J. F. CORNMAN

THE BULLETIN

of the

UNITED STATES GOLF ASSOCIATION GREEN SECTION

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Contents

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Annual Report of the Chairman of the United States Golf Association Green Section for the Year 1927

TO THE MEMBERS OF THE U. S. G. A. GREEN SECTION:

Heretofore the annual report of the Green Section of the United States Golf Association has been rendered by that body as a separate corporation. On the recommendation of the Executive Committee made at the annual meeting held in Pittsburgh in January, 1927, the Green Section as such was dissolved. Since that time the work of the Green Section has been managed by a committee of the United States Golf Association known as the Green Section Committee. Thus far the new arrangement has worked out satisfactorily to all concerned and there is no apparent reason why it should not continue to do so indefinitely provided the officials maintain the same friendly spirit toward, and interest in, the work as at present.

Last year we reported the serious and irreparable loss of Dr. C. V. Piper, and the temporary loss, through illness, of Dr. R. A. Oakley. Unfortunately Doctor Oakley is still compelled to be away from Washington, but it is most gratifying to report that he is so much improved in health that he expects to return to us sometime this year. In the meantime he is just as keenly interested in the welfare of the Green Section as though he were with us in person.

Again it is our misfortune to report a further loss through the resignation, to accept a more lucrative position, on December 15, 1927, of Mr. George T. Cunningham, who has borne his share of the duties of the Green Section in a most satisfactory and efficient manner. The loss of his services and counsel at this time will be very keenly felt. However, it seems that the loss of men through better offers from other sources or for other reasons is a situation with which the Green Section may always expect to be confronted, as many of the clubs are financially able to make very tempting offers.

In spite of its handicaps the Green Section has completed its seventh year in a fairly satisfactory manner. Very gratifying progress has been made in brown-patch control and in the control of the Japanese beetle and other insects that infest turf. The discovery that snow-mold, often called "winterkill," is due to a fungous disease that may be controlled by fall applications of certain mercuric compounds, is an accomplishment of no small value to courses in the Northern States. Fertilizer experiments have shed further light on the treatments that will give the most satisfactory results and reduce the weed growth to a minimum.

That the work of the Green Section is becoming more widely recognized is evidenced by the number of articles dealing with some phase of our work, that have appeared in golfing magazines as well

as the press, which, although often exaggerated in some respects, are accurate in others.

MEMBERSHIP

The United States Golf Association clubs receiving Green Section service total 1,012, as of November 30, 1927, as compared with 940 Green Section members on November 30, 1926. The number of former Green Section member clubs which had never been either active or allied U. S. G. A. clubs and which are still carried on our mailing lists and receive Green Section service as well total 174.

FINANCES

In spite of many unforeseen items of expense, the Green Section has operated well within its budget. The total appropriated for the current year was $22,954.58. The total expended for the year amounted to $21,139.34, which included $16,239.34 for expenses for the Washington office and $4,900 for experiment station work. The budget provided $500 for experiments in the Chicago District, but as we did not succeed in getting work established there this amount was not expended. Unforeseen items of expense included payment of the November, 1926, issue of The Bulletin during the current fiscal year, and reprinting of the January, February and March, 1927, issues. Other unforeseen expenses included the Greenkeepers' meeting in Washington, and The Bulletin Index. The Green Section office in Washington has collected and forwarded to the New York office $3,414.25, which represents the payment for such classes of Green Section service as services to daily fee courses; foreign clubs; individual Bulletin subscriptions; the sale of back numbers of The Bulletin and binders; refunds of amount expended on seed analyses; travel refund because of services to clubs; and unexpected travel allotments. A detailed financial statement covering the work of the Green Section for the year ending November 30, 1927, has been published in the Report of the Executive Committee of the United States Golf Association.

THE BULLETIN

Our complete Bulletin mailing list has increased from approximately 2,600 on December 3, 1926, to more than 3,200 on December 1, 1927. This includes 1,012 clubs that are members of the United States Golf Association; 21 privately owned or daily fee courses; 53 municipal golf courses; 431 individual subscriptions from clubs, architects, seedhouses, implement dealers, etc.; 249 complimentary subscriptions; 31 clubs located outside the United States that received Green Section Service, of which 28 are Canadian clubs; and 37 foreign subscriptions exclusive of Canada.

TURF EXPERIMENTS AT ARLINGTON FARM

Intensive studies on brown-patch control, fertilizer experiments and other treatments relating to turf maintenance have continued at Arlington Farm. Considerable attention is being given to the selection of creeping bent, in the hope that eventually a strain may be found that is practically immune to brown-patch. Due to the increased interest in velvet bent for putting greens in the Northern States, selections of this grass are being tried out, and plans are

under way to determine the best treatment for this species of bent grass. During the past fall many of the old plots that have outlived their usefulness were torn up and the work rearranged. Areas have been sown to Rhode Island bent, South German bent, seaside bent, and red fescue, which are to be utilized for experiments to determine what treatments give the best turf where these grasses are used.

Cooperative Experimental Work

The cooperative experiments have been continued at New Brunswick, N. J.; Manhattan, Kans.; Lincoln, Nebr.; St. Paul, Minnesota; and Gainesville, Fla. For the most part there has been a decided improvement in the character of the work at these stations, due to a better knowledge gained through experience of the methods of handling the work. Interest in the work is increasing at all the stations, and the authorities are anxious that it be continued, as the turf experiments have been of material assistance in answering inquiries from golf clubs on turf grass maintenance. Money was appropriated for establishing work in the Chicago District, but so far we have not been able to make the necessary arrangements, although we are hopeful that this plan can be put into effect during 1928. Last fall plots were established in cooperation with the Missouri Botanical Gardens under the supervision of one of the Green Section men. This year it is the hope of the United States Golf Association Green Section to establish experiments at some point in California.

Greenkeepers' Convention at Washington

The first meeting of greenkeepers fostered by the United States Golf Association was held at Washington on August 29, 1927. More than 150 representatives from various parts of the country were present. The morning was devoted to the inspection of turf experiments at Arlington Farm and the afternoon to visiting several golf courses in the vicinity of Washington. Following dinner in the evening, some time was spent in an informal discussion devoted largely to the advantages and disadvantages of *Poa annua* and velvet bent. As a whole those in attendance expressed much satisfaction with the convention and suggested that it be an annual event.

The Service Bureau

Correspondence with the United States Golf Association member clubs has continued to occupy considerable attention. Many samples of seed, soil, and fertilizer have been submitted for analysis or for an expression of opinion as to their probable value. There has been personal service by visits to clubs, but due to a limited personnel such visits have been far less frequent than desirable. This is a branch of the service that could be enlarged to the advantage not only of the clubs receiving such service but indirectly to the Green Section. Local service bureaus and green sections have for the most part kept in close contact and have sought advice on many questions.

The Green Section Abroad

Interest in the work of the Green Section is increasing abroad, particularly in England, South Africa, and New Zealand. We have considerable correspondence and several reports indicating the excel-

lent results that have been obtained through information contained in The Bulletin. Some of the experiences have been published from time to time. It is a matter of pride to the Green Section that the results of our work have been helpful to and are so much appreciated by golfers in far countries.

The Future

The opinion has been voiced that the turf problems are now pretty well solved and that we should look to some other line of endeavor. However, if experiences with other plants in the past can be regarded as any sort of a criterion we are far from a solution of all turf problems. It is true that we can not expect such striking developments as during these first few years that the Green Section has been in existence, but new diseases and new insect pests are likely to appear to make life more difficult for the greenkeeper. Furthermore, much remains to be accomplished in the selection of grasses and in treatments that will give best results. It is our belief that work along these lines will be worthy of attention for an indefinite period. It would be very desirable however if we were in a position to offer better advice on architecture, construction and drainage. The drainage problem is of prime importance and one that is often overlooked. If we could enlist the assistance of an expert in drainage we would undoubtedly be rendering the clubs an invaluable service. All these phases of the work require additional funds, which means more members, and to obtain an increased membership we should be in a position to give better service to a larger number of clubs.

H. L. Westover,
Acting Chairman.

Feeding Versus Seeding Turf

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

Last year I took charge of the Pine Valley Golf Course with the greens and fairways in a most discouraging condition. By September first these greens and fairways were covered with a strong, vigorous turf having an excellent putting surface. The answer to this rapid development is found in the subject on which I have been asked to speak, "Feeding Versus Seeding Turf."

In looking over the situation, it did not take me long to arrive at the conclusion that all that was needed to correct this condition was proper feeding of the turf already on the greens, which would enable it to stool out and thicken up, rather than by heavy seeding which had been customary. From my study of the United States Golf Association Green Section Bulletins and from practical experience, I believed this could be accomplished by topdressing with a mixture that would retard too rapid evaporation of moisture; provide a balanced plant food ration for the turf; kill and prevent the growth of weeds; and destroy the Japanese beetle grub.

As I had been told by the previous manager that it was almost impossible to get topsoil on account of prohibitive freight rates, I decided to make use of what Pine Valley itself had to offer in the

way of topdressing. There are 520 acres in the Pine Valley tract, of which about 225 acres comprise the golf course proper. The unused acreage is covered with oak trees and a scattering of native pines, underneath which there is a four to eight inch layer of leaf mold mixed with soil. We first imported some clay from Pennsylvania, then hauled in soil from our woods, screened it and mixed it with the clay in the proportion of about four loads of woods soil to one of clay. To this mixture were added arsenate of lead, sulfate of ammonia and mushroom soil in the proper proportions, and a very liberal quantity of the mixture was applied to the greens and fairways. Not one pound of grass seed was used during the entire season and no returfing was necessary. The supply of mushroom soil which was on hand when I took the club over was exhausted by September first. Then we started the use of Milorganite, which, when mixed with our woods soil, produces practically the same results as a mixture of woods soil and mushroom soil. The absence of any weed seed in Milorganite is a point in its favor, as mushroom soil usually contains many bad weed seed.

I am working with three definite objects in view and feel that they can all be accomplished by proper topdressing.

First, to prevent weed seed from getting into the greens. This will reduce the amount of hand weeding, add to the appearance of the greens and provide a more even putting surface. By eliminating the frequent seeding of grass that is practiced on many courses another source of weed seed is eliminated, for even the best grades contain a certain percentage.

Second, to prevent the too rapid evaporation of moisture. The soil at Pine Valley is very sandy and it requires much water to keep the turf growing at certain periods of the year. The clay that is mixed with the topdressing contains very few weeds, and if not used in too great quantities will mix with the sand without resulting in the formation of a crust impermeable to water. The mixture of sand and clay will retain moisture better than sand alone.

Third, to kill the Japanese beetle, earthworms and other grubs, and the small amount of weeds that come in from various sources. For this purpose arsenate of lead and sulfate of ammonia are being used most effectively.

In giving you my experience at Pine Valley, I do not want you to think that the good results obtained are due to any extraordinary ability on my part, and I would like to take this opportunity of placing the credit where it is due. I lay most of my success to following closely the simple facts that have been written and rewritten in The Bulletin of the United States Golf Association Green Section. I have studied them very thoroughly, as they have been my only guide since taking up golf work, and I sincerely feel that they are the greenkeeper's best friend if he will make use of them. Also, from the experience I have had with soils and grasses throughout most of the United States, I believe that conditions for producing the very best turf are as near ideal at Pine Valley as you will find them in any place in the world. Furthermore, the committee in charge of operations at Pine Valley is composed of men of much intelligence and foresight, and you can readily understand what a great help their support and cooperation has been to me.

The New and the Retiring President of the United States Golf Association

MELVIN A. TRAYLOR
President, United States Golf Association

The annual meeting of the United States Golf Association held at New York City, January 7, 1928, marked the election of Melvin A. Traylor, of Chicago, Ill., as President of the Association.

Mr. Traylor, who was Vice-President of the Western Golf Association in 1923 and 1924, and who has long been active in the affairs of that Association, became a member of the Executive Committee of the United States Golf Association in 1925.

Mr. Traylor, who has just completed a term as President of the American Bankers Association, brings to his new office wide experience and great ability. He was born at Breeding, Ky., October 21, 1878, and after practicing law in Texas for some years, became connected with the banking business in Texas and in St. Louis. He is at the present time President of the First National Bank of Chicago and the First Trust & Savings Bank of Chicago.

WILLIAM C. FOWNES, Jr.
Retiring President, United States Golf Association

Mr. Fownes, in retiring from the office of President of the United States Golf Association, we are happy to say, does not lose contact with the Association, as he has agreed to serve as a member of the Rules of Golf Committee and also as a member of the Implements and Ball Committee.

Mr. Fownes has had an active connection with these two committees for several years, and during his entire connection with the Association has personally supervised much of the experimental work in connection with golf balls. The Association is fortunate in being able to have the benefit of Mr. Fownes' advice and assistance on two of its most important committees. He has been one of the most thorough students of the game in its entire history in this country. In 1910 he won the Amateur Championship of the Associa-

tion and has been semi-finalist in the Amateur Championships of 1905, 1907, 1914 and 1919. In the past twenty years he has qualified in all but four of the Amateur Championships, and in addition has been captain of the Walker Cup Team. Prior to his term as President, he served for two years as Vice-President of the Association, in 1924 and 1925.

Further Experiments in the Control of Japanese Beetle Grubs

By B. R. Leach, Riverton, N. J.

The results of five years of experimental work in grub, worm and weed control in fine turf by the use of arsenate of lead were announced to the members of the Green Section at Chicago in 1926. Since that time the method has been under test by many golf clubs in various sections of the country, and, judging from my correspondence and conversations with greenkeepers and officials of various clubs, it would appear that the method is producing the desired results in a measure even greater than was originally hoped for, and that it promises to become a valued part of the accepted turf-maintainance system.

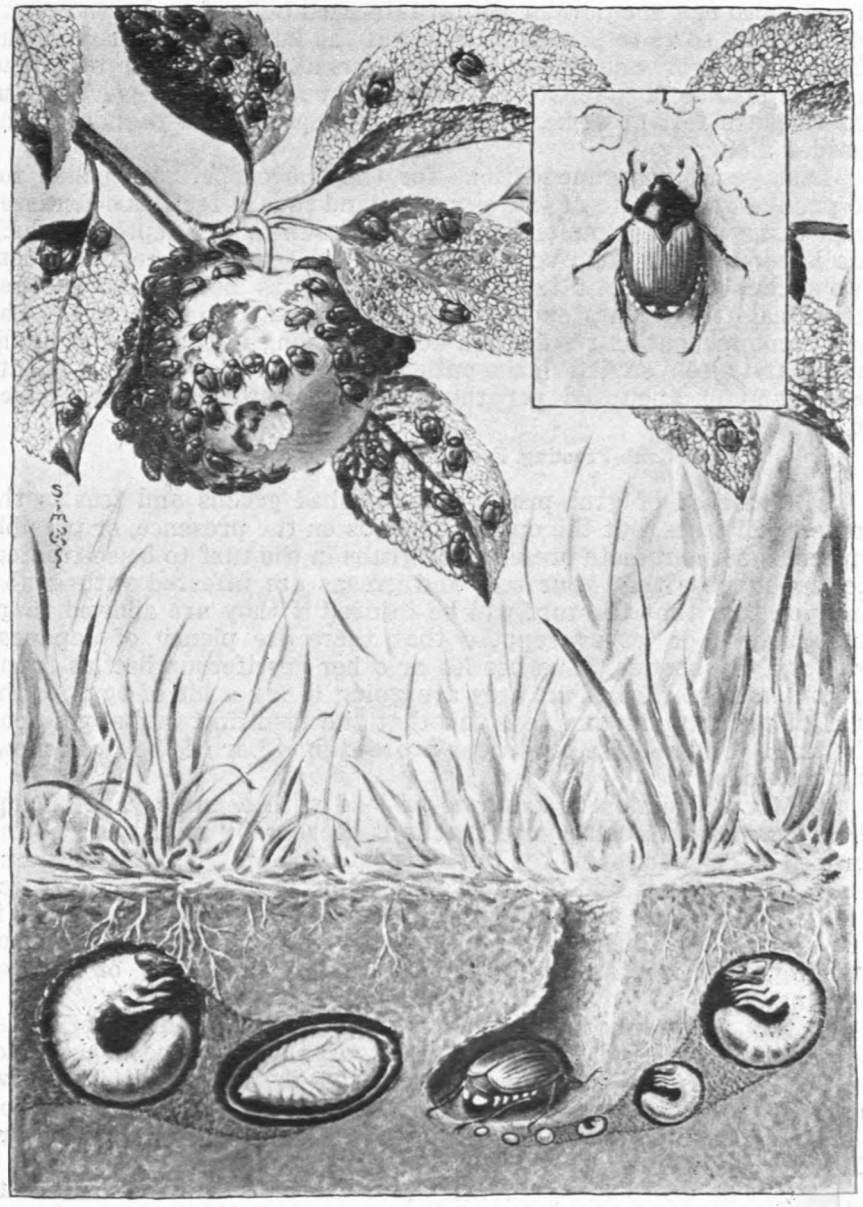
In view of the satisfactory reports on the use of arsenate of lead on fine turf during the past two years there need be no hesitancy in announcing the experimental results obtained during 1927, since they provide a basis for a decided simplification of the method with resulting reduction in the items of labor and cost of materials.

These latest results have been obtained in part by the continued maintainance and observation of the experimental plots at Riverton, N. J. In addition, however, much further information has been obtained as a result of very conservatively planned, extensive treatments of the turf of several golf courses in which all applications of arsenate of lead have been made under my personal supervision. I refer primarily to the Pine Valley Golf Club at Clementon, N. J., the Riverton Country Club, the Morris County Club at Convent, N. J., the Ashbourne Country Club, of Philadelphia, as well as various other clubs at which I have had the opportunity of observing the results of lead arsenate applications.

The most outstanding development, as a result of the years' work along the above lines, has been the gradual disclosure that decidedly less arsenate of lead is necessary to secure grub-proof turf than had previously been supposed; that, in fact, as little as 15 per cent of the amount of arsenate of lead formerly recommended is ample.

Grub-Proofing New Greens and Tees

Where it is desired to grub-proof greens and tees while in the process of construction and before the seed or stolons are sown, apply five pounds of arsenate of lead to each thousand square feet of soil surface and scratch in with a short-toothed rake to a depth of one-half inch. Do not work it in any deeper than one-half inch, otherwise you will lower the toxicity of the upper soil layer which is the only layer that counts in grub control. Do not apply the arsenate until all grading, smoothing and contouring is completed, otherwise you may bury the arsenate in spots with a layer of unpoisoned soil. In



JAPANESE BEETLE (*Popillia Japonica*)

The beetle deposits its eggs in the soil. The larvae, or grubs, hatching from them, feed on grass roots and decaying vegetable matter until autumn, when they become full grown. No feeding occurs during the winter, but in the spring the grubs feed for about a month before transforming to the tan-colored pupae. These change to the adults, or beetles, and emerge about the middle of June. The beetles cause damage by feeding on foliage and fruit. The grubs cause serious injury to sod lands through the damage which they inflict on the roots of grasses. Stages in soil, and inset, somewhat enlarged; beetles on foliage and fruit much reduced. (From U. S. Dept. of Agric. Cir. 363).

applying the arsenate to tees or greens in the process of construction it is best to mix the powder with a fair-sized bulk of moist (not wet) soil or sand, so as to prevent blowing of the fluffy powder, reduce the chances of error, and insure an even spread. It is easier to spread the five pounds of arsenate mixed with a bushel of soil over a thousand square feet of surface than it is to spread five pounds of the powder alone.

Last year's recommendations for the above operation called for 35 pounds of arsenate of lead per thousand square feet, as contrasted with this year's recommendation of five pounds, the depth to which the latter amount is to be worked into the soil being reduced from two inches to one-half inch. The change has been made because large scale treatments show the 5-pound dosage to be ample. The new recommendation results in a decided saving in the labor of application and also a saving in the outlay for arsenate of lead at 14 cents per pound of about $4 per thousand square feet of soil surface so treated.

Grub-Proofing Established Greens and Tees

The method of grub-proofing established greens and tees is the same in all cases, but the dosage depends on the presence, or possible presence or the remote presence, of grubs in the turf to be so treated. Let us suppose that your tees and greens are infested with grubs, and you fear that the turf will be injured if they are allowed to go undisturbed; or let us suppose that there are plenty of Japanese beetles, May beetles, June beetles or other pestiferous beetles flying around, and you fear that they are going to lay a lot of eggs in the turf of your greens and tees and that the resulting grubs will spoil the turf. Under these conditions proceed in either of the two following methods:

1. Mix 25 pounds of arsenate of lead with a cubic yard of topdressing material, being sure that it is thoroughly mixed and not all lumped in one portion of the topdressing, and apply it to 5,000 square feet of turf. This will give it a fairly smooth covering, but not too heavy. Work it in with a rake or broom. Do this when the grass is dry so that the topdressing works down through the grass without sticking, thereby avoiding even the slight possibility of surface burning.

2. Mix five pounds of arsenate of lead with a bushel of moist screened soil or sand, and scatter this over a thousand square feet of turf just as you would sow seed. This is the easier of the two methods, provided you have a man who can sow the bushel of poisoned soil evenly. Old-time farmers can do this to perfection, but the ordinary workman is a "dub" at this job.

It will be up to the greenkeeper to use his own judgment as to the best method of application. When No. 2 is followed it is important to apply the lead arsenate only when the grass is dry, otherwise the arsenate may stick to the blades of grass and cause a temporary burn—nothing of a lasting nature, but enough to spoil the color for a few days.

When the above dosage, which is relatively heavy when put on in one application and only recommended on fine turf when facing an emergency, is applied, worked in and watered, the arsenate of lead penetrates into the soil to a certain extent, and if you watch

the grubs present in the turf, you will note during the course of a week to ten days that they are beginning to succumb to the poison. Bear in mind also that they cease eating the roots for some time before they die, due to the arsenic making them sick. So much for high-speed grub-proofing.

Let us suppose, on the other hand, that no grubs are present in the tees or greens, but that the Japanese beetle is working your way, or that your turf has been spoiled in the past by native grubs and that you wish to have your turf grub-proof so as to play safe. In this event mix five pounds of arsenate of lead with a cubic yard of topdressing and apply it to 3,000 square feet of turf. Repeat this with the next four topdressings. This will give you a grub-proof turf in the course of four or five months, depending on how frequently you topdress. If you prefer to mix the arsenate with a little soil or sand and sow it over the green as you would seed, well and good; only be sure it is sown evenly.

Maintaining the Grub-Proofed Green or Tee

After the green or tee has been grub-proofed by either the heavy or light applications described above, you can not topdress repeatedly with unpoisoned soil from then on. If you do this, you will gradually bury the layer of poisoned soil and the grub-proof condition of the turf will be lost. As you apply topdressing to the surface of a grub-proofed green or tee you must apply arsenate of lead in proportion so as to poison the layer of soil so applied in grub-proof condition also. For every application of topdressing one-half pound of arsenate of lead should be applied to each thousand square feet of turf, assuming that you put the topdressing on at the rate of one cubic yard to 5,000 square feet of turf; or, in other words, that you apply it in a layer one-sixteenth of an inch thick. You can put on three or four unpoisoned topdressings and then apply all the lead arsenate that should have gone with them at one time, that is, one and one-half or two pounds per thousand square feet as the case may be. Ammonium sulfate and lead arsenate may be mixed with the topdressing and the mixture applied with safety, thereby resulting in a saving of labor.

Poisoned Barrier Around Greens and Tees

I have repeatedly advised against the prevailing tendency among greenkeepers and green committeemen to stop short with all treatments at the edge of the green or tee. Let me again reiterate that all approaches and an area at least ten feet wide around greens and tees should be poisoned regularly. Poisoning the turf immediately adjacent to the green or tee is very important in keeping the latter free from pests. There are plenty of grubs, worms and weeds in this area just outside the green or tee, and they will constantly invade the latter unless they get a dose of the poison before they reach the edge. Where June beetles are plentiful, a strip 50 feet wide around the green or tee will be necessary in order to keep them out.

Steep banks or tees and greens are a problem in grub-proofing, inasmuch as the surface soil has a tendency to wash badly, carrying the poison with it. It will be necessary to watch these steep banks closely and apply arsenate of lead more frequently where washing occurs.

Grub-Proofing Fairways

Fairways, due to the acreage involved and their infrequent top-dressing, are best grub-proofed by methods differing somewhat from those employed in the case of greens and tees.

Arsenate of lead, 250 to 300 pounds per acre, when properly applied, controls grubs and worms in fairways and gives an appreciable weed control. The method of application is optional with the greenkeeper and depends to a certain extent upon his course and equipment. To date I have found that the best method is to mix the arsenate of lead with fine soil, or sand, and apply it to the turf with a lime spreader. Hang burlap bags on the front and back of the box so that they touch the ground, thereby preventing as much as possible the arsenate of lead from blowing when it is dropping to the ground from the feeders. If the machine tends to drop the arsenate in drills, steps should be taken to break up each stream before it reaches the soil surface, the idea being to get the poison on evenly all over the turf rather than in streaks. Use enough soil or sand to give enough bulk so the machine will cover an acre while you are putting on 250 to 300 pounds of the arsenate, the amount of soil filler depending, of course, on the type of machine employed. I have not as yet tried cottonseed meal as a filler, but have an idea that it would prove very satisfactory. Follow the spreader immediately with a spike or spring-tooth alfalfa harrow so as to lightly scratch in as much of the arsenate as possible. It is also a good plan to harrow both ways across the field.

How long this system and dosage will insure grub-proof fairways can not be stated at this time. On relatively level areas I believe it will insure grub control for at least two years and that the fairway turf can be maintained in that condition by the annual application of 100 pounds of arsenate of lead per acre. Sloping fairways where washing occurs is, of course, a problem, and I do not have much data as yet along this line.

Everything considered, the treatment of fairways by this method is sound. It is a very cheap method of grub and worm control, costing as it does from $35 to $40 per acre for the chemical and with a relatively low labor cost for applying it to the turf.

At the present time I am supervising the grub-proofing of 60 acres of fairway at one of the Philadelphia golf clubs, the fairways having been badly damaged by Japanese beetle grubs together with an infestation of June beetles in spots. Two-thirds of the grass was dead when we began applying the arsenate of lead in late October. Within ten days after the application of the lead a large number of the grubs were in that characteristic "flabby" condition, which is the first indication that the grubs are beginning to feel the effects of the poison. A normal, healthy grub is always tightly curled up with the head and tail close together, and the flesh is firm to the touch, whereas grubs that are beginning to feel the effects of the poison are not tightly curled and the flesh is soft and flabby. When grubs reach this stage of arsenate poisoning they eat very little, hence while they hang on to life for a little while longer, turf injury is checked.

How small a quantity of arsenate of lead is necessary to grub-proof turf can not be stated definitely at this time. In this connec-

tion, however, at a certain club in the Philadelphia district early last summer, all the creeping bent greens but one were given one application of ten pounds of arsenate of lead (about two pounds per thousand square feet). No additional arsenate of lead was applied. These greens today are firmly turfed and in splendid condition, except along the edges where the grubs have crept in and chewed up the turf to some extent. The one unpoisoned green is cut to pieces with grubs, and the turf can be rolled up with the hands—all this in the presence of one of the heaviest Japanese beetle infestations in my experience, for the fairways were simply teeming with grubs. This experience is given merely as an indication of the value of arsenate of lead as a grub-control measure and not as a dosage recommendation. It does not seem advisable to be stingy as regards the amount of arsenate of lead applied to turf, since the chemical is relatively cheap and an absolutely grub-proof condition is the object of the treatment.

Time for Treating a Fairway

If grubs are not present in the fairways, but an infestation is feared, apply the entire amount of arsenate of lead at one time before the first of June. This will insure its being on the turf before the beetles begin laying eggs. If grubs are present in the turf and injury is feared, apply the arsenate of lead at once, regardless of the season, provided the ground is not frozen or muddy.

In conclusion it seems advisable to issue a word of warning regarding the grade of lead arsenate used in poisoning the soil for control of the Japanese beetle where turf grass is to be grown. As the demand for the poison increases it is not inconceivable that a lower grade of material may be put on the market which might be more or less injurious when applied to the fine turf grasses. As a safeguard, therefore, the purchaser of lead arsenate should always demand a grade similar to that used for insecticidal purposes.

An Unusual Golf Course Pest

A recent letter from Mr. L. W. Kephart, who has spent several months in plant exploration in East Africa for the United States Department of Agriculture, tells of a problem that greenkeepers encounter in some parts of that country, but with which they are never likely to be confronted in the United States. In speaking of the golf course at Jinja on the north shore of Lake Victoria in the Province of Uganda, he says:

"In the evening Bill and I took a stroll out across the beautiful little golf course that has been built along the hillside overlooking the lake and the falls. The Jinja golf course is, undoubtedly, distinguished from all other golf courses on earth, by reason of the fact that one of the chief difficulties of its manager is to keep the hippopotamuses off the greens. I have no doubt that many an inebriated American golfer has seen green crocodiles and purple hippos in his sleep, but here they are a sure enough hazard. One evening, not long ago, a dance was held at the golf club. During an intermission two couples went out for a stroll across the grass in the moonlight. Coming to a nice shady mound they sat down to enjoy the moonlight, when the mound with an enormous grunt rose up beneath them, scattered the couples wildly in all directions and moved off. Since

then the Jinjitas have chosen other scenes for their moonlight sonatas. And it must be discouraging for a greenkeeper to have his carefully nurtured turf devoured in one gulp by a pensive hippopotamus."

Resignation of Mr. O. B. Fitts

It is with regret that we are again called upon to report the loss through resignation of another member of the Research Committee of the United States Golf Association Green Section. Mr. O. B. Fitts, who has been with the Green Section since March 1, 1923, resigned, effective February 1, 1928, to assume charge of a golf course at Washington, D. C. For some time Mr. Fitts, as a part of his duties, has had direct supervision of the turf garden at Arlington Farm. He has also upon request visited many golf courses for the purpose of consulting with and advising greenkeepers and green committeemen regarding their problems. While his services will be greatly missed, the Green Section wishes to take this opportunity to extend its best wishes for success in his new field of endeavor.

Hints on Making Compost

By Kenneth Welton

At this time of the year every greenkeeper will find himself with one of three situations facing him as regards the compost pile. He may have insufficient compost or, worse still, none at all, and will look forward with dread to the day when he will need it, and need it badly; he may have a pile recently made and which will, therefore, need watching during mild spells and thaws to avoid loss of nitrogen, or humus, through neglect; he may have an abundant supply of well-rotted compost as a result of following a regular procedure year after year. The greenkeeper with sufficient compost is to be congratulated. It is likely that he will have his pile under cover, where he can put his men to work now and then during the winter months. Compost already screened will lighten the work in the spring when there are so many other things to do.

In building a compost pile the thickness and number of layers should be governed by the material that is available and the character of compost desired. Ordinarily, with partially rotted manure that is not too strawy, equal layers of loam and manure will do; but if the soil to be used is a stiff clay, the pile should be built in three layers, as follows. Six inches of clay, six inches of manure, and four inches of sand. If the humus is furnished by peat, muck, or leaves, it may be advisable to add 25 pounds of lime to each ton of such material to assist in decomposition and guard against any toxicity that may be present, otherwise lime should not be used. If the manure is fresh and very strawy, the thickness of the manure layer should be doubled. If the available soil is of a light, sandy type, enough manure or vegetable matter and clay should be used in the pile to make the resulting mixture that crumbly garden loam so desirable for use on the green. When the pile has been made up, do not let it overheat. The rain usually takes care of the cooling, but otherwise the hose should be used.

If the compost pile is in the open, a hint as to possible economy in turning the material when ready may not be out of place. Often some contractor has a gas or steam shovel in the neighborhood of the club and will turn the pile at so much per hour or yard, doing it four or five times as cheaply as it can be done by hand. The shovel will move along the pile, dig into it and drop the compost in a large pile parallel to the old one. So as to better spread and separate the material, the operator can swing the bucket as he drops the load. The pile may also be turned with slip scrapers at one-half the cost of hand turning. For piles of four or five hundred yards, three teams can be used very economically. The teams should go up over the old pile to load the scraper and dump so as to build a new pile, thus turning and mixing the compost.

The above methods of turning the pile are mentioned, as the writer has seen the value of many well-built compost piles lessened to a great extent as a result of not being turned at all, or else not being turned at the proper time. This neglect is often due to the time required and labor entailed in turning by hand.

Gypsum (Calcium Sulfate) of Questionable Value for Turf Grasses

Recently considerable interest has been displayed as regards the advisability of using calcium sulfate, or gypsum, on golf courses. This is probably the direct result of the propaganda put out by those interested in selling the product. Some of the benefits claimed to follow its use are to the effect that it increases the acidity of the soil, thereby creating a condition more favorable to the growth of certain turf grasses such as the bents and fescues; furnishes calcium for the plant without increasing the alkalinity of the soil, as happens when ordinary lime is used; liberates plant food; supplies sulfur; and improves the physical character of the soil. Most of these claims are well answered in the Cornell University Agricultural Experiment Memoir 97, issued 1926. The author, M. H. Cubbon, goes into the history of the use of gypsum, discusses in considerable detail a large number of experiments that have been conducted at various times and places, and adds further evidence by describing carefully conducted experiments of his own. While turf grasses have received very little consideration in the tests, the conclusions reached with other crops apply to a greater or less extent in the growing of turf grasses. The following quotations are taken from the discussion and the summary of the Bulletin:

"In summarizing results from the various experiments reported herein, the conclusion must be drawn that calcium sulfate has not proved to be the active stimulant which it has heretofore been considered. Such results, it seems, might have been anticipated from the use of a single material whose constituents may or may not be essentially lacking in the humid sections of the country. Experience seems to show, too, that when a stimulating action is apparent, it is brought about by some unusual soil condition which, very likely, is not connected in any way with the lack of a particular element. It seems, further, that calcium carbonate produces a stimulation in many more cases than does calcium sulfate, and hence it must be

repeated here that the sulfate can not be logically recommended for as many different uses as can the carbonate.

"There is no good reason for thinking that gypsum produces or intensifies acid conditions in soils. The experimental evidence on this point is not so contradictory as one might suppose on first thought. It is true that some reports have been unfavorable to the use of gypsum, and these must be accepted as authentic even though they are based on work not carried out in the field. However, a review of the literature of the subject indicates that field experience does not show any detrimental acid condition due to the use of gypsum. When the soil becomes more acid under field conditions where calcium sulfate has been applied, it seems to be the result of rapid leaching together with an insufficient application of calcium to meet the leaching losses. If the leaching losses were always considered when the question arises as to the amount of gypsum to be added, there should be no pronounced acid condition resulting from the use of the material alone. Usually, however, such a small quantity of calcium sulfate is added that it can have but little influence on the potential acidity of a soil, and hence no effect in preventing the soil from becoming acid in accordance with the general tendency of soils to become acid. Furthermore, the use of acid phosphate, carrying as it does about 50 per cent of calcium sulfate, has not produced measurable soil acidity. * * *

"Data regarding the influence of calcium sulfate on bacterial activities in soils fail to indicate a consistent and regular beneficial effect. Other evidence than that reported here indicates just the opposite effect, namely, an unmistakable benefit. Since such variations occur, it is impossible to recommend the general use of calcium sulfate on soils. Soils that show increased nitrate production should give a response to gypsum in the field, and no doubt they do. The results obtained by growing a denitrifying (nitrate-reducing) organism in pure culture, help to emphasize the many and varied ways in which calcium sulfate may produce a beneficial effect. * * *

"The ordinary application of gypsum is not in sufficient quantity to produce a noticeable effect on the physical condition of the soil. Likewise, the moisture relations of soils do not seem to be affected materially. Here, again, the experience from field work is not sufficient for conclusions to be drawn. * * *

"Crop responses have been very uncertain, as has been pointed out. Experience would indicate that greater responses have been obtained when either calcium or sulfur was a limiting factor in the soil, than when the calcium sulfate functioned in an indirect way to stimulate other processes.

"Since most soils are low in sulfur, the question of supplying that element in some form is rather an acute one. It remains for the individual farmer to decide which carrier of sulfur he can use most effectively. * * *

"Calcium sulfate had no effect on the growth of pasture grasses. * * *

"Leaching various soils with saturated calcium-sulfate solutions did not result in a marked liberation of potassium. * * *

"Calcium sulfate had a very slight effect on the physical condition of the soil. The water-holding ability of various soils was slightly increased, while the hydroscopic moisture capacity was not

affected, by heavy applications of calcium sulfate in solution form. Wooster silt loam soil was influenced more strongly than any other of the soils leached."

It should be remembered that many of these tests were conducted with crops such as legumes that are frequently benefited by applications of gypsum, especially where the soil is low in sulfur. There is little evidence that turf grasses are actually benefited by applications of gypsum, except in very limited areas. Furthermore, gypsum has a tendency to encourage the growth of clover, which most greenkeepers and golfers regard as very objectionable. In some cases applications of sulfur have proved actually injurious. It is further shown by the results reported in the publication quoted above that gypsum has very little effect on the soil acidity; is of little consequence in releasing plant food; and in the amounts normally used, has little effect on the physical condition of the soil. In view of this situation any club considering the use of gypsum is strongly advised to try it out experimentally before spending money, which may be worse than wasted, in purchasing large quantities of the material.

Conditions Which Influence the Growth of Turf

By C. A. Tregillus

The study of soils and soil conditions and their effect upon turf growth; the study of grasses suited to varying conditions of soil and exposure; the study of fertilizers and their effect, and the study of chemicals for the control of pests and diseases, have within the last few years, greatly modified and regulated our methods of course maintenance. Greenkeeping is a development of the old art of gardening which, in those sections of the earth blessed with a suitable climate, has long reached a high stage of proficiency and has acquired results of outstanding merit. It must be remembered that while a great deal of credit is given to the climate and to the natural grass flora that lends itself to such practice, the early greenkeepers had evolved from custom and observation, a system on which rests the basis of modern golf course management. In recent years, due to the rapid expansion of the game of golf, the science and practice of greenkeeping has had to considerably widen its scope to embrace circumstances under which it was formerly thought impossible or at least uneconomical to grow and maintain grass of the quality demanded by the game. Extremes of climate and other natural phenomena bring up problems that are gradually being solved both by close study and analysis in the laboratory, and by trial and error in the experimental plot. This has been going on apace until there are very few regions left where it is not possible to produce at least a fair to medium turf.

Success in turf culture lies in thoroughly understanding the various influences, whether natural or artificially produced, that bear upon the life history of the grass plant and being able to eliminate or modify those that have an adverse effect and to promote those that are conducive to healthy development. It means that we should seek to acquaint ourselves as closely as possible with the intimate relation of the common circumstances under which turf will grow.

The early men possessed a vast amount of this information which, acquired by the long process of constant observation, and well served

apprenticeship, became practically an intuition and could meet most emergencies with simple but effective methods, even if they did not understand the underlying causes from a scientific viewpoint. Since that time however, a great change has taken place and we approach the study and practice of turf culture from quite a different angle. This is not a revolt against old-time methods as some old-timers are inclined to think, but an evolution that is bound to come as in all lines of endeavor. The spread of the game to new territories, the intrusion of diseases and pests hitherto unknown, the rising standard demanded by players and the immense sums now spent on course maintenance throughout the world, have all lifted the industry to a plane before undreamed of. To this end the up-to-date greenkeeper has to organize his information and regulate his methods as never before. He must be prepared to delve beneath the superficial symptoms of trouble in order that he may treat for permanent improvement, he must be able to cope with a wide diversity of weather and climate, be able to recognize the effects of weeds, diseases and other pests and know where to get reliable information concerning remedial measures—in short, he must keep himself informed of all the new developments related to his profession.

Of first importance and as a foundation for all other knowledge associated with his craft, the greenkeeper must possess a clear conception of the fundamental principles of plant growth, particularly as they refer to the grass family. Without this he cannot intelligently follow the technical and scientific discoveries, of which these present years are very fruitful, nor successfully evolve his own system of management. With this thought in mind it might be of interest to scan this field rather hurriedly and touch upon those points that show the related circumstances that affect the natural development of the grass plant.

It is necessary to know in the first instance that there are certain essentials for the growth and development of grass and without which we could get no results. These are, light, heat, air, food and water. While not entering into a long explanation of each, it might be well to tabulate the main features.

Light is essential because it is intimately associated with the green coloring in the leaves. Without this green matter the plant could not digest its food and build up its structure. It explains in part why heavily shaded greens are not healthy and also brings to our notice that some grasses need more light than others, hence those that can get along with less are the ones for the shady places.

Heat or warmth starts the plant functioning—puts the life processes under way. Grass has a liking for moderate temperature, above or below which it will become dormant or semi-dormant. We also notice that in these outside temperatures, disease may readily develop and do severe injury.

Air is a necessity because it contains life giving oxygen, essential to the plant and to the countless numbers of bacteria that are busy preparing food by working it into a condition to be absorbed by the plant roots.

The need for food of course is obvious in order to increase the plant structure. The various substances of mineral origin that the plant feeds upon are generally present in the soil, though not always in sufficiently available quantities to supply every need; those most

often deficient are nitrogen, phosphoric acid and potash. They are the chemicals that are supplied under the heading of fertilizers.

It is characteristic of grasses and practically every other form of plant life, that they take in their food in solution, so that all food elements must be dissolved in water before the grass plants can get them at all. Therefore we see that absence of moisture not only results in the plant drying out, but theoretically starves it.

It might be well also to consider the conditions of growth from an environmental point of view. While it is possible to grow a plant in a glass jar with just the necessary things already mentioned, it would not be robust or healthy. That is purely a laboratory method. In the ground there are other factors. There is the soil type most suitable for the free movement of moisture and food, and for the easy penetration of roots and air. This is the physical consideration and is associated with the texture of the topdressing material that is applied to the surface of the turf. There is the matter of food supply which deals with the fertilizers necessary to procure the best development. This is the chemical aspect. And thirdly, organic or biological requirements must not be overlooked, for without a sufficient amount of humus supplied by good compost or topdressing material there would be insufficient bacterial action, and an unsatisfactory texture to the surface soil. Compost, or its active essence, humus, is very vital to the well being of a close cut turf.

Again, in the production of a high-quality turf, there are other influences at work, which have a modifying effect upon continuous and healthy growth. There are those that come from natural causes, as climate, and related to that, seasonal growth, and also perhaps, disease might be classified here. There are those of artificial origin as, for instance, greenkeeping methods.

The influences that favor the fullest development of turf are worthy of mention because in the practice of course maintenance it is imperative that these conditions be assisted and methods so systematized as to bring about in an artificial way if possible, such a happy combination as would not be naturally provided.

A maritime or insular climate has for decades been considered the ideal in which to produce good lawns. The temperate coolness, and the moisture-laden breezes combine with the native grasses, to make a fine leaved, compact, hardwearing mat that suits the purposes of golfers so well. A salubrious climate is a very favorable influence.

A satisfactory soil texture has a marked effect. By the term satisfactory, we mean a soil of fairly loose, friable structure, that permits water to either go down or come up with comparative freedom; does not bake and crack in hot, dry weather, or become puddled when wet; does not dry out too readily. It also means one that has a sufficient amount of organic matter in it to regulate the food requirements of the plants.

Even with a favorable climate and with a soil of suitable texture it is impossible to develop and maintain satisfactory turf without an adequate and well balanced food supply. The importance of this factor should not be overlooked.

Looking at the situation from the reverse side of the picture, it is perhaps more illuminating to mention those conditions that retard rather than advance the development of turf for golfing purposes:

1. *Insufficient moisture.*—No doubt the most generally submitted reason for poor turf is dry weather, and it is a fact that except in

very favored sections, it is impossible to maintain a stand of closely clipped turf by depending upon the natural precipitation. Large sums of money are spent on water systems, not as a luxury but as a necessity, for without it the expenditure on seeds, fertilizers and grounds maintenance would be a useless waste. It is so obvious that it needs no comment.

2. *Starvation.*—Here is a very general cause for a large proportion of poor turf that is found throughout the country. This particularly refers to putting greens. Clubs are gradually becoming enlightened on this matter, are being more liberal with compost and fertilizers for their putting greens, but it appears that further missionary work must be done before replenishment of the food supply in the putting green soil is a universal practice. In discussion with committees on this point the answer is often given that funds will not permit, that enriching the soil brings attendant trouble as worms, disease, etc., but nevertheless, there is no gainsaying the fact that if we do not put into the greens at least as much as we take off, in the course of time there will be little or none to take off. The regular removal of grass clippings takes away from the turf a large quantity of real fertility, and besides, the close mowing limits the root range of the grass so that it is unable to feed as deeply as it would do if allowed a heavier top growth. Grass can be starved in two ways: by taking off all it produces, and by limiting its roots so that it has to find most of its food within a very narrow surface layer.

The only answer to this condition is to feed the top layer well and wisely. It requires care and close observation to do this properly, since by an injudicious hand, it is possible to do much damage. The turf, to do well, must have a balanced ration. It may have too much of one thing and not enough of another as some elements of fertility are easily conserved while others are lost. Composts vary in their fertilizing value and usually have to be augmented with chemical manures of one sort or another. It is in this field that special care must be exercised. The value of ammonium sulfate and ammonium phosphate are well established in greenkeeping practice. Many now use these forcing nitrogenous fertilizers and some are inclined to over-do it because of the excellent showing. The nitrogen contained in this type of fertilizer is only one of several food elements and in over-dosing with it an unbalanced condition is likely to be set up, and while the turf may present a very beautiful appearance, constitutionally it may be in very low health and unable to withstand sudden extremes in temperature or disease.

3. *Unsuitable soil texture.*—This might well stand next in importance as being responsible for an unhealthy stand of grass. There is no doubt but that one of the big considerations in the building of a golf course outside of the architectural features is to incorporate the right sort of soil into the putting greens. The right sort of soil has already been briefly described.

4. *Improper drainage.*—Soil texture and drainage are very closely allied and to derive the best results, the latter must be thoroughly understood. Insufficient drainage makes the soil wet, waterlogged and cold. Air is as necessary to the roots of the grass and to the soil organisms as it is to the leaves and stems, but it cannot descend if the ground is already filled up solidly with water. The water used by the plant is that which clings as a film around the

soil particles, not the water that occupies the spaces between. The water table should be kept well below the root range. The amount of artificial underdrainage needed depends upon the soil texture and the location of the part to be drained. Drainage in the fullest sense of the term involves the movement of the water within the soil and on the surface of the soil as well as the movements of the air currents above.

5. *Location a vital factor.*—There are putting greens that have never been right and have not held a good turf because they were put in the wrong place. Due attention to the other circumstances already mentioned may lessen the importance of location.

6. *Poor methods.*—By no means the least important factor to be considered is the human element—greenkeeping methods—and how they affect the natural development of grass. Mis-management in this particular may result in poor greens, even though other circumstances are quite satisfactory.

Success in greenkeeping lies in keeping as nearly as possible to a healthy balance between all these influences, by a close study of the life habits of the grass plants both when growing unhampered and when subjected to close culture. Appreciating this we may regulate our methods so as to assist the natural inclinations where they suit the golfer's purpose and bear down as lightly as possible where they do not fit so well.

Many of the common golf grasses are naturally of the tall-growing sort, extending their stems, leaves and flower heads a couple of feet or more into the air, and, likewise, penetrating with their roots a fair distance into the ground. On the other hand there are familiar grasses that prefer to lay their stems flat upon the ground in a prostrate fashion, and send small roots out at each joint, being somewhat of a shallow feeder. It can, therefore, be readily seen that the surgical operation of cutting off all but a fraction of an inch of the top growth is much more severe for the tall than for the low plant, not only because of the shortening of the stem, but also on account of the danger of scalping, since tall growing species usually develop noticeable crowns. There seems to be a great deal of adaptability among such forms, and they will conform to a remarkable degree to the treatment of mowing, and, since the absence of top growth prohibits root depth, will make up for the deficiency by producing a multitude of small surface feeding roots, taking on the form, in a loose way of speaking, of the low-growing types. The particular point brought to light here is that the tall grasses lend themselves to considerable modification of their natural habits, though it should be remembered that they can not be expected to retain their full vigor and robustness when changes are carried to extremes. The most practicable way of handling this circumstance is the adoption of low-growing types for putting green turf as has been done in the case of creeping bent.

Another prominent habit to be observed is that of the seasonal periods of growth activity. There are times of the year when growth is vigorous and times when it lags. The slowing down may be due partly to inherent characteristics and partly to a response to surrounding conditions, such as the drying out of the ground and excessive heat or cold. It is possible by the use of stimulating fertilizers and much water to induce the grass to keep up its springtime

energy, and continue green and lush right through the summer till the last moment in autumn, or winter, when the growth stops altogether. It is very doubtful if such practice is at all wise. Turf that has been over-stimulated is not in good shape to weather the troublesome times of midsummer with its fungous menace or meet the sudden onslaught of winter. Observation tends to show that the time to feed a green is that period when it can, by reason of weather and inherent habit, make the most active and ready use of the nourishment. Fertilizing right through the year is possible, but must be done with extreme care.

The natural hardiness of certain strains and their ability to withstand cold weather, winter kill and summer scald, better than other varieties is very noticeable among the various grasses found on the golf course, whether of native origin or introduced. Immunity from disease is another variable character. Consideration of these factors and selection with them in mind has had a great deal to do with the development of our best turf grasses for the golf course.

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. Brown-patch fungus affects leaves.—Why is it that, if brown-patch spores live in soil, the brown-patch attack starts at the tips of the grass and not at its roots? (Massachusetts.)

ANSWER.—Your question as to why the disease affects the blades of grass when the fungus lives in the soil is one which is frequently asked. Just why this happens we do not know. It is not an uncommon thing for a fungus to attack the leaves of a plant and not injure the roots. Similar conditions exist in human pathology. The organisms causing some of our skin diseases, for instance, do not affect parts of the body other than the skin.

2. Winter killing: probably snow-mold.—I am sending you under separate cover a sample of fungus. This sample has been taken from a green lying high and dry. Two-thirds of the green is affected and the grass seems to be dead. We had 30 inches of snow in the early part of December, which disappeared on January 6th, and it was then I noticed the fungus. I do not think this can be snow-mold as I saw this fungus in the winter of 1926 and 1927 before the snow came. (British Columbia.)

ANSWER.—From your description we suspect that the injury was due to some fungus, probably of the snow-mold type. The fact that you found the same type of injury even in the absence of snow does not necessarily rule it out of consideration. "Snow-mold" is a common name used to designate one or more of the fungi injuring plants at a very low temperature. The moist conditions provided by a

covering of melting snow apparently are just the conditions needed for the growth of this group of fungi. Therefore, the damage is ordinarily associated with a covering of snow, although the snow itself has nothing to do with the damage except in an indirect way in so far as it affects the growth of the fungi. This association has led to the common name, "snow-mold." However, moisture from light showers or heavy fog during periods when the temperature is just a little over the freezing point may also provide conditions favorable for these fungi. Therefore, it is not an uncommon experience to find injury from the so-called "snow-mold" fungi when there has been no snow whatever on the greens.

3. Injury from ammonium sulfate.—May we ask you to assist us in getting rid of brown-patch in putting greens? Something has been tried; I am under the impression that it was a suspension of calomel. It did not work well. This is the first year that yellow-patch has appeared here, it followed the application of ammonium sulfate, I think in excessive amounts. (Rhode Island.)

ANSWER.—The "brown-patch" of which you write is probably not the diseased condition for which calomel is recommended. Calomel is used to control fungous diseases on grass, but is altogether ineffective against brown-patched areas which are caused by excessive amounts or careless applications of other chemicals. Since the yellowing appeared soon after an application of ammonium sulfate, we assume that the injury you speak of is simply a burn due to uneven or excessive applications of this fertilizer. There is nothing to do in such cases except to keep the turf thoroughly watered and, as a rule, this will soon make it recover.

4. Sulphur for soil improvement.—I am enclosing an article on "Sulphur in Soil Fertilization Problem." You will note that it refers particularly to the fact that a heavy application of sulphur is necessary, in some cases, to bring about a change in the structure of clay particles which allows better water percolation and drainage of alkali salts. Do you feel that sulphur could in any way help our grass problem on the greens and fairways? (Missouri.)

ANSWER.—There are certain soils which are unquestionably benefited by an application of sulphur. This is particularly true of certain crops. As the article points out, sulphur may act as a fertilizer and may also influence the structure of the soil. As is usually the case in such articles, there is no mention made of the limitations to such benefits. There are probably comparatively few soils where sulphur is the limiting factor for plant growth, and certainly your soils are not likely to require a great deal of sulphur. The alkali soils mentioned in the article are those which are found in the Far West and do not apply to the so-called alkaline condition found on golf courses. Our Mid-Western soils are not "alkali" soils, although they may be "less acid" than is desired for putting greens. Sulphur, as you may know, is used as a fungicide against many of our plant diseases. This suggested that it might be used against brown-patch. We soon found, however, that instead of controlling the fungus these applications proved toxic to grass and, therefore, had to be discontinued. For some reason, which we are at present unable to explain, sulphur when used in excess on grass gradually reduces its vigor. For that reason we advise you to avoid using it on your course.

AS WE FIND THEM

Stepping from the eighteenth green with the Green Committee Chairman and the Greenkeeper, it was suggested that we "stick around and hear the angels sing. You will hear their daily chant to the Green Committee and Greenkeeper." So there we waited and watched.

One Mr. Average Golfer soon waddled up to attempt what looked like a "dead sure one." In that terrifying silence, which precedes great storms, he went through all the most approved and prolonged preliminaries of sighting and preparing for that momentous tap. Horror of horrors, he missed! We guessed it; the green was all to blame. The storm broke!

> **"Bill, why in the name of galloping golf balls can't we have some greens on this course? These things would be a disgrace to any cow pasture. There isn't a golfer in the world who could putt on them." Ad Infinitum.**

All this in spite of the fact that the other members of his foursome sank good, long shots and were last seen headed for the locker room with beaming faces not ordinarily associated with "rotten" greens and high scores.

The next group furnished this helpful suggestion: "If you fellows are interested in improving greens, why don't you first find out what the players want? After all, greens are for the golfers and everything should be done to give them exactly what they want."

> **We beat him to that idea by many years. We had long ago been told "when baby cries, give him what he wants." But we had also learned that to obtain results it makes some difference whether baby is "crying for something" or "just crying."**

The greenkeeper suggested that we question a few of the club's best players as to how fast they preferred to have greens. "One of my men is ill and that has interrupted our schedule. Number 16 has not been cut and is very slow today, but this eighteenth is the real 'lightning type.'" The first reply was:

"This green is perfect! Anyone can putt on it. If you could only get all our greens as fast as this one, every player in the city would be clamoring to join this club. Number 16? Is that supposed to be a green? We thought you were planning to let that grow up for hay."

"Fore!" The next foursome is having a terrible time rolling them back and forth across the green. "Bill, what on earth is the matter with this green? If you simply touch the ball, it goes clear across. No use trying to putt on it. Why can't we have all the greens like 'sixteen' is today? You can really hit a ball on that one without making it roll a mile."

> **Now that's settled! All that the green committees, greenkeepers and "those scientific guys" have to do to give the players just what they want (in speed of greens, at least) is to develop some kind of gear-shift. Then if a player "likes 'em fast" he can shift into high, and if he "likes 'em slow" he can shift to low. Bet some of them will want it fixed so they can shift after the ball is struck. Then they'll want a "reverse" so that the one which is "too strong" will roll back at just the right speed—all counting a single stroke.**