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A MONTHLY PERIODICAL TO PROMOTE THE BETTERMENT OF GOLF COURSES

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The Vital Importance of Topdressing in the Maintenance of Satisfactory Creeping Bent Greens

By O. B. Fitts

As the subject of topdressing has been given considerable space in the BULLETIN from time to time it may appear to the older readers of the BULLETIN that this particular factor in greens maintenance is being overemphasized. Notwithstanding this, many complaints of unsatisfactory creeping bent greens are still being received, accompanied with descriptions of conditions which indicate the lack of proper topdressing. As there are many greenkeepers who this season are having their first experience with creeping bent greens, it is felt that the importance of topdressing can not, therefore, be overstressed at this time.

Every greenkeeper wants to keep his greens in the best possible condition. Every active green-committeeman appreciates the satisfaction which his club members derive from playing on turf of fine quality. It is our desire to help both the greenkeeper and the green-committeeman as much as possible toward achieving the very best in this respect, by passing on to them the information gained through our experimental work with turf grasses.

The results of the experimental work at the Arlington Turf Garden during the season of 1925 have furnished convincing evidence of the fact that topdressing is indispensable as an aid to the production of turf of good quality in the maintenance of creeping bent greens. One has only to see the difference in the quality of turf between the areas which were topdressed at the turf garden and the areas of the same grass which were not topdressed, to be thoroughly convinced of the importance of topdressing. Many who visit the garden observe this difference and are convinced. And being convinced that the turf on the areas which have been topdressed is far superior to that on the areas not topdressed, they almost invariably have certain questions which they desire answered. Usually the first question is, "How often do you topdress?" And this is followed by the inquiries, "With what material do you topdress?" "How much topdressing do you put on at one application?" "How do you apply it?" Asking questions is what we are particularly desirous of having our visitors do, as it then becomes an easy matter to explain the different phases of the work. Now, an answer to a question with the evidence before one is much more convincing than is a written answer. But, unfortunately, not all who are interested in greenkeeping are able to visit our plots; therefore this article is prepared in order to discuss certain features of topdressing for the benefit of readers of the BULLETIN to whom opportunity has not been afforded for discussing the matter in person.

TIMES WHEN IT IS NECESSARY TO TOPDRESS.—The results of experiments at the Arlington Turf Garden indicate that a very satisfactory frequency of applying topdressing is once a month during the growing season, which, in the northeastern quarter of the United States, corresponds to the period of approximately April 1 to October 1. Of course the frequency may be increased or decreased somewhat, as may be rendered necessary by prevailing conditions, without great variation in the results obtained. In our experience, however,

monthly applications have been very practical and satisfactory, and we feel that they should be adhered to as closely as practicable.

MATERIALS TO USE FOR TOPDRESSING.—For ordinary clay loam soil, a compost made up of equal parts of loam, sharp sand, and well-rotted stable manure or similar organic material, has been found to give very satisfactory results. These proportions should, however, vary according to the type of soil on which the compost is to be used. If it is to be used on sandy soil, the percentage of sand should be decreased and the percentage of loam increased. If it is to be used on soil rich in organic matter, the percentage of manure should be decreased and the percentage of loam increased. This compost dressing should be reinforced with ammonium sulfate or ammonium phosphate, as these stimulating fertilizers help to keep the grass in a vigorous condition.

RATE OF APPLICATION.—One cubic yard of compost, in which has been thoroughly mixed 10 to 25 pounds of ammonium sulfate or ammonium phosphate, is sufficient to dress 5,000 square feet of green, after the turf is established. In the early stages of a creeping bent green—that is, before the turf has attained a playable condition—it may be found necessary to make slightly heavier applications in order to get a smooth and firm surface more quickly. The amount of ammonium sulfate or ammonium phosphate should moreover be varied according to the season. In the cooler months of spring and fall 5 pounds per 1,000 square feet of green, or 25 pounds per cubic yard of compost, may be used; in the hot months of summer, however, the quantity should be reduced to about 2 pounds per 1,000 square feet, or 10 pounds per cubic yard of compost.

Fig. 1.—Spreading compost with a shovel and rubbing it into the turf with the back of a rake. Note the uniform distribution

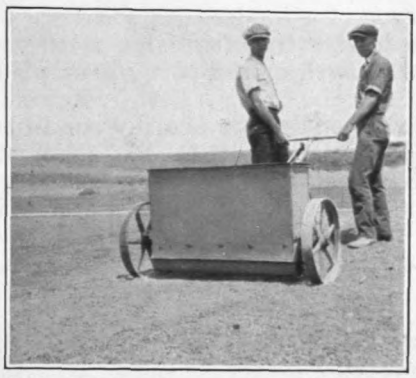


Fig. 2.—Spreading compost with a top-dressing machine. Satisfactory results are obtained by this method, with an accompanying economy in labor

METHODS OF APPLYING COMPOST.—There are two general methods in practice for dressing putting greens. Each is satisfactory as far as results are concerned. They are illustrated in Figures 1 and 2. Spreading the compost with a shovel by hand is a rather slow method; but if the man is onto his job he can make a very nice, uniform distribution of the material. The method of applying compost with the topdressing machine is more practical where large areas or a number of greens are to be dressed, as it is much faster than hand spreading. Regardless of the method used, it is necessary to follow the applica-

tion with brushing the compost down into the turf. For this purpose a number of devices have proved satisfactory. The compost may be rubbed in by the back of a rake, as shown in Figure 1, or it may be brushed in by the use of a flexible metal door-mat, shown in Figure 3, or by any other means that may prove satisfactory. Apart from the method employed for brushing the compost in, the important thing is that it must be brushed in well if satisfactory results are to be obtained.

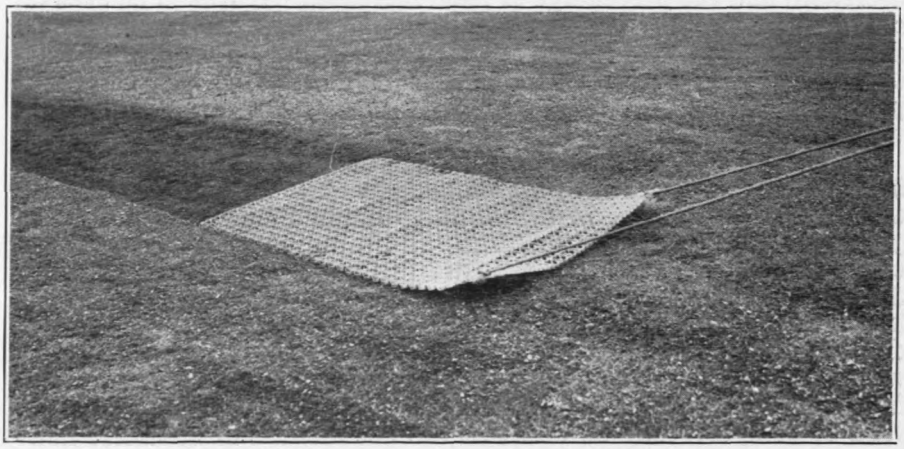


Fig. 3.—Brushing compost into turf with a flexible metal door-mat

WHY IT IS NECESSARY TO TOPDRESS GREENS.—There are many reasons for topdressing greens. It is necessary, in one sense, because the topdressing furnishes additional plant food, which is essential to the growth of the turf grasses. It is necessary, further, because it adds to the green a new lively surface of fresh soil, which is essential to the continuous healthy condition of the turf and which keeps the surface from getting too hard. It is necessary because it helps to fill up small depressions in the green, thereby making the surface smoother and more uniform. It is necessary, especially in the case of creeping bent greens, because it keeps the turf which is continu-

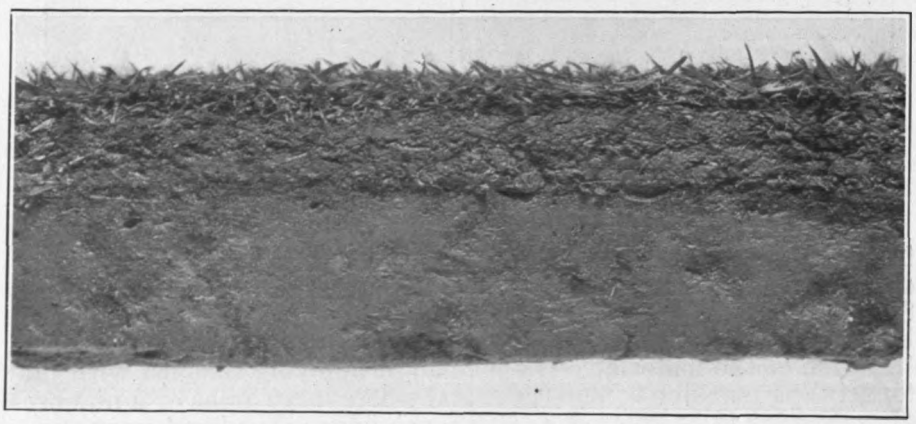


Fig. 4.—Cross-section of a piece of turf from a portion of a plot of Washington creeping bent at Arlington Turf Garden, which had been topdressed monthly during the season of 1925. Note the firm, true surface presented

ously accumulating above the surface of the soil filled and firm. If creeping bent is allowed to grow through the season without topdressing, a mat of loose, fluffy or spongy turf will develop, a condition about which many complaints have been received. On the other hand, if the greens are topdressed as suggested above and cut closely, the turf will be firm and true, simply because the compost serves to fill in the open spaces that occur between the stolons or

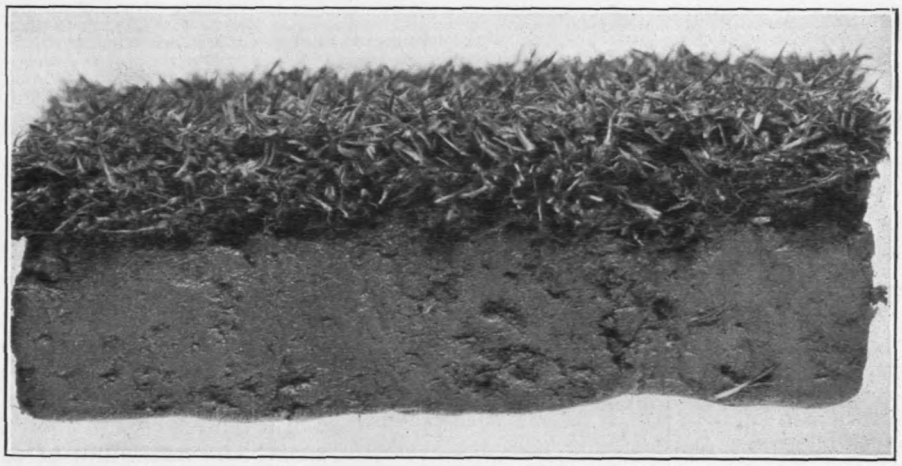


Fig. 5.—Cross-section of a piece of turf from another portion of the same plot which had not been topdressed during the season. The turf is loose and fluffy, impossible to cut satisfactorily, and undesirable for putting purposes

runners. This difference in results obtained is clearly illustrated in Figures 4 and 5. In both figures is shown turf of the same strain of creeping bent, given identical treatment in both cases except that the turf seen in Figure 4 was topdressed each month during the growing season and that in Figure 5 had not been topdressed during the season.

Bermuda Grass Experiences at Enid, Oklahoma

By H. L. Entriken, Enid Country Club

Last winter (1924-1925) the thermometer stood at 10 degrees below zero for a long spell and most of the Bermuda lawns in the city froze out.

As a precaution against freezing we covered seven of our Bermuda putting greens with wheat straw late in November and six with a topdressing mostly of soil. Those covered with straw withstood the freeze and remained green all winter under the straw; those covered with soil all had to be replanted in the spring. The straw was removed from the seven greens in spring, and the greens were then topdressed. They were ready for play weeks before any others in this part of the country and even farther south. We expect to cover all of our greens during the coming winter and to use the approaches for temporary greens.

Brown-patch attacked our Bermuda greens for the first time this year, but the greens recovered after a few applications of chloro-phenol mercury followed by topdressing. The new growth seems to be somewhat coarser, perhaps due to the stimulating influence of the chemical.

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 UNITED STATES GOLF ASSOCIATION, PUBLISHED MONTHLY, AT WASHINGTON, D. C., FOR OCTOBER 1, 1925:

District of Columbia, ss:

Before me, a notary public in and for the District of Columbia, personally appeared W. B. Lydenberg, 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 United States 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 United States Golf Association, Room 7213, S.W. corner Seventh & B sts. N.W., Washington, D. C. Editor and managing editor, C. V. Piper, P. O. Box 313, Washington, D. C. Business manager, W. B. Lydenberg, P. O. Box 313, Washington, D. C.

2. That the owners are the United States Golf Association, a mutual organization of golf clubs. President, W. D. Vanderpool, Newark, N. J.; vice-presidents, R. A. Gardner, Chicago, Ill., and W. C. Fownes, Jr., Pittsburgh, Pa.; secretary, H. H. Ramsey, 110 E. 42d St., New York City; treasurer, E. S. Moore, Roslyn, N. Y.

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

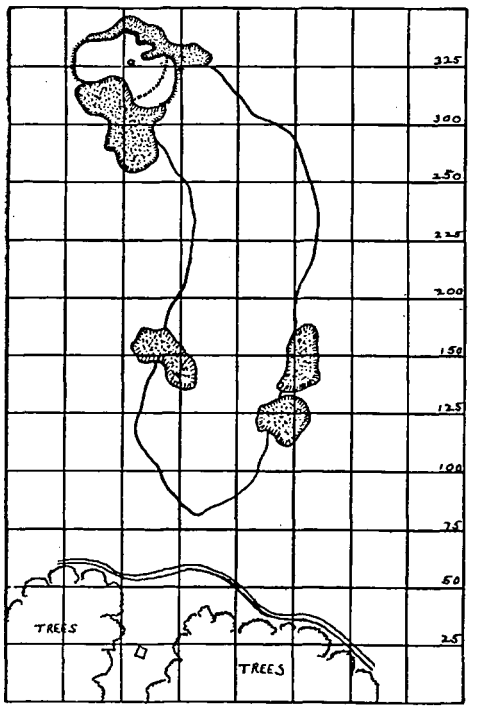
(Signed) W. B. LYDENBERG, *Business Manager.*

Sworn to and subscribed before me this 1st day of October, 1925.

(Signed) BERNARD CONNOR, *Notary Public.*

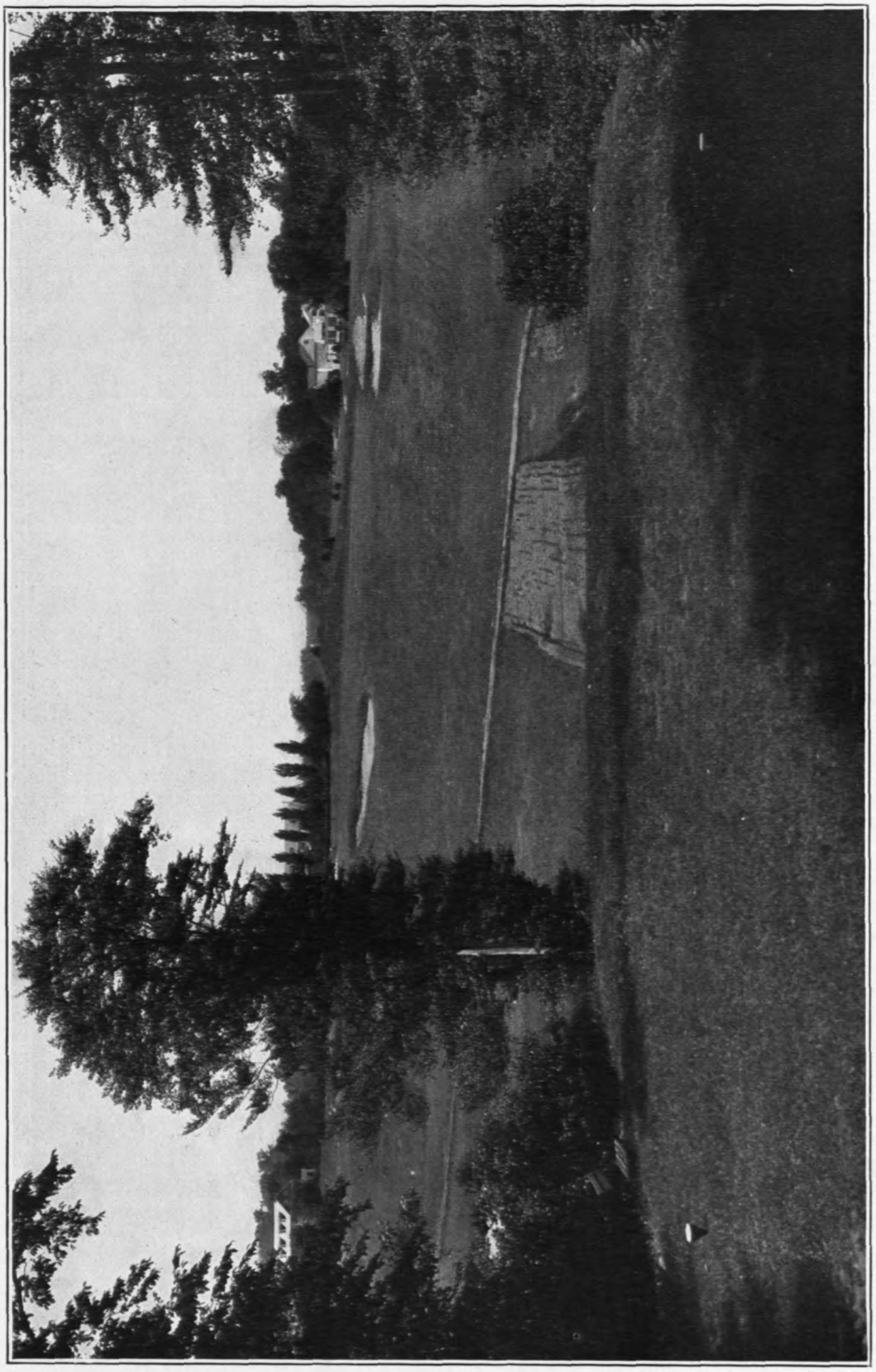
Instructive Golf Holes XVII

No. 10, Merion Cricket Club, East Course, Ardmore, Pa., Length, 335 Yards

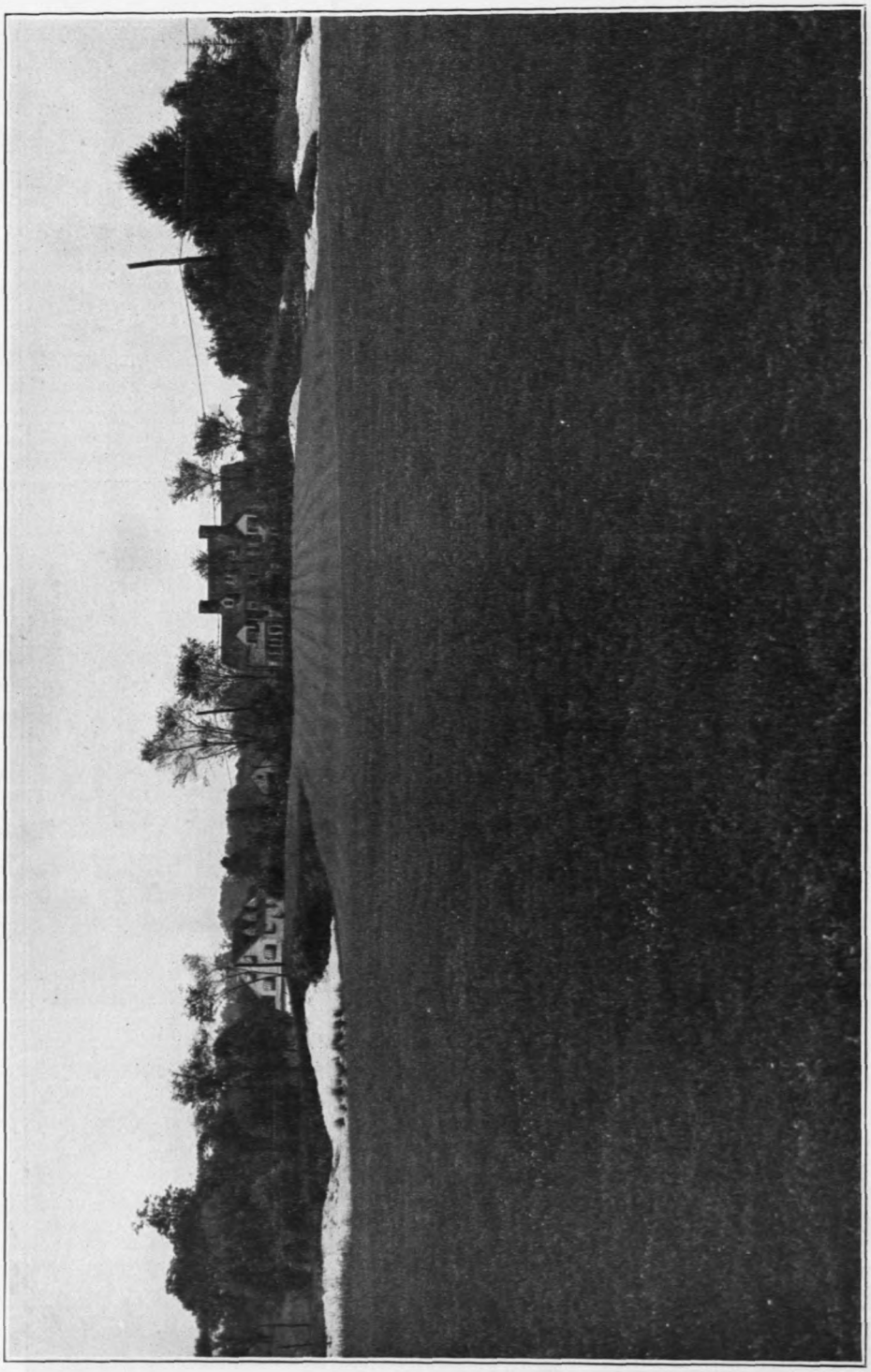


The maximum desirable length of a 1-shot hole is about 240 yards; the minimum of a straightaway drive-and-pitch hole is about 330 yards. Between these two lengths, namely 240 to 330 yards, the only desirable plan for utilizing the space is the adoption of a so-called cape type of hole. The principle involved in such a hole is a sharp elbow to the fairway at about the 225-yard point, a rather narrow putting sward, a large bunker in the elbow, and some sort of a hazard on the far side of the green. The player who drives 225 yards has an easy open approach to the putting sward; one whose drive is short has a possible but very difficult shot over the bunker in the angle to the green. This same bunker should make it impossible for a player to reach and hold the green with his tee shot.

Our illustrations show an excellent example of this type of hole, which should be represented on every golf course.



Hole No. 10, East Course, Merion Cricket Club. View from tee



Hole No. 10, East Course, Merion Cricket Club. Close-up view of putting green

Winter Treatment of Bermuda Greens

By C. G. Holland, Danville (Virginia) Golf Club

In the fall of 1924, by reason of the difference of opinion existing as to the advisability of sowing Italian ryegrass on Bermuda greens for winter play, we decided to test the problem out experimentally on our golf course. On our three best greens we sowed Italian ryegrass and played on them all winter. The other six greens, after the Bermuda grass became dormant, we covered, two of them with rotten cotton and four of them with sand. The covering of these six greens was suggested to us by the fact that the winter before on one of the greens we left two piles of topdressing and on another we left two piles of sand all winter and observed the following spring that where these piles had been the Bermuda grass came out earlier and thicker than it did on any other places on the greens.

We left the six greens covered until the grass began to come through in the spring. Some of these greens had a good stand of *Poa annua,* which would come up in the fall but, although serving as a fairly good winter grass, delayed the spread of the Bermuda in the spring, and to such extent that it would be the middle of summer before these greens would be in first-class shape. One object in covering these greens accordingly was to get rid of the *Poa annua,* which was accomplished.

In the spring when the Bermuda grass began to show signs of life, we raked off the covering, which was from 1 to 2 inches thick, smoothed up the surface with a steel mat, and with hardly a sprig of grass showing they looked like newly seeded areas. However, the Bermuda came through quickly and spread rapidly due to stimulation from ammonium sulfate, and by the first of May the greens were in as good shape as that in which during previous years they had been by the middle of July. Not having much rain, we could not use as much ammonium sulfate as otherwise we should have used.

This being our first experience in using ammonium sulfate, we burned several spots in two of the greens, but these were soon covered over again, and in spite of the fact that we have no means of watering our greens and we did not have an inch of rainfall from the middle of May until the first of September, our greens were above the average in quality in our section and not surpassed by any.

With regard to the three greens on which we sowed Italian ryegrass and on which we played all winter, although they were our three best greens the year before, they were our poorest greens this year, due to the fact that the Italian ryegrass and the *Poa annua* prevented early spreading of the Bermuda. When the drought came in the middle of May the Italian ryegrass and *Poa annua* died out, leaving the Bermuda very thin and the greens entirely bare in spots. As we have no water on our greens, this condition remained until about the first of October, and with the October rains they still have not become as good as they were the year before.

Our plans now are to cover our greens every year after Christmas with sand from 1 to 2 inches deep, and uncover them about the first of the following April.

When we covered our six greens our players protested vigorously, wanting to play on all nine of the greens throughout the winter.

After seeing the results of covering the greens last winter, however, they have surrendered to the idea and want all the greens covered this winter.

Another result of covering the greens was that we practically eliminated all weed trouble, as the covering kept the weeds in check until the growing season for the Bermuda grass. Heretofore every spring we have had to hire extra help to weed the greens; but this year such was not necessary, and our greens have been practically free from crab grass, which has given us considerable trouble during previous seasons.

This fall we have topdressed and sown spots on the fairways to Italian ryegrass for use as winter greens during January, February, March, and part of April.

We therefore feel that any club having Bermuda greens and lying in the northern part of the Bermuda belt will find it advisable not to sow any winter grass on the greens, but to smother out all the other grasses by covering the greens with sand about the first of January and uncovering them when the Bermuda shows signs of growth about the first of April. The players will probably kick the first year; but when they will see the results in the spring and summer following they will be more than satisfied.

Ammonium sulfate and compost.—Through error the proportioning of compost and ammonium sulfate was given on page 213 of the September, 1925, BULLETIN in the answer to question 5 as "15 to 25 pounds of the former to 1 cubic yard of the latter." This should have read, "15 to 25 pounds of ammonium sulfate to 1 cubic yard of compost."

Fertilizing Bermuda Grass With Ammonium Sulfate

By Thomas P. Hinman, Druid Hills Golf Club, Atlanta, Ga.

In the early spring of 1925 we began to use ammonium sulfate exclusively as the fertilizer for our greens of Bermuda grass at the Druid Hills Golf Club. The past summer has been unusually dry with us, and at the present time (October, 1925), we are about 20 inches short of normal rainfall for the year; as a consequence, the conditions have not been really favorable for our fairways during the entire summer, and we have had to use winter rules. In the whole history of Atlanta we have not had such unfavorable weather conditions to contend with. In spite of this, however, we have had the most beautiful greens in the history of the Club. This has been due entirely, I believe, to the use of ammonium sulfate.

In using ammonium sulfate we mix it carefully with the topdressing, thus obtaining a rather even spread of the fertilizer and preventing burning. The fertilizer has been applied at the rate of about 8 pounds to each green, about every 5 weeks, mixed with the topdressing. The greens have been constantly watered, and always watered immediately after the application of the topdressing and fertilizer. Heretofore we have used the "starvation" method in handling our Bermuda greens (that is, no watering other than that obtained from the natural rainfall, and very little fertilizing); but

I am now firmly convinced that Bermuda should receive both nutriment and plenty of water. A number of our greens are comparable to good bent greens. I believe that the use of ammonium sulfate has done more for our Bermuda greens than anything else.

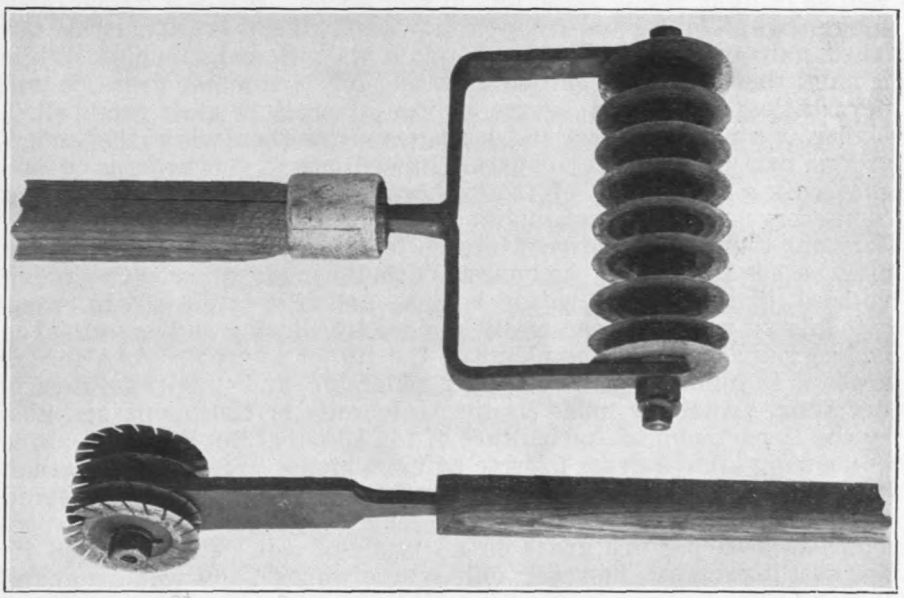
It is interesting also that not one of the 18 greens has a single bit of foreign grass, and no weeds; and yet the grass has not been picked since we have been using ammonium sulfate.

With regard to the best time of day for watering greens, we have watered them in the morning, midday, afternoon, and night, and can see absolutely no difference in the results.

Weed Killing Instrument

By W. R. Hurd, 2d, United Shoe Machinery Athletic Association, Beverly, Mass.

We have had considerable success for over a year now in ridding our greens of clover, chickweed, dandelions, crab grass, and similar weeds by the use of an instrument with rotary cutting disks shown in the accompanying illustration. The instrument is made at our factory. The disks are made from discarded metal, and are mounted on a spindle on which they rotate, with a bushing made from gas pipe between each disk to hold it in position. The diameter of the cutting



Disking tools for killing weeds

disk is 2½ inches. The disks are set about ¼ inch apart on the shaft. By running the instrument over the weeds in several different directions they are cut so they are killed, and without injury to the grass. During the crab grass season we use this on the greens in the areas that are infested with crab grass, before the seed heads have had a chance to ripen, and then go over the spots with a greens sweeper to gather up the cut seed heads.

Kikuyu Grass

By E. S. Garner, La Cumbre Golf and Country Club, Santa Barbara, Calif.

Kikuyu grass (*Pennisetum clandestinum*)[1] is a strong, creeping perennial grass, a native of Uganda, Africa. It was first introduced by the United States Department of Agriculture in 1915, and tested in California in 1916 at several places. In January, 1920, however, Dr. P. B. Kennedy, of the University of California, secured a small quantity of the grass direct from the University of Pretoria, shipped in a small tin tube. When this was received by Dr. Kennedy, six weeks after it had been shipped, he found, to quote from his report, that "New roots had formed a matted growth, and leafy shoots several inches long were present. These were planted in the greenhouse and grew readily." From that time on kikuyu grass has never ceased to "grow readily"; and though it has never been known to produce seed, relying for its increase entirely on vegetative propagation, it is no exaggeration to say that there is now sufficient material available to supply every community in the state with at least a little. Already reports from various sections of California indicate that kikuyu grass finds itself in a congenial atmosphere. That it is far from exacting in its requirements is evident, since it has been found to do well under both dry, semi-desert condition, and in flooded, swampy places, as well as in light, sandy loam, and in stiff adobe. It is also remarkably tolerant of alkali. In one respect, however, kikuyu grass must be satisfied, namely, in that it needs abundant warmth and sunshine. While it must therefore be regarded as essentially a summer grass, it will nevertheless weather a severe winter after it is once established. Under winter conditions the leafage may wither while the underground part of the plant survives. In such places, however, as experience only a few nights of frost, there will be little effect beyond a temporary browning and, unlike Bermuda grass, it will not remain dormant during the entire winter. In other respects kikuyu grass may be advantageously compared with Bermuda grass. Producing no seed, it can be kept within bounds, and if it is desired to eradicate kikuyu grass this can easily be done by plowing and exposing the underground parts of the plants to the sun or to frost. As a forage grass it is infinitely more luscious, palatable, and nutritious than is Bermuda. Analyses made by the University of California and also by the Department of Agriculture of the Union of South Africa agree in showing kikuyu grass to have an even higher protein-content than has alfalfa. As kikuyu is eminently adapted also to withstand trampling and grazing by stock it seems that it has very great possibilities as a pasture grass on all types of soil. It will attain its greatest luxuriance, however, only where warmth and water go hand in hand. Its full range of adaptability is yet to be determined, but it appears likely that it will flourish throughout the warmer parts of California wherever occasional summer irrigation is possible.

Experiments have recently been made to determine whether kikuyu grass may be of value on golf courses in the regions to which it is adapted. It seems that as a fairway grass it probably will not

[1] Kikuyu grass, on the basis of numerous tests, will survive the winter only in Florida, along the Gulf coast, in southern Texas, and in the warmer parts of Arizona and California. It is moreover distinctly a rich-land grass, and is unsatisfactory for poor sandy soils.—Editors.

be as great a success as was hoped, for though it will produce a very dense and brilliant carpet of turf it has a tendency gradually to thicken and "push up" until, in the case of kikuyu, the mat of grass may become quite four inches thick. While a perfect "lie" for the ball may be provided, the turf is too soft for a firm stance. Another disadvantage is, that on alighting the ball is so effectively cushioned that practically no roll is obtained. It would seem that even with the most assiduous mowing it would be impossible to counteract this tendency to form a thick mat; but however undesirable this may be for fairways, no such consideration can be advanced regarding kikuyu as a grass for the rough, for which purpose it is most excellent. For bunkers, unsightly banks, ditches, and all such places as are liable to erosion, kikuyu grass is likewise most excellent. The luxuriance which it attains on unweathered subsoil, whether sand or clay, is most remarkable, though ample water will be required until it has become established.

In short, kikuyu is a great grass if grown in the right place. Since it bears no seed, there is really no reason why it should be grown in any other than the right place; there need be no fear of its ever "getting into the greens"—no more fear, that is, than cabbages "getting in."

A Three-Year Record of Unit Costs in Course Maintenance

By Guy C. West, Superintendent, Fall River Country Club

By "unit costs" I mean separate records of costs involved in the various elements in course maintenance, such as greens, fairways, rough, tools and equipment, turf nursery, and others, as listed in detail in the following table. A record of unit costs is the best record for comparative purposes. In my article beginning on page 286 of the BULLETIN, Vol. II (1922), October, I outlined a system of unit-cost analysis, and after adhering to that system for the past three years I am able to present its results to the readers of the BULLETIN.

In the following table is shown, for the three years, the cost percentage for the various units:

Unit	1922-23	1923-24	1924-25
	%	%	%
Compost piles	3.0	5.5	2.4
Fairways	29.9	18.3	11.6
Greens	33.1	35.8	33.1
Rough	9.7	9.6	8.6
Stable	3.4	4.9	5.8
Tees	9.4	12.4	12.5
Tools and equipment	4.2	5.8	7.2
Traps and bunkers	5.5	6.7	14.3
Turf nursery	1.1	.5	1.8
All others	.7	.5	2.7
	100.0	100.0	100.0

The cause of unit costs differing materially from year to year under any one item should be readily explainable. Unless there is some known cause to explain an increase in the unit cost of any item, investigation should be begun with a view to determining the cause and taking steps to lower the cost the following year. For example,

my unit costs for maintenance of fairways, or *Fairways, Care,* as I head my item, the unit in this case being an acre of fairway, dropped from $35.65 in 1922-23 to $22.93 in 1923-24 and $23.62 in 1924-25. The decrease in cost was due chiefly to the purchase of new equipment for mowing and to some extent to other factors of relatively minor importance.

Among unit costs of interest which I have thus obtained are the following:

Cost per cubic yard of compost built, 1923-24, 89½c.

Cost per tee maintenance: 1923-24, $25.73; 1924-25, $27.57.

Cost per trap maintenance: 1923-24, $16.21; 1924-25, $13.54.

Cost per square foot of green maintenance: 1923-24, $0.0264; 1924-25, $0.0248.

Keen insight is obtained into the work of the year from cost analysis figures; and when one has figures for a course for several consecutive years, much of interest can thus be found. As a result of keeping these figures for over three years, I feel certain that the information gained is well worth the comparatively small amount of time needed for the work involved. Reports, easily prepared from the figures obtained, give the greens committee a good idea of how the work is progressing and how the money is spent, and are certain to result in closer cooperation and better harmony between the greenkeeper and his greens committee.

If you know something good, tell others about it.—That is the only way to put greenkeeping on a scientific basis. Science grows with disseminating knowledge, not secreting it.

The editors of the BULLETIN will be glad to publish in its pages instructive and helpful items pertaining to greenkeeping. Contributions from greenkeepers or members of green committees are always welcome. Run through the back pages of the BULLETIN and see how many helpful suggestions you can find contributed by others. Then do your own share in helping others who have not had the benefit of your experience. Photographs of new and useful implements, or of instructive features on golf courses, are also of great value to others.

Brown-Patch Control Resulting From Early-Morning Work on Greens

By Al. Schardt, Wanakah Country Club, Hamburg, N. Y.

Our course, of 18 holes, is within 600 yards of a lake, and is thus subjected to a heavy dew all summer, and to an abundance of worm casts in the mornings. To remove the dew and the worm casts so the greens can be cut it is necessary each morning first to sweep some of them with a bamboo pole. Of course this work can not be done on all of the greens at the same time, as they must be taken in rotation. The surprising thing in connection with this feature of our work during the past two summers is that the greens which were swept and worked on first in the morning when covered with dew had no signs of brown-patch whatever, while those that were worked on two hours later, or when the dew had dried off, were the ones which in every

case were affected. The conclusion that one is naturally led to draw from this is that the mechanical removal of dew from grass in the early morning will prevent brown-patch. At any rate these results are so interesting that next year we propose to sweep all of our greens in the early morning when they are covered with dew to see if we can not entirely eliminate this dread disease.

In order more clearly to illustrate the application of this principle in our case I shall briefly outline the program which we have adopted in connection with this morning work on the greens. We use 6 men for mowing the greens, each man cutting 3 greens. The men start to work in the morning at 7 o'clock, each man starting to work on the same green every morning. For instance, if a man is assigned to cut the 6th, 7th and 16th greens, he will start first on the 6th each morning, then go to the 7th, and finish on the 16th. So the first thing this man does is to sweep the 6th green each morning with a bamboo pole, then cut it, and proceed thence to the 7th and 16th greens, invariably maintaining the same rotation of first the 6th green, next the 7th, and finally the 16th. This cutting in rotation applies to each man and his three greens.

[Mr. Schardt's observations with regard to the early-morning removal of dew in the control of brown-patch seem to be strikingly in accord with observations which have previously been reported in the BULLETIN relating to other mechanical means of removing the dew from turf in the early morning and the resulting diminution of the extent of brown-patch injury, namely, the early-morning watering of greens and early-morning air-drainage. The effect of air-drainage has been observed in the cases of greens sufficiently open or unprotected by surrounding trees or brushes to permit the free sweep of air in the early mornings in the direction of the prevailing breezes.—EDITORS.]

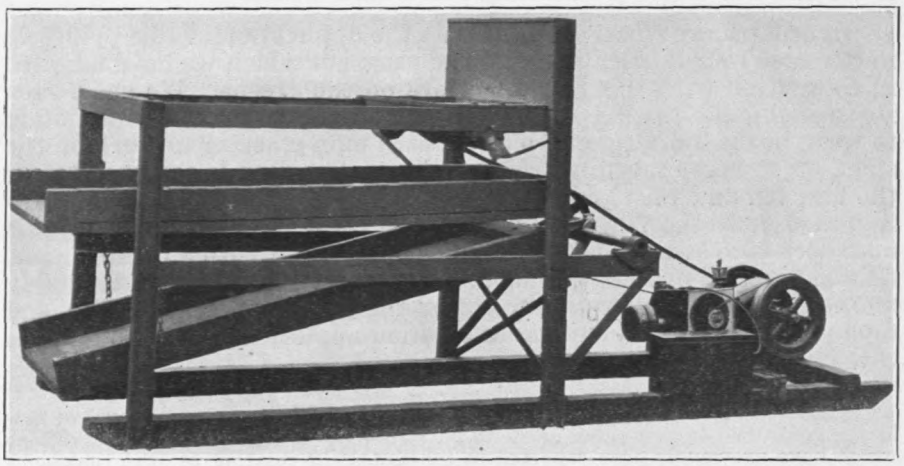
New Member Clubs of the Green Section.—Fisher's Island Club, Fisher's Island, N. Y.; Wyantenuck Country Club, Great Barrington, Mass.; Albemarle Golf Club, West Newton, Mass.; Belvidere Golf Club, Charlevoix, Mich.; Raquette Lake Golf Club, Raquette Lake, N. Y.; Wentworth Hall Golf Club, Jackson, N. H.

Producing Turf on Sandy Wastes

Particularly along the seashore extensive stretches are found admirably situated for utilization for golf-course purposes, although such conditions not infrequently exist inland also. Good turf can be grown on these stretches after they are first covered with a layer of loamy soil not less than 4 inches in depth. Various expedients have been tried at times of covering these wastes with material more readily available, such as coarse sand, mud, or silt dredged from the ocean floor or river bottoms, or with salt-water turf. Such material has been found to be of no value for producing fine turf. Soil from inland excavations, such as cellar soil removed in the course of building operations, will also be found to produce a good turf bed provided the turf is afterwards well fertilized; but if a good loamy top soil can be secured for the purpose, better and more lasting result will be obtained at less subsequent expense for maintenance.

A Simple Combination Compost Grinder and Screen

The material is fed into the hopper at the top, in which any lumps of dirt are crushed by a breaker. From the hopper it is discharged onto two oscillating screens, the upper of ¾-inch mesh and the lower



Compost grinder and screen

of ¼-inch mesh. Should any stones get into the hopper too large to go through the breaker, no harm would be done, as the breaker is belt-driven, and only stoppage would result pending removal of the stones. The machine in the illustration is being driven by a lawn-mower engine.

Returfing divots.—The Peripatetic Golfer (THE BULLETIN, page 216, September, 1925) remarks: "It does not help to fill up divots with soil and seed; and besides, it is very expensive." A correspondent accordingly writes in to know how divots should be returfed. His fairways are "pock-marked with a multitude of divot holes." We have observed that an ordinary divot is covered with turf from the edges at least as quickly as it would be by putting in soil and seed. In most cases the grass that develops from the edges is more vigorous than seedlings, which are thus crowded out. It is therefore felt that filling up divots with soil and seed is a waste of time and money, and that better results are obtained with applications of fertilizer and water.

Testing Seed For Germination.—Ordinarily grass seed more than two years old should be tested carefully before any extensive seeding is done. It is an easy matter to test seed simply by means of a box of soil which can be kept moist. An ordinary test of this kind is about as satisfactory as one made in a laboratory. Red fescue seed loses its germinating power in a comparatively short time, and seed more than a year old is usually very inferior in germination. On the other hand, Kentucky bluegrass, as a rule, germinates better after it is a year old than it does immediately after it has been harvested, and it will hold its germination usually for at least two years. Bent seed five or six years old has been known to germinate satisfactorily.

Spent Hops as a Fertilizer and Amendment for Heavy Soils

By Eberhard Anheuser, Sunset Hill Country Club, Sappington, Mo.

Some of our fairways are on the highland and are of a very stiff clay. When we first sowed them the grass seedlings had trouble in coming through the hard surface, which resulted in a very poor stand of grass. We then proceeded to spread spent hops over this troublesome area, harrowed the hops in, and resowed, and the grass came up satisfactorily. In this way we have found spent hops to be very useful in making heavy soils friable and mellow. We have also used spent hops with good results in our topdressings for the greens and as a straight topdressing on the fairways.

Spent hops is the residue from hops used in the brewing industry. The original hops are employed in brewing for the purpose of imparting flavor, aroma, and other properties to the wort—that is, the liquid extract obtained from the malt and other cereals used in the industry. The wort is brought to the boiling point and the hops are then added to it. The boiling of the wort continues for a specified period of time, during which process the extractive matter and flavoring substances in the hops are dissolved. The liquid extract is then separated from the hops, to be further processed, and the hop residues, which are then useless, are either given an additional washing with hot water or are dumped directly as being of no further value. It is rather difficult for the average brewer to wash out thoroughly all the extractive matter from the hops, and consequently a certain loss of extract or wort is the result.

Extractive matters remaining in the hop residues, although relatively small in quantity, nevertheless contain a certain amount of carbohydrate and nitrogen compounds and mineral salts, all of which tend to enrich the residual hops with substances which are entirely lacking in the hop. It can therefore well be assumed that if the spent hops are allowed to remain heaped up for a long time and kept moist, a chemical action will result similar to that which takes place in standing manure, and the composition of the mass will thus be so altered that products favorable for fertilizing purposes will be formed. Due to the fibrous structure of the hop leaves and flowers the natural disintegration process takes at least three or four years.

An analysis of spent hops thus treated made by the Bureau of Plant Industry, United States Department of Agriculture, is as follows: Potash (K_2O), trace; phosphoric acid (P_2O_5), .34 per cent; nitrogen, (N) 5.55 per cent.

The material is however quite acid (technically expressed as hydrogen-ion exponent 4.7 per cent). The total amount of acidity calculated as lactic acid is .4 per cent.

Compost under cover.—We have built a shed, 60 by 60 feet, with two sides enclosed, and with four bins, at a cost of $200. Into this, on dry days, we bring our topdressing material, and there on rainy days we work it over. It is then ready for use when needed. Before that we stored our topdressing material in the open, and it seemed that every time we prepared a batch of topdressing rain would come to spoil the work, as the material would have to be rescreened before use.—*Dewitt Gallaher, Kanawha Country Club, Charleston, W. Va.*

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

How and in what order do matches take precedence? Does a threesome have right-of-way over a foursome?

Decision.—It is assumed that by "threesome" and "foursome" reference is made to three-ball and four-ball matches. Neither of these takes precedence over the other, as under the Rules of Golf three-ball and four-ball are not properly constituted matches.

A stream runs nearly parallel with one of our holes. When a ball is driven into the stream we drop back on the side from which the ball entered. Is that right? Some players contend that the hazard should be kept between the player and the hole and that the ball should be dropped on the other side.

Decision.—Unless your local committee has ruled that the stream is a "parallel water hazard," in which case the ball could be dropped on the nearer side of the stream, the player on this hole would have to be governed by the provisions in Rule 27.

What is the proper procedure in the case of a ball being sliced or pulled to and stopping upon the putting green of a hole that is not the hole being played?

Decision.—There is no rule in golf covering the situation you describe. It is, however, the custom for local committees to make provision for dropping a ball off a putting green other than the one that is being played.

May the club be soled in a road crossing a fairway, the road being a hazard?

Decision.—As the road is a hazard the club may not be soled. Refer to page 6, definition 6, in the book of golf rules.

Clearing a Lake or Pond of Vegetation

Vegetation of two kinds is often troublesome in lakes or ponds, namely (1) scums, which consist of minute plants of the algae group and which cause bad odors and flavor in the water, and (2) water weeds, which root in the bottom and rise above the surface of the lake. Scums can be removed by dragging a sack of copper sulfate, or bluestone, back and forth through the water, either from the stern of a boat or from the end of a pole handled from the shore. This chemical, if not used in excessive amount, will not injure fish in the water nor make the water unfit for drinking purposes. Copper sulfate should be used at a rate not to exceed 1 pound to 125,000 gallons of water. In order to calculate the approximate number of gallons in a lake or pond, the product of the average length, breadth, and depth of the body of water in feet may be multiplied by 6.25.

As regards water weeds, no chemical has been found which may be used successfully in killing weeds rooted in the bottom of a lake. The methods usually employed to rid water of such weeds are scraping out the plants from the bottom of the lake, occasionally cutting them at considerable depths below the surface of the water, alternately raising and lowering the surface of the lake by drainage and

subsequent damming, and stocking the lake with ducks or swans. Dragging water weeds with a heavy chain is a rather slow, cumbersome process which is not always successful. For cutting the weeds a sharp scythe blade, saw, or similar instrument may be used, and is often attached to the end of a row boat or launch with wire ropes, chains, or wire, and dragged at an angle of about 30 degrees. A submarine saw especially designed for the purpose is manufactured. This may be operated by two men, one on each bank. It is a ribbon-like, flexible saw, weighted in such a manner that it cuts the plants close to the bottom.

QUESTIONS AND ANSWERS

All questions sent to the Green Committee 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 Committee.

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

1. Fall and winter applications of ammonium sulfate and bone meal.—In the last paragraph of the article ending on page 232 of the BULLETIN, October, 1925, you state that ammonium sulfate may be applied to turf during the winter. I have always understood that readily available fertilizers, such as ammonium sulfate, were of value only during the growing season and that their value was lost if applied when the grass was not in a growing state. Our fairways are very poor. They were never worked up, as far as I can learn, and were cut from the natural field of farmed-out clay, which is very thin and underlaid with gumbo clay. All wet locations we have now well drained. Compost soil is scarce here, and we have enough only for the greens and approaches. We have, however, purchased 10 tons of bone meal, which we are planning to spread this fall. Would it be advisable to mix ammonium sulfate with the bone meal when we use it? (Ohio.)

ANSWER.—It is true that the most economical use of ammonium sulfate is made during the growing season of grasses. Occasionally, however, it is advisable to apply this fertilizer rather late in the fall. The growing season moreover varies with latitude, extending in places quite into midwinter. Growing conditions in the fall are especially favorable to fairways in the crab-grass belt, as at that time of the year crab grass is dormant, and anything to stimulate the growth of turf grasses at that time of the year tends to thicken the turf for the following season. Bone meal is a slowly acting fertilizer and requires some time to become available. Experience has indicated that in your latitude it is used most economically when applied in February, and we would advise you to defer its use until that time. We would advise you to use ammonium sulfate only when conditions are favorable to the growth of grass. Accordingly, we would not consider it economical to mix ammonium sulfate with bone meal, as the two are best applied at different seasons of the year.

2. Bent as a winter grass in the South.—While we know that as a general thing the bent grasses are not adapted to warm climates, we should like to have your opinion with regard to growing them in the South as winter grasses. If they might be killed back by the summer heat, would they revive in winter? (Georgia.)

ANSWER.—After considering all the evidence we have with regard to the behavior of bent under conditions similar to yours, we are of the opinion that it would be unwise to go to any expense in trying to grow bent as a winter grass in the South. We believe that under ordinary conditions the effect of the summer heat would be so disastrous that the turf would not recover satisfactorily in the winter, and that the expense of special care given to it in the summer to keep it in good condition would not justify the results that might be obtained.

3. Getting rid of marsh pennywort.—Our greens have become heavily spotted with a running plant which is practically smothering the Bermuda grass on one or two of the greens and is beginning to appear on a few others. Some of these weed patches are 6 feet in diameter. We dislike to dig the patches of weed out on account of the bare spots that would be left; moreover, the weed makes a putting surface practically as good as clover. The roots of the weed form an interlaced mass, and the leaf stems are so tender that it is practically impossible to make any impression by hand weeding. I am sending you a specimen of the weed, and shall be glad for any advice as to how to get rid of it. (Florida.)

ANSWER.—The plant you send is one of the marsh pennyworts (*Hydrocotyle*). It is one of three very similar species which occur in your region, but the exact species we can not determine without its flowers and seed. A very similar species occurs in the North, introduced from India, which is illustrated and described in THE BULLETIN, November, 1921, page 220. As you point out, its putting qualities are about like those of white clover. On some of the greens in the South it has been rather favored. Very little experimental work has been done in connection with the eradication of this weed, and all that we can suggest is that the patches be cut out bodily. The infested turf may be lifted to a depth of an inch or more and replaced with good turf. The pennywort may then be destroyed by composting the infested turf for a year or two, or it may simply be spread on the fairways, where the weed is not objectionable. The flowers of this plant are so close to the ground that it will probably form seed even under putting green conditions. After the greens are rid of the weed, care will have to be exercised in keeping them free of it. The seed of the weed is apt to be introduced on the greens again in applications of topdressing or soil, and particularly so if woods soil is used.

4. Winter use of putting greens.—We have used our greens in the fall after the grass has become dormant and until the freezing and thawing made them slippery, without apparent injury. Is there any objection to continuing this practice through the winter at periods when the ground is not covered with snow or ice? (Wisconsin.)

ANSWER.—Most golf clubs now use their greens throughout the winter except at times when the ground is freezing and thawing. at

which time temporary greens should be made on the fairways. Putting greens should never be used when subject to intermittent freezing and thawing, nor when in a soggy condition in the winter.

5. Standards for length of golf holes.—We are getting the ground in shape to put in 18 holes next spring, and would like to know if there is a regulation as to length of holes; and if not, we would like to know what lengths would be best to give a variety of play. (Oklahoma.)

ANSWER.—In recent years there has been a marked tendency to standardize on the length of holes. The present ideas are that from 6,200 to 6,500 yards is the ideal length. Three-shot holes (that is, holes over 500 yards in length) are disappearing, but they may be used where they are especially desirable for the topography. The length of the hole, of course, varies with the slope of the green, the character of the soil, and other conditions; but in general a typical golf course would be about as follows: 1 hole from 130 to 140 yards in length; 2 from 165 to 180 yards; 1 of 225 yards; 5 from 320 to 370 yards. The holes in this group are of the drive-and-pitch type. Where the ground necessitates it, there may be a hole of 280 to 310 yards. This would be a hole of the elbow type; that is, the drive should reach about 240 yards for the second or pitch shot to reach the green. In holes of this type there is commonly a severe hazard in the angle of the elbow for the purpose of making a very difficult shot for the man who makes the short drive. The eight other holes are of the two-shot type, and they vary all the way from 400 yards to 480 yards, and sometimes up to 500 yards. In general, this series of holes should vary by about 10 yards difference in length. Of course, this can not be done accurately, but must be determined on the basis of the topography.

Length is not the only consideration. One architect has made the statement, which seems to be quite true, that a good golf course consists of 18 holes, each a good one of its type. The ideal of 6,000 to 6,500 yards has been over-emphasized. Doubtless American golf courses would be better if there were more 1-shot holes; but this unfortunately slows up play so much that the limiting of 1-shot holes to four or five holes is almost universally adopted. Where there are too many full 2-shot holes they become monotonous. There is much more variety of play possible on the drive-and-pitch type of hole, and therefore at least five of these would seem desirable, although more would do no harm.

Bear in mind that this is all very general, as it would be impossible, in the case of a golf course, to lay out any such definite specifications as an engineer would lay out for a bridge or a building.

6. Drainage and brown-patch.—Last summer we built a green in what had been a small valley of virgin timber. The place was very soggy, with a couple of springs. We raised the green 2½ feet above the level of the springs, and completely circled it with two small brooks. The soil was very black. From this soil we made the top four or five inches of the green, and beneath this is 2 feet or more of blue clay. Below that level there seems to be a good deal of seepage

water. We also tiled the green at a depth of about 1 foot, and at intervals of about 20 feet. After a rain this tile shows good drainage. The green was planted with creeping bent stolons the first week in September. The growth was at first much better on the raised portions, but this last spring it became uniformly good. From that time, however, it has not done well at all. It was seriously attacked this summer with large brown-patch. We treated it with both Bordeaux mixture and mercury compounds, and topdressed frequently but lightly. In putting in the cups we found that the top two or three inches of the soil had packed down very hard and that beneath that the soil was fairly soggy and of a disagreeable odor. We tried a light dressing of lime, which counteracted the odor to some extent. On the hillside just above the back of the green is an old tree which overhangs a portion of the green. Smaller trees surround the green on all but the approach side. The hollow is so far below most of the rest of the course, and has so many trees, that there is undoubtedly a certain amount of air-pocketing. We have, however, cut away some of these trees. Lately we have been spiking the green and topdressing with 90 percent sand in the hopes of opening up the hard crust. The creeping bent on all of our other greens has given excellent results. (Ohio.)

ANSWER.—We think the trouble on your green is poor drainage, both as regards the soil and the surrounding air. It is on such greens that brown-patch is always the worst. The air drainage should be corrected as much as possible by the removal of any trees which obstruct free circulation of air over the surface of the green, and the soil drainage must be improved at all hazards if continued trouble with the green is to be avoided. The best way to improve the soil drainage is to build up the green so that you have at least 3 feet of well-drained soil above the water-table. The use of tile is not necessary if the 3 feet of soil is of such a character that water will seep through it readily.

7. Topdressing with sand for winter protection.—A greenkeeper of considerable experience has advised the use of a topdressing of sand to carry our bent greens through the winter. What is your opinion in this matter? (Illinois.)

ANSWER.—Our experiments with topdressings of sand have been very unsatisfactory, indicating that they are harmful to turf. When sand is used as a topdressing the tendency is to use it altogether too liberally. A very light topdressing of sand would probably do no harm, although we can not see that it would do any good. Moreover, when used on heavy loam soils, there is a tendency in sand to form a sort of cement-like, hard crust. We would advise you to use only a topdressing of a loamy consistency, preferably a compost of loam, well-rotted manure or some similar organic matter, and a proportion of sand so as to make the mixture relatively light. This dressing should be applied evenly, at a rate of about 1 cubic yard to 5,000 square feet. What is, however, vitally essential to maintain greens over winter is adequate drainage, and we would suggest that above all things else you provide suitable drainage—surface drainage if that will answer, and subdrainage if necessary—for any spots on your greens which are not adequately drained already.

8. Winter covering of putting greens with straw or manure.—We planted two putting greens with bent stolons the middle of September. The stolons started to grow very well, but recent dry weather and cold nights have stopped their growth. Would you advise covering the turf with straw or light straw manure for the winter? (Maryland.)

ANSWER.—While the covering of putting greens with straw or manure over winter has seemed to give good results in certain cases farther north, we would not advise it for your latitude. Often such coverings, instead of benefiting the turf, kill it out in spots by smothering the grass. A fairly good topdressing with compost for the winter months is all that is needed for your greens.

9. Time required in acidifying soil for effective weed control.—Our soil is only very slightly acid, the ph. reading being 6.1. Have you any information that would indicate the length of time that would be required under the usual treatment with ammonium sulfate to render this soil sufficiently acid to prevent the growth of white clover, chickweed, and other weeds? (Indiana.)

ANSWER.—The acidity of your soil is approximately the same as was the acidity of our soil at Arlington Experimental Farm at the time we started using ammonium sulfate on the plots. It has required about three years there to get rid of clover by using ammonium sulfate at the rate of 6½ pounds per 1,000 square feet applied six times during the growing season at intervals of one month. We would not, however, advise you to use ammonium sulfate on your greens at a 6½-pound rate. To avoid burning, the applications should not exceed 5 pounds per 1,000 square feet in the spring and fall nor more than 3 pounds during the hot summer months. The lighter applications can be used more frequently than once a month, and in all cases should at once be followed by sufficient sprinkling to insure that the chemical is entirely washed off the leaves of the grass, otherwise burning is very apt to result.

10. Barnyard manure substitutes.—We are building a new golf course, and the architect specifies a large quantity of stable manure to be used on both the greens and the fairways. It is impossible to secure stable manure here, and to attempt to buy it and have it shipped in carloads would be prohibitive. We are securing from time to time the little we can get in the neighborhood, for composting in connection with the upkeep of our old course. What fertilizer would you recommend as a substitute for the manure? (Pennsylvania.)

ANSWER.—In the past there has been a tendency to use too much manure in preparing soil for putting greens. A modest amount is all right. As for the actual fertilizing of turf, this can be controlled from above by applications of ammonium sulfate or ammonium phosphate and topdressings. Your attention is invited to the article in THE BULLETIN, Vol. IV (1924), page 141. In the absence of barnyard manure we would recommend tankage or fish scrap as the organic fertilizing element for your soil. Our results with bone meal are not altogether satisfactory. Bone meal contains lime to such an extent that it greatly encourages the growth of weeds, and the use of lime in any form should be avoided.

Meditations of a Peripatetic Golfer

The most important thing on any golf course is to maintain good, not mediocre, putting greens.

You can not, even in the South, have good putting greens one-half of the year if they are neglected the other half.

Centipede grass is a wonderful fairway grass over the sandy regions of the South. Let us give you a start.

There are probably as many strains of Bermuda grass as of bent. That means hundreds of them.

If you develop really first-class putting greens your neighborhood clubs are pretty sure to adopt your methods.

The use of ammonium sulfate and good compost topdressing will make Bermuda greens of exquisite quality.

There is no basis for the idea that cold water from wells or springs harms grass turf.

A golf club has some moral responsibility to its employees. To put any one of them in a position where he can be bribed by unscrupulous salesmen is not only poor business, but a culpable wrong, morally indefensible.

A long putt in golf is not nearly as trying a shot as is the short drive. A short drive worries the golfer a whole lot more than the long putt, provided the green is good.

Over the hill to the blind green is nearly as much a tragedy as "over the hills to the poorhouse."

If a golf architect were a real artist it would not be nearly so easy to recognize his work at first sight.

Fertilizer, especially ammonium sulfate or ammonium phosphate, has a marvelous effect on thickening thin turf.