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UNITED STATES GOLF ASSOCIATION GREEN SECTION

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Work of the Green Section Appreciated

That the golfers of the country appreciate the need for organized golf turf studies such as are being conducted by the Green Section is being shown in a gratifying manner by their response to the campaign being conducted by the Executive Committee of the Green Section to raise funds for the enlargement of the work which we have already begun. On another page of this number of The Bulletin is presented an article summarizing the contributions which the trained investigator has made to greenkeeping. In that article are also indicated the unsolved problems of greenkeeping. Give the golfers of the country turf as near to the ideal as possible. That is the purpose of the Green Section. It is hoped that every chairman of a green committee will fall in line behind our Executive Committee in their efforts to raise needed funds for the Green Section and lend his unstinted support to the movement. Plans for raising these funds have recently been furnished to the president of each golf club in the United States.

Government Recognizes Green Section As Scientific And Educational Institution

The scientific and educational character of the work of the United States Golf Association Green Section has finally been officially and legally recognized by the United States Government.

On January 9, 1926, the Government rendered a decision denying the right of the taxpayers to deduct from their gross income amounts contributed to the United States Golf Association Green Section.

James Francis Burke, General Counsel for the United States Golf Association, as well as General Counsel for the United States Golf Association Green Section, was called into the case and appealed from the Government's original decision.

It was Mr. Burke who secured the original charter when the Green Section was incorporated, and he contended that the articles of incorporation were so worded and the work of the Green Section so conducted that it must come within the Federal tax law embracing scientific and educational institutions; that its work involved, not only the deepest research, but the widespread dissemination of scientific knowledge of value, not only to golf clubs, but millions of owners of lawns and growers of grass all over America.

After the consideration of all the arguments presented and the brief filed, the Treasury Department on May 25, 1926, reversed its former decision and held that all amounts contributed to the Green Section were deductible for income tax purposes, and those who have been taxed heretofore are entitled to rebate.

The larger value of the decision is in the Government's recognition of the value of the Green Section's work and its scientific and educational character.

Corrosive Sublimate as a Control for Brown-Patch

By John Monteith, Jr.

In the experimental work at the Arlington Turf Garden, near Washington, D. C., last summer, it was found that all the mercury compounds tested were effective in checking brown-patch. This work was summarized in the October number of THE BULLETIN, where it was pointed out that mercuric chlorid (corrosive sublimate or bichlorid of mercury) gave equally promising results when compared with the various organic mercury preparations. Before giving details as to its use, it was felt desirable to test this chemical more thoroughly another season.

At Arlington the large brown-patch has so far this year been negligible; but unusually severe and repeated attacks of small brown-patch during the latter part of May and throughout June, have given us abundant opportunity to further test the efficacy of mercuric chlorid in checking this more persistent type of disease. The results so far this year have substantiated those obtained last season, and have been repeated frequently enough to warrant the conclusion that mercuric chlorid, under conditions such as we have at Arlington, is as effective against this disease as are the organic mercury preparations—and considerably cheaper.

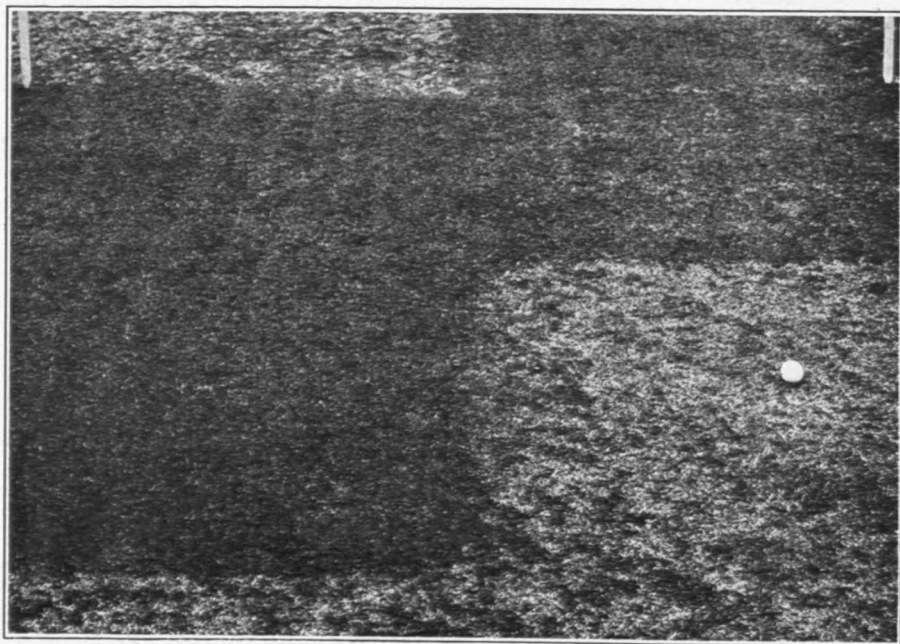
It is the purpose of this article to summarize the experiences with bichlorid and to indicate methods of application found to be most effective, in the hope that clubs may try it and help us determine its limitations or adaptability under a variety of climatic and soil conditions.

In the August, 1921, BULLETIN, on page 151, there is a brief note, stating that Mr. J. A. Roseman had used corrosive sublimate effectively against brown-patch on the greens of the Westmoreland Country Club, Glenview, Illinois. His method apparently did not become popular; and corrosive sublimate, although widely used for earthworm eradication, has been generally overlooked as a means for checking brown-patch.

In the experimental work at the Arlington Turf Garden, mercuric chlorid has been compared with a number of organic compounds of mercury. The work there has all indicated that when properly applied it gives results very similar to those obtained by the organic preparations. It is by no means a permanent cure, for it has the same limitations as do the organic forms in that the period of protection varies considerably, depending on climatic conditions. At times we find the protection afforded by any of the mercury compounds lasts less than a week; but at other times, when the organic preparations prevented brown-patch for several weeks, we found that bichlorid gave equally prolonged protection.

One of the chief objections against the use of bichlorid is that it is likely to burn the turf or cause serious discoloration. We have found that if used in comparable concentrations the "burning" by bichlorid is of no more consequence than that produced by the commercial organic preparation. In using the various organic compounds it has been found that an application strong enough to satisfactorily control brown-patch usually causes some discoloration of the grass. At times there may be no evidence of burning, whereas

under other conditions the same application may produce a distinct injury. As a rule, however, if proper care is used in application and in subsequent treatment the discoloration produced is insignificant and but temporary. Mercuric chlorid behaves in a similar manner. In using corrosive sublimate against worms most greenkeepers have learned that it is a dangerous chemical in careless hands. The same objection applies also to ammonium sulfate and some of



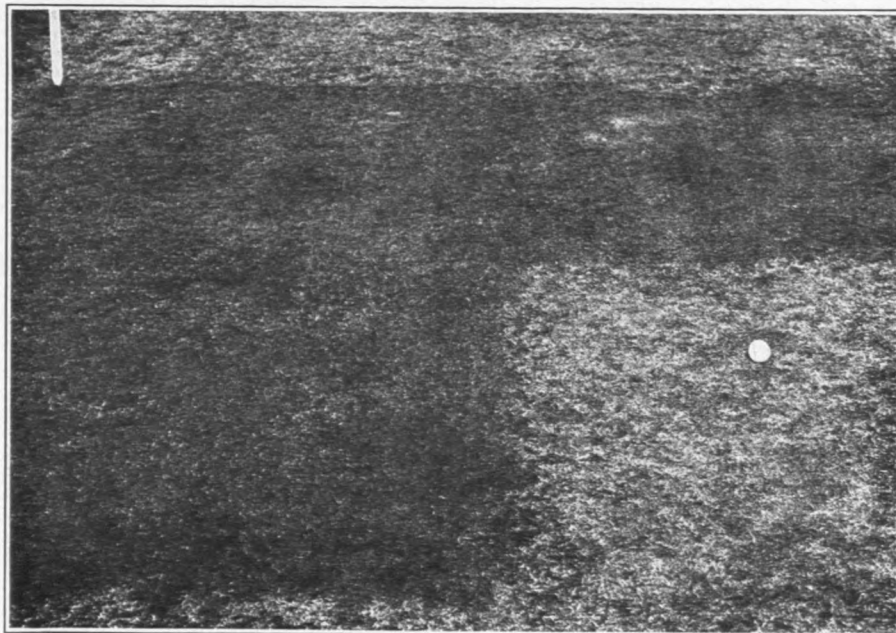
Control of small brown-patch with bichlorid applied at the rate of 1 pound per 1,000 square feet

This 8-foot plot of badly diseased turf was divided into four equal squares and treated as follows: The lower right corner (where the golf ball is lying) is the "check," which received compost without any addition of chemicals. The square just above it received a spray treatment of bichlorid at the rate of 1 pound per 1,000 square feet, after which it received the same application of topdressing as the check. The two squares at the left received the same amount of topdressing as did the check, with the addition of powdered bichlorid at the rate of 1 pound per 1,000 square feet. For the square in the foreground this mixture was prepared the day previous to application, whereas the one just above was treated as soon as the bichlorid was mixed with the compost. All were then watered thoroughly with a rotary sprinkler. Note that the disease was not lessened by the topdressing alone in the check, but the addition of bichlorid controlled the disease in all three squares. The photograph was taken two weeks after the application was made, when the discoloration in the upper left square had disappeared entirely.

the other chemicals used on greens. Any greenkeeper with experience in applying chemicals to turf, either fungicides or fertilizers, has learned that the degree of burning varies with the conditions of the turf, and the climatic conditions prevailing at the time of application. Also he has learned that strong chemicals must be applied evenly, must be well "watered in" immediately, and the green must be kept adequately watered for several days to prevent burning. One who has learned these lessons should experience little difficulty with the bichlorid treatment for brown-patch.

In using bichlorid it should be remembered that it is usually sold in practically the pure form, whereas in the case of the most common organic mercury compounds, whose trade-names are Uspulun and

Semesan, only 30 percent of the material purchased is the active mercury compound. Allowance must, therefore, be made for the 70 percent inert material contained in these preparations. In other words, in applying the standard treatment of 1 pound per 1,000 square feet of Uspulun or Semesan, only three-tenths of a pound of the active chemical, "chlorophenol mercury," is being applied. Since corrosive sublimate is usually purchased without any "inert material," it follows that in a solution of 1 pound of bichlorid to 50



Control of small brown-patch with bichlorid applied at the rate of $\frac{1}{3}$ pound per 1,000 square feet

The square where the golf ball lies is the check, which received no chemical. The square just above the check was treated with powdered mercuric chlorid at the rate of one-third pound per 1,000 square feet, mixed in a small amount of sand to aid in even distribution, and was then well sprinkled with water. The two squares at the left received a liquid treatment at the rate of one-third pound of bichlorid in 50 gallons of water per 1,000 square feet. The upper of these two was not watered for several hours after treatment, but the lower one, just to the left of the check, was well watered immediately after the chemical was applied. None of these methods caused noticeable injury to the grass, as is evident by the dark healthy growth in each treated square when compared with the check plot where the disease continued to be active. The photograph was made five days after the application of bichlorid, showing the quick response of turf to this chemical.

This rate of application, one-third pound per 1,000 square feet, is effective in controlling the disease and much less likely to injure the turf than is the heavier treatment.

gallons of water there is over three times as much of the mercury compound as is contained in an equivalent solution of one of these chlorophenol mercury preparations. For that reason a smaller amount of bichlorid must be used to prevent burning. No definite rule as to the best concentration or amount of solution can be given for any of these compounds, since burning is so largely dependent on the condition of the turf when treated and the subsequent attention. On the Arlington Turf Garden we have found that an application of 1 pound of Uspulun or Semesan in 50 gallons of water applied to 1,000 square feet when evenly applied with a sprayer or sprinkler caused no serious injury to the turf—provided the green was not

neglected after treatment. Using one-third pound of bichlorid in the same amount of water for the same area gave no noticeable difference in burning. We have applied the chlorophenol mercury preparations at the rate of 3 pounds, and bichlorid at the rate of 1 pound, per 1,000 square feet, without any permanent injury. These applications, however, are somewhat excessive and apt to cause bad burns, and except in rare cases should not be attempted.

The method of application which at present appears most promising is that in which the powdered bichlorid is mixed with compost and applied as the usual topdressing. This method has several distinct advantages over the liquid method of application. The usual recommendation for treatment with organic mercury includes a spraying or sprinkling application of the disinfectant followed by a light topdressing containing some plant food, such as ammonium sulfate, to stimulate new growth to cover the scars of the disease. By mixing the bichlorid with compost no additional expense of equipment or time is required. Adding the usual amount of ammonium sulfate to the compost apparently does not interfere with the desired effect of the bichlorid or sulfate. Since topdressing is one of the periodic requirements of a good putting turf, the cost of the chemical is the only item of expense involved in brown-patch control by this method. Greenkeepers, in topdressing turf with a compost containing ammonium sulfate, have learned the necessity of properly watering and caring for the green after an application, and should find that similar care will solve the problem of "burning" with bichlorid.

We have also found that by mixing the mercuric chlorid in the compost the day before it is to be applied the danger of injury to the turf is greatly reduced. In some recent tests at Arlington, bichlorid at the rate of 1 pound per 1,000 square feet was mixed with compost and allowed to stand over night. The following day an equal amount of bichlorid and compost were mixed and applied at once, after which the mixture prepared the previous day was scattered in a square plot immediately adjoining, and both were then thoroughly watered with a rotary sprinkler. For a few days the plot receiving the preparation, which was applied immediately after being mixed, showed a decided discoloration, whereas the plot receiving the mixture of a day's standing showed only a slight discoloration. This difference is probably due to a chemical change taking place in the mixture left standing over night. There was no noticeable difference in disease control; so the chemical change, which is apparently responsible for the reduction in burning, does not detract from the fungicidal value of the bichlorid. This experiment has been repeated on other plots with other strains of grass and has given similar results, so that we now feel justified in recommending its trial on golf courses in various localities.

Recognizing the possibility of different results when used under conditions other than those obtaining at the Arlington Turf Garden, it is recommended that this method be first used on only a portion of a green, leaving a part untreated for a fair comparison. This will enable the greenkeeper to decide its merits on his own course without risking any large area until he is familiar with the treatment. The Green Section will welcome any reports as to its value on various

courses, for it is only after a large number of such trials that a general conclusion can be arrived at.

We therefore suggest an application of bichlorid in an ordinary light topdressing of compost (with or without fertilizers, depending on the needs of the turf). The bichlorid should be in the finely powdered form and *thoroughly* mixed with the compost, using from 4 to 8 ounces of the chemical for 1,000 square feet. It is preferable to prepare this mixture the day before it is to be used. Immediately after this topdressing is applied it should be well watered, and the turf should be sprinkled frequently the next few days to avoid any serious drying at the surface. If an attack of the disease develops when it would be undesirable to apply topdressing, the bichlorid may be applied with the usual spray or sprinkler method, using about 5 ounces per 50 gallons for each 1,000 square feet. The green should be given a light watering soon after the solution is applied, and kept moist for several days.

Contributions to Greenkeeping by the Trained Investigator*

By R. A. Oakley

Greenkeeping is a very old art. Certain features of it had their beginning long before golf itself, and the advent of the game did not bring with it anything new in turf growing. Early greenkeeping had a very crude beginning. It involved neither construction, soil preparation, sowing of seed, artificial fertilizing, watering, or mowing, as we practice these features of culture today.

We have made much progress in the art since the fifteenth century, or whenever it was that golf made its first real recognized start. Modern greenkeeping owes its birth to the rotary mower, or the lawnmower as it is now called. Had it not been for this mechanical device or had something to do similar work not been invented, our conception of a putting green today would be a closely grazed bit of sward which would permit a putted ball to approach the cup with a minimum of hops, skips, and jumps. Modern greenkeeping then may be said to have its origin in the vicinity of 1870; for it was about that time that the rotary mower came on the scene.

Greenkeeping as it exists today is very largely the product of empiricism. The results of cut-and-try methods comprised most of it; but the same may truly be said of plant-culture in general. Science, however, has made contributions to it, and very important ones. Science, through the trained investigator (the term is used here in the collective sense), has contributed to greenkeeping in two general ways: (1) by exposing mysterious and fake practices and materials and doing away with honest but erroneous practices, and (2) by making discoveries in new lines. Indirectly trained investigators have been assisting greenkeeping for many years. Hundreds of them today are working on problems related to it without knowing it; but it is not so many years since the trained investigator actually enlisted in greenkeeping and commenced work specifically on its problems.

*An address delivered at the Annual Meeting of the Royal Canadian Golf Association Green Section at Toronto, February 6, 1926.

Previously published in CANADIAN GOLFER for February, 1926.

In fact, his specific enlistment dates back scarcely more than a decade and a half. To understand more clearly just what he has accomplished since he was recruited to the service it is well to recall some of the conditions which existed in greenkeeping when he entered the field. It had accumulated many of the unsound theories and practices of gardening. There was no specific literature on the subject except that published by the purveyors of seeds, materials, or equipment used in connection with it, so that a newcomer or in fact a veteran of a studious turn had no source of unbiased information. In brief, this very unsatisfactory condition existed: the golf course architect, the builder, the turf expert, the seedsman, the fertilizer man, and the equipment man were all tied up in one organization, and, sad to relate, this organization too frequently was tied up with the greenkeeper through a system of rebates. In a way this was a natural development, but a very unhealthy one. The unsound practices of the greenkeeper and the trade had become pretty thoroughly entrenched. To use a common expression, the trained investigator was up against a hard proposition in assuming the role of reformer. Briefly to anticipate the outcome of his activities let it be said without going further that the architects, the builders, the merchants, and the greenkeepers, with few exceptions, have accepted him as a useful servant of the profession. Even at the outset this group was only a little less willing to recognize the trained investigator than were the golfers and green-committeemen who hailed him as a theorist.

One of the first lines of study the trained investigator undertook in greenkeeping was that of the species of grasses best adapted to fine turf making under various conditions of soil and climate. As in the other lines of his research, he had no object other than to discover the facts. After extensive and careful testing he found that the good northern fine turf grasses are few in number, that many that were commonly used in putting green or fairway mixtures were expensive away beyond their usefulness, if useful at all, and that the theory and practice involved in the use of special seed mixtures for special conditions were for the most part unsound and uneconomical. The acceptance of this by the greenkeeper has resulted in better putting greens and a vast saving in money to the clubs, since special mixtures were appreciably higher in price than were their useful constituents.

Almost coincident with the breaking down of the special seed mixture practice came a great reduction in the rate of seeding. It likewise was the result of carefully conducted investigations. The sowing of 20 pounds of seed to each 1,000 square feet of putting green finally gave way to 5 to 7 pounds of red fescue or 3 to 5 pounds of bent to each 1,000 square feet. This likewise produced a very material economy.

Secret fertilizer mixtures could not withstand the analysis of the trained investigator. He soon reduced them to their component parts and informed the greenkeeper as to how quite as effective fertilizers could be compounded much more cheaply. Later he did more than this in the field of fertilizers. He virtually revolutionized this department of greenkeeping. Proprietary compounds all along the line were investigated. Earthworm eradicators came in for their share of study. A little investigation disclosed the fact that the

powder or meal that was sold under various special names as an earthworm eradicator was composed of meal from the seed of the butter-tree of India (*Bassia latifolia*)—called mowrah meal—and usually a considerable percentage of inert matter was included with it. Of course the pure product purchased under its proper name was much less expensive than the trade product. An analysis of liquid worm eradicators sold as proprietary compounds showed the active principle in the best of them to be mercuric chloride (corrosive sublimate). In some of them certain substances such as ammonium chloride were added with a view to increasing the solubility of the mercuric chloride and of decreasing its tendency to burn the turf. Out of this bit of investigation came the very simple practice of using 2 to 3 ounces of mercuric chloride with 50 gallons of water, sprinkling this on each 1,000 square feet of green to be wormed, and then watering freely. It is highly efficacious and much cheaper than the proprietary earthworm killers.

The trained investigator has pulled apart many other patent compounds used in greenkeeping, including weed killers, ant killers, and fungicides.

One of the best pieces of destructive work done by him was in fighting the use of peat commercialized under the name of humus. The sale of this product had reached large proportions, based chiefly on the fact that it is organic matter but partly on its color. Its use is not only a waste of money, but the material itself in the vast majority of cases is prejudicial to the growth of grass. Nearly every good point claimed for it, it does not possess. It is relatively high in nitrogen, but the nitrogen in it is almost totally unavailable to the grass plant. It is organic matter but it is not humus, since to be humus, organic matter must be in a fairly rapidly decaying condition. Peat decays about as rapidly as charcoal, which is one of the most inert common substances known. After much effort backed by unimpeachable evidence against it, the trained investigator has succeeded in putting peat very largely in the discard, where it is hoped it will remain until he or someone else discovers how it may be used advantageously in turf growing.

Freak and more or less harmful practices in green construction have been broken up as the result of investigations. The layer method of building a green, involving cinder layers, peat layers, or other unusual layers, has been thrown into the scrap-heap. Many relatively harmless but quite expensive or wasteful practices have been exploded, among them spiking, scarifying or disking of turf to rejuvenate it or to prevent it from becoming "sod-bound," regular reseedling of old turf spring and fall, the use of charcoal to sweeten the soil, and the use of lime for a similar purpose—although this last can not be said to be a harmless practice where bent and certain other greens are involved.

The foregoing are some of the more important freak, fake, unwise, or useless practices the trained investigator has been largely responsible for upsetting. His work in this direction has in a sense been destructive, although withal very constructive. Attention is now called to the truly constructive work along new lines which can be definitely credited to him.

Critical studies in fine turf grasses did more than determine their soil and climatic relations. They disclosed the details of the habit of growth of each species. In this connection some very useful discoveries were made. The reason why red fescue will not withstand close cutting on putting greens while bent will thrive under it was learned by a study of the basal parts of the shoots of these grasses. This study provided a basis for their treatment on greens so as to obtain the best results with each. A similar discovery was made in the case of Kentucky bluegrass and Canada bluegrass. The habit of growth of the basal part of the shoot of Canada bluegrass is such that no system of culture can make a true turf grass out of it.

The discoveries of how grasses perennate—that is, how they live year after year or become perennial—and of the annual nature of the roots of perennial grasses, are outstanding features of work of the trained investigator in his studies of the fine turf species. In brief, he has pointed out that a grass is perennial through a succession of shoots or new plants, and that the roots of these grasses do not live indefinitely as do the roots of oak trees or alfalfa plants, but last for only a relatively few months, when they give way to new roots from new shoots which are continuously forming. These two discoveries very greatly modified the practice of soil preparation of putting greens, and likewise certain features of the cultural treatment of greens. Today the builder of putting greens, if he is wise, will reserve most of his supply of manure for the compost pile, to be used as topdressing for his turf later, rather than attempt to incorporate large quantities of it with the soil before sowing the seed or planting the stolons.

Since turf is a succession of grass shoots with roots constantly developing, the plants must have good soil at the surface to produce their best growth. If soil is not added as top dressing the shoots that make the turf are compelled to live on the remains of their ancestors, which condition is not conducive to their health and vigor. Furthermore, the trained investigator discovered that the roots of grasses under putting green conditions do not penetrate deeply into the soil during the growing season but remain near the surface, where they make up an important part of the turf. Good putting green turf with deeply penetrating roots is an impossible combination. The rich soil, therefore, should be on the surface, and not a great deal of attention need be given to the under soil, except as to its drainage, which is exceedingly important.

A very useful outcome of the critical studies of grasses was the working out of characters whereby the seeds of the common bents may be distinguished from those of redtop and from one another. This marked an important step in the use of the bents. Prior to 1914 no one, not even seed specialists, attempted to distinguish between bent seed and redtop seed. This permitted a very unsatisfactory condition to exist in the merchandising of bent seed. Unscrupulous dealers found it easy to substitute redtop seed and redtop chaff for bent seed, and honest dealers and the clubs were their victims. The discovery of characters whereby these species can be positively identified has brought about a great reformation in the sale of bent seed, which has resulted in better and cheaper greens.

Along with studies of seed characters of the bents came studies of their vegetative or leaf and stem characters. Species and strains

were studied critically in isolated clumps, in rows, and in turf plots. These studies disclosed the fact that at least three species are included in what was commonly called creeping bent or what is now known as German mixed bent. These species pass by the common names of Rhode Island bent, velvet-bent, and creeping bent. It was found that there are many strains of velvet-bent and true creeping bent, varying appreciably in their putting green making qualities.

The story of the development of the vegetative propagation of creeping bent for making putting greens has much of romance about it, but it is now so generally known among golfers that it need not be repeated here. It is one of the outstanding accomplishments of the trained investigator. Some have said it is his best offering. Certain it is that the critical seed and vegetative studies put the bent grasses decidedly to the forefront as putting green grasses where these species can be grown. This is truly a blessing of the greatest magnitude to golf.

Putting greens have their diseases and insect pests. Fortunately in Canada the notorious disease of putting greens called brown-patch is as yet not a serious problem. Southward in the United States it constitutes one of the most serious putting green menaces. Trained investigators are at work on it and already have done much in developing measures for its control. These involve the use of resistant strains of grasses, special fungicides, fertilizers, and the adaptation of certain of the features of culture common to greenkeeping.

In the fight against earthworms and insects which injure turf, the trained investigator has helped and promises greater help. The improvement of the carbon disulfid emulsion method of exterminating grubs has assisted very greatly in solving the problem created by the June beetle, Japanese beetle, and others of their kind. Within a few days there will be published the results of three years' experiments which point quite clearly to the possibility of rendering the soil of putting greens immune to the attacks of earthworms and grubs by mixing with it certain substances that are poisonous to these pests but are not harmful to the grasses.* Lead arsenate and sodium silico-fluoride have been used very successfully in experiments, but a large number of others will be tried out thoroughly. This line of investigation promises much.

Diseases and insect pests are serious enough, but after all are secondary as compared with weeds. When the earth was cursed to bring forth "thorns and thistles," chickweed, pearlwort, crab-grass, and a dozen other putting green weeds were included with them. The weed problem is always before the greenkeeper. It is his Nemesis. Thus far hand methods have been his heavy artillery in the fight against nearly all of the important putting green weeds. Relatively recently, however, careful investigations have pointed to another and simpler method of warfare. In brief, it involves the systematic and continuous use of such fertilizer as ammonium sulphate and ammonium phosphate, nitrogenous fertilizers which tend to produce an acid condition in the soil. The explanation seems to be relatively simple. The best northern putting green grasses—that is, the bents

* Since the date on which this address was delivered, the results of these experiments in grub-proofing turf were published in the article beginning on page 34 of THE BULLETIN for February, 1926.

—are able to thrive on soils that are regarded as highly acid to a much greater degree than the weeds that compete seriously with them on relatively alkaline soils. Fertilizing to produce acidity in the soil, then, is the greenkeeper's hope in his fight against weeds in the future—not all weeds probably, but the most troublesome ones. This means that he must avoid lime or similar alkaline substances which have been used extensively either as soil amendments or fertilizers in the past.

The trained investigator is at work on a very large number of problems relating to greenkeeping; but the field is merely being scratched. In what he has done, the help he has received from greenkeepers, green-committeemen, and merchandizers of golf course supplies and equipment has contributed very largely to his success.

What he may accomplish in the future will depend largely on the financial assistance he receives and the cooperation that these groups give him. There are a great many problems still to be solved. The requirements of golf are becoming more and more exacting in the matter of fine turf. Greenkeeping must keep pace with them. More and more training will be required of the greenkeeper as time goes on. In helping him to keep pace with his profession he will find the trained investigator his best friend and lieutenant. He will find the Green Section of the Royal Canadian Golf Association an institution upon which to lean and to which he may go freely for assistance.

Crab-grass.—The sure way to rid putting greens of crab-grass is hand-weeding in June and July. After that the plants have become large enough to injure your turf; and, moreover, they begin to produce seed in August. A single plant that is allowed to produce seed will infest a large area of turf. Keep your mounds free of crab-grass, so that the seed from the mounds can not wash onto the greens. Crab-grass is a short-lived plant, appearing rather late in the spring and dying with the first frost, but it is a rapid grower and will quickly become uncontrollable if it is not attacked in its young stages.

New member clubs of the Green Section.—St. Louis Amateur Athletic Association Triple A Club, St. Louis, Mo.; Westwood Country Club, Glendale, Mo.; Pitman Golf Club, Pitman, N. J.; Creve Coeur Golf Club, Creve Coeur, Mo.; Norwich Golf Club, Norwich, Conn.; Bloomington Golf Club, Minneapolis, Minn.; Riverview Club of St. Louis, St. Louis, Mo.; Tuckaway Country Club, Wauwatosa, Wis.; Mt. Pleasant Country Club, Mt. Pleasant, Mich.; Mt. Tom Golf Club, Holyoke, Mass.; Verona Hills Golf Club, Bad Axe, Mich.; Flint Country Club, Flint, Mich.; Kalamazoo Country Club, Kalamazoo, Mich.; Phoenix Country Club, Phoenix, Ariz.; Long Beach Country Club, Long Beach, Calif.; Sunnyside Country Club, Fresno, Calif.; Maple Hills Country Club, Kalamazoo, Mich.; Lake Placid Club, Lake Placid, N. Y.; Mr. B. E. Taylor, Detroit, Mich.; Meridian Hills Country Club, Indianapolis, Ind.

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

In a medal round, A and B arrive at a certain putting green where the cup is found to have been slightly pulled up so that the edge protrudes above the surface about one-quarter inch. A, lying five feet away, putts first, without noticing the condition of the hole. The ball strikes the edge and is deflected to the side. B, before making his putt, which was only one foot from the cup, pressed the tin back into the green. Was he justified in so doing? The common-sense view of the matter is that this was the proper course for him to follow, and that A's failure is due to his bad luck in not having noticed the condition of the cup, just as if he had failed to remove a worm or a stick from his path.

Decision.—A player or the caddie could have ascertained whether the cup was in proper position before playing. A would have to suffer the penalty of two strokes. B was within his rights to have the cup placed in its proper position before playing, but in this case he should have pointed out to A the defect before he putted out.

A single was playing behind a four-ball. The four-ball had played the 17th hole and had walked over to the 18th tee, and one of the players had shot from the tee. The four-ball then decided to let the single finish the 17th hole and go through. The single then came to the 18th tee and were told to go through. The player who had shot his ball from the 18th tee did not tell the players they had shot. The players (the single) then teed off and played the 18th hole. One of the players beat the other by one stroke. The player who was defeated advanced the player who had defeated him to the next match. Some 15 or 20 minutes later the same single joined a four-ball, when the player who had defeated the other player as mentioned above, discovered that he had some other player's ball, which was of the same mark but of a different brand. He then realized that he had played the player's ball that was first shot from the 18th tee (that is, the ball that had been shot by one of the players of the four-ball), and that his own ball had been found by one of the four-ball behind them. Does this player who shot the ball as explained above lose the match or win it?

Decision.—The player who played the ball outside of the match loses the hole, as provided in section 2 of Rule 20.

A water hazard extends across the course between a tee and the green. A ball is played across the hazard and beyond the green. In playing back to the hole, the player over-approaches and sends his ball into the water. Under the exact wording of the rule, he should return toward the tee, drop a ball, and again play across the water hazard which he has already safely crossed. Some of our members maintain that the ball should be dropped beyond the green at the spot from which the shot which entered the water was played. Is there any basis for such a ruling, or would it be necessary to make a local rule to that effect?

Decision.—Rule 27 would apply to the case you have cited, unless your committee have made a local rule covering shots played in the way you describe.

Birds of the Golf Course

By W. L. McAtee

No need to describe the best-known of all our birds. The robin nests in the northern half of the eastern United States, in nearly all of the western states, and winters in southern states all the way across the continent. Thus at one season or another bird lovers the country over have an opportunity to see this confiding and handsome species. Its pleasing colors and familiarity must have endeared it to the earliest settlers, for they transferred to it the name of that favorite among British birds, the robin redbreast, celebrated in poetry and in such folk tales as "Babes in the Wood." This European robin is a much smaller species, belonging to quite a distinct family of birds, while our robin has a true relative and an almost exact counterpart, except for color, in the English blackbird. However, this tangle of names is never likely to be undone, and the robin in America, like the robin in England, although a different bird, is just as immutably enshrined in popular affection.

The American robin is a lover of lawns, hence inevitably of golf courses. Especially does it favor lawns when they are moist after a shower, and its characteristic actions at such times have been noted by all. It hops quickly a few steps, then pauses, head cocked, as if listening, but in reality peering, we believe, for the slightly moving grass blade that will betray the presence of the worm it is seeking. Our illustration shows the robin with a mouthful of the booty it obtains from rain-soaked earth, and so assiduous is the bird in the pursuit of earthworms that it is our chief natural aid in the control of these pests of putting greens, whose evil work, worm casts, have attained the dignity of mention in the rules of golf. The robin, an instinctive and tireless worm eradicator, really deserves to be classed as a patron saint of putting greens.



The Robin

Robin Redbreast by no means confines his services on golf courses to the destruction of earthworms, but is an ally not to be despised in the warfare against numerous other turf pests. The bird is very fond of the larvae of March flies, which sometimes become so numerous under turf as to wholly separate an upper layer, which promptly

dies. Over a thousand of these larvae have been found in the stomach and gullet of a single robin; and from 100 to 200 of them in a stomach have been found in numerous instances. Leather-jackets or the larvae of crane-flies, insects with similar habits to the March flies, also are freely eaten by the robin.

Caterpillars, almost exclusive feeders upon green vegetation, are an important source of food for the robin, and cutworms and armyworms, special grass pests, are included in this part of the dietary. Grasshoppers, and leaf-hoppers, well-known consumers of grass are eaten, and even the minute but notorious chinch-bug is not overlooked. The robin feeds upon most, if not all, kinds of the dung-beetles which make considerable holes and throw up correspondingly objectionable heaps of earth on putting greens. It is an inveterate foe of the destructive white grubs, and of the persistently annoying ants. It feeds upon clover root- and clover leaf-weevils, upon the Japanese beetle, and upon crayfishes, all pests of the golf course.

Except when obtaining the wild fruits of which it is very fond, the robin feeds almost exclusively upon the ground, and thus, with its taste for insects and worms destructive to turf, is naturally adapted to be of great service on golf courses, where its cheery presence should be encouraged as much as possible.

Removal of all tree stumps inadvisable.—Mr. A. C. M. Croome, well known to both British and American golfers, suggests that in many cases the removal of all tree stumps in course construction is inadvisable, for the reason that they form an excellent foundation for mounds diversifying the surface of the course through the green. This has been done at Addington with charming results, producing an almost dune-like effect.

Fertilizer Experiments on Turf Grasses at Purdue University

Some interesting results from the use of different fertilizers on lawns are reported by Prof. S. D. Conner, of Purdue University Agricultural Experiment Station, La Fayette, Ind., in *THE INDIANA ACADEMY OF SCIENCE*, vol. 34 (1924), page 169. A summary of important features brought out by Professor Conner's work is presented in the following paragraphs:

The first experiment, started in 1918, included the following six fertilizer treatments: (1) Untreated; (2) limestone, 3,000 pounds per acre; (3) commercial fertilizer, 600 pounds per acre; (4) limestone and commercial fertilizer; (5) chicken manure, 1 ton per acre; (6) chicken manure, limestone, and commercial fertilizer. The commercial fertilizer employed in the experiment contained 6 percent nitrogen, 8 percent phosphoric acid, and 2 percent potash.

The second experiment, started in 1922, included the following 10 treatments: (1) Untreated; (2) nitrate of soda, 150 pounds per acre (equivalent to $3\frac{1}{2}$ pounds per 1,000 square feet); (3) ammonium sulfate, 100 pounds per acre (equivalent to $2\frac{1}{3}$ pounds per 1,000 square feet); (4) dried muck, 3,000 pounds per acre; (5) limestone, 3 tons per acre; (6) phosphate and potash; (7) phosphate, potash,

and nitrate of soda; (8) phosphate, potash, and ammonium sulfate; (9) phosphate, potash and muck; (10) bone meal, 200 pounds per acre (equivalent to approximately $4\frac{1}{2}$ pounds per 1,000 square feet).

In these experiments no appreciable effect could be noted from the use of limestone, in spite of the fact that the soil was somewhat acid. Neither was there any noticeable benefit from the use of phosphate, potash, or bone meal. Nitrate of soda and ammonium sulfate both produced a dark green luxuriant lawn the first season. Very little effect from these fertilizers could be noted the second year or still later. The application of muck at the rate of $1\frac{1}{2}$ tons per acre produced no effect.

As a result of these experiments, it is concluded that fertilizer for turf grasses should be high in available nitrogen, a requirement which is best met by nitrate of soda and ammonium sulfate. Dry chicken and sheep manures contain available nitrogen and benefit the grass, but the price of the dried manures per unit of ammonia is so high that they do not do as much good per dollar invested as do fertilizers containing nitrate of soda and ammonium sulfate, which are water-soluble. Used alone, these soluble salts should be applied with care to avoid injury to the grass, as if used in excess or unevenly distributed harmful results follow.

An interesting observation is made regarding the use of city water on lawns. It is stated that the average city water of different towns in Indiana contains lime, and that on lawns that have been sprinkled for many years with city water the lime content of the soil is high and the proportion of weeds is increasing.

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. Fertilizers for and treatment of fairways built on a sandy sub-soil.—We are sending under separate cover a sample of top soil from our fairways. These fairways were built up by spreading about $3\frac{1}{2}$ to 4 inches of this top soil over a sea-sand bottom. What fertilizer would you recommend for such top soil to give the best results? They were seeded with redtop, fescue, and bluegrass about two years ago, and we have been using a mixture of 250 pounds of ammonium sulfate, 400 pounds of acid phosphate, and 250 pounds of muriate of potash, spread at the rate of 900 pounds to the acre. We have also been spreading compost over parts of the fairways. We have also used $4/8/4$ at the rate of one-half ton to the acre, with quite good results. Would a quick-acting fertilizer be better for this soil? We do not have much rain during the summer, and this soil dries

very quickly after showers. Please inform us as to what you think would give best results on these fairways? (Maine.)

ANSWER.—The sample of soil from your fairways has been received and examined. This is apparently a very good type of soil, but owing to the fact that you have a sand subsoil you would naturally get very quick drainage, which accounts for the fact that your fairways dry up very rapidly after a shower. We would suggest that you use either bone meal or cottonseed meal, at the rate of about 400 to 600 pounds per acre. If bone meal is used it should be applied early in the spring and then again about May 15. Cottonseed meal may be used later in the spring and again about July 1. A dressing of manure late in the fall would probably be very helpful, and if convenient to do so it would not be a bad idea to mix some clay with this manure, the manure and clay to be used in about equal proportions. This will help to make the soil a little heavier, a quality which is necessary to hold moisture properly.

2. Reducing vegetation in the rough.—We have about everything that grows in our rough, from white birch and apple trees down to crab-grass. This is all made ground, and as the subsoil is pure sand we can not plow it up. Any suggestions you can give us with regard to getting rid of this vegetation will be appreciated. (Connecticut.)

ANSWER.—Under ordinary conditions the best way to make good rough out of overgrown land is to scalp the land and then sow it to sheep's fescue or Canada bluegrass. The top soil scalped off may advantageously be used in making compost. If it is impossible to work on your soil by either plowing or scalping it our suggestion would be that you kill the vegetation with chemical weedkiller sprays. The use of chemical weedkillers is fully discussed in the article beginning on page 169 of THE BULLETIN of July, 1924. If you should succeed with this method we would advise you to seed the land with Canada bluegrass or sheep's fescue.

3. Disappearance of fescue in bent turf.—A native fescue is very abundant over our entire course. It is our desire to have pure bent greens and fairways. Do you think that the bent would in time crowd out the fescue entirely, or would it be necessary for us to use other means in order to get rid of the fescue? (New Hampshire.)

ANSWER.—As for your putting greens, if you already have bent in them, and particularly creeping bent, there is no doubt that under close cutting and adequate fertilizing and topdressing the bent will crowd the fescue out. The same will likely be true for your fairways, as even without the close cutting the adequate fertilizing of the bent should tend to effect the disappearance of the fescue. In the rough the bent is not likely to crowd the fescue out, but we believe you will find the fescue a desirable grass for your rough. Fescues do not stand close cutting well, and where they are in competition with the bents under such conditions, the bents will almost invariably get the upper hand in a short time.

4. Value, making, and use of compost.—For the last two years we have used nothing but ammonium sulfate, about 5 pounds to the green, mixed with bone meal, and this mixed with dirt and sand and

applied as topdressings, but have not used any compost on the greens on account of the weed seeds. The latter part of last summer we mixed the ammonium sulfate with water and applied it wet, and topdressed with the bone meal, dirt, and sand separately. Our greens have improved in texture and have fewer weeds than formerly. In view of this do you think we can dispense with the use of compost right along? (Pennsylvania.)

ANSWER.—We should urge you to use compost in addition to the ammonium sulfate, as nothing else seems quite to take the place of good compost. If your compost is in a bed which is relatively large and low, the control of weeds can easily be handled by turning them under with a harrow, thus dispensing with expensive hand-labor. Compost improves with age, and after it has passed through one summer and has been turned over so as to prevent weeds from seeding, you need have no fear of the weed seeds which it may contain. The compost should, of course, be screened before using.

5. Velvet-bent as compared with creeping bent for putting greens.—We have a large nursery of velvet-bent, and it seems to thrive with us. How would it compare with creeping bent for our putting greens? (Alberta.)

ANSWER.—Velvet-bent perhaps makes a better quality of turf than creeping bent, and we have several beautiful strains of velvet-bent which succeed here at Washington. In parts of Canada and New England velvet-bent is much more vigorous than creeping bent, and under such conditions where the two bents are grown together the velvet-bent eventually predominates. It takes more work and time to grow velvet-bent vegetatively, however, and to plant greens from the stolons, but where the tendency of the land is to go to velvet-bent we would certainly advise its use.

6. Alluvial soil as a topdressing.—Our course lies along a creek. We have a very rich meadow, and it is our opinion that the accumulation of soils along the stream in the meadow should make a very excellent topdressing. This soil, you understand, accumulates there from the sediment in the water during high water. Would you advise us to use this soil for topdressing purposes? (Pennsylvania.)

ANSWER.—The alluvial soil concerning which you write is usually excellent for topdressing, as it is commonly very rich. Care should be taken, however, to see that it has the proper texture. Some of the alluvial soils contain much silt, which makes them puddle and bake. The ideal soil is a loam which does not puddle or bake, and it may be necessary for you to mix more or less humus material in the meadow soil that you get along your creek.

7. Possibility of controlling brown-patch by use of sterilized compost.—Have any experiments been conducted with the use of steam-sterilized or baked compost in the control of brown-patch? A report has reached us from one golf club that during the past season they had topdressed their greens with only sterilized compost and had practically no brown-patch on the course. (Ohio.)

ANSWER.—So far as we know, no experiments of this kind have been conducted. The organism causing the brown-patch disease is

so widespread that it seems unlikely that the use of sterilized compost could safeguard a green from the disease. There is always a likelihood of turf becoming infected with brown-patch from spores of the organism carried by the wind, no matter what previous treatment may have been given to the turf. The fact that the club you mention had no brown-patch on its course during the season is not conclusive evidence that the immunity resulted from the use of sterilized compost. In almost any district it may be found that while one golf course has suffered from brown-patch, its neighboring course has remained uninjured, and that the conditions on both courses were apparently identical. Sterilizing compost with steam or by baking has various merits apart from brown-patch, chief of which is the killing of weed seeds.

8. Use of beach sand.—What is your experience with the use of white beach sand as a topdressing for putting greens and as an ingredient for topdressing materials? We are using the somewhat coarser sand near the ocean. Is sand from inland to be preferred to beach sand? (New York.)

ANSWER.—Beach sand may be used with safety, as the amount of salt in it is negligible. Sand is particularly useful as an ingredient of compost topdressings where the soil is naturally very heavy, as it tends to bring about a loamy condition in the soil. It is not advisable to use sand alone as a topdressing except probably in occasional very light dressings or when it is desired to apply some concentrated fertilizer or chemical mixed with sand in order to get an even distribution. We have seen many cases where greenkeepers have used $\frac{1}{8}$ to $\frac{1}{4}$ inch of sand as a topdressing on putting greens, and in all such cases the results have been harmful. The proper material for topdressing a putting green is a loam, and if sand is necessary in making a mixture to get a loamy consistency, it is good material to use.

9. Meadow fescue as compared with sheep's fescue for the rough.—Meadow fescue can be purchased for \$15 delivered and sheep's fescue for \$26. Have you any information as to how suitable meadow fescue would be as a grass for rough? (Connecticut.)

ANSWER.—We do not think you would be satisfied with meadow fescue on your rough. It is of too rank a growth, and a ball lost in it would be extremely hard to find. Sheep's fescue would be much the better grass for your rough. By very close cutting of the meadow fescue, however, it might prove satisfactory.

10. Bent as a grass for wet land in the fairways.—We have considerable low swampy land on our course and desire to seed a portion of it for use as fairways. We have heard that the best seed for use on wet land is bent. Would you advise us to use bent instead of the ordinary bluegrass-redtop mixture on these portions of our fairways? (Connecticut.)

ANSWER.—We believe it would be best for you to use a mixture of 2 pounds bent seed, 2 pounds Kentucky bluegrass, and 1 pound redtop, seeding at the rate of 100 to 150 pounds per acre. Bent is one of the best grasses for poorly drained land.

MR. GREEN-COMMITTEE CHAIRMAN:

Midsummer is the time to give your greenkeeper all the encouragement possible.

Give him more than words of cheer. Give him laborers enough to carry out his summer program successfully.

This is the critical time of the year.

Greens must have first call on the club's resources. Crab-grass and other summer weeds must be fought to a standstill; and to do this properly the young plants must be pulled as soon as they show themselves. Do not be deluded into thinking that your greens are crab-grass proof. They may resist crab-grass to a considerable degree, but they need your help.

Brown-patch, too, may take a notion to attack almost any night. Give your greenkeeper facilities for applying mercury, and help him train his men to use this chemical properly. He will need a force of men to water his greens early in the morning. This is not a preventive but is an important feature of control. If brown-patch hits hard be prepared to give first aid promptly with compost and quick-acting nitrogenous fertilizers.

Mowing must not be neglected. Bent greens must be mowed closely and every day. If you are so unwise as to raise your mower blades you are more than likely to lose your putting surface and cause a fluffy condition of the turf.

Top dress lightly once a month.

Keep the water system in good repair. The greens will tell you when they need water, and how much. A failure of your water supply might be fatal.

Do not let anything distract attention from the greens. Think of the rest of the course as a mere side line, if you must, but from now until the cool weather of fall, the greens are the thing.

THE GREEN SECTION.