

THE BULLETIN

of the

UNITED STATES GOLF ASSOCIATION GREEN SECTION

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Turf Culture in South Africa

"Greenkeeping in South Africa," by Dr. C. M. Murray, of the Royal Cape Golf Club, Capetown, South Africa, is an interesting pamphlet which recently came into the Green Section's possession.

The turf conditions in South Africa are comparable to those in our southern states, and the grass which covers both greens and fairways (*Cynodon dactylon*), the Bermuda grass of our country, is there known as "fine quick." The results of Dr. Murray's experimental work are so similar to the results secured by the Green Section that they will be of interest to all BULLETIN readers and will be of particular value in the section of this country where opinions still differ on the proper maintenance of Bermuda greens. A brief outline of Dr. Murray's work is quoted from a letter recently received.

"Up to two years ago I had had to fight a lone hand for my views. The history of that fight forms such a vindication of the correctness of your work and observations that I believe it will not bore you if I give you a brief outline of it.

"When I returned from college in England to my home in this country in 1904, golf was very much in its infancy. It was supposed that turf would only grow in the British Isles, and so we played on hard putting areas covered with 'blue ground' from the diamond mines. These we called 'blues.' They are still in vogue on some of the country courses.

"In 1905 I commenced experimenting with local grass (*Cynodon dactylon*), and in the course of three years we finally gave up the 'blues' and ever since then have played on turf. As time went on the maintenance of the greens began to give us trouble. Being medical with a working knowledge of chemistry I commenced studying the problem of so fertilizing the greens as to favor the turf at the expense of the weeds. By 1914 I had discovered that our grass preferred acid soil and that lime and alkaline fertilizers promoted the growth of weeds.

"Then came the war and in common with most people I went to France. On my return in 1919 I rejoined the committee of my club and we discussed the problem of re-establishing our greens, which were in fair condition but showing a considerable growth of weeds and bare patches in the summer caused by their depredations. My proposal to concentrate on their destruction by the use of iron and ammonium sulfate in the winter and spring, when they flourish with us, and the subsequent use of ammonium sulfate in all topdressings in the spring and summer to stimulate the grass was considered too theoretical, although I had proved to my own satisfaction before the war that the results were sure. We then called in the aid of the staff

of a big fertilizer factory, to whom I explained my views and scientific reasons for holding them. As the result of this conference my proposals were turned down once more, the main objection raised being that our soil was acid and that what I proposed would make it more so, and finally destroy such turf as we had.

"The recommendations made by the experts were that during the autumn we should lime heavily, and two or three months later apply a heavy dressing of bone meal and finally in the early spring whale meat. This was to be pursued each year until the soil had become sweetened, when we might hope for good turf. I had to content myself by putting on record that if this scheme was carried out we should raise an immense crop of weeds, and that if these were not dealt with most of our turf would be destroyed. To make a long story short all that I had foretold came true, and by the end of the second summer our greens were mere sandy wastes with nothing but an odd patch of turf here and there. On the other hand two abandoned greens which had been left to lapse into fairway had rather improved than otherwise.

"After this disaster I was asked to try my scheme. I said I would do so if given three summers to show results. In the first year I used three tons of iron and ammonium sulfate and two tons of ammonium sulfate on the 18 greens. During the second and third years we used 3 tons to the 18 greens of the same formula. By the end of the first year the bare patches were fast disappearing. During the second year water was laid on and with its help most of the greens were completely healed. The third year has now passed and the club are unanimously of the opinion that our turf has never been better. A satisfactory feature from my point of view is that three of the greens that have not had water owing to impending alterations to the course, and all the tees, have recovered more slowly but quite as well as the watered greens."

Arsenate of Lead as a Beetle, Worm and Weed Eradicator

By Norman L. Mattice, Manager, Pine Valley Golf Club

When I entered the employ of the Pine Valley Golf Club last spring permission was obtained to secure the services of Mr. B. R. Leach, of Riverton, N. J., to act in an advisory capacity to supervise the use and application of arsenate of lead on the tees, fairways, approaches and greens. This chemical was used for the purpose of exterminating the grub of the Japanese beetle, which had done considerable damage to the turf in former years. As planned, the arsenate of lead was mixed in the topdressing at the rate of 5 pounds per cubic yard and spread on 1,000 square feet of area. To date the tees, approaches and greens have been topdressed five times and the fairways once. As a result of carrying out this program the main object of killing beetle grubs was accomplished before any appreciable damage to the turf occurred, and in addition three other beneficial but unlooked for results were obtained as follows:

Many of the greens contained chickweed in large quantities. In one instance, on the old 9th, an effort was made to remove some of the chickweed last year by cutting it out, leaving large patches with

no turf, so that the green has not been in play all summer. After the first application of the prepared topdressing it was noticed that many of the patches of chickweed on all of the greens (including the old 9th) turned yellow and disappeared and the turf came back in its place. After each subsequent topdressing more chickweed disappeared until all of the greens are almost entirely free from it and strong and vigorous turf has taken its place.

During July the beetles began to fly over this part of the country and light on the greens. They immediately began to burrow down into the soil to deposit their eggs, and in doing so little piles resembling worm casts covered the surface of the greens. On closer observation, a full grown, dead beetle was found in each pile of earth. It seems that the soil had been sufficiently poisoned to kill the mature beetle as well as the grub.

After the second topdressing early in May, worm casts disappeared entirely from the topdressed area, which would indicate that worms do not take kindly to soil so poisoned.

Although some crab grass appeared in the surface of the tees, approaches and greens, it did not start to grow until the first of August, and then it did not grow vigorously as is its custom. Other unpoisoned areas developed strong, thrifty crab grass plants late in June, which have already seeded at the time of this writing (September). Employees who have worked for many years on this course state that crab grass on the tees, approaches and greens is not one-tenth as bad as it has been in former years. However, the big decrease in the growth of crab grass can not be attributed wholly to the use of arsenate of lead, for sulfate of ammonia has also been used in every application of topdressing. If the marked effect from the use of arsenate of lead is as great next year as it has been so far this season it is reasonable to believe that weeds of all kinds will be eliminated from the poisoned area and a better and more thrifty turf will result.

Milorganite—An Activated Sludge

By H. L. Westover

For years good stable manure has been highly prized for use on golf courses particularly in a compost pile as it furnishes not only organic matter, an essential to proper bacterial life of the soil, but also some of each of the most essential plant food elements. Unfortunately, the supply around cities has been diminishing rapidly due to the marked decrease in the number of horses and mules. This has been associated with a greater demand not only for manure but also for other fertilizers due to the enormous increase in the number of golf courses during the past few years. The limited supply of stable manure and the high price of commercial products already available has resulted in efforts to utilize all sorts of waste products, particularly those which carry considerable humus and in which the nitrogen is in organic form. In this connection sewage has come in for its share of attention as being a potential source of plant food and organic matter. The use of sewage in its natural state on golf courses is not only unsanitary but the odor is very objectionable to the players. Dried in the usual manner the product is more or less inert

and even then can hardly be regarded as a sanitary product. In recent years a special treatment has been devised whereby these objections are obviated, the term "activated sludge" being given to the product. Milorganite is an activated sludge put out by the Milwaukee Sewerage Commission. It is probably the best known and most widely used of any of the activated sludges. It is a granular and porous organic material containing less than 10 percent moisture and of a uniform chemical composition. It carries approximately 5½ percent nitrogen (6½ percent ammonia), about 2½ percent phosphoric acid and a little less than ½ percent potash. The end product is said to be slightly acid, testing about pH 4.4. This acidity results from the use of sulfuric acid used in dewatering and is not objectionable in growing such turf grasses as the bents and fescues. The acid treatment and the high temperature to which the sludge is subjected results in a sterile product that is free from weed seeds and bacteria. It is said that this is the first time in the history of sanitation that a product has been produced from sewage that is very uniform both chemically and physically. Due to its excellent chemical condition it can be applied at a minimum labor cost.

Milorganite has been used on numerous golf courses during the past few years with very satisfactory results. It has been tried in a preliminary way at Arlington Turf Garden and has resulted in very appreciable increase in the vigor of the grass to which it has been applied. As a turf fertilizer Milorganite is sufficiently promising that plans are under way to give the product a more thorough trial in order to determine the effect of continued applications on the grass and also on the weed growth.

It is said that applications of 100 pounds to 3,000 square feet have shown decided benefit, while three times this amount has been applied with no bad effects due to burning where used as a topdressing. To insure quick and certain results it is advised that Milorganite be mixed with sand and soil and allowed to stand under cover for 10 days or two weeks before applying. This treatment is said to promote bacterial activity and to insure conversion of the nitrogen into forms available to the plant.

Where soil is deficient in fertility it is advisable to add fertilizers before planting. Milorganite applied at the rate of 100 pounds per 1,000 square feet and worked into the soil before sowing seed or planting stolons has given very good results. Quick acting fertilizers can not be used safely at planting time as they are apt to injure the seedlings or stolons that have not become established.

On putting greens the effects of a topdressing of Milorganite are apparent for four to six weeks and applications should therefore be made with about this frequency. In fertilizing fairways yearly applications, preferably early in the spring, have proved of material benefit to the turf grasses. On some of the better soils it appears that after the first two years the turf may be kept in good condition by applying Milorganite every other year but on soils low in fertility, particularly sandy soils, annual applications may be advisable.

The nitrogen in Milorganite is not as readily available as in ammonium sulphate and certain other inorganic fertilizers but being

slowly released furnishes nitrogen over a longer period. Some ammonium sulfate mixed with the Milorganite furnishes a combination in which a part of the nitrogen is quickly available and a part slowly available. Due to its colloidal properties activated sludge fixes the ammonium sulfate and reduces the possibilities of burning.

Some of the advantages claimed for Milorganite are that it does not burn the turf and may be applied with safety under all conditions; it is dry and ground sufficiently fine for even distribution; and is practically odorless and free from harmful bacteria.

More About Velvet Bent

The following letter from Mr. W. R. Hurd, 2nd, chairman of the green committee of the United Shoe Machinery Athletic Association, Beverly, Mass., will be of interest to those golfers to whom the growing of velvet bent is of importance:

"I have read the article in the August BULLETIN by Major R. Avery Jones regarding velvet bent and I thought it might interest you to know that the Kernwood Country Club of Salem, Mass., has been raising velvet bent for nine years.

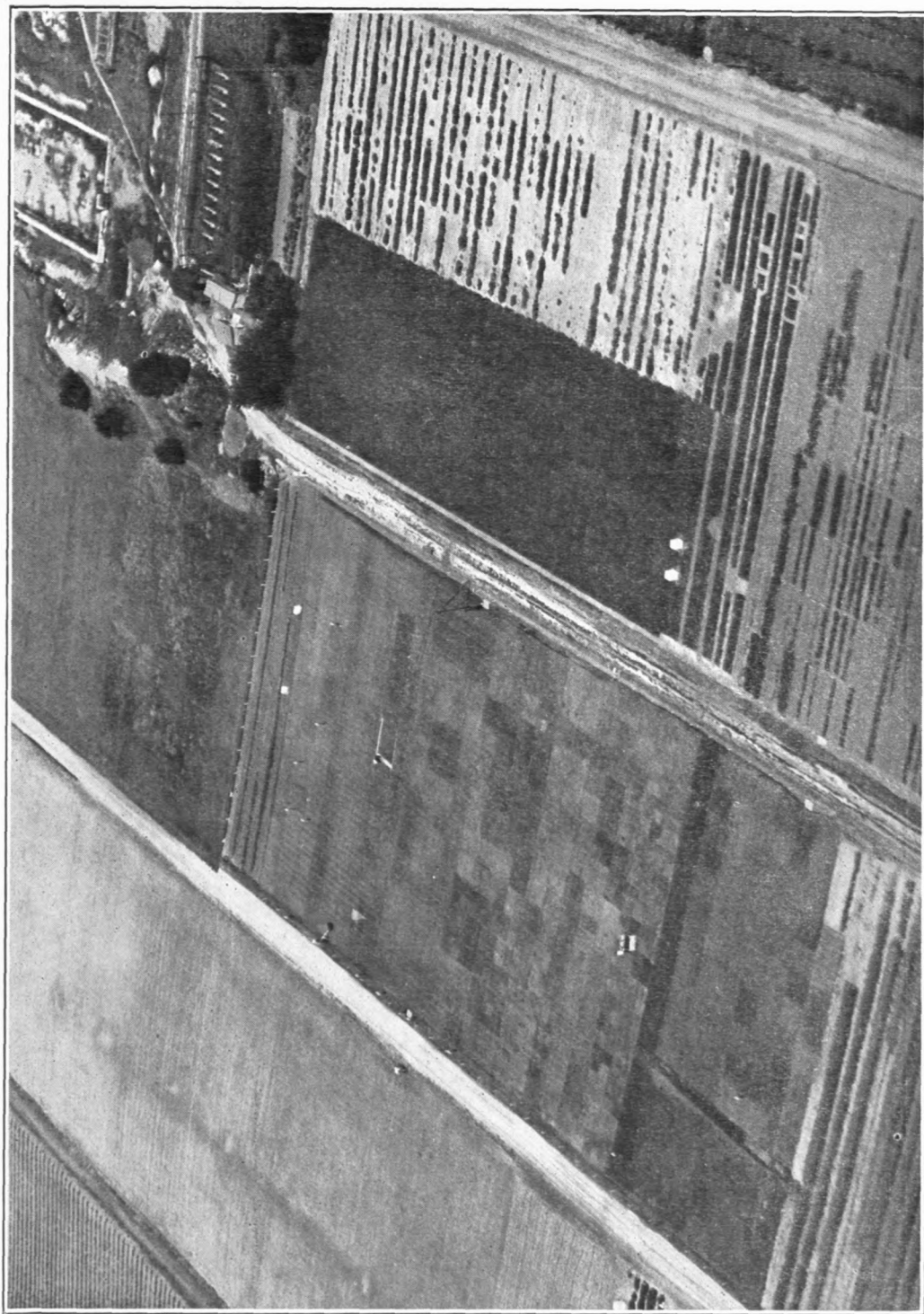
"The United Shoe Machinery Athletic Association Golf Club at Beverly, Mass., has been raising this same velvet bent for two years, and so far we have never seen any brown patches in the sod beds. I wish to say that everything Major Jones has told of we can verify.

"We have one sod bed of velvet bent 150 ft. by 40 ft. which was planted the first of last August, and it is in wonderful shape. We have another sod bed planted the year before this which is about 20 ft. by 60 ft. We have taken turf or sod from the last bed, and used it on a number of our greens for over a year and are very much pleased with the turf. We have a very large mother bed of velvet bent and a large mother bed of Washington bent. We are gradually changing our tee sod over to Washington bent, using the stolon method of planting."

"There is no portion of a golf course which requires more care at the time of construction, and more attention later in the up-keep, than the area upon which most approaches to the hole will land."—The Links.

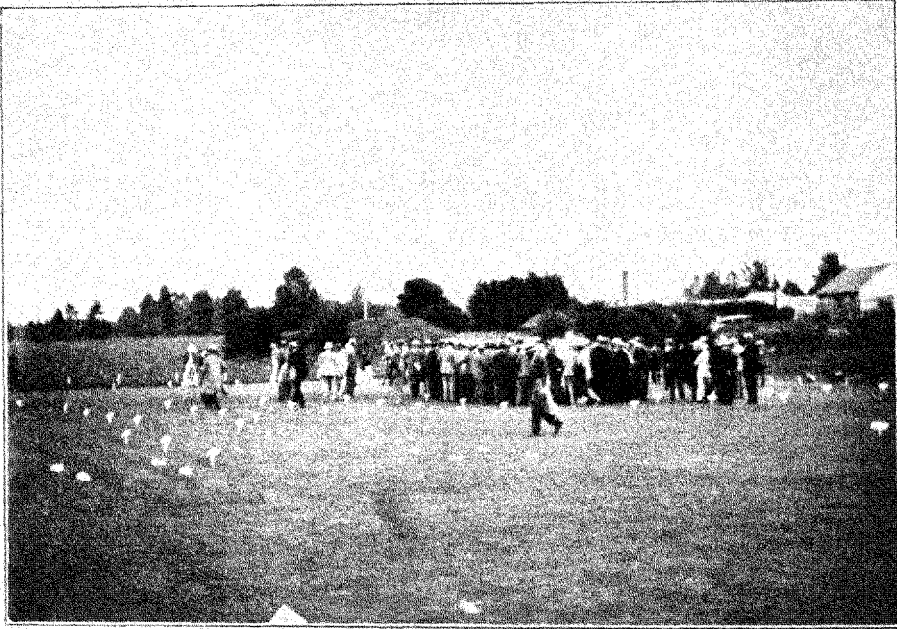
The Green Section Meeting in Washington

The Green Section meeting in Washington on August 29 was well attended, about 175 green committee chairmen and greenkeepers being present from almost every section of the country east of the Mississippi. The morning was spent in the examination and discussion of experiments at the Arlington Turf Garden. During the afternoon four local golf courses were visited where a variety of turf conditions and maintenance methods were noticed. After dinner an informal discussion was held concerning turf problems in general, which proved of so much interest that the meeting lasted until nearly midnight. This was the first field meeting sponsored by the Green Section.



(Courtesy of the U. S. Army Air Corps)

The Arlington Turf Garden from the air.



The Arlington Turf Garden as it appeared during the Green Section meeting.

Golf Clubs Owning Lakes Can Aid Waterfowl

By W. L. McAtee

The migratory waterfowl of the United States including the wild ducks and geese so much sought by sportsmen need every help that can be extended to them to insure their perpetuation. Drainage projects have so reduced and so continue to reduce the area of water available to them that every suitable bit of permanent water should be protected and improved either as a resting, feeding, or breeding place for wildfowl.

The presence of these birds enhances the attractiveness and value of a body of water so that attracting them is not without its rewards. Wildfowl will visit unbelievably tiny pools where they enjoy perfect protection, for instance, the writer saw them dropping into fountain basins on the grounds of the Pan-Pacific Exposition at San Francisco while the buildings were still under construction by an army of artisans; and they come into park pools in the midst of great cities.

Ordinary water hazards on golf courses may be too small or too disturbed to attract these birds, but some golf courses include larger ponds, or are laid out along the shore of lakes or other bodies of water over which the club exercises control. In such cases effective steps to help the waterfowl can be taken, and at the same time a splendid resource for entertainment of the members provided. The Biological Survey, U. S. Department of Agriculture, distributes publications giving recommendations for attracting waterfowl and it will be very glad to hear from and to advise any golf clubs that are in position to protect and improve bodies of water as refuges for wildfowl.

Golf Course Architecture and Construction

Designing the Course—Part II

By William S. Flynn

In staking the preliminary layout of the golf course on the ground the first thing the architect's engineer does is to locate the center of each tee, green and the angle, if there happens to be one, on the various holes. The staking is done so that the architect may check up and revise any particular site where necessary.

The stakes should be high enough to be easily visible and each one should have a different colored piece of bunting tacked on—white for the tees, yellow for the angles and red for the greens. This color combination is not necessarily standard and sometimes in the absence of bunting, newspaper or absorbent cotton for that matter may be tied on so as to make the stakes visible from a distance.

In the case where holes are played through woodland it is necessary to cut a sighting gap approximately three feet wide. This not only provides visibility but also makes it much easier to walk along the line of play and study the varying condition of the terrain.

When the preliminary staking has been completed the architect starts out with his engineer, beginning at the first hole and making a complete study of the course. It is wise in making this study for the engineer to accompany him because in this way there is very little chance of making mistakes in the construction later on. With the engineer along, it is possible for the architect to secure a great deal of valuable help in finally determining the exact location of tees and greens. The engineer is also of great help in discussing conditions involving engineering problems as they arise and which can be disposed of before the final plans for the layout have been completed.

It often happens that swinging a hole slightly to the right or left eliminates the necessity of drilling and excavating rock. Serious drainage conditions may be obviated by the slight shifting of a green or tee.

It is unwise for an architect to attempt to finally decide the locations of his holes without the help of an engineer.

Many architects may have engineering training but so many details come up in the designing of a course that have a bearing on the subsequent construction that it is very easy for one man to miss what two might find.

It often happens that a layout planned on paper does not exactly stake out where the architect thought it would and it is necessary to make a very careful check of the site for greens and tees.

It might also be that moving a tee slightly to the right or left precludes the necessity of taking out some beautiful tree. This also applies to green sites. Sometimes a slight change in the alignment of the hole permits the architect to keep a specimen tree or trees which also may act as a key or turning point in the hole.

In making minor revisions as outlined above it does not necessarily follow that the character of the course is in any way changed. As a matter of fact it generally improves the layout.

While the five foot contour map discussed in the previous article is invaluable in connection with the design of the course it is necessary to have a really close survey of the green sites.

It is hard to tell by the eye just how much slope there is to the ground and one of the most difficult things to do is to attempt to judge accurately when the grade is slight in any direction. It often happens that the ground looks as if it were running away when it is actually pitching forward.

In connection with the design of greens it is very desirable to have a close survey or cross section of each green site, say 100 feet square, showing one-foot contours. With this type of survey the architect can then design a green that will fit into its particular location, making it blend with the surroundings and presenting a natural effect.

It is also possible after the design of a green has been completed for the engineer to determine fairly accurately how much material must be moved to construct it and the cost.

There has been in the past considerable copying in the designs of greens. The custom has been to select so-called famous holes from abroad and attempt to adapt them to a particular hole. While it is a simple matter to copy a design it is almost impossible to turn out a green that resembles the original. This is not due to any technical reason but is on account of the surroundings being different from the original.

Copying greens in detail is not generally a good plan but there should be no hesitation about copying the principal connected with any green particularly when it is good.

It has often been said that architects have designs for 18 greens and that the same ones are used over and over again on the various layouts.

A successful architect of today does not follow that system. His greens are born on the ground and made to fit each particular hole.

In constantly designing greens it is very easy for an architect to acquire a pet type and to apply this frequently, thus creating greens of great similarity. A tremendous amount of study must be given each site on the ground and also on paper so as to get distinctive types, thus avoiding sameness.

The length of the shot to the green as well as the bunkering scheme of the hole must be considered in the design of each green. A green receiving a long iron shot should not have the same gradient or be of the same size as a green receiving a mashie, niblic or a brassie shot. Care must be taken so that in the main body of the green there shall be sufficient cup space, a very important consideration when the wear and tear of the green is considered as limited cup area increases wear.

The tendency in the past ten years has been to bank up greens to a greater degree than is really necessary. While holes with long second shots whether iron or wood should have a reasonable amount of rise, yet the value of being able to apply stop or under spin to a shot is entirely lost when such a condition prevails with a mashie or mashie niblic to the green.

The advent of vegetatively planted creeping bent in a measure checked this condition. This is due to the fact that the bent creates a more uniform surface and mowers have been improved, thus giving us a faster green or one that is in tournament condition all the time rather than, as in the past, merely during the running of a competition.

Steep slopes are out of the question particularly in the main body of a vegetatively planted green. In the old days the mixed seed greens were cut down real close only when an important tournament was being played. At that time the word "slippery" was often used in connection with a description of the greens. If we still keep steep slopes with our vegetative greens we will keep on hearing the expression "slippery."

The maximum gradient of the main putting surface of any green should be not more than one foot in thirty-five. There can, however, be slopes greater than this gradient on a green particularly where a roll blends into the putting surface or a mound perhaps built at the back or side of a green sweeps in naturally.

While the maximum gradient of a green should receive due consideration the minimum gradient should also be taken into account. It is necessary in designing greens to consider the rainfall and care should be taken that the slopes of the surface are sufficient to get a quick run off. In fact the water should be carried off at several points and the minimum gradient in this respect should be not less than one foot in fifty.

The most important consideration in conjunction with the designing of a green is to create naturalness. Of course this condition can only be brought about as construction progresses, but the frame work must be right in the beginning. Naturalness should apply on all construction on golf courses, greens, tees, mounds and bunkers alike. It is much more expensive to construct a natural looking golf course on account of the tremendous amount of material that must be moved, but the money saved in the subsequent maintenance greatly offsets the original cost.

In designing greens the architect not only makes a close-up study of the green sites but also studies from a distance, that is from the spot where the shot to the green is supposed to be played. Having visibility of the green surface from this point is one of the most important considerations in the design of a golf course. The drive, with the exception of the carry or accuracy required is practically similar on each hole and securing visibility of the area played to is not nearly as important as securing visibility for the shot to the green on any type hole. The green is the final objective and how can a man reach the objective satisfactorily if he can not see it?

It naturally follows that any bunker construction in conjunction with the greens should also be visible.

However, it is not always possible to have visibility of every green but the hole that does not have a visible green should have some other feature or indicator which tells the player where to go to get the best results. Visibility in the shot to the green is much to be desired and a little more time spent in modifying the layout may perhaps bring about the result desired and increase the pleasure in the play of the course.

The design for bunkering the course is tremendously important and the architect should spend a great deal of time going over the various holes determining the exact location of his fairway bunkers.

It is important in locating fairway bunkers to place them in positions where they also are visible.

A concealed bunker has no place on a golf course because when

it is concealed it does not register on the player's mind as he is about to play the shot and thus loses its value. The best looking bunkers are those that are gouged out of faces or slopes, particularly when the slope faces the player. They are very much more effective in that they stand out like sentinels beckoning the player to come on or keep to the right or left.

A very important consideration in the design of bunkers is to make each one surface drain. In flat country this condition can be secured by building them above the surface of the surrounding terrain.

It is not wise to attempt to design a complete bunkering system for the course in the beginning but the frame work bunkering plan can be worked out and as the course is played a complete scheme developed more satisfactorily and to better advantage.

The placing of the tees requires considerable thought and they also should be designed to fit in and blend with the landscape.

The topography of the ground should have a bearing in the outlining of the fairways, they being designed with the idea of producing character rather than the commonplace straight line effect of a decade ago. A curving line whether it be a road or the outline of a fairway is much more attractive than the straight line.

After a complete study of the whole course in the preliminary layout the architect takes his plan again back to his office or drafting room to make his final general layout plan.

The notes and changes that he has made in the original are transcribed to a new plan which is final in so far as a paper plan can be. From this general plan he makes individual hole plans on cross section paper. This is done to simplify the work of the constructing engineer and to indicate just how each is to be treated, instructions being written on same for the foreman's use.

The superintendent of construction may divide his work among his foremen giving each the plans of the particular holes on which he is to work. The detail plan can be very readily explained to the foreman and is not cumbersome to handle in the field.

In conjunction with the plans the architect must prepare specifications for the construction of the course. While the specifications for golf course construction are generally similar, yet, there are seldom two courses alike and the architect must consider any peculiarities that may occur in a particular course and take care of them accordingly.

Although the architect has spent a great deal of time and study in the preparing of the plans only the frame work has been finished. The ultimate character of the course must be developed as the construction progresses.

"Skilful golfers should be able to control their shots, and few of them resent punishment when they fail to do so; but high handicap players and older men playing indifferent golf are punished quite enough by their own incompetence without having to suffer additional penalties. The fewer the better of those hazards which simply levy fines on bad shots."—The Links.

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

A was playing in a foursome qualifying for a cup, medal score to count; but was also playing a foursome match game at the same time. On the 15th hole A lost his ball in the rough. He then dropped a ball taking no penalty and played three or four strokes getting out of the rough towards the green. A then realized that he was qualifying medal play and went back to the tee and played the hole over, taking a penalty of stroke and distance. The other players contend that under local rules governing match play A could drop a ball without penalty but that after he had played the ball he could not go back to the tee and play the hole over for his medal score, but was disqualified. A then claimed the strokes should be counted as practice strokes. The other players claim that there is a rule against practice shots being played towards a green during a match and also that A was disqualified after playing two or more shots with the second ball.

Decision.—Rule 22 states definitely and specifically the conditions covering Lost Ball. A did not comply with the Rules of Golf and therefore he is disqualified. There is no possible justification in his claim that the strokes should be counted as practice strokes. The Rules Committee wishes to point out that the Local Rule of your club, allowing the player to drop in Match Play when the ball is lost, without penalty, is entirely contrary to the rules as well as the spirit of the game of golf. The question as to the penalty of Lost Ball has been discussed many times and in equity to the players, Rule 22 has been decided to cover the point thoroughly and we see no occasion for having a Local Rule that is in violation of this Rule.

A and B are playing C and D in a four-ball match. A is in a sand trap just off the putting green but within twenty yards of the cup. C's ball, his opponent, is on the putting green but farther away from the cup than that of A, but C's ball is within twenty yards of the cup. Which should play first A or C? A claims that the man farthest from the hole should play first whenever he is in any kind of a match. Is he right or wrong?

Decision.—Rule 7 states "that the ball farthest from the hole shall be played first"; therefore C, being farther away from the cup than A must play first in any kind of a match. The exception to this is Rule 1 under Rules for Three Ball, Best Ball and Four Ball Matches. In this case, if any ball lie in such a position as to interfere with the player, he may ask the owner of this ball to either lift or putt at the option of the owner.

A, B, C, D, are playing a match. A teed his ball and took a swing that differed in no way from his accustomed swing. His club hit the ball on the toe and knocked it some ten or twenty feet at right angles off the tee. A then stated the swing was a practice swing, thereupon the other members of the foursome told him to retrieve his ball and take his drive from the tee without penalty. B then stated that, according to the rules, A had a right to do so. C demurred, claiming he did so entirely at the sufferance and with the permission of the foursome and not by any right or privilege contained within the rules. Had A the right to retee his ball without penalty?

Decision.—The entire point in this question is whether A's intent

was to make a stroke when he knocked the ball off the tee. A player must know if he means to play a shot or not, and there is nothing in the rules to prove the intent; it is a question of fact that the player must decide. See definition 13 and Rule 2, paragraph 1. One of the fundamentals of golf is that no player wilfully takes an unfair advantage of his opponent.

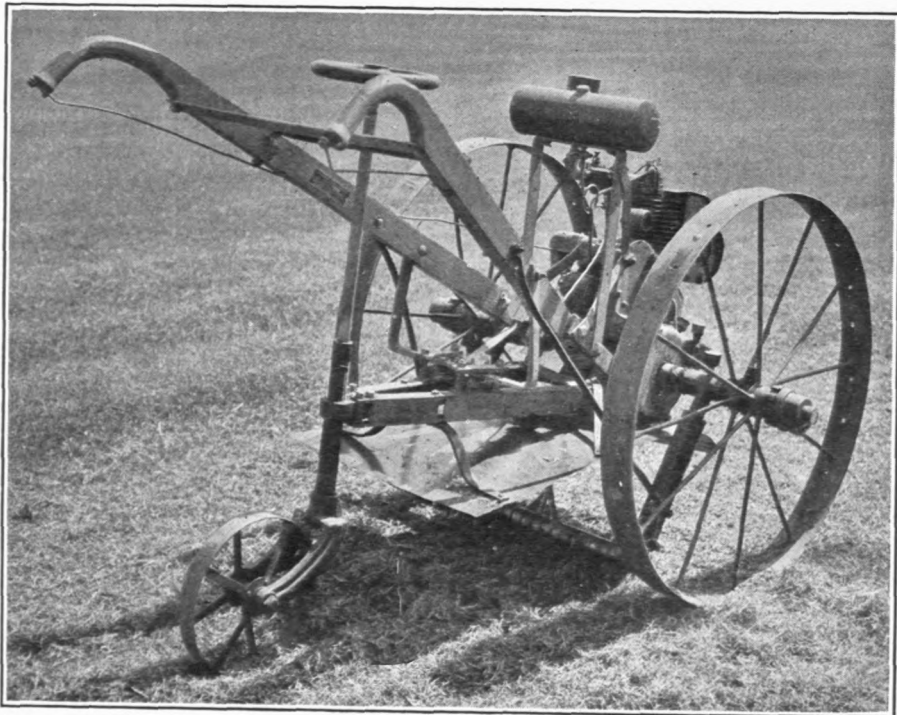
During a golf match when one of the players' ball is lost is it permissible for anyone in the gallery to assist in finding the ball?

Decision.—There is no rule prohibiting anyone in the gallery to assist the players in finding golf balls.

What penalty is incurred by a caddie getting into a trap with the player? This rule has come up for ruling in several matches and no one seems to be positive on it.

Decision.—There is no rule in the game of golf that penalizes a player for allowing his caddie to get in the trap with him. The practice should not be allowed as the caddie might in some way improve the lie of the ball or give the player information as to the consistency of the soil, which would be in violation of Rule 25.

“The climax of golf is at the hole, and the moulding and care of the entrance to the green is of no less importance than of the green itself.”—The Links.



A new Bermuda grass renovating machine which undercuts the turf, bringing the runners to the surface. The knives are adjustable so the soil can be penetrated to any desired depth up to three-quarters of an inch

Turf Grass Experiments in Kansas

By J. W. Zahnley, Assoc. Prof. of Farm Crops

Three years ago this month the United States Golf Association through the chairman of the Green Section, Dr. Chas. V. Piper, started a series of experiments relating to turf grasses in cooperation with the Kansas Agriculture Experiment Station. Dr. R. A. Oakley and Mr. H. L. Westover of the U. S. Department of Agriculture have kept in close touch with the work. It is through the financial support of the Green Section and the advice and help of its chairmen, Messrs. R. A. Oakley and H. L. Westover, that the work has been made possible.

Kansas is located on the west edge of the section to which cultivated grasses are adapted. The extreme heat of Kansas summers, which is usually accompanied by more or less severe drought, is disastrous to most tame grasses. It is therefore difficult to maintain lawns or putting greens in good condition. Probably no greater problem confronts the golf clubs of this section than that of establishing and maintaining grasses on their courses. Especially is this true of the greens. Our limited knowledge of grasses for golf courses in this section makes experimentation along this line highly desirable.

The purpose of the experiments is threefold (1) to determine the adaptability of certain grasses, the bent grasses in particular for putting greens and for lawns in the region of Manhattan, Kans., (2) to ascertain the best cultural methods for establishing and maintaining turf of these grasses and (3) to observe the influence of various fertilizer treatments on the control of weeds and maintenance of the turf.

The experiments comprise eighty-one plats 10 feet square. Fifteen different grasses are being tested, consisting of Kentucky bluegrass, redbud, Chewings fescue, buffalo grass and eleven strains of bent grass. The Rhode Island bent, German mixed bent, and two strains of seaside bent were started from seed, the others being started from stolons.

The Washington and Metropolitan strains have produced the finest putting turf and at the same time have stood up better under rigid summer conditions than the others. The summer of 1926 was a severe test on all grasses in this section of Kansas. The total precipitation from January 1 to September 1 at Manhattan was only 12.12 inches while the normal for the same period is 23.47 inches. For the five months, April to August, inclusive, the total precipitation was 8.83 inches compared with a normal of 19.94. This latter period of extreme drought, accompanied also by periods of high temperatures and unusually high evaporation afforded a good opportunity to observe the relative summer hardness of the various grasses. Excellent turf was maintained on the Washington and the Metropolitan plats throughout the entire summer. The best of the other strains produced only indifferent turf and some suffered severely. The Columbia and Arlington strains produced an open turf and languished during the hot weather but recovered considerably as autumn approached with cooler days and higher humidity. The Virginia strain produced a turf of coarse texture which lacked the smoothness observed in the Metropolitan and Washington. The Ver-

mont strain withstood the hot weather but is more upright in growth and seemed to suffer somewhat from close mowing with the greensmower. The Acme velvet has suffered severely from hot weather every summer, becoming thin and patchy it produces an unsatisfactory turf. The mixed bents have held their own quite well but the turf is not so dense and even as that of the better strains of creeping bent. Kentucky bluegrass was almost completely destroyed where it was cut close with a greensmower. Apparently close clipping must be avoided in order to maintain a stand of bluegrass. It is therefore not suited to greens in this section. It has also been found practically impossible to keep white clover out of the bluegrass plats.

Chewings fescue has been the nearest approach to a complete failure of any of the grasses tested. It makes a good growth in the autumn and early spring but as soon as hot weather comes the plants begin to die and the stand becomes thinner and thinner until the entire area is only sparsely set with bunches evenly distributed but at some distance apart.

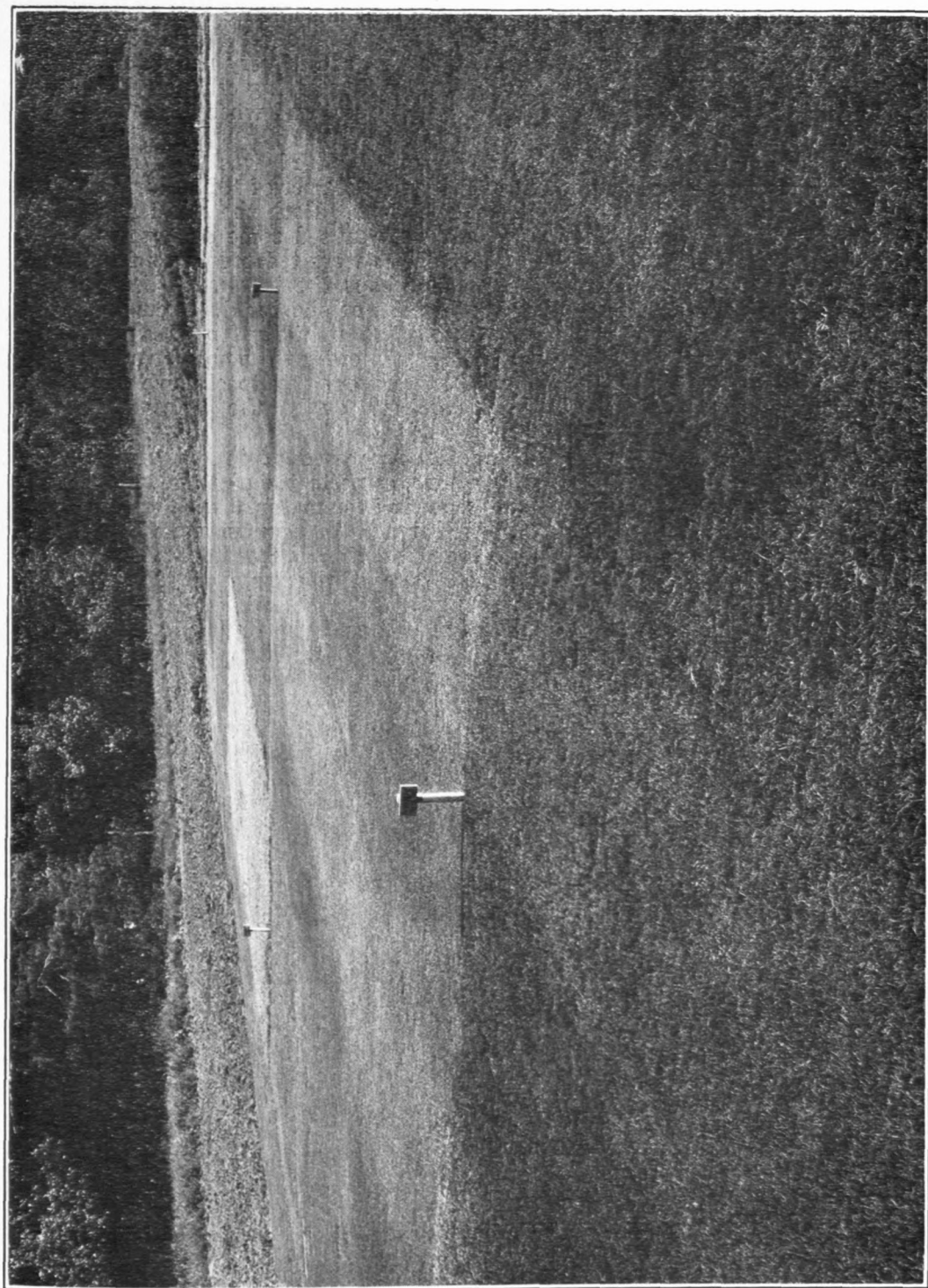
Some of the plats have been reseeded the third time and an excellent stand obtained from Chewings fescue. The seedlings start quickly when sown about September 1 and the grass looks extremely promising until about May of the following season when the plants begin to die. After repeated failures to maintain a stand this strain has been discarded and the plats planted to the better strains of creeping bent.

Buffalo grass is well adapted and requires little or no care to maintain the stand. Close mowing and topdressing have failed to make the turf dense enough for greens, so it is probable that it can be used to best advantage only on fairways in this section. Buffalo grass must be started from small pieces of sod but spreads rapidly if the weeds are kept out for a few weeks after planting. It does not compete well with weeds on fertile soil that is well supplied with moisture but will persist on dry uplands of central and western Kansas where tame grasses will not thrive. The purest stands of Buffalo grass are maintained without care under conditions which are unfavorable for the growth of weeds and other grasses.

The Country Club at Manhattan, Kans., has started a Buffalo grass nursery in which they propose to produce sufficient sod to plant a considerable portion of their fairways.

The fertilizer tests comprise 42 plots on which sodium nitrate, ammonium sulfate, uréa and compost are used. Four applications have been made each season at the rate of $6\frac{1}{4}$ pounds per 1,000 square feet for the ammonium sulfate and sodium nitrate. This is equivalent to approximately 1,080 pounds per acre annually of these fertilizers. The effect of all the nitrogenous fertilizers on the growth of the grass is very marked. Check plats receiving neither fertilizer nor compost are in bad condition; the ground is hard, the turf is thin and making little growth. None of the fertilizers have shown any effect in the control of weeds or white clover. Tests show that the soil on the ammonium sulfate plots is still rich in lime, indicating that heavier or more frequent applications of that fertilizer will be required to obtain an acid condition and aid in the control of weeds.

Very little difficulty with weeds has been experienced on creeping bent plats outside the fertilizer tests which received both compost and



A corner of the experimental plats at Manhattan, Kans. Metropolitan and Washington bent in the foreground. Buffalo grass in the left background and South German mixed bent at the right

ammonium sulfate. The turf of creeping bent is so dense that there is little opportunity for crab grass or other weeds to get a good foothold. The contrast with bluegrass in this regard is very noticeable. Bluegrass turf becomes open in midsummer thus giving crab grass a chance to start at the season when it thrives best and when the bluegrass is somewhat dormant.

Brown-patch was not observed when the turf was new and caused very little trouble in the extremely dry summer of 1926. During the past season it has been extremely serious. Both the small and large brown-patch appeared repeatedly and caused some damage to the turf of all varieties of bent. Some plats were treated every few days throughout the entire summer. Perhaps the treatments have been less effective than usual or the benefits of shorter duration because of unusually frequent showers and high humidity from May to September. Experience has taught us that in order to combat brown-patch successfully one must be on the job every day to observe the very first signs of an outbreak and to apply the treatment immediately.

During the dry weather when watering was done in late afternoon and evening birds, especially robins, came to the plats in great numbers, apparently in search of insects and for material with which to build their nests. The turf would often be torn up in spots producing a roughened surface. As many as 50 of these torn places were found on 100 square feet of turf. Most of the damage was done soon after dawn when robins would flock to the plats in great numbers and work industriously until the middle of the forenoon when it began to get hot, leaving the torn spots to suffer from the heat of the day. This trouble was largely overcome by watering earlier in the day so that the surface would be fairly dry before evening. No damage was done immediately following showers as the birds then seemed to go elsewhere for food and nest building material.

The experimental work in Kansas up to this time leads to the conclusion that the routine essentials in maintaining good putting turf in this section are close mowing, frequent, light watering, use of compost and fertilizers, and close attention to the control of the brown-patch disease.

“How often we see courses where the approaches have not only been overlooked by the architect, but also forgotten by the greenkeeper.”—The Links.

QUESTIONS AND ANSWERS

All questions sent to the Green Section will be answered in a letter to the writer as promptly as possible. 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 Section.

While most of the answers are of general application, please bear in mind that each recommendation is intended specifically for the locality designated at the end of the question.

1. Winter greens for the South.—We have always sowed Kentucky bluegrass on our Bermuda greens so as to furnish turf for winter playing. We find however that on certain other southern courses the regular Bermuda greens are not used during the winter but a temporary green is selected on the fairway and sown to a winter grass. Is it known definitely which of these is the better practice? (Georgia.)

ANSWER.—There is a good deal of difference of opinion in the matter you bring up. A winter grass sown on Bermuda greens, such as bluegrass, redtop, or Italian ryegrass, has a tendency to retard the recovery of the Bermuda in the spring. We are inclined to advise that where it is practicable to do so, temporary greens of winter grass be used.

2. Scum on turf.—I am sending you a sample of turf from one of our greens on which the grass has been killed by a slimy growth, which can still be noticed on the sample. This is a bent green. It was doing well until the middle of July, at which time some brown-patch appeared, but from which it recovered under treatment with ammonium sulfate and compost. Toward the end of August however these dark slimy patches began to appear, and have since covered the entire green. This green has received 15 pounds of ammonium sulfate once a month, with compost, and has been thoroughly watered twice a week during dry weather. (Ohio.)

ANSWER.—The scum on your sample is a fungous growth commonly referred to as algae, but the cause of which is not definitely known. It has been observed however that it usually appears on poorly drained soils and on putting greens which are over-watered, that is, on greens which have been soaked with water until they are in a soggy condition. We have found that daily moderate sprinkling of putting greens gives better results than soakings at longer intervals. In case you have no reason to suspect that the drainage of your green is defective, we would suggest as a remedy for the trouble that you scratch the surface of the soil lightly and then topdress with a compost consisting of about 50 percent sand, 25 percent rotted manure or other composted organic matter, and 25 percent loam. This topdressing should be brushed well into the turf and kept moderately sprinkled each day until the grass has recovered.

3. Late fall treatment of turf.—Do you advise fertilizing grass as late as October in this latitude? (New York.)

ANSWER.—Our practice in maintaining turf has always been to keep up our regular treatment as long as the grass grows, this including watering, cutting, and fertilizing if the stand is thin. After the growth of the grass ceases in the fall we do not find that it is necessary to give it any treatment. A light topdressing is however highly beneficial in early spring as soon as growth is resumed.

4. Pea and butter bean vines in compost.—We can secure quite a lot of pea and butter bean vines at no expense beyond that of hauling for a few miles. Would you advise us to use the vines in compost? (Delaware.)

ANSWER.—Yes, but they should be composted with a considerable quantity of loam in order to get a fairly compact mass which would hasten the decomposition of the vines.

Cleveland, Ohio, August 25, 1927.

United States Golf Association Green Section,
Washington, D. C.

Gentlemen :

In reference to *Poa annua* in putting greens.

We have two greens of bent of the Inverness strain. These two greens have been a great disappointment but have improved as *Poa annua* came in.

We have several old greens, seeded in 1921 with the good Lord knows what, but with considerable clover, and these also have improved as regards putting as they have been invaded with *Poa annua*.

At present we have six creeping bent greens of a good strain. We will have nine or ten more greens next year of the same strain of bent.

While *Poa annua* has improved the putting qualities of the old greens we do not think that they compare with the new greens. Therefore we are fighting out all *Poa annua* from the good bent greens.

What we do is cut it out with a hole cutter just as soon as we see it, and replace with a plug from the bent nursery. From thirty to fifty plugs are needed to keep a green clean of *Poa annua*, chickweed, etc., most of the plugs of course being used during the spring and early summer.

As we change our greens we are doing away with excessive grades, either by reshaping the green, or by moving the putting surface to a more level portion of the original green, many of the greens being a great deal larger than is necessary.

Yours truly,

SPENCER M. DUTY,
Chairman, Green Committee,
The Canterbury Golf Club.