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UNITED STATES GOLF ASSOCIATION GREEN SECTION

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Contents

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The Parasites of the Japanese Beetle

Natural Balance in Nature

By J. L. King, Japanese Beetle Laboratory, Riverton, N. J.

Under primeval conditions in nature there is found to exist a natural balance of all living organisms among themselves. This may be illustrated by the role the small carnivors, such as the fox, skunk and weasel, play in checking the rapidly multiplying rabbits which are entirely plant feeders and which if not held in check would overrun a given region in a very short time. An illustration of this last statement occurred in Australia shortly after the introduction of rabbits into that country. Australia is a region inhabited with peculiar primitive plant feeding animals of comparatively low reproductive ability; carnivors are almost lacking. Thus when rabbits were introduced the natural carnivor check was inefficient and rabbits soon dominated portions of the country in such overwhelming numbers as to become a serious pest and a menace to agriculture.

The same law of natural balance just mentioned as functioning with the higher animals also holds for the lower animal forms such as insects. Thus we find that the majority of our serious insect pests of agriculture are foreign in origin. They cause depredations because they multiply without check. Their natural enemies are not present to prey on them in the region into which they have been introduced.

THE OBJECT OF PARASITE INTRODUCTION

The object of introducing foreign insect parasites of insects is simply an attempt to restore the natural balance and hold the injurious insect in check. This work is commonly referred to as biological control. As a rule biological control methods are used chiefly on foreign insects which have been accidentally introduced into a country new to them, the introduced insects most frequently proving to be pests largely because they are free from all their natural enemies or parasites.

EARLY PARASITE INTRODUCTION WORK IN THE U. S.

The most outstanding example of effective parasite introduction work in this country occurred in California in 1889. Prior to that time the orange groves had been seriously threatened by the ravages of the Australian fluted scale bug which had been accidentally introduced into California on citrous stock from Australia. Dr. C. V. Riley, then Chief Entomologist of the U. S. Department of Agriculture, on learning that the fluted scale bug was not a serious pest in Australia had the natural conditions carefully studied in that

country. It was learned by Mr. Koebele, who made these investigations, that in Australia there were several peculiar ladybird beetles which fed almost exclusively on the scale bug. These were collected in large numbers and shipped to California. The ladybird beetles arrived in good condition and were at once liberated in an infested grove. Results were almost immediate and the year following the introduction of this insect the scale bug was reduced in numbers to such an extent as to be of no further economic importance.

Since this foregoing work met with success similar attempts have been made with other insects. These have met with success in some instances and only partial results in others; however, negative results in several instances have not stood in the way of further trials. Even though only partial results are obtained, the effort is highly desirable, for after the initial expenditure, there is little expense, if any, thereafter.

Japanese Beetle Parasites

It was with the above ideas in mind that the parasite introduction work on the Japanese beetle was undertaken. At the time this insect became established in this country (1916) it was found to be practically free from natural parasites and predators.

Fig. 1. Centeter parasite of the Japanese beetle.

In 1920 the foreign parasite work in Japan was instigated. Careful research soon revealed that the so-called Japanese beetle in its native land was not a pest of importance and that it had as many as five common parasites or special enemies which held it in check.

Later in 1922 an investigation was carried on in Korea. It was found there that the true Japanese beetle was wanting, but that a number of very closely allied forms were to be found. Further study revealed the fact that the natural enemies or parasites of these allied beetles could be easily transferred to the true Japanese beetle. This possibility increased the scope of the work and the ultimate possibilities of control in the United States.

Since the work in Korea was so successful the field of the work has expanded to China and India and we are now receiving shipments of parasites from all of these countries.

The parasites proper represent two groups of insects, namely parasitic flies of the family Tachinidae and parasitic wasps of the genus Tiphia.

Of the flies there are two species which have interesting life cycles and are worthy of mention.

First, the Centeter fly (Fig. 1). This fly is about as large as the

common house fly and superficially resembles it. The fly is a parasite of the adult beetle. It deposits its eggs on the back of the beetle just behind the head (Fig. 2). The eggs hatch in about 24 hours and the young fly maggot drills down through the back of the beetle; it then migrates to the abdominal region of the beetle where it feeds on the internal organs. The death of the beetle occurs in an average of six days from the time the eggs hatch. The fly maggot then transforms into its winter resting stage and remains in this state until the following year.

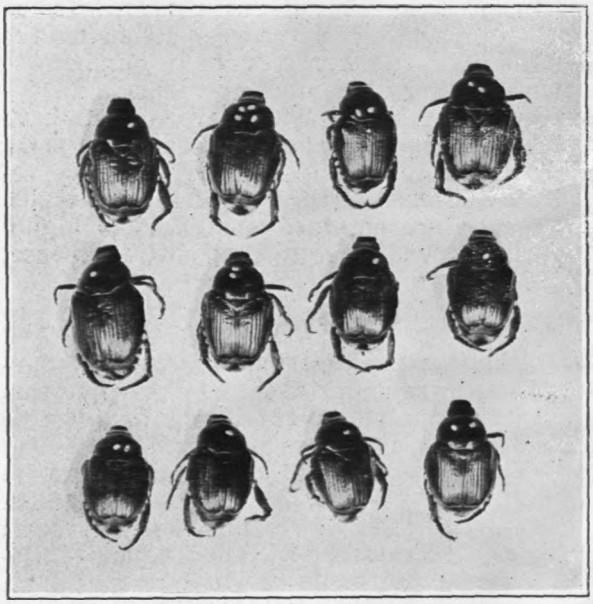


Fig. 2. Eggs of Centeter parasite on Japanese Beetles.

This parasite was found in North Japan and in certain localities it was responsible for the destruction of over 50 percent of the Japanese beetles. This fly is now established in New Jersey where it has spread thinly over an area of approximately 60 square miles.

The second fly of importance is the Prosena fly. This fly is somewhat like a long legged horse fly. It is formidable looking but is perfectly harmless. It feeds on flowers as do many parasitic flies. It deposits living maggots on soil infested with Japanese beetle grubs. The maggots search for the beetle grubs and on finding them, bore their way into the bodies of the grubs and become internal parasites. In the spring of the year, rapid growth starts and they soon destroy the beetle grub by completely devouring it.

It is not definitely known whether this parasite is yet established in this country, hence, work will continue on it until it is either proved that it is established or can not be. It would be a valuable addition to our fauna as it commonly effects 15 to 20 percent parasitism of the host beetle.

Fig. 3. Tiphia wasp parasite of Japanese beetle grub.

The second group or parasitic wasps, all have similar habits so it will be necessary to give only one life history as an example.

The Tiphia wasps (Fig. 3) all deposit their eggs on the grubs of beetles. The wasp proper looks much like a winged black ant of rather large size being about three-quarters of an inch in length.

The female wasp spends much of its time in the soil in search of Japanese beetle grubs. Upon contact with a grub the wasp stings it causing a temporary paralysis during which time the wasp deposits her egg, attaching it firmly to the beetle grub. After the recovery of the host grub, feeding takes place only for a short period, for when the parasite egg hatches the wasp grub (Fig. 4) starts to sap the vitality from it at such a rate that the host is soon devoured completely. The parasite grub then spins a silken cocoon in the soil and remains in it until the following season when it transforms into a wasp and the cycle is again started. In nature these wasps effect about 20 percent parasitism of the beetle grub. Of this group two species are now established; one a Japanese species and the other a Korean species.

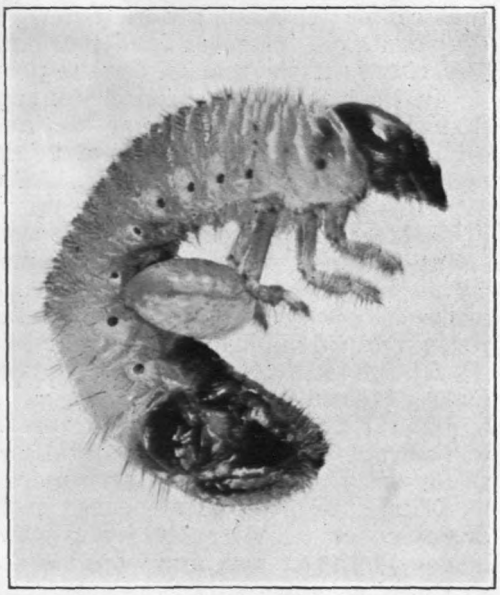


Fig. 4. Tiphia larva feeding on Japanese beetle grub.

Out of a possible nine or ten natural enemies of the Japanese beetle so far only three give evidence of actual establishment, however, in the six years in which the work has progressed this number is not discouraging. The long distance which some of the parasites have to travel before reaching the laboratory at Riverton, N. J., causes a high death rate with some of the parasites, but gradually methods have been improving and we are now more encouraged and determined than ever before.

It is by this method of biological control that some of the insects which are found on the golf course are being controlled by the U. S. Department of Agriculture.

What seems most needed in golf architecture today is a greater use of variety by undulating the fairgreen, the construction of natural-appearing strategic mounds and ridges, and some character given to the rough.

To attempt to penalize all badly played strokes is just as futile as to imagine that a police force can be made large enough to catch all those who err.

Golf Course Architecture and Construction

The First Step—By William S. Flynn

Much has been written about golf course architecture, about the theory of construction, as to why certain holes should be laid out in this way or that way, as to the cost of maintenance and concerning the gradual improvement of the links. But it seems to me that too many of these authors fail to go back far enough. They ignore the basic fact that in order to have a satisfactory golf course you must first secure a suitable piece of land over which to lay it out.

And that first step is most important, for an unwise choice of terrain may prove so costly in the end as to almost, if not quite, bankrupt the whole project. So my advice to a club in process of organization, or to an old club that is forced by circumstances to seek other quarters, is to appoint a close-mouthed committee and have that committee scout around quietly so as to secure options on several available tracts of land without the secret leaking out that a golf club is in the market for the property.

In the past it has been customary to purchase one or more old farms, with a stone house or two and an old barn, a creek or two, orchards and a few small hills and dales and then call in a Golf Architect and tell him to make the best of what the club owns.

The men on the purchasing committee, lacking special knowledge of engineering problems, frequently buy land because its scenic beauties appeal to them and without thought of the practical difficulties involved. So, when it comes to planning the course and the architect goes over the property he is forced to tell the committee that a really good layout is not possible unless expense is no object.

As the cost of construction is usually a very vital item in the budget the committee is much upset. And if it is decided to go ahead and build as good a course as the terrain and the club's treasury will permit the members never take as much pride in what they get as they would if there had been more latitude of choice.

If an option has been secured on three or four tracts of land the architect can go over each carefully and then tell the committee which he considers the best, and why, his reasons including its possibilities as the site for a really first-class course, for keeping down the cost of construction and for economical maintenance after it has been completed.

The golf architect who knows his business can tell the committee in plain, understandable English just why one tract should be chosen over the others. He can show by figures why the cost will be lower and the results more acceptable. He can explain why drainage and future upkeep must always be kept in mind, picture the grades that would have to be climbed on every round if this tract were chosen, or the chances of having fairways and greens flooded every year if another were selected.

There is no way of telling how much money has been literally tossed away by the lack of foresight in choosing land over which to build golf courses, but it must have been an enormous sum. Not only have mistakes been made in the past, but they are still being made by committees selecting the wrong properties for golf courses, and it does not seem fair to the host of golfers who annually pay the bills.

Any conscientious architect by exercising tact and persuasion can save prospective clubs a great deal of unnecessary expense in making a proper selection of property for a new course, and this is all the more true when the architect is possessed of some knowledge of engineering.

In considering the man to select the property and lay out a golf course of the 1927 model a club should view the problem broadly. The committee in charge of the matter should inquire whether the man under consideration really cares for golf and its future, whether he cherishes the ideals of the game as handed down from the fathers and whether he has vision or whether he considers the building of courses as merely an easy way of making a good living.

They should visit some of his other efforts and find out if the members of clubs for whom he had built courses were satisfied. They should not engage him merely because he can prepare attractive plans. They should determine whether he has sufficient engineering ability to see to it that his plans are carried out as he intended and that all problems of future maintenance were provided for in advance.

The relative merits of the various architects available at the time the club wishes to secure its property and start work should be discussed with leading amateurs who have made a study of the theory of golf architecture and their opinions of the men under consideration secured. These amateur students would have little or no bias, for they greatly desire the betterment and advancement of the game.

Once the decision has been made and the architect named, there should be a conference during which the committee should put all its cards on the table. It should be frank about what it wants, should tell the architect exactly how far the club can go financially and whether a really stiff course or one not quite so hard is desired.

The architect should look over the various tracts under option and eventually report to the committee which he considers the best for the particular purposes of the club in question and why he deems it so. When the choice has finally been made, the committee should outline any ideas or suggestions the various members may have in mind.

Some architects are faintly contemptuous of suggestions made by "amateurs," but the wise architect is aware that he does not know it all and that really good ideas are often developed in these conferences. He never turns down a sensible suggestion simply because it has been made by someone else. On the contrary he accepts it thankfully and promptly embodies it in his plans.

The committee has every right to disagree with its architect at that time, but not later when work has actually begun. During the preliminary proceedings it is up to the committee to advance every objection that comes to their minds, and it is up to the architect to prove to them that he is right when he is firmly convinced that such is the case.

He must explain to the committee clearly and convincingly just why one suggestion would not work, why another would be too costly, or why still another would draw the ironic laughter of the critics. Often objection is made that the course, as planned by the architect, would be "too hard," but these very objectors are usually the ones who boast about their "sporty course" after it has been completed.

The architect must be tactful, he must have his facts at his tongue's end and must be firm. But in the end, if he knows his job, he will get rid of unsound suggestions and obtain sanction for a course on which he is willing to stake his reputation. For no matter how many first-class links a man has built, just let him be overpersuaded by a committee to construct a freak course and the word at once goes around that he has lost his vision, is slipping fast down grade, and his reputation bursts like the proverbial bubble.

But after the architect's plans have been accepted and he has been told to go ahead the committee should, most distinctly, lay off. The architect should not be pestered with more suggestions as to changes, and so on, or bothered in any way by the individual members of the committee. He should be let alone to carry on the work after his own fashion.

It is impossible for most laymen to visualize what the completed course will look like during the early stages of construction. The whole terrain resembles a segment of land between the front-line trenches while the World War was on, and pessimistically minded members often want to fire the architect on the spot after just one brief glimpse of ploughed up fields, hundreds of tree stumps, deep ditches where water pipes are to go and unsightly mounds and broad scars that eventually will be smooth greens and shining white sand traps.

If the club has sufficient confidence in the architect to hire his services it should be taken for granted that he is capable of laying out a course possessing both variety and interest, that it will be scientifically constructed and that once finished it can be maintained at reasonable expense.

No club should expect and no architect should consent to submit plans and specifications and then not supervise the construction. The architect's reputation depends on what he produces. If he allows others to carry out his ideas the chances are strongly in favor of confusion that will result in a botched job.

The most successful method, when possible, for building a golf course is for the club to let a contract for a lump sum covering the complete construction of the course. This insures against additional financing, when the course is partly finished, as has been true in some cases in the past. It also relieves the committee of a great deal of worry should they attempt to build the course themselves, hiring someone to supervise the construction and sub-contracting labor, teams, material, etc., and places all responsibility under one head.

In nine cases out of ten when a club attempts to construct the course the man designated to superintend the job is not familiar with the architect's method, nor is he, perhaps, capable of interpreting the framework plans the architect provides.

It naturally follows that if a plan is incorrectly interpreted in the construction work much money is wasted, because the architect should insist on the work being done as he conceived it.

It is often a very hard matter to convince a committee that their work has been done improperly because they are not familiar with seeing a course develop from the start and they always seem too easily satisfied with what has been done and are loathe to change it.

The best results, I think, can be obtained when an architect has engineers associated with him who have been trained in his way of

doing things and who are familiar with the problems connected with golf course construction, namely, soil structure, drainage, turf culture, and course maintenance.

With an organization of this kind nothing is left to guesswork or done in hit or miss fashion. Practically all of the construction problems have been worked out before a spade full of earth is moved.

The advantages of having only one concern to deal with are obvious. Trained men will be in charge of all the various ramifications of the proposition and once finished the engineering firm should stand back of its product. If anything is wrong, which is unlikely with an organization that knows its business, the firm will promptly put it right.

But, if a club has been dealing with many sub-contractors, it is hard to fix the responsibility and even more difficult to locate the man to blame and force him to make good.

If a club, however, insists on attending to the actual construction of the course, the architect should insist on supervising the work. It is not fair to himself or to the club if his plans are not carried out as he visioned them. No conscientious architect should accept more commissions during any season than he can give his personal attention to.

The plans first submitted by an architect should cover what might be well termed the framework of the course, but should be flexible in the matter of pits and bunkers. Those around the greens and certain traps just off the fairways may be fairly well determined in advance, but the location of the others can be determined better after the course has been completed and played on for a time.

In this connection it would be well for a club to retain its architect in an advisory capacity for a year or so after the actual work of construction has been finished.

He will then be able to better determine the definite location of a complete bunkering system for the course and will be able to advise in the treatment of the course in preparing it for play. In this way the club can secure the best results and eventually find itself possessed of a course that will be satisfactory in every detail.

NOTE—This is the first of a series of articles by William S. Flynn on Golf Course Architecture and Construction and the relations that should exist between the golf architect and the golf club. The second article will appear next month.

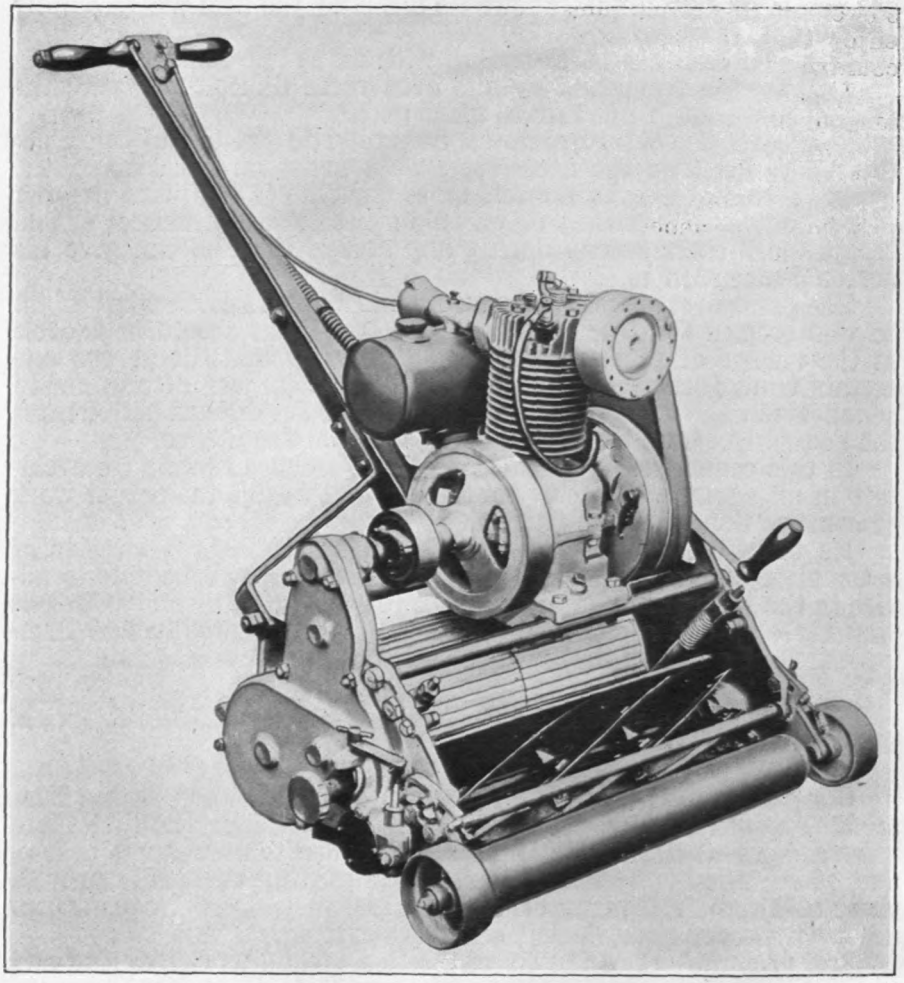
Our greens were sown five years ago with German Creeping Bent seed. As soon as the grass matured it became apparent that there were a dozen varieties of bent, some of a fine texture, some coarse, and of various hues. Each year, as the putting surface improved, there still remained many coarse runners, in spite of frequent top-dressing, proper nourishment and close cutting.

A representative of the Green Section visited us this spring and suggested sweeping the greens with an ordinary street broom. In doing this we endeavored to lift the grass or make the blades or runners stand erect. We have followed this practice faithfully immediately before mowing and in 10 weeks' experience have found most of the coarse grass eliminated, and naturally, the putting surface greatly improved.

DeWitt Gallaher, Chairman Greens Committee,
Kanawha Country Club, Charleston, W. Va.

A New Power Putting Green Mower

This machine weighs 165 pounds, and the weight is evenly distributed on the large aluminum rollers, reducing the pressure per unit of surface to a minimum, thereby eliminating the danger of packing the soil of the greens excessively. The large rollers are operated direct from the motor through an expanding ring clutch and are separated by an auto type differential which eliminates any danger of scuffing or scarring of the turf in turning.



The machine cuts a 19-inch swath. This narrow cut and the compactness of the machine, together with the guard roller in front, enables it to cut undulated greens without scalping the high points. The speed of this machine and the ease with which it is operated enables one man to do approximately the work of two men with hand mowers.

Course Conditions in the Northern Latitudes

An Address by C. A. Tregillus, Editor, Bulletin of the Green Section of the Royal Canadian Golf Association, at the Annual Meeting of the U. S. G. A.

Mr. Chairman, Ladies and Gentlemen: It was with great pleasure that I accepted the invitation to address the meeting of the Green Section of the United States Golf Association. The golfing interests of the whole world have watched with interest the organization and development of this Green Section, because it realized that it has a tremendous bearing upon the present enjoyment and the future success of this great game. And what better commendation could it enjoy than to know that this example is being followed by other countries in different quarters of the globe.

Looking back over its brief history, we see that an enormous amount has been already accomplished and a moment's thought upon this will bring to mind a conception of the still greater work that lies before it.

Much research work still remains to be done and a great deal of practical experience must be gathered and recorded before we can feel confident that we have brought the science of greenkeeping and course supervision to a par with other agricultural and horticultural endeavor.

The golfing public of the United States is unconsciously wielding a slow but certain influence over golf in Canada, owing to the numbers of Americans who visit us every year. During the motor touring season of 1926 a daily average of several hundred cars crossed the border daily with permits to tour in Canada for 30 days or six months. Since golf bags were very conspicuous on these cars, it is fair to assume that the majority of the visitors were golfers, and it is further probable that many of them might not have come if they could not have enjoyed the game while on vacation.

Golf courses are becoming a matter of civic pride among the towns that are strung along our main highways and are considered as important a municipal asset as good camping facilities, hotels, scenery, climate, and other features that entice the traveling public who are on pleasure bent.

Canada is well supplied with golf courses. It is safe to say that every town of 2,000 inhabitants or more has a golf course, some are rather primitive, but on the whole they will all provide the essentials for an enjoyable game.

The problems of turf production are very generally similar throughout the Dominion and those States that lie adjacent, or to be more specific, from let us say the 44th or 45th parallels of latitude northward to the limits of railway penetration.

Latitude really has not so great a bearing as might be expected at first thought, because we find that grasses which are frost hardy appear to stand extremes of climate unaffected by cold of itself; therefore, turf grasses that will thrive on the shores of Lake Erie can be depended upon for many hundreds of miles north of that line with proper care.

It is characteristic, however, of the temperate zone that the climate is subject to extreme changes of weather conditions (temperature and humidity).

The relation of oceans, lakes, plains, etc., which produce con-

tinental changes in climate have a far greater bearing upon our subject than our position between the Equator and the North Pole.

This somewhat relieves our worry, for, though we can not change the position of the sun or the length of time it shall shine, we can at least partially make up for conditions brought about by the physical features of the earth's surface such as aridity, alkalinity, soil texture, and so on.

Traveling westward from the Atlantic Seaboard over the hills of Vermont or the Valley of the St. Lawrence, past the Great Lakes region, across the prairies to the Rockies and the Pacific watershed, we encounter a succession of climates, ranging from both extremes in temperature and humidity, and from short growing seasons to almost continuous ones.

To produce and maintain turf suitable for golf so that courses from coast to coast may be favorably compared with each other and this with such a range of climate to contend with and manage satisfactorily appears, if one pauses to think, a superhuman task. But difficult as it may seem, such is our ambition and in a measure is being successfully attained.

There is still a good deal of work, both research and educational, to be done. What has been accomplished already is due to the close study of local condition of climate, soil and grass by zealous greenkeepers, professional and amateur, and by the latter I mean the Chairman of the Green Committee, whose heart is in his job, and not a little credit is due to this organization (Green Section) whose bulletins are eagerly read by and have been of immense value to clubs in every part of Canada.

In design and general features, such as turf, methods of maintenance and so on, there is little to distinguish the courses from those of this section of the country. The machinery in use is largely of United States manufacture, although some European equipment is found here and there.

Since irrigation is the key to successful permanent grass greens, year in and year out, in 90 percent of our courses, it is the general practice where lack of funds will not permit water systems in the dryer sections to use sand greens.

We are experimenting in the West, however, with some creeping prairie plants such as cudweed, which has been found to produce a fair putting surface where traffic is not heavy. A number of these were moderately successful before the vogue for sand greens came in.

In the East work has been done with the hope of producing non-irrigated creeping bent greens by laying a good sod of well matured bent. There has not been sufficient time yet to prove how it will stand up, though there are many natural native bent greens of many years standing that are all that can be desired as a putting surface.

Coming to permanent living greens where every attention can be shown, we find a number of fine turf grasses in use, all of which are giving satisfaction. If a survey of the larger courses in Canada had been made two years ago, we would have found a very general inclination towards red fescue as the predominating grass for first class greens. Creeping bent was talked about but not taken up except for an odd green here and there. Since then many greens of creeping bent have been vegitated, and the argument is well on between bent and fescue.

On the side of bent we have the choice of creeping bent or Rhode Island, and on the other New Zealand and European red fescue. Nearly every course has a nursery of creeping bent of an approved strain, sufficient in most cases to start converting their greens to this grass, but the question of which it shall be is not yet settled in the minds of many.

As a practical proposition, the creeping bent has easily proved its ability as a turf former from coast to coast. It is rugged, vigorous, and well adapted to the vagaries of our climate. Many native forms found adjacent to courses have made admirable putting surfaces. Its ability to squeeze out foreign plants, weeds and other grasses makes it an available ally of the greenkeeper.

On the other hand, we have strong advocates of fescue. Some have experimented with the bent, but consider that the other gives the better green. With them I have no quarrel for there are many points of excellence about a fescue turf that makes it the sward par excellence, where conditions are favorable.

We can grow good fescue greens in some parts of Canada. They might be temperamental and require more attention, and they are more costly to maintain, but there is no denying their beauty when well cared for. I could not but admire their wonderful, vivid hue, when I had an opportunity of comparing them closely with creeping bent greens during this past summer. There was not the bright shining and trim finish to bent that caught the eye as did the fescue. Many bent greens that I observed during the latter part of the summer went very much off color, but the putting was unaffected and the grass continued to grow, judging from the amount of clippings obtained, but the grass looked dull, almost shabby, while the fescue seemed unaffected. This characteristic caused some to rather criticize the bent.

As you perhaps know, we are out of the brown-patch belt, at least I have not seen any yet that has been authentically identified as such, but during hot humid periods I have noticed that the oppressive atmosphere affected the closely cut turf greens. Shaded and other secluded greens have to be very carefully watched to prevent serious injury, which in some cases involves the total collapse of the grass in round and irregular areas. Examination of plant and soil have shown no brown-patch organisms, but considerable algae growth, plainly the result of sodden conditions, resulting from insufficient air and drainage. With cooler weather and brisk winds, the grass soon regained its normal appearance, but the circumstance was distressing while it lasted. This season we had an abundance of moisture in Ontario from August until the close of the season, so much so that some courses were at no time dry under foot. In consequence, we had during the warmer spells enough of this trouble to cause many greens to lose their bloom, though not sufficient to cause alarm.

While one can not say that the bent was the only grass that suffered, it appeared to me that the fescues stood up the best except in secluded shady greens where it was hard to maintain any kind of turf.

It might appear from my remarks that I am championing fescue as a turf for greens against the bent. I do not wish to leave this impression, but only to say that we have some very excellent fescue swards, and in some sections it is quite likely they will remain in favor. Where a club has a fancy for this grass and does not mind

the extra expense, and a greenkeeper is employed who understands their treatment, I consider they are well worth the trouble.

The average golfer is not a "turf nut," as you would perhaps express the term. He is not interested in the economic or greenkeeping side of the game, and if he fancies a certain texture and appearance in the greens, we should, when practicable, cater to his wishes.

Greens of Rhode Island bent grasses are popular and are growing in popularity. It is a grass that does well with us, and since the seed is readily obtainable it is a simple manner to renovate a nondescript green by seeding in with Rhode Island bent.

While no one will argue against the creeping bent as a very desirable grass for putting, not all will be persuaded to put in a nursery which entails a certain amount of labor that is liable to be neglected.

For such the Rhode Island bent seed is more acceptable. We are working in a small way with the velvet bent to determine, if we can, whether there is a future for this grass as a straight and pure turf. This, the very finest of all turf formers, appears to be as diverse in forms as the creeping bent, and whether the strain we have secured will fill the bill, we do not as yet know.

In the colder sections of Ontario and on the prairies, attention has been paid of late years to white Dutch clover. This movement got under way really before these sections took up creeping bent as a serious consideration. It seemed like flying in the face of all tradition, but to hold a healthy stand of grass on the heavy gumbo clay usually found in these regions was impossible with the usual commercial mixtures. It became the practice to add a small proportion of white Dutch clover which appeared to do quite well, and the proportion has steadily grown until as much as 50 percent of the mixture used was clover, and very fine greens resulted. These are comparatively inexpensive and may well be used where creeping bent is thought to be out of the question.

For fairways and tees, Kentucky blue and fescue are used on most courses where desirable turf is looked for, with of course redtop. We have not gone to any extent in vegetating fairways to creeping bent, but we have on some of the older courses some fairways of the native creeping bent that are all that one could wish for.

Many smaller courses, or to be more correct, we should perhaps say the majority of small courses, have, wherever possible, developed the existing vegitation which is largely Canada blue. While not the equal of Kentucky bluegrass, it is quite serviceable.

It is generally supposed that as we travel northward the winters are more severe, and consequently the wintering of greens is a serious problem. It is true that we have some snappy cold in parts of Canada when the mercury almost recedes from view in our thermometers, but as I said before, I have seen little evidence where cold of itself has really been injurious, and considering that grass will grow naturally and thrive to the northern limits of civilization, it would seem logical that greens should be wintered over the average season without serious loss.

From observation I have come to the conclusion that the most cheaply run courses, those where no money is spent to prepare them for winter, and without even a water supply or a very primitive one, come through on the average most successfully. From that I deduce

that, given half a chance, nature will pull the greens through the winter without much artificial assistance.

The mulching of greens with straw, manure and other materials is not followed to any great extent, and the only places where it can be done without risk of injury is in the region of steady extreme cold; and I very much doubt if it is worth the trouble.

There are many courses that place boughs and brush over the greens to hold the snow and so prevent either drying out in the case of wind-swept locations, or the awakening of life processes during the mid-winter warm spells in sunny corners. Brush covered greens will commence growing a couple of weeks or so sooner in the spring, but I doubt whether it is wise procedure or worth the expense, except perhaps in the particular cases I have mentioned.

The best precautions we find against fall, winter or spring injury as the result of climatic conditions, is to provide ample surface drainage so that water can run off easily during the thaws and to encourage as much top growth as can be permitted in the fall.

I think it is a mistake to try to keep the grass green and verdant until the last possible moment. It is better far to observe the way that turf will, under natural conditions, harden off in preparation for the dormant season, and endeavor, as far as we may, to adopt similar methods in our system.

We have noticed in recent years the spreading of a spring injury resulting from a fungous growth that occurs when the snows are melting off the greens in the early spring. For want of a better common name, we term them "spring webs" on account of the cobwebby nature of the mycelium. It was only this last spring that we got a good development in laboratory in order that it might be more closely observed. It was characteristic that a few hours' sunshine would cause the webs to disappear.

The club at Grand Mere, Quebec, observed that where the webs were allowed to remain undisturbed the turf beneath suffered, but if the web was broken up, no serious injury followed. This entailed a survey of the course every morning during the days of likely development. This was not always successful unless a gang of men were employed on days of most active development. Samples of diseased turf were taken, but no development occurred in the laboratory where the sod was placed in moisture chambers and in ordinary room temperature.

This spring, however, Mr. Weight of the Seed Branch at Toronto secured an excellent development of the fungus by placing turves in low temperature germinators where it grew rapidly and later produced sclerotia or hard cased masses of tissues which might be called a resting stage and will carry the germ of life over unsatisfactory conditions of moisture and heat.

So far we have not been able to germinate these sclerotia in order that they might produce fruiting bodies.

All the material we gathered we have turned over to the Ontario plant pathologist who is working on it so that before another season we may be more fully informed regarding it. We have tried various treatments, but as yet have not arrived at definite remedies. As I mentioned a moment ago, at Grand Mere the webs are broken up or raked over, but this has given only temporary relief.

At another Quebec course, the greenkeeper sprayed the affected

parts with a sulphur wash which cleaned it up quite effectively, and as nearly as I could learn it was much reduced if it appeared at all the following year.

This last fall one of the Ontario clubs, which is badly affected, treated an affected green with the organic mercury with the hope of arresting growth as soon as it commences in the spring, as it seems to grow under the snow. From the data already collected, the only stage at which this fungus is at all sensitive is when it is forming the webby, cottony, masses. These are so delicate that when transferred to a warm room from cool chambers where the temperature is around 40 degrees, it melts down like ice cream. The critical period for the development is during the general thaw in the spring with warm days and cool nights when the mercury hovers around freezing point. Excessive moisture, coupled with low temperature and darkness, will make it very active.

Such are the main features of course maintenance as touch the range of latitudes northward.

The successful greenkeeper, be he amateur or professional, in these days of high efficiency and superb golf grounds, is the man who can make himself familiar with climatic conditions of his immediate locality as they affect the growth of grass. He must be familiar with the texture of the soils he has to work with, and ascertain the chemical and physical requirements to bring them to the maximum fertility suitable to his purpose.

With this knowledge and ability to use it wisely and capacity to watch for and combat the inroads of disease and pests, he is truly worthy of a fellowship in that noble profession known as the Art and Science of Greenkeeping.

Weeding

By Sherrill Sherman, Yahnundasis Golf Club, Utica, N. Y.

When we speak of weeding it is primarily as it applies to putting greens, for there are but few clubs in the country where budget for the green committee is great enough to allow the weeding of tees, approaches, and fairgreens. Of course such an arrangement would be ideal but too good to be true and almost too high a standard at which to aim.

It is generally conceded that good putting surfaces mean at least, and maybe more, than 50 percent of the value of a course, at least from the standpoint of satisfaction and pleasure of the average player. For as a rule the average player, if he plays at all regularly, is reasonably proficient on the greens and the truer the greens the lower he can score, for it is there that he can the most easily save strokes rather than through the play to the green where distinguishable hazards penalize his mistakes more greatly.

Weeding is an every day job, an every week job, an every month job, an all season job, an every year job. Yet a weeding program, properly planned and carried out, means lessened rather than increased work in the future but is never finished. It is of vital importance in having really first-class greens as grass of one variety and uniformity unquestionably produces truer and better putting surfaces, if properly cared for. Care and thought must be given the problems of producing such turf. In using the word "weeding" I

am using it in a broader sense than usual, for I desire to include in this term the elimination, not only of the commoner better known weeds, but the elimination of all foreign or different varieties of grass. This article deals primarily with northern course conditions and I am assuming that greens of bent are desirable and desired. This being so, from the bent turf should be eliminated *Poa annua*, the greatest grass pest, along with all other strange varieties that will creep into established turf no matter how well nourished. From a visit to the Arlington Turf Nursery at Washington in April, 1927, I am convinced, in view of the clay which forms the base of the soil there, that bent can be grown anywhere successfully, if in its climatic belt, for I could not imagine tougher soil on which turf would have to be produced. Because bent is so distinctive it is as easy to distinguish the undesirable grasses from it as it is the weeds such as dandelion, chickweed, or butter cup. The very best time of the year, I believe, to eliminate these grasses is early in the spring before growth has started. While spring, before growth has started, or became rapid, is the best time to weed, it has a serious drawback and that is the fact that weeding at this time of the year is particularly hard on the men employed, due to the cold wind, the dampness of the ground, and the low temperature. While I have not tried it, I believe that a windbrake of canvas erected to protect the workers, with the work done on the sunny side of the shelter, would take away most of the discomfort. Unless one has weeded for a period of an hour or more it is hard to realize how hard and monotonous the work is to the weeder. The average man would prefer the greater labor of even green cutting to the hours of weeding.

At this time the laborers, even the least skilled or careful, can readily tell the difference between *Poa annua* and bent, and if the weeding has been well done previously the clumps will be small. After the removal of the unsatisfactory grasses the bent, with the growth of May, will have filled in the bare spots left by the weeding, if the weather is normal, by the first of June.

Where the climate allows it, I believe velvet bent to be by far the finest and best turf, the fineness of its blades, with its upright growing characteristics, and thickness and depth of its root system, giving the best surface for a putting green, smooth without variation of grass, a proper resiliency to pitch upon, and an ability to stand up under the heaviest of play, in wet or dry weather. I seem to have rambled somewhat from the subject of weeding in singing the praises of velvet bent, but I believe it is necessary to emphasize such a green as a standard to which all greenkeepers should measure their greens.

To put into dollars and cents how much should be spent for weeding annually is almost impossible but I am sure that the average club at least is far short of a proper and adequate amount in its green committee budget to give the attention to systematic weeding that its greens require and deserve.

There is no one perfect and complete method for weed control and I am sure that those at Washington will agree with me that weeds will spring up even in soil supposedly hostile to their propagation. Because conditions vary different methods should be combined and used in any comprehensive plan, but the secret of success is embodied in the words "ceaseless attention." We have all seen clubs whose greens were built and started under as nearly ideal conditions as

possible, yet, after a few years have become almost poor from the failure to keep proper watch and call up the reserves when the first scouts of the weed army appeared. The 17-year locusts have the reputation of being real pests, if history is at all correct, but the armies of the weeds are ever on the alert to drive forward and consolidate their advance posts. As bad habits are more easily broken when first started, so weeds and coarse grasses can be cut out with the least trouble and damage when young.

Chemicals, while they can help, can not entirely, at least from our present knowledge, eliminate weeds and the Green Section does not desire that such an impression should be broadcast. It may be possible in the construction of new greens to so prepare the soil as to lessen the probability of weed growth, but we still have before us the problem of caring for the vast number of greens that either because of expense, desire of members not to have their play interrupted, or other reasons, can not be so treated. Chemical treatment will help, but in greens already constructed the change will come but slowly to a condition that can be even remotely considered as weed proof.

The tried and true method of laneing a green by strings and having the individual worker proceed to carefully cut out the weeds by hand weeding in his lane can not be excelled. A lane three or four feet is wide enough. Before the passing of such a lane as being properly weeded the foreman or greenkeeper should carefully inspect the same, and if necessary have the worker cover it a second time that day. After a thorough weeding of a green, which as a practical matter is generally done in the afternoon, for the morning is well occupied by the men of the greenkeeping force by specific tasks, which unless the force available is quite large or a green quite small, can seldom be done in less than three afternoons, the green should have a second weeding or check over in about two weeks. This naturally can be done much more quickly if the first weeding has been thorough. It will surprise one how quickly a weed given just the littlest bit of root can recuperate and grow in a period of two weeks.

On an 18-hole course of the first class, with averagely large greens, it would require, at least for the first year or two, a minimum weeding appropriation of $1,000.00. Granting a crew of eight men are available for weeding from 1 to 5 p. m., this would make a daily labor time of 32 hours, and three days to a green, a one-time weeding time of 96 hours, at 50c an hour, about $50.00 per green, and the use of but simple arithmetic will very easily show a total of $1,000.00. Because afternoon play is the greatest, there will be some lost time, from the fact that weeding must stop while the players are on the green. If a separate force were employed it could be used mornings as well as afternoons. But there is a drawback to this in the fact that extra labor is often not available and if available must be trained. In addition it would not take the same interest in results as the regular greenkeeping force.

I know that to the average member of a club, and even to a green committee chairman, the idea of spending say $60.00 per green in weeding, for the reweeding cost will bring it to this figure, will not but seem rather high, but I question whether a green can be kept properly free of weeds and undesirable grasses for a lesser amount.

In stating this figure I do not wish to discourage those clubs who feel such a sum is beyond their financial resources, but as a child usually learns to creep before walking, so the approval of spending some definite sum yearly, even if small, is a step in the right direction. If there should be criticism or objection in the club to the expenditure, I am sure that selecting one green, concentrating all the weeding efforts there—a green near the club house that would be in sight of the majority would be a wise choice—would make that green stand out as such an example that the club would demand that the other greens be brought up to the same clean condition. I can quite conceive that some of the clubs whose courses with their large greens rank in the championship class could spend $5,000.00 a year weeding to keep their greens up to the highest standard. One could quite readily visualize the work that will be required to keep the 180,000 square feet, over four acres of green surface, free from weeds at the new course of Yale University at New Haven, Conn.

A point that I especially desire to bring out is this, that weeding must be planned both from the expense standpoint and the arrangement of available time and men. To me it is as truly important as the proper cutting of greens or fairways, a rather broad statement, but nevertheless true, like some other greenkeeping problems the solution is so simple that it is likely to be ignored or overlooked. There is nothing new in my suggestion, unless it is that undesirable grasses, at least in bent greens, should be classified in the same detrimental class as are weeds. If *Poa annua* is eliminated early in the spring it is prevented from blossoming and so going to seed and producing the second crop later in the season. Cold and backward as the season has been here at Utica, N. Y., this year at the Yahnundasis Golf Club, before the first of May I have already seen *Poa annua* in blossom.. In writing as I have I am assuming, and I believe rightly, that the grass that will be used in the future for all northern putting greens will be some variety of bent, either from seeds or stolons. Personally I believe strongly in turf by the stolon method for a number of reasons, its greater uniformity, the greater certainty of the desired variety, and the greater quickness with which the turf can be played upon without damage to it.

In conclusion I hope to impress this message vividly on the mind of the reader, do not rely entirely on acid reacting fertilizers to eliminate weeds. Such fertilizers are valuable aids but do not eliminate the necessity for considerable hand labor.

Greenhouse soil as a topdressing.—We can secure at a low cost some compost rejected by a greenhouse for the reason that it has become too fertile for greenhouse purposes. Would material of this kind be suitable for topdressing putting greens? (Indiana.)

ANSWER.—We assume that in this case, by "too fertile" is meant too rich in organic matter. In such a case we believe such compost would be excellent material for use in topdressing putting greens provided it is first mixed with an equal, or preferably a larger, quantity of loamy soil.

It has been suggested that a meeting of Green Committee Chairmen and Greenkeepers be held in Washington late in August to visit the Arlington Turf Plots and discuss the experiments conducted there with Green Section representatives.

During August brown-patch is generally active in the vicinity of Washington and the effect of various treatments for its control are conspicuous. At this time the relative ability of various strains of bent to withstand extreme heat and humidity are also very interesting. Fertilizer experiments are also striking in their contrasts at this time.

While August is a busy month for every one engaged in c. management the work at Arlington is also in its most interesting stage, in fact the men who have not seen the turf plots during the summer months have really never gotten a good impression of the work done there.

If sufficient interest is shown in such a meeting a formal program will be arranged which will include visits to various local clubs and an evening session at which papers on various subjects of course management and turf culture will be presented.

Will you write to the Green Section stating whether or not you will come?