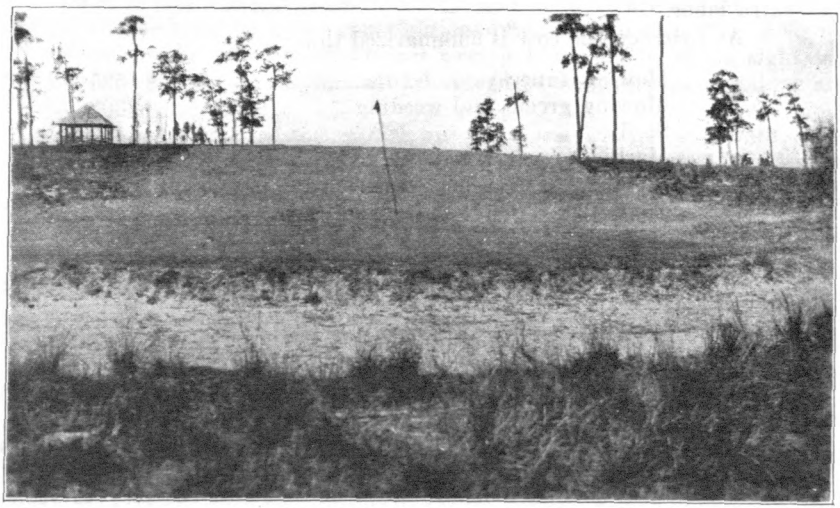
An innovation tried at the Country Club which worked out well in keeping up the club interest and at the same time making the club the social center of the town, was the erection of small cottages on the grounds. A dozen or more of the members have erected small cottages on the grounds on land set aside by the club. No extra rental or fee was demanded for this, and for a long time no water rent was charged. Some of the cottages were the small portable type—plenty big enough for a small family for the week-ends or even longer; others were larger; and some were used for summer homes the entire summer. This always brought a colony to the club for the week-ends and over holidays. These families made the club their headquarters and gave the members facilities which could not have been enjoyed unless the club-house was much larger and had a greater overhead.

We have seen the club grow until now we are beginning to realize that we need eighteen holes. This winter we added a toboggan chute and winter sports to our club program, and it has been a move in the right direction.

A New Method of Making Putting Greens

HUGH I. WILSON, PHILADELPHIA

The problem of making a green in a dry country, such as New Mexico, which will putt well and hold a ball if pitched on it, is a pretty difficult problem. One great difficulty with sand greens in that section is the high winds, which, unless the greens are kept heavily oiled, will take off all the surface and make the up-keep a large item. Some experiments recently tried near Silver City, New Mexico, would seem at least partly to solve the problem. They involve the use of magnetic iron dust from a concentrator located at Hurley, New Mexico. This dust is so heavy that it does not blow and holds the ball much better than ordinary sand, when the shot is pitched. It is slower than sand; but as all the particles are practically the same size, it makes a good putting surface, if it is dragged with a piece of carpet, as is done on ordinary sand greens. The experiments are preliminary, and further information will be sought on the subject. The green committee, I am sure, would be pleased to receive any experience that anyone has had in using such material.



MODIFIED PUTTING-GREEN

Two views of the same putting-green before (upper) and after (lower) modification. The shelter-house and trees in the background prove it is the same hole

Inexpensive Golf

E. J. MARSHALL

My friend Judge Francis M. Hamilton, of the Court of Appeals of the Cincinnati Circuit, who is a good judge (at times) but a sad golfer, in response to my inquiry about the cost of maintenance of the course at his home in Lebanon, Ohio, said, "Expensive maintenance of a golf course we find to be largely a matter of taste and management. We find we could spend larger sums of money, but the net result would add nothing to our pleasure in the use of the course."

This read so much like one of his decisions that it seemed desirable to find out if there was any truth in it. A similar inquiry addressed to friends at Hillsdale, Michigan, brought a comparable response. So I am able to exhibit the maintenance figures on two nine-hole courses that are kept up at low cost on a basis that satisfies the members.

The satisfaction of the members is the real test and it is pleasing to find two clubs where the members are not disturbed because the cost is low or some one else is spending more money. It gets back to the old proverb, "Better a dinner of herbs than a lot of bull."

In 1920 it cost $1,384 to maintain the Hillsdale course. In 1921 the cost was a little less than $1,800. The Lebanon course was kept up for $1,375 in 1921, and the average cost is reported to be between $1,200 and $1,400 a year, depending on rainfall and other conditions.

At Hillsdale one man, who furnishes a horse also, is employed the year through for $100 a month. One hundred eighty-four dollars covers extra labor.

At Lebanon the cost is summarized thus:

Mowing fairways	$ 525
Mowing greens and weeding	300
Seed	150
Machinery replacements	100
Extra labor and incidentals	300
	$1,375

If the members are satisfied and pleased, why is not this good maintenance?

At Lebanon there is no way of getting water to the greens; and to keep them in condition, redtop, bluegrass, and white clover seeds are sown frequently. The bluegrass stands the dry summer weather and the combination keeps the greens looking fairly well most of the time.

Those who think they cannot putt except on bent-grass greens may well listen to Judge Hamilton, who says that while the greens are slower by reason of the coarser grass, they are accurate and the players soon get accustomed to them.

It is estimated that it will cost $450 to get water to the greens at Lebanon, but the advisability of the expenditure is doubted as it is argued that the frequent application of water to the relatively coarse grasses on these greens will only result in making them coarser.

At Hillsdale greens are watered by means of a gasoline engine and

pump mounted on wheels, the water being taken from four wells which were sunk for the purpose. The engine and pump outfit cost $123.13, and the wells cost $301.13, from which it can be seen that the estimate of $450 for a water system at Lebanon was not far off.

Inverness is just completing a new piping system at a cost of about $12,500, indicating that there is a rather wide range of investment for irrigation.

The story of the organization and construction of these two courses is very interesting and tends to prove Judge Hamilton's point that a golf course can be made and maintained at a very small cost and that enormous expenditures for golf courses are due to nothing more or less than extravagance and fastidiousness. The people of any town of from two thousand people up can have a satisfactory golf course if they will go at it sensibly.

The land at Lebanon, the gift of Mr. W. E. Harman, of New York, afforded a splendid area for the golf course, with natural instead of artificial hazards. The course was built with the proceeds of ten dollars a year dues from twenty-five members and $500 of borrowed money. The purchase of a horse-drawn fairway mower, a hand-mower, and a roller used up the $500. So it can be seen that the construction showed few attractions for the so-called "expert" and called for nothing but a little common sense.

Two hundred and fifty dollars in dues covered the first and second years' expenses on six holes. In the third year the nine hole course was finished by plowing, removing stones, surfacing, building greens and the like at a cost of something like $400.

There is now a membership of ninety, and the dues are still $10. Any deficits are made up by a few contributions of about $50 each.

What expert would have advised sowing bluegrass in strips eight to ten feet apart, figuring on the natural spread of the grass, as was done at Lebanon?

At Hillsdale the land cost $3,000, but the course was laid out, built, and maintained for the first year, including a locker house, for $1,170. Much of the work of removing stones and building the course and house was done by the members who organized several "bees" for the purpose. Mr. Webster, who wrote a dictionary, defines a *bee* as a neighborly gathering to work for some one or for some joint concern.

There is quite a little difference between the club spirit that will get members out to remove stones and the sort that will neglect divots.

Hillsdale, from the green-committee point of view, has the misfortune to have a really serviceable and attractive club house that was put up in the last year or so, and instead of getting on with dues of $10 or so, as at Lebanon, they have to pay $15 or $40, depending on the class of membership. As might be expected, fully two-thirds of the club's revenue goes into the club house instead of on the golf course; but, however the property of the club house may be considered, Hillsdale has a golf course that is giving pleasure and satisfaction to the members at a maintenance cost of less than $1,800 a year.

It is not claimed for these courses that they compare favorably with the expensively maintained courses, but the figures show that costly maintenance is not essential to real satisfaction and enjoyment of the game.

The Effect of Trampling and Rolling on Turf

DR. WALTER S. HARBAN

It has always been a mooted question whether to roll or not to roll. Some hold that turf prospers better in light loamy soil, and others again as strongly advocate a moderately compact one. I must say that my experience prompts me to accept the latter view. What may be favorable for lawn turf can not be considered in turf for golf courses, as the requirements are as different as day from night. I can not conceive how a *perfect putting surface* can be developed or maintained without rolling. A certain compactness of surface apparently tends to produce a finer, denser turf; whereas in loose soil the plants are coarser and stalky. However these things may be, a golf course is designed to meet certain requirements, and the turf must withstand the hardest usage to which grass can be subjected.

Since putting greens are very severely compacted by players constantly walking over them, it would not seem unreasonable to use fairly heavy rollers at times; first, to prevent deep foot or heel prints, and secondly to smooth out those that are made when the ground is moist or soft. I can not think that many of us have appreciated how great is the load per square inch of a man's foot and what it means to a green to have several hundred players tramping on it every day and often throughout the year. The ground is necessarily much compacted, especially within a radius of five or ten feet of the hole. To present this phase of the subject more fully, Dr. Lyman J. Briggs, of the U. S. Bureau of Standards, has kindly worked out some very interesting data on the relation of weight to pressure, and which, with his consent, I take pleasure in introducing here.

Note on the Effective Load Secured in Rolling a Putting Green

DR. LYMAN J. BRIGGS

The following simple computations have been made for the purpose of forming an approximate idea of the loading to which a putting green is subjected during the process of rolling.

The limiting conditions encountered in rolling are represented diagramatically in Figures 1 and 2. Figure 1 represents a smooth cylinder roller on a hard, smooth, horizontal surface. The limiting condition in this case would be a line contact between the roller and the surface, in which case the loading would approach infinity. But, of course, such a condition is not actually realized, since both the roller and the surface deform to produce a surface of contact, and the loading falls off inversely proportional to the width of the surface of contact.

A second limiting condition is represented in Figure 2, in which the green is supposed to possess no resiliency and to be compressed as indicated in the diagram as the roller proceeds from left to right over its surface. If the green possessed no resiliency the roller would be in contact with the green only through the sector indicated by the angle a in Figure 2.

The actual conditions are more nearly represented by Figure 3, in which the green is considered to possess some resiliency and to rise up behind the roller as the latter passes over it. It is evident that under such conditions the bearing surface is greatly increased and the loading (that is, the weight of the roller divided by the projected bearing surface) is correspondingly decreased. It has been assumed in the calculations that this resiliency increases the actual bearing surface by 50 per cent over the condition as represented in Figure 2. We shall call the vertical distance from the surface of the undisturbed green to the bottom of the roller *the depth of imbedding* of the roller. Let us represent this distance by d. Let r equal the radius of the roller, and a the included angle of the arc of contact in Figure 2. Then $d = r\ (1 - \cos a)$. If s is the projected surface of contact

on a horizontal plane (Figure 2) and L is the length of the roller, we have $s = Lr \sin a$. If we assume that the loading is uniform over the projected surface of contact, the loading per square inch then will evidently be the weight w of the roller divided by s.

In the numerical computations we have assumed a roller 2 feet in diameter, weighing 150 pounds per foot-length of roller. It has also been assumed that the form of contact is that shown in Figure 3 (that is, that the projected surface of contact for any given imbedding depth is 50 per cent greater than represented by the condition shown in Figure 2). Using the equations given above and the numerical values indicated, the loading has been computed for depths of imbedding varying from 1/100 inch to 1 inch. The results are given in the following table:

RELATION OF LOAD TO IMBEDDING DEPTH

Imbedding depth	*Projected surface of contact*	*Loading pounds per square inch*
0.01 inch	8.7 sq. in.	17.2
.05	20.0	7.5
.10	28.0	5.4
.20	39.5	3.8
.30	48.0	3.1
.40	56.0	2.7
.50	62.0	2.4
.75	75.0	2.0
1.00	85.0	1.7

It will be seen from the table that the imbedding of the roller in the green to the depth of 1/100 inch results in an average load over the surface of contact of 17.2 pounds per square inch. With an imbedding depth of only 1/10 inch the average loading falls off to 5.4 pounds per square inch and decreases steadily as the depth of imbedding is increased.

When a man weighing 170 pounds supports his weight on the ball of one foot he develops a loading on the green beneath the sole of his shoe of about 13 pounds per square inch, since the area of contact of a sole of a shoe of average size is, roughly, 13 square inches. Consequently, a man walking over a green develops a much greater loading over the surface which supports his weight than would be developed by a roller of the size and weight described which settles into the green only 5/100 of an inch. It seems evident, therefore, that on a springy green which allows the roller to sink into the green to a depth of one-quarter of an inch or more, it would be necessary to employ a much heavier roller than the one used in these computations in order to secure a loading greater than that developed by the players in walking over the green. In fact, if the compression of the green is one-quarter of an inch when the player is supporting his weight on the ball of one foot, it would require a roller weighing about 550 pounds per linear foot to give an equal average loading.

Dr. Briggs does not contend that this load is equally distributed on all parts of the projected surface as indicated in Figure 3, but distinctly says, "if we assume that the loading is uniform over the projected surface." What difference this may make in his table "relation of load to imbedding depth" he has promised to work out later.

The vital points brought out by Dr. Briggs's deductions are:

First, that on a hard, smooth, horizontal surface the loading per square inch is the greatest, and as the roller sinks into the surface, increasing the surface of contact, it diminishes according to the imbedding depth.

Second, that a man weighing 170 pounds, walking over a putting green, develops a loading under the ball of his foot of 13 pounds per square inch; consequently, when the weight is carried, as it must be for a time, on the heel of the shoe, which has less than one-half the area, the load is more than doubled, as evidenced by the greater depth of heel prints when walking over soft ground.

Finally, that it will require a much heavier roller to equalize these

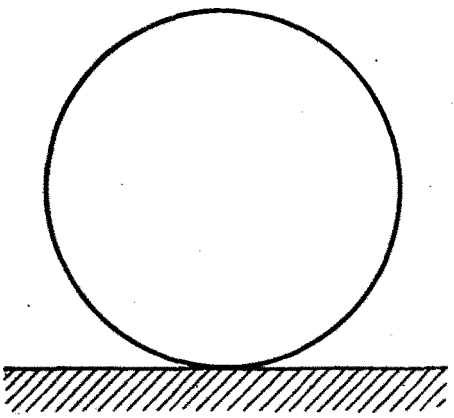


Fig. 1

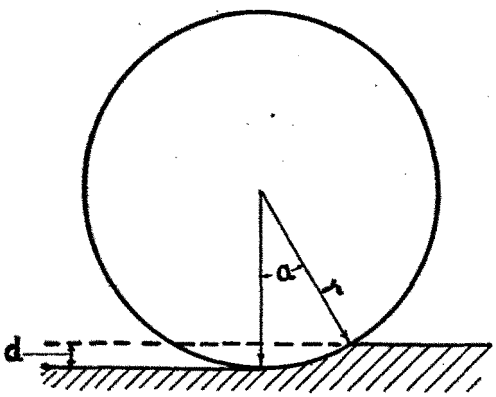


Fig. 2

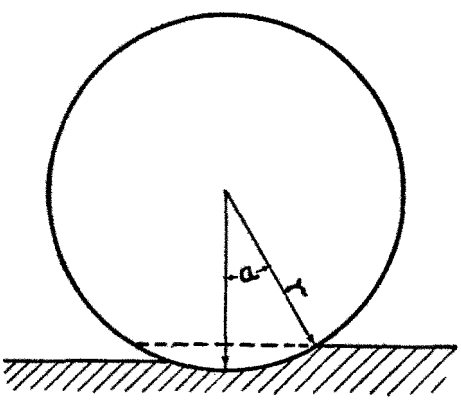


Fig. 3

differences than any greenkeeper has ever used or suggested heretofore.

I wish to emphasize what I said on page 87, Volume II, No. 3, of THE BULLETIN, as to early spring rolling, and to add that one such treatment at Columbia this spring was sufficient to put the course in good shape to prevent deep foot impressions. We shall not hesitate later to repeat the rolling if the necessity should arise. It is useless to roll when the ground is dry and hard. Wait until after a good, soaking rain, when the soil under the turf will, if tightly squeezed in the hand, crumble readily by gentle pressure of the fingers. The ground can then be rolled and will not pack or crust under these conditions, especially if covered with a fair mat of turf.

Some writers claim that rolling makes a fast course. Under some conditions this may be true. But is it not true of all courses when dried out? If you want a slow course, my advice is to pay a little more attention to the care and feeding of the fairways, as a dense turf is the greatest reducer of long driving.

I hope I have made myself clear in these observations. To sum up, I do not believe in rolling as a mere fad, but do think there are times when it is indispensable to make, keep, and protect a proper turf and surface on greens; and since they are to be compacted by trampling anyhow, I believe that, in order to meet this situation approximately at least, it is better to roll as a preventive against a greater injury.

Bermuda Putting Greens

The factors involved in securing and maintaining first-class Bermuda putting greens in the South are not yet well understood, but progress is certainly being made, as indicated by the improved quality of the greens on many courses. The following contributions should be helpful to all southern greenkeepers:

Experience at Atlanta, Georgia

H. H. BECKETT

After experimenting with Bermuda grass the past three or four summers it seems to me that the simpler the methods used the better are the results. To my mind too much fertilizer is not good nor necessary, especially commercial fertilizer.

In starting a new green special care should be taken that the soil is so well mixed with well-rotted barnyard manure that the soil becomes very loose and of a soft texture. Sodding a green is not advisable, as the growth is very slow and poor. Sprigging is much the better method; the growth is much faster and of a much better quality. After the runners have begun to grow and are two or three inches in height, a good top-dressing should be applied, not only to cover the runners and start fresh growth, but to smooth up the green and to give it a good putting surface. Cutting should commence just as soon as possible and be kept up every day. And this, I want to say here, is the secret of a good Bermuda green—cutting close and often, and by often I mean every day.

Where a green is already established it is hard to say just what are the best methods to use. It depends entirely on conditions. Where a green is very hard and the growth of grass is very poor, one can, instead of tearing up the green, take a garden fork, press it into the ground its full depth at an angle of about 45 degrees and gently raise upward so as to give an opening in the ground of about two inches. This should be done in one direction over all the green. Then after this is finished, the holes should be filled with a good dressing of screened cow manure or any good humus, after which the whole green should be rolled in the direction so that the roller will press the sod back into its original position.

Artificial watering is not essential. This I have proved to my own satisfaction after going through a few rainless months the past summer. In fact, I think that without water the runners become more firmly anchored, as the roots seem to go deeper into the ground for moisture. Where I was making a new trap and had to dig into the old green, we found that the roots had gone down at least two feet. Watering too much keeps the runners and roots too near the surface, where they become brown and have a dried-out look. All the moisture which a green needs is a good topdressing once in a while. Where a green starts off at the beginning of the season looking fine and then becomes stubby and brown, it is mostly due to the fact that either the knives on the cutter have been lowered too suddenly or that the grass has been allowed to grow a few days and then cut.

As I have already said, too much attention can not be paid to the cutting. The machines should be started early and kept going day in and day out with the knives set close. This keeps the runners down and forms a very good putting surface without any stubbles whatever.

Sand about every two years does very well for a winter dressing. Of course the quantity or how often sand should be applied all depends on the quality of the soil.

Commercial fertilizers such as tankage or cottonseed meal are very good in the spring of the year, using about 100 pounds to a green.

Practically no rolling should be attempted during the summer months. A little rolling during the fall months is not harmful.

During the winter months there appears on the greens a thick growth of annual bluegrass which grows in bunches, and on account of this we are compelled to stop regular play on the greens and use temporary greens. After trying out different ways of getting the bluegrass out at the beginning of spring, I find that the best method is to take a sharp hoe and scrape the whole top surface just deep enough, say about a quarter of an inch, to get the bluegrass and leave the Bermuda runners. This gives the Bermuda full sway with nothing in its way to keep it from getting a quick start and to come right along.

Experience on the Druid Hills Course, Atlanta, Georgia

DR. THOMAS P. HINMAN

My experience in growing Bermuda is only of rather short duration.

You can not expect to have good Bermuda greens unless the green is an elevated one. The factor of elevation, of course, produces a perfect drainage and prevents seepage into the subsoil as well as overflow on the topsoil. If a Bermuda green is built in the side of a bank, it should have a deep, grassy hollow between it and the bank, and the bottom of this hollow should be lower than the center surface of the green. This will prevent the seepage from the hillside going in and injuring the growth of the grass.

Bermuda greens should not be watered except in very dry weather. In the early spring, if the green is dry, a little water is a very essential thing to start the growth. It is important also that Bermuda be not shaded. If there are any trees around the green, they should be cut away so as to let the sunlight come in. Our experience so far indicates that the green, if it is at all packed, should be carefully spaded with a spading fork before the grass begins to grow. Before the green is raked, but after it is weeded, we give about a hundred pounds of blood and tankage to each green, letting the fertilizer go into the holes that have been made by the spading fork.

Bermuda greens require a little more topdressing than the average green. Our experience is that it should receive a topdressing at least once a week. If the growth is very rank, then the runners become abundant, and this prevents a good putting surface. Bermuda greens will not stand as much cutting as greens of bent or fescue. We find, as a general proposition, it is best to cut every other day, unless it rains—then they might be cut every day. No two greens can be treated alike; one green will require cutting more frequently than another. This must be left to the judgment of the greenkeeper.

We have not found much benefit from the use of lime on our greens. Our topdressing is composed mostly of woods earth which has been carefully screened, first through a quarter-inch and then through an eighth-inch screen.

We have not found rolling to be of much benefit after the grass has become prolific.

If too much water is used on the greens we find that the roots all come to the top and then when the hot sunshine hits it the green dies.

We have found that when we change the cup to another position on the green, if we give a very light coating of sand in a circle of about twelve feet around the cup, this gives enough sand to prevent the packing of the soil, which is clay mixed with woods earth.

Experience at Dallas, Texas

C. B. BUXTON

Bermuda and mesquite are the only grasses that will stand the intense summer heat and long droughts that frequently occur in this section. Experiments have been made with other grasses, but without success except during the winter months.

Mesquite is a native grass, used to some extent on fairways, but it does not compare with Bermuda, as it does not form a solid mat and will not stand punishment.

My first experience with Bermuda grass was the fall of 1916, when I came here from Philadelphia. At that time it made an excellent fairway but poor putting-greens. Since then experienced greenkeepers have been developed, notably P. V. Hawkins, of the Dallas Country Club, and I can now truthfully say that a Bermuda green properly cultivated affords a fast, true putting surface better than the average putting greens of the New York and Philadelphia districts. Constant expert care is needed to keep the grass from becoming coarse. This is accomplished by frequent topdressing with sandy loam and sufficient fertilizer to stimulate the growth, daily close cutting, and watering only when absolutely necessary. Bermuda feeds from the top, and too much water makes the grass grow rank and destroys the desired putting surface. Occasional topdressing will keep the grass green during the hot summer weather without water.

There are three ways of planting Bermuda: spot sodding, or vegetative process; solid sodding; and seeding. In our black-land golf courses, spot sodding

has been the most effective method; but in our sandy loam soil all three ways have met with success.

In sodding the green solid after the foundation has been properly prepared, it is a good plan in black land or heavy soil to put on a three-inch layer of coal cinders and roll with a heavy roller. This makes for good drainage and discourages worms. This is not essential in sandy loam soil. Next put on a layer of about six inches of well-rotted cow manure and roll with heavy roller, then about three inches of loam soil. On this you carefully place your Bermuda sod. The grass should be clipped as closely as possible and the sod cut about ten inches square and 2/3 inch thick. After the green is covered, roll with heavy roller, being careful to have all undulation with gradual slopes to avoid trouble in the future from mowing and washing. When the green is covered and moulded into the desired shape, top-dress with good, rich sandy loam or leaf-mold, with cottonseed meal added to stimulate growth. We use 100 pounds of meal to 2½ yards of finely screened loam. This last top-dressing is not rolled but is raked perfectly smooth and watered by hand with a fine spray. As soon as the grass grows well, daily cutting and frequent top-dressing are essential to get a true putting surface.

If a green is not sodded solid, it can be spot sodded with pieces of sod dropped every ten or twelve inches, in rows about a foot apart, preferably with a small amount of cottonseed meal or well-rotted manure in the rows to stimulate growth. When the grass begins to run, use the same treatment as described for the solid sodding.

In seeding greens see that the soil is well worked and then rolled firm. Mix the seed (50 to 100 pounds, depending on size of green) with finely screened soil, about a gallon to the wheelbarrow load of soil, and sow the green until the entire space is covered; then top-dress lightly, smooth off, roll, and water thoroughly by hand, and cover the entire green with a light mulch, preferably short grass clippings. The green should be kept moist until the grass appears. Then rake off the mulch, being careful not to disturb the seedlings. This young grass should not be cut closely for the first month. Clipping it will cause it to put out runners and not grow straight up. Water at night and only with a light spray that will not disturb the surface of the green. Three top-dressings after the green is covered with grass will give the desired putting surface.

Be careful in the use of water and fertilizer during the summer months. Too much will make Bermuda grow rank and coarse. Cut close daily, top-dress once a month, and water at night once a week when absolutely necessary, and the greens will be kept in fine shape; at least under our conditions.

The Golf Ball and the Law of Trespass

E. J. MARSHALL

Nearly every course has one or two holes which parallel a neighbor's farm on which sliced or hooked golf balls are sown in profusion and growing crops are trampled beneath the feet of players and caddies. In most cases the neighbors are kindly disposed and recognize that the damage to fences and crops in each year is more than offset by the enhancement of land values arising from the location of the adjoining golf club; but now and then the feeling is not so friendly, and the irate farmer threatens to have the law applied to the golfers. To gain some idea of the rights and liabilities of the parties in such circumstances, the Green Committee of the United States Golf Association called upon counsel likely to take a sympathetic view of the golfers' side of the case, for an opinion, which, in substance, is as follows:

It is settled that an entry on land in the peaceful possession of another is deemed a trespass, without regard to the force used. Indeed, it is estab-

lished that any invasion of the property of another, whether above, below, or on the surface of the ground, constitutes a trespass. As the old-fashioned lawyer would state, "A trespass is committed *vie et armis* whenever a golf ball is driven, sliced, hooked, foozled, bunted, or otherwise propelled or forced on the land of another, whether the said ball is followed or pursued by its owner, and (or) his caddy, and (or) his companions, and (or) their caddies, and (or) the gallery, if any."

It has been considered a trespass to throw stones or clods of earth on the land of another, or to shoot with a gun across such lands. It being clear that a trespass results whether the players actually enter upon the adjoining lands or not, the next question is, What becomes of the ball, and whose golf ball is it? Of course, the title to the ball does not pass to the adjoining landowner when it soars over or trickles under the fence; but the right of possession to the ball is another thing if legal rights are to be strictly enforced. The situation is analogous to trespasses by animals. Under the common law, when cattle were found upon the land of another doing an injury, the landowner, under certain restrictions, was permitted to seize and detain them as a pledge or security for the payment of the damages he sustained. The right of distraint of cattle has come to be regulated to a large extent by statute, since fencing laws have been enacted, but it seems that we must refer to the common law to find out the rights of the parties respecting the trespassing golf ball. It is obvious that the owner of the ball has no right, except by the grace of the adjoining property owner, to commit a second trespass and perhaps incur thereby more damage by searching for his ball. If refused permission to recover his ball after a tender of damages, he might commence an action for replevin, but would, of course, be obliged to pay all damages.

No landowner is obliged to submit to repeated trespasses, and he may in a proper case obtain an injunction to restrain future trespasses. It certainly would create a fine state of affairs if the owner of an adjoining property obtained, as he might, a permanent injunction prohibiting the members of a club from driving golf balls on his premises. In such a case, the players would lose stroke and distance, or distance only, whichever way the United States Golf Association ruled; and they would also become subjected to the pains and penalties of the law for their contemptuous and continuous violation of the injunction. It certainly would be tough to be put in *durance vile* for an inadvertent slice.

Some lawyers may take issue with the conclusions of this article; but it serves to indicate the propriety and good sense of keeping on good terms with neighbors. A little give-and-take on both sides is much better than insistence on legal rights. It is better for a golf club to arrange in advance to compensate its neighbor in some reasonable way for the damage he might suffer, and he in turn can minimize his loss by using the land for crops and purposes that will not be seriously injured by trespassing golf balls and players. It may be well for golf players to bear in mind the rights of the neighbors, and by friendly recognition of such rights and proper arrangements avoid the disagreeable consequences that may otherwise ensue.

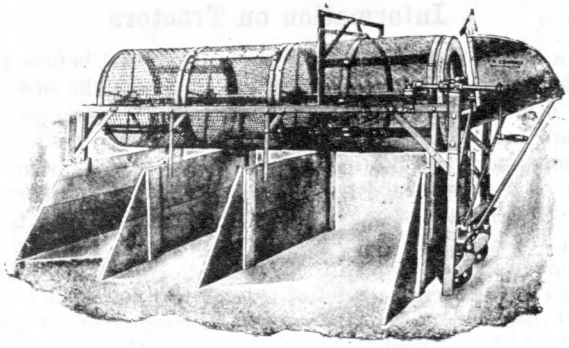
(*Obiter.* The Committee would like to see the court that could stop the writer from slicing into the cornfield on the right of No. 1.)

A Mechanical Sifter for Humus and Top Soil

FRANK B. BARRETT

That the top-dressing of greens and fairways is productive of highly satisfactory results cannot be denied, and without doubt the practice would be much more general except for the cost.

Top-dressing, either of compost or of rich soil, is usually prepared for distribution in a primitive, old-fashioned way. A standing wire-mesh screen, about six feet by three feet, is supported by adjustable uprights. The screen is placed near the compost heap and the laborer assigned to the work shovels the soil so as to play up and down the screen, usually spending about fifty per cent of his energy in playing a tattoo on the wooden sides of the frame.



Because the work is commonly done in a secluded spot, and possibly on a day when the thermometer is a bit high, the master of the screen ends his day with about a yard and a half of sifted soil. The pay sheets show labor at four dollars per day, so the top-dressing costs about $2.66 per cubic yard; rather costly, but still worth the price.

A green committee is to be judged partly by its expense and partly by its results. Anything that will reduce the cost of top-dressing is important so that more can be done for the same money. It is a calamity when economy necessitates less top-dressing.

Considerable time was spent by the writer looking over the market for machinery for sifting compost. The apparatus must be reasonable in cost, simple in construction, resistant to wear and tear, portable, and adaptable for different sorts of power, including hand power if necessary.

A manufacturer was found who said he could build such a machine and which when produced was found to be satisfactory in all ways. The cost was about $140. It is shown in the accompanying illustration.

The machine is connected by belt to a portable gas engine, both being mounted on wheels, so they can be drawn anywhere about the course. The cylinder screen, about six feet long, is made of quarter-inch mesh and revolves at medium speed. With the use of six men it will deliver about forty-five cubic yards of sifted material a day.

Now, as to the cost of the top-dressing: six men at four dollars per day is twenty-four dollars, and with an allowance of another four dollars for

gasoline, oil, and wear of engine, the total is twenty-eight dollars, which makes an approximate cost of sixty cents a yard for sifting. At this price one can afford to use top-dressing frequently, a practice which will never be regretted.

The writer desires to mention at this time that he has always been a strong believer in the use of compost, good humus, and top soil for dressing both greens and fairways. It has been his pleasure to top-dress the course of the Hollywood Golf Club in the past five years, upwards of seven hundred cubic yards per season, and it is well worth the price as measured by the superb turf secured, as well as the feeling of satisfaction it brings.

Information on Tractors

Under a Nebraska law a State permit is required before a tractor may be offered for sale within that State. The object of the law is to prevent the sale of over-rated tractors and to provide a reasonable assurance of prompt repair service to tractor users. The permit is issued by the State Railway Commission, but not until after the tractor has been tested by the Department of Agricultural Engineering, University of Nebraska, Lincoln, Nebr.; the performance of the tractor in the tests is compared with the claims made for it by the manufacturer, and provision must be made for the maintenance within the State of a service station with full supply of replacement parts for each model of tractor to be offered for sale.

In 1920 there were tests made at the University of 69 models of tractors, and 14 additional models were tested in 1921. At the conclusion of each test the results were tabulated and embodied in an official report consisting of a statement of the performance of the tractor in each part of the test as to belt horsepower developed, engine speed, kind and amount of fuel used, amount of water used, temperature of cooling fluid, drawbar horsepower, drawbar pull in pounds, speed in miles per hour, slippage of drive wheels, and amount and kind of lubricating oil used. All advertising literature submitted by the manufacturer with the application for permit, was gone through and any claims that seemed unreasonable or excessive on points not comparable with the results of the test, were quoted on the official report. In the comments on each tractor is mentioned the repairs and adjustments made during the test.

A summary of the reports on the tests of the 69 models conducted in 1920 is published in Bulletin 177, Agricultural Experiment Station, University of Nebraska, Lincoln, Nebr. The summary of the reports on the 14 additional models tested in 1921 is contained in a supplement to the Bulletin. A copy of the complete report on any of the models tested in 1920 may be purchased from the Agricultural Engineering Department, University of Nebraska, for 15 cents for each report. The report consists of three letter-size blue-print sheets. The reports for 1921 were mimeographed and can be obtained for 5 cents per copy. The *Farm Implement News*, Masonic Temple, Chicago, Ill., has published a 76-page pamphlet containing the complete reports made by the University on 65 tractor models tested in 1920, together with an analysis of the reports; this pamphlet may be obtained by remitting 25 cents in postage to the publishers.

Are Moles Held in Check by Blacksnakes?

REMINGTON KELLOGG, *U. S. Biological Survey*

The following communication contains some very interesting observations on the relative numbers of blacksnakes and moles on a golf course in New Jersey, before and after the cutting away of the rough. A point of unusual interest is raised in this letter, namely, the relation of snakes to various animals frequenting golf courses. The letter is quoted in full for the benefit of those who are in charge of courses infested in like manner:

I appreciate very much the interest you have taken in my soil problems, and this confirms the importance I have from the beginning attached to your Committee.

As the relationship of snakes to the mole nuisance may be interesting, I am going to give you the facts as they have come under my observation.

The area is approximately 60 acres, perhaps a little more. It is bounded on the south by woodland. This area up to 1915 served as a 9-hole golf course for a small club with a membership of 25 to 40. The area, as a whole, was not closely cut. There was considerable rough, and also brush and tree growth.

Within this area there lived and bred a number of blacksnakes. Owing to the small membership, there was a limited use of boys, and this, coupled with the high rough, brush, and tree growth, gave the snakes protection. There was little or no trouble with moles. I live within the area, and have a lawn, and at no time did the presence of moles on the lawn attract my attention. I presume they were there, but not in sufficient numbers to attract my attention.

In 1915 the club was expanded. A great deal of the brush and tree growth was cut away. A good bit of the rough was also cut down to fairway length. The rough that remained was cut down to normal rough length. Protection to the snakes, due to this change, was reduced to a minimum. In 1915, however, I still noticed there was a very considerable number of snakes about. The improvement in the club brought to the course an increased number of boys, and in 1915 the snakes began to be killed. In 1915, however, there was still an absence of impressive effect due to the moles.

In 1916 the moles began to show and then first I began to be conscious of their work. In 1917 the course was reduced to 9 holes, as it stood in 1914, and these 9 holes were further cleaned up, *i. e.*, the rough was narrowed or cut away entirely, additional shrubbery was cut out, and again protection to the snakes was very substantially reduced. Also the reduction of the course to 9 holes resulted in much more intensive playing over this area, and this condition continued through 1918. Snakes were killed more or less regularly.

In 1919 the work of the moles began to attract the attention of all the members of the club, and especially of myself, because I live on the course. Through the season of 1919 I saw only a few snakes—a far less number than prior to that time. In 1920 I did not see a single snake but the depredations of the moles increased alarmingly. We used traps from the beginning of the summer to the end, without appreciable result.

In 1921 the mole-runs were all over the place, including the lawn. Not only that, but you can see them at work. In 1921 the moles were so abundant that the men carried spears to spear them when they noticed them at work. In 1921 I did not see a single snake.

Even as late as this date (December 23, 1921) the moles continue their depredations. Areas sometimes are crossed with runs so close together that the soil has the appearance of being plowed.

Within this area the increase of the moles bears a very direct relationship to the decrease of the snakes. Also the increase of the moles bears a direct relationship to the decrease of cover for snakes and their increased destruction. Except for the changes I name, there has been no modification in the area to which I can trace the increase of the moles; but it is certain that the number of moles now living within this area is many times that living within the same area in 1914. It is also beyond all question that the number of snakes living within this area, if any, is many times less than that of those living within the same area in 1914.

The writer suggests the following explanation for the situation as it exists:

The extended account of the physical surroundings contained in the letter explains in a large measure the disappearance of the blacksnakes and the increase in numbers of the moles. The blacksnake generally prefers rather dry and open districts, occurring most abundantly on the edges of meadows which are bordered with underbrush and bushes. A tangled underbrush of this sort affords ideal protection for the blacksnake, and in such surroundings it will thrive and multiply. It rarely enters underground passages or runways of the smaller mammals, such as moles and pine-mice *(Pitymys)*. It does enter the burrows of the larger species of mammals for temporary refuge in emergencies. The blacksnake is mainly a terrestrial species, occasionally climbing trees in search of young birds and the like, and is capable of crawling rapidly over vines and thickly growing bushes. It is remarkably agile and captures most of its food in the open or in rocky places. Surface lists the stomach contents of the blacksnakes examined in his investigations, and gives a summary of the data obtained by other writers. No mention is made of the presence of moles in the stomachs of any of the snakes examined. Instead, field-mice, voles or meadow-mice, snakes, and insects were found to constitute the chief items of the food.

When the rough on the golf course was cut down the shelter for the blacksnake was reduced. As this process of removal of the rough continued, the blacksnakes were afforded even less protection. The natural consequence of this policy would be that the snakes would seek a nearby district which possessed their favored habitat. In such a situation blacksnakes will no doubt still be found in abundance, but they will not become abundant again on the golf course until the rough is allowed to grow up.

The care of the golf course, including the planting of grass, has increased the number of insects which thrive under such conditions. The insects and other creatures preferred as food by moles are partial to meadows and open fields. Examinations of stomachs of moles made in the Bureau of Biological Survey show that their food consists largely of animal life and comprises the following: earthworms, Scarabaeidae (May beetles and white grubs), Elateridae (click-beetles and wire-worms), Lampyridae (firefly larvæ), Curculionidae (weevils and grubs), ants, Orthoptera (grasshoppers and crickets, including their eggs), and Oniscidae (sowbugs). The removal of the brush and bushes also has opened up an area of rich, loose soil, extremely favorable for the workings of moles. Hence they now find an abundance of food and a soil suitable for burrowing. Similar results were observed by the writer on an estate in France. The workings of the European moles, especially those in certain parts of France, are extremely large and can be observed at some distance. On this estate referred to the brush and other undergrowth over several acres was cut down and tied in bundles for use in making fires in the homes. The ground was plowed and planted with small grain. In less than six months this entire plot was thickly infested with moles. What happened was that there was a rapid invasion of moles into this area from the surrounding fields. A similar thing has probably occurred on the golf course in New Jersey.

Snakes are not attractive animals and popular traditions throughout the historical period have encouraged their persecution by mankind. The

presence of poisonous snakes in many regions inhabited by man has inspired a dread for these creatures which has endured throughout all ages. Snakes are easily confused with one another; and as it is usual to regard all snakes as venemous, the burden of proof is on those believing in their innocence. During the summer of 1920 the Secretary of Agriculture approved a project by the Bureau of Biological Survey to investigate and disseminate the information obtained from a study of the economic relations of the reptiles and amphibians to agriculture, horticulture, and forestry. In pursuance of this policy, the Biological Survey is now making laboratory examinations of the stomach contents of various reptiles and amphibians. Reptiles have been persecuted in the United States chiefly because their habits and economic value have been unknown or misunderstood.

Splash board irrigation.—It has been found that large areas can be economically and effectively irrigated by the use of a splash board, which consists only of a board say 16 inches wide and 4 feet to 5 feet long, upon one end of which a hose is fastened by staples or otherwise. The water runs down the board and on the ground without tearing up the turf. A board will supply water for quite a large area—as far as the water will flow. A good soaking once a week or so should suffice to keep a fairway or clubhouse lawn in good condition—probably better and at less expense than if sprinklers are used. An inch of rainfall in ten days is enough for an ordinary garden crop; so a soaking once a week should keep turf healthy.

How to destroy land crabs.—Land crabs are frequently troublesome and may be destroyed by dropping a piece of calcium carbide down the tunnel. The carbide unites with the water at the bottom of the hole, making a gas, which kills the crabs. It has been suggested that this be tried on some of the large grubs which work on putting greens. A few small pieces of carbide followed by a little water might possibly prove to be an easy means of killing grubs.

Some monument.—"A new golf course has been presented to the City of Glasgow by the Reid family—Sir John Reid, Mr. Hugh Reid, Mr. Andrew T. Reid, and Mr. Walter M. N. Reid. The course occupies a site just outside the city boundary, north of Stobhill Hospital. It is roughly of triangular outline and bounded on the north side by Auchernairn Road."—*The Gardeners' Chronicle, Nov. 26, 1921.*

Don't lay out your bunkers too soon.—On a new golf course the fairways and greens should have first consideration. Bunkers can be added at any time later and actual play will indicate the best location for them.

"The smallest worm will turn, being trodden on." King Henry VI.—Also if a little corrosive sublimate is put on his tail early in the morning. Do it before he gets too numerous.

Rake the bunkers.—It is just as important to keep traps and bunkers in good condition as it is to look after greens and fairways.

Questions and Answers

All questions sent to the Green Committee will be answered as 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. *Please bear in mind that the recommendations given apply specifically to the locality designated at the end of the question.*

1. **Sheep's fescue being sold as European red fescue.**—What is your opinion of the following statement received from the * * * Seed Company? "In regard to your inquiry for European red fescue we would state that there is no European red fescue grown. Our personal investigation has shown that some concerns in Holland are selling a certain type of sheep's fescue as European red fescue. We are sending you a sample and quotation on this seed, but we will sell it for what it is, sheep's fescue."—(Illinois.)

There is plenty of red fescue in numerous varieties in Europe. Before the war the seed was gathered and could be obtained. Whether the European red fescue seed on the market now is true red fescue or sheep's fescue we are unwilling to say, as thus far we have been unable to find any absolutely dependable character by which to distinguish the sheep's fescue seed from red fescue seed. The actual identity of the seed, therefore, we would be unable to state until we had grown plants.

2. **Order of preference of different manures in compost.**—Would you be kind enough to tell me the best manure to use for compost? Is sheep manure really good, or can I procure better than it?—(New Jersey.)

All manures are good, but we would list them in about this order of preference: cow, horse, sheep. Chicken manure is also excellent, but it needs to be very thoroughly mixed in the compost.

3. **Timothy as a grass for tees.**—We will have to seed new tees this spring. Our native grasses are Rhode Island bent and timothy. Would you advise the use of this mixture on our tees?—(Massachusetts.)

We have some doubts about the advisability of using timothy on your tees, and would advise you to use redtop.

4. **Pine sawdust as soil admixture; layering putting-greens; preventing adobe soil from baking.**—Will you please inform me if it is possible to use pine sawdust as a lower layer in the making of a green? We are confronted with adobe soil at our * * * course, which packs very hard, and we are endeavoring to find some sort of a remedy that will create a cushion to furnish ventilation to the grass roots.—(California.)

We think you would find results very unsatisfactory by putting in a layer of pine sawdust, or, indeed, of any other material. Generally speaking, the layer type of green has not been found satisfactory. What you need to do is to mix enough sand and humus in your adobe soil until the mixture is practically the same as a garden loam. Offhand we would say that you could use for the top eight to twelve inches of soil, about four inches of sand and a liberal amount of humus material. A good deal of pine sawdust can be used as part of the humus material, but this would really be much better if it were first composted with soil or manure for six months or a year. A small amount of pine sawdust can be mixed with the soil and have some advantage, but if an excessive amount

is used some difficulty may be experienced from injury to the grass on account of the resin which the pine sawdust contains. We do not think you will ever get your green in a satisfactory condition until you get top soil of a satisfactory type.

5. Seeding northern putting-greens and fairways located on sandy soil; economy in using redtop in mixture with bent.—Our club is located within five miles of the shores of Lake Huron, where the soil is sandy in spots and in some places has a heavy yellow clay. Could you outline to the writer what seeds would be best for the greens in this section, as well as for the fairways?—(Michigan.)

Red fescue is usually the best grass on soils distinctly sandy in texture. If, however, in your putting-greens you change the character of the soil so that it makes a good loam, the bents have a little superiority over the fescue. On your fairways you have two choices, either straight red fescue or else bent, either Rhode Island bent or German bent, which is admirably adapted to sandy soils in your latitude. To reduce the cost of seeding we would suggest, in case you use the bents, that you seed the fairways to a mixture consisting of 4 pounds of redtop to 1 pound of bent. The redtop is very satisfactory, but is comparatively short-lived. and in the course of about three years your fairways will be straight bent, which will gradually replace the redtop. By using redtop in the original seeding you will save considerable in your seed bill.

6. The use of muck and lake-bottom soil; composting it with stable manure: redtop, fescues, and bents for northern putting-greens; rate of seeding redtop.—In constructing 9 of our putting-greens last spring we used a top-soil which we mixed up as follows: 70 per cent muck, 20 per cent black dirt or clay loam, and 10 per cent sharp sand. We did not incorporate any fertilizer, but in the fall applied 150 pounds of hydrated lime with a top-dressing of muck, clay loam, and sand in about the same proportions as used in constructing the greens. In May we sowed 50 per cent redtop and 50 per cent Chewings fescue, 125 pounds to the green, averaging in size 80 by 80 feet. Owing to a very hard summer for want of rain and the great and continued heat, we could do nothing to bring forward what seed germinated. We covered the greens with hay to protect them, but all to no purpose; and not until after the fall seeding did we get any growth; and still the lack of rain was a great handicap. We saw no signs of the fescue coming up except for a few blades here and there; but the redtop was excellent and formed a dense growth, but later, toward the end of November, turned yellow and thinned out and generally looked sickly. We accordingly decided to experiment with the use of acid phosphate, nitrate of soda, and muriate of potash, on patches of about two yards square on different parts of the green, with different compositions of the above fertilizers, and found a very great change by using the three in equal proportions, the grass on the treated plots becoming of good color and healthy. What I desire is to get a condition of soil which will not bind and will allow a ball being pitched right up to the hole and staying "put" without the necessity of having the green, as heretofore, in a sodden condition. I would also like to know what grasses will thrive on a soil such as we have here. We also have available for use about 1,500 loads of the top surface of the bottom of one of our lakes.—(Minnesota.)

The chief difficulty in using muck is the inert condition of the material. Muck is liberally supplied with plant food, but the food is locked up or unavailable for plant use. Plants will thrive in it only after it has decayed. This decay is effected by the introduction of microscopic life, which is best accomplished by the application of stable manure. If you had used several loads of stable manure in preparing this mixture we believe you would have had much better results. As regards commercial fertilizers to be used on the greens you have constructed, we would invite your attention to the article on this subject in the October, 1921.

BULLETIN. Ammonium sulfate is to be preferred to sodium nitrate in that the former discourages the growth of clovers and certain weeds while, at the same time, encouraging the development of the bent and fescues. We would also advise you to compost your muck and clay loam with stable manure, and the more stable manure you put in the compost pile, the better. After the mixture becomes thoroughly pulverized through composting we would then advise your using it as a top-dressing. In the meantime the use of commercial fertilizers will keep the grass growing until the plant food in the soil is liberated.

In regard to seeding putting-greens, we consider that you used too much redtop for best results. We recommend as a maximum rate 5 pounds to 1,000 square feet. If the fescue you used had been of reasonably good germination it would have been better not to have used any redtop at all. Redtop makes a very vigorous growth at the start and gives the appearance of being a very fine putting-green grass, but it afterwards becomes coarse and the turf open and poor. We believe, however, that the bents will give you a much better turf than the fescues.

In regard to the top-surface soil you have taken from the bottom of one of your lakes, we would strongly advise you to compost this with stable manure before using.

7. **Red fescue vs. bluegrass for tees.**—Bluegrass is natural to our soil and climate. Would it be better to reseed our tees with bluegrass or with red fescue, which some authorities think offers a better turf for the purpose and stands up well under hard usage?—(Indiana.)

If the turf of your tees is very poor we think you will find resodding preferable to reseeding. If, however, you must reseed the tees, we would suggest that you use redtop and bluegrass, especially since bluegrass naturally forms your turf.

8. **Average purity and germination of Kentucky bluegrass seed.**—What information can you offer as to the average purity and germination of bluegrass seed?—(Indiana.)

Lots of Kentucky bluegrass seed purchased by one user during the past ten years have shown an average purity of 77 per cent and an average germination of 63 per cent.

9. **Specifications for ammonium sulfate and bichloride of mercury in soliciting quotations.**—In making inquiry for prices on ammonium sulfate and bichloride of mercury should any specification be made as to grade, percentage of strength, or other details?—(Indiana.)

These are both standardized products and no specifications need be made in connection with purchasing other than to request pure stocks.

10. **Commercial humus as a top-dressing.**—Is commercial "humus" or good muck a desirable substance to use as a top-dressing?—(Pennsylvania.)

Yes, if it does not cost more than one-fourth the price of good barnyard manure. Even when muck or peat deposits occur on a golf course, it is best to use it as an element in compost heaps rather than raw.

11. **Ice remaining on turf; winter-killing of turf.**—On a couple of our putting-greens we find the water and snow rest and form into a heavy layer of ice which remains on parts of the greens until the sun melts it. This is due to bad drainage system. As it would be unwise now to remove the sod, I write to ask if you could let me know if there is any solution or preparation we could put over the ice when formed on the green. Are we right in assuming that when

the sun penetrates the ice and melts it, and the standing water freezes over again, and the process thus continued for any length of time, it is bad for putting-green turf?—(New Jersey.)

Three years ago putting-greens and fairways around Washington were covered for two months with a sheet of ice, but no harm whatever resulted to the grass. Even in New England, where similar conditions occur, there never seems to be any winter-killing of the grass unless the turf is water-logged; that is, the killing occurs in low places where water stands or in areas below snow banks where the soil is kept continually soggy. In other words, as far as our information now goes, winter-killing is always associated with water-logging of the soil. The practical significance of this is that you need not worry about your putting-greens if they are ordinarily well drained, but if the drainage is such as to keep the soil water-logged you may anticipate killing. We have tried a good many times to emphasize the point that probably 70 or 80 per cent of all turf troubles are associated with insufficient drainage, which is admitted to be the case with your greens. As regards getting rid of the ice itself, this could probably be accomplished by covering the surface with well-rotted barnyard manure, or even with straw or leaf-mold, as all of these have a pronounced tendency to melt ice. The whole matter is one of great interest, and we trust you can observe conditions carefully during the winter and in the spring advise us as to what actually happened.

12. **Ridding sand greens of weeds.**—We desire to kill all the vegetation within a space of about 12 feet around our sand greens. Salt or creosote have been suggested to us for this purpose. Is there anything better?—(New Mexico.)

Where oiled sand greens are used, as described on page 109 of THE BULLETIN for 1921, there is no difficulty in regard to weeds. If sand greens without oil are used, salt is the cheapest thing to keep out weeds.

13. **Comparative values of creeping bent seed containing different proportions of redtop.**—I am sending you samples of creeping bent seed, one which we can purchase at $1.35 per pound and the other for $1.15 per pound. Will you please tell me which would be the best purchase?—(New York.)

The seed at $1.35 per pound contains little redtop and the seed at $1.15 per pound contains considerable redtop. Under putting-green conditions the redtop will disappear in a year or two, being replaced by the bent. Redtop is not objectionable on putting-greens when sown in mixtures with bent, in view of the fact that it will soon disappear and in its young stages it makes a fair putting surface. We regard the sample at $1.15 per pound the best purchase for use in seeding a putting-green.

14. **Bermuda greens vs. bent greens for southern Virginia; rate of seeding Bermuda grass.**—We are troubled with crab-grass on our putting-greens during July and August. At Norfolk, where they have Bermuda, they are not troubled with crab. I have, therefore, decided, after my experience with Bermuda grass in the South, to change our greens from bent to Bermuda grass.—(Virginia.)

We are not at all convinced that you are wise in changing from bent grass to Bermuda. You are not far from the northern limit of the growth of Bermuda grass, as indeed you are somewhere near the southern limit

of the bent grasses. Would it not be wiser for you to start in with a single Bermuda green and compare it with your bent greens before you decide on the general change from bent to Bermuda? The maximum amount of Bermuda grass seed you should apply for putting-green purposes is 5 pounds per 1,000 square feet. Bermuda seeds are very small, one pound containing about two million seeds, so that at the rate of 5 pounds per 1,000 square feet you would be putting on 10,000 seeds per square foot. You can really get along easily with half this amount provided the seed is of good quality. The seed should be sown in a thoroughly well-prepared and fairly firm seed bed about corn-planting time, not before, as Bermuda seed will not germinate except in warm, moist soil.

15. **Spring seeding and fertilizing of northern fairways; bluegrass; redtop; barnyard manure; bone-meal; fish-scrap.**—I would like to know how much grass seed you would sow per acre on fairways, also fertilizer. Would you advise mixing fertilizer with soil or just throwing it broadcast on fairways?—(New Jersey.)

We would recommend that you seed your fairways with a mixture of bluegrass and redtop in the proportion of four pounds of bluegrass to one pound of redtop. On well-prepared soil 150 pounds per acre is heavy seeding; even half of this amount will give a good stand with fall seeding. Fall seeding is much to be preferred. If you must resort to spring seeding, be sure to get your seed in as early as possible; any time when the soil conditions are favorable will be all right in your locality. The question of fertilizers depends, of course, on the richness or poorness of your soil. You gave us no information on this point. The best fertilizer for you to use, in case you can get it, is well-rotted barnyard manure, which should be harrowed into the top few inches of the soil. The next choice to barnyard manure would be an organic fertilizer, such as bone-meal or fish-scrap, depending on which is cheapest. In using the bone-meal or fish-scrap, the amount will depend upon the character of your soil. After harrowing in your fertilizer, scatter the seed broadcast, and then roll the fairways lightly. The grass seedlings do better in a somewhat firm seed bed.

16. **Cutting newly sown greens.**—How soon after seeding should we start to cut the grass and how often should it be cut?—(Connecticut.)

We would suggest that young grass be mowed as soon as it reaches the height of two or three inches.

17. **The use of liquid manure.**—We have procured a large iron tank 5 feet in diameter by 4 feet deep, into which we have fitted a screen to hold the manure for tankage, from which we intend to transfer the liquid to three or four barrels, and from those with a hose put the liquid on the green by syphoning same. Have you any recommendations to make with regard to this procedure?—(Minnesota.)

We think your plan of using liquid manure on the green is excellent. We would give one caution—do not apply this liquid in too concentrated a form. It is likely to burn grass, especially the fine turf grasses on putting-greens, by applying too strong a solution of manure, just the same as with

too heavy an application of nitrate of soda or ammonium sulfate. It will be all right for you to apply this liquid and then water the green immediately afterwards.

18. **Invasion of clovers encouraged by an excess of potash.**—I notice on page 203 of the 1921 BULLETIN, as well as in other places throughout the 1921 volume, the statement that an excess of potash encourages the growth of clovers. Is this conclusion derived from general observation or from actual experiments?—(Michigan.)

The conclusion is based on a large number of actual experiments as well as on the general experience of farmers.

19. **Value of sheep manure.**—Where well-rotted manure is not available, will sterilized sheep manure be satisfactory? The advertisers claim an excellent percentage of humus, as well as of potash, phosphoric acid, and nitrogen. We had planned to apply sheep manure with equal parts of black loam.—(Illinois.)

In our experiments we have not found sheep manure nearly as satisfactory as well-rotted barnyard manure. We should say the answer to your question would be that of costs. At equal prices we should prefer the barnyard manure. If the sheep manure costs no more than the barnyard manure it might be well to buy it, as the convenience of its application about makes up for its lower fertilizing value.

20. **Improving drainage in putting-greens.**—Where greens have been built without drainage except natural drainage, what system should be followed for drainage? We have thought of using tile, and in that way it would not be necessary to tear up the whole green but only lines on which tile would run.—(Illinois.)

If a green has poor drainage, probably the best plan of all is to remove the turf, reconstruct the green so as to have ample drainage as well as desirable architecture, and then relay the turf. Tile drainage is the most satisfactory kind of artificial drainage, but if you can so construct your green as not to require any artificial drainage it is that much better.

21. **Poa annua in putting-greens.**—For the last three or four years we have been greatly troubled with *Poa annua* in our putting-greens. We have repeatedly raked the greens up and sown with New Zealand fescue and a little creeping bent when we could get it, top-dressed them with sand and loam, fertilized with sulfate of ammonia through the season, and fairly heavily with bone-meal in the fall, but the *Poa annua* seems to be getting worse, crowding out the other fine grasses in the green. Of course, it does not make bad putting up to the end of July, but then it dies off and the greens are pretty bad for about two months until it grows again. Could you suggest anything more that we could do? We certainly do not want to take the greens up completely and reseed them if there is any other way of fixing them.—(New York.)

The trouble you speak of is a general one on northern golf courses. In the latitude of Washington, however, we regard *Poa annua* as rather a desirable feature of putting-greens; it begins to grow late in the fall, and during spring and early summer makes exquisite putting-greens, disappearing entirely about midsummer but so gradually that the bents take its place and unless one watches carefully the transition will occur without your noticing it. Farther northward, as we have learned from several green-keepers, there is a break between the time when the *Poa annua* disappears and the other grasses take its place, which according to your

letter is your experience. We are at a complete loss to make any suggestions as how the difficulty can be overcome. *Poa annua* will reseed itself no matter how closely it is kept clipped, and it is likely to increase year after year under putting-green conditions. It is possible that some chemical may be discovered which will kill the *Poa annua* without any injury to the other grasses; but we fear the chances are exceedingly slight.

22. Fertilization of putting-greens; nitrate of soda and ammonium sulfate.—We notice in a report from the Rhode Island Experiment Station that by the use of ammonium sulfate as a fertilizer the inroads of weeds can be prevented. Would you advise our using this as a fertilizer on our putting-greens? and if so, in what proportions?—(Ohio.)

A good compost dressing such as is described in THE BULLETIN in various articles on compost is as a rule all the fertilizer that is needed for the greens. However, sulfate of ammonia or nitrate of soda may be added, especially in the spring and fall, with good results. Sulfate of ammonia has a tendency to produce an acid reaction in the soil, while nitrate of soda is inclined to produce a neutral or alkaline reaction. We have had reports of those who have used sulfate of ammonia liberally and for a certain length of time to the effect that it should be followed by liberal dressings of compost. Judging from our experiences, you are safe in using sulfate of ammonia at the rate of not to exceed 5 pounds to 1,000 square feet twice a year. The best way to apply it is to mix it with sand or compost and apply dry. There are little definite data on the subject, but it is thought that when applied in this way it may be used for an indefinite number of years without causing any deleterious reactions on the soil. In general we would say you would be justified in anticipating results similar to those obtained by the Rhode Island Experiment Station by following the course that they follow.

23. Soft water vs. hard water for sprinkling turf.—Please give me information regarding the difference in the effect on turf from the use of hard water and of soft water.—(Ohio.)

We really have no definite, clear-cut information in regard to the relative values of soft water and hard water when used on grass turf. The opinion widely prevails that soft waters are preferable for irrigating turf and in cultivating plants. We are unable to find that any accurate experiments have ever been conducted on the subject. Of course, where hard water contains lime, sulfur, magnesia, or other mineral salts in rather large quantities, some difference might be expected. Generally speaking, however, we doubt very much if any difference could be detected between two greens, one watered with stream or pond water and the other with ordinary well water, even after years of use.

24. Compost from oak leaves; tannic acid.—Around our golf course we have the green oak trees. I have made pits and put the oak leaves in them with half soil and some gypsum on the leaves. It has been said there will be too much tannic acid when this is completely rotted. What are your views with reference to this matter? I also made a compost heap of sod, manure, peat, and soil. I understand this should be turned once each month and at the end of a year it

should be ready for use. Your advice on this matter will be appreciated.—(California.)

We have not had a great deal of experience with the making of compost from oak leaves, but from the experience of others we learn that there is relatively little if any tannic acid left when the leaves decompose, as they should for the making of good compost. It is usually well, however, in making compost from oak leaves, or in fact from leaves of any kind, to add some lime and also some stable manure, since these aid in the decomposition of the leaves. Recent experiments conducted by the Rothamsted Experiment Station, England, indicate that nitrate of soda added to the compost piles in which are large proportions of straw, leaves or poorly decomposed vegetable matter, aids in decomposition. We note you are interested in having this information in connection with your golf course, and would call your attention to the article on "Humus-Producing Materials and the Making and Use of Compost" in the April, 1921, number of THE BULLETIN. There is also an item on the subject on page 20 of the January, 1922, BULLETIN.

25. **Sheep's fescue for quick growth on poor soil.**—We have a piece of ground from which the sod was taken for patching. The soil is very poor, and as the piece is entirely off the course it hardly seems worth while to put on additional top soil. However, it can be seen distinctly from one green and in its present condition is quite unsightly. What seed would you advise planting that would grow quickly, giving a green appearance and tending to control the weeds? —(Pennsylvania.)

In regard to the piece of ground from which the sod was taken for patching, we would suggest that you seed it to sheep's fescue, which will grow on very poor land and which is a desirable grass for the rough.

What and Where is the Longest Golf Hole?

This question has been put up to us by a correspondent. Please send to the Green Committee of the U. S. Golf Association such data as you have in regard to the length and location of the longest hole in the United States, in Canada, and elsewhere in the world. The information will be highly interesting.

Meditations of a Peripatetic Golfer

Golf playing, golf architecture, golf course construction, and greenkeeping or turf culture are four widely different subjects. It is a rare man, indeed, who is expert in more than one of them.

For a whole month no changes were made on the course of the Columbia Country Club. Something must have happened to Dr. Harban.

An exclusive golf club on a midweek day is about as cheerful as a morgue. For the good of golf every such club ought to have a limited membership class who are permitted to use the course except on holidays and at week ends.

They sowed their new course in spring and expected to play on it the same season. Faith may be able to move mountains, but it doesn't influence grass much.

About half the bunkers on any course may well be deep grassy hollows. Where sand is scarce or expensive the grass-floored bunkers are much cheaper to maintain.

Putting-greens in May apparently pure Poa annua! Watch them carefully and note how the bent grasses gradually recover as the Poa annua wanes in June and July.

On cleared land of good quality a first-class golf course should be built at from $1,000 to $1,500 a hole. It is wisest to allow at least 2 years for completion if first-class turf and properly placed bunkers be considered.

One golf course we know was greatly improved by absolutely reversing the direction of play. Another was greatly bettered by laying off a new course at right angles to the old one. It pays to study the topography with great care.

A hard-surfaced road across a fairway about where a good drive should land. If the ball hits the road—sowie!

A putting-green divided into four quadrants each on a different level, one of the back ones lowest of all. The effort was to secure novelty, but the result is absurdity.

"I do not believe in sowing grass seed until the ground is nice and warm," declares a theoretical greenkeeper. "That's when we plant corn." The trouble with this theory is that the fine grasses do not act like corn nearly as much as they do like winter wheat. Except in the northernmost tier of states, the fellow who sows winter wheat in spring will reap but a scant crop.

Don't offer prizes for good work. Don't be liberal in figuring time of workmen. Don't allow extra time for work done Sundays. Pay wages that are fair and just and do business with your men on a business basis—the same as other employers.

"Yes, we seeded this with the regular putting-green mixture," said the chairman of a green committee. Evidently he did not know that nothing else in the world is quite so irregular.

An heroic bunker—invisible on account of an intervening ridge—guarding a full one-shot green. Certainly the architect wasted an opportunity.