

My Chairman is My Best Friend

By ERICH W. PAHL

Greenkeeper Interlachen Country Club, Hopkins, Minn.

I FIRST got my start in golf course work during the summer of 1911 when Interlachen was first started here, working on maintenance and general construction at that time.

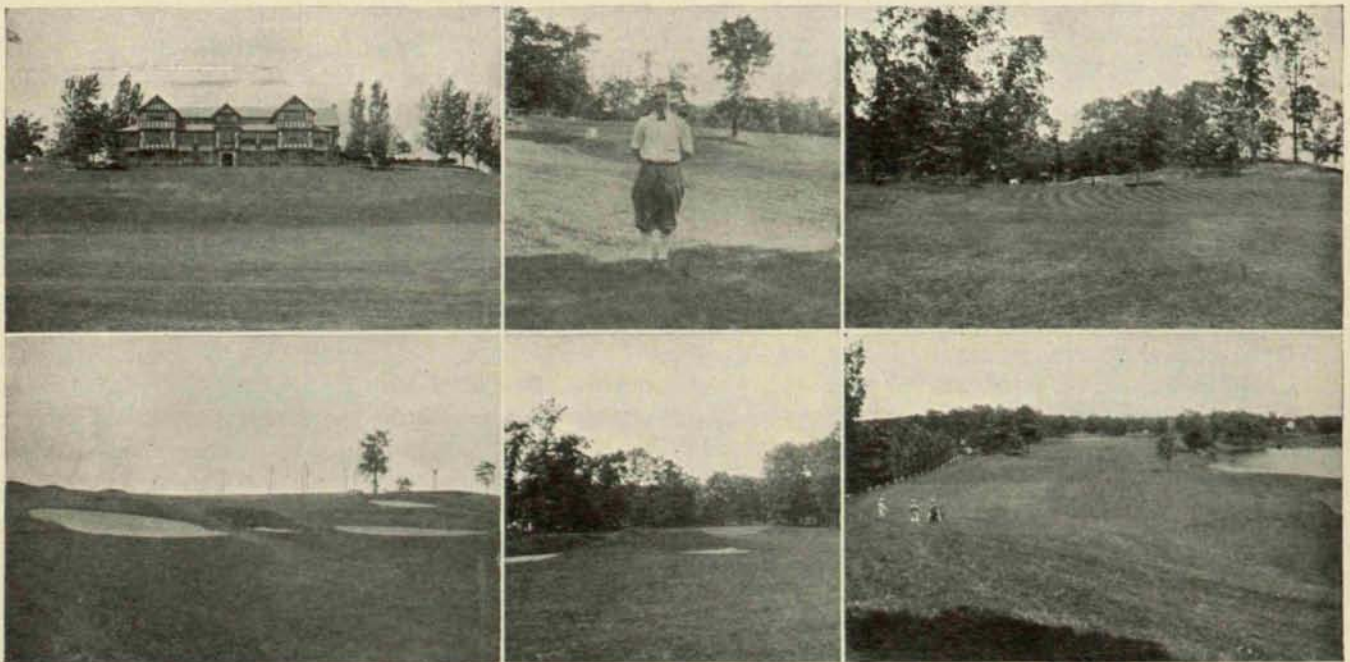
After three seasons of that, the club purchased an Austin power mower for the fairways and I was picked to run it. The following year after unfair treatment from the new greenkeeper, I went to work in a boiler shop at the Thresher works here, working up to boiler-maker. Then the war came on and I went into the service. Returning from France I again went to boiler-making. After a little more than a year of that, I decided to leave that work on account of the noise. I again tried to get work at Interlachen and was informed that the club was purchasing a Toro mowing machine (then first coming on the market) and that as soon as it was certain to go through, I could have the job running it. I started the next week doing mower repairing and general mechanical work for a couple of days until the new machine was delivered. After three years of that I was finally selected for greenkeeper when a change was decided upon by the chairman. Knowing something of the difficulties they had had and no co-operation on the part of the greenkeeper, when thinking back I can not blame the chairman. We still have the same chairman, and

I want to say here and now that I have never worked under a better man.

With a very little knowledge of greenkeeping, I was promised his assistance at any and all times when needed and he has always been willing to co-operate in every way and to the satisfaction of everyone. Together, we have been doing, I think, splendid work. Being a lover of trees, there have been about 600 planted on the course during his term with more to be planted when funds are available.

Thus far, I have always been able to come out ahead on my budget and during reconstruction have always been able to save money by doing things a little different, getting the same if not better results with less money. My first construction job was to make a practice course out of a swamp near the clubhouse. It had been tiled the winter previous. We first took up about 1600 yards of good peat, stored it in one pile to use in top dressing fairways and have obtained wonderful results thus far. My next was to rebuild our number 4 green which was planted to stolons of Washington Bent, having started a nursery the year before.

Had considerable hard luck with the bent, as having heavy rains right after planting washed it out three different times before we got a stand of grass. I started



Views of the Interlachen Country Club, Hopkins, Minnesota. Upper left, club house practice green in foreground; upper center, Erich W. Pahl, greenkeeper; upper right, Number 16 green; lower left, bunkers guarding No. 13 green; lower center, bunkers guarding approach to Number 8 green; lower right, 479-yard Number 1 hole taken from club house

cutting that close as soon as there was anything to cut, and will say we have a wonderful green there now with excellent turf. Our soil being heavy yellow clay, we scouted around the country to find suitable soil and finally found a real sandy loam, which we hauled with trucks and put about 7 inches on each green before sodding. We raised a sod nursery of bent and year before last reconstructed six greens and sodded with bent sod, replanting the nursery for the following year's work on greens. Last year we rebuilt five greens and have six left to do this year, then we will have 18 bent greens. Have twelve now and they are all coming fine. Our number 15 was about two-thirds killed out with snow mold this spring, and we tried seeding the spots with very poor results. We decided to re-sod the part killed out as we had plenty of bent sod left in our nursery.

Our nursery covers approximately 43000 square feet. After this year we will maintain about enough for 2 greens in case we need it.

Have had a lot of help out of the Green Section bulletins and feel that The National Greenkeeper is going

to give as much if not more help. Find the various articles very interesting and helpful and think that Mr. Morley was on the right track when he started the National Association.

I have a crew of 14 men divided as follows: One man cutting fairways which we cut three times a week; one man cutting rough and general hauling; two men for night watering for fairways and greens; six men for cutting greens, tees, etc. Each man has three greens and tees to take care of and also taking care of trimming bunkers on those fairways; one man to take care of the nursery; one man to rake bunkers; one man for the garden, which is under my care this year, and one man for all around work.

Have started a system of maintenance costs this year to keep an account of the different classes of work.

Greenkeeping is truly a great game and I intend to follow it up. I find it very interesting as there is plenty to think about. The main thing is co-operation of the chairman and greenkeeper and I have been very well treated in that respect. If we had more chairmen like ours we would have better golf courses.

Sand Greens in South Dakota

By LE ROY JOHNSON

Greenkeeper Yankton Golf and Country Club, Yankton,
South Dakota.

ALTHOUGH we do not have grass greens, we meet up with some questions of maintenance that I believe are greater problems than any of the greenkeepers of eastern clubs have to contend with.

We are beyond the belt of good bent and other good grasses for fairway turf. We have seasons of no rain, and we have no watering facilities for the course. If we had a medium to average rainfall, or water, we could maintain a good turf, but without either, let any greenkeeper "try and do it."

We have sand greens, and would like to hear from those who have a success or a near-success with them. I am having better luck with my greens at present than I did last year. Our greens get so hard it is impossible to putt a well directed ball, but I have recently been commended by our club president on the condition of the greens.

Our greens are constructed of clay and sand, just enough sand to keep them smooth, and enough oil to keep the clay soft and yet firm. I use oil from automobile crank cases, a fifty-two gallon barrel to each green. I put the oil on the clay after leveling out the marks and rough spots, then put the sand on with a

shovel and spread it with a float I constructed myself.

Spreading Sand with Wooden Float

This float is a piece of 2 x 2, cut 4½ feet long, bolted to a handle in the form of a T. I made a bevel cut on the lower edge of the handle, about forty-five degrees, so as to get a good smooth floating surface.

I start directly at the cup and around, then I cross the green from cup out to the side. Then I finish from the cup out in a circle. When the job is finished the green looks like a plastered surface.

I use oil every time the green gets a good washing rain, as the oil seems to disappear into the ground after a heavy rain or during a hot dry spell. The worst time we have with sand greens is late in the fall when the frost starts, and early in the spring when it begins to work out of the ground. The greens have a tendency to sweat and heave, get terribly soft from the oil, and no amount of rolling does any good.

I would certainly like to read something written by a greenkeeper who has made a study and a success of the maintenance of sand greens, but I do want to say that I enjoy the NATIONAL GREENKEEPER, and hope to get some more good advice on turf culture.

Golf Course Irrigation

By W. A. BUCKNER

THE problem of fairway watering is no longer perplexing or prohibitive in cost. The business end of golf is now very generally handled by men who have made it a study, rather than by a doctor one season, then a lawyer and then an undertaker and so on down the line, each trying to beat the other's record of not spending any money. The men who do the real work on up to date golf club committees today have brought the business up to a standard of efficiency which many other lines of business would do well to emulate.

Golfers in general have therefore grown expectant to a degree that a few years ago would have been considered irrational. With the advent of turf putting greens, came the worst thing that has happened to golf clubs, the installation of inadequate water systems and toy sprinklers. This was of course very well for a short time, but from the turf green idea sprung the

turf fairway dream and the grass tee experiments, so that in a short time the water systems installed for greens only, were wholly inadequate. But they had cost a considerable sum nevertheless, and the club members were loath to pay for tearing them out and putting in new systems. This prevails today to a certain extent, but not with the clubs being handled by good business men. However, it has had a disastrous effect on progress. The small pumping plants and the small water systems are responsible for the hundreds of different types of toy sprinklers, the manufacturers of which were in keen competition trying to get great distance out of a small sprinkler on poor pressure. Sort of trying to pull oneself up by the boot straps. It cannot be done.

Like every other progressive business, the business of golf course construction and upkeep had to pass through



A view of the Eighth Green at the Monterey Peninsula Country Club, one of the many California golf courses equipped with a modern and complete irrigation system

the experimental stages as in the past we had no experimental stations operated by men thoroughly familiar with the needs of the courses, as we now have.

The organization of the district greenkeepers' Associations was the first real stride in the direction of economy and efficiency. Then came the National Greenkeepers' Association and with it *THE NATIONAL GREENKEEPER*, its official organ, the clearing house, so to speak, of progressive ideas. This magazine places every greenkeeper, experienced or inexperienced, in close touch with the trend of things he is most interested in and will do more for golf than any organization or system of things that can be conceived of by those not familiar with the knowledge that is required of greenkeepers.

This matter is perhaps more apparent to the writer than to the average golfer, as being in the business of promoting turf, closer contact is made with the real needs of clubs, than is made by those who follow other lines of endeavor.

The modern methods of golf course irrigation include the fairways as well as the tees and the greens. After a course has been laid out the first thing to be considered is the water system, as there can be no worth while course without a good system. You read every day about where and how to locate the pumping plant most convenient to the water etc., so we will not dwell on that subject here.

As has been said, originally water systems were built for green irrigation only, but these greens have gradually grown larger and the practice of watering the approaches, when water was available, followed. Then came the grass tees and later the final demand for turf fairways and thus the problem of fairway irrigation.

California Clubs Pioneers in Irrigation

The California clubs have pioneered the way in this extensive watering for the reason that the climate is such that grass is necessary for comfort and California being the "playground of the world" just naturally had to devise ways and means to promote this luxury in an economical way. The construction engineers and sprinkler manufacturers got together and thought out a plan, to use much less pipe and save installation cost and upkeep by using giant sprinklers. This saved a great deal of money also in elimination of hose and labor. California having a climate demanding artificial irrigation practically throughout the entire year, was therefore, the cradle of the all turf courses and the home of the golf course sprinkler industry.

At the present time, practically every golf club on the Pacific coast boasts of an all-grass course and during the past two years they have been equipped with the famous slow motion type of sprinkler which covers many times the area of previous types of giant sprinklers and most of the new courses during the past year have adopted the hoseless system of golf course irrigation

for fairways. The Castlewood Country Club at Pleasanton, California, is a shining example of what can be done with an adequate water system. This course is built on the estate of the late Mrs. Phoebe Hearst and is one of the most beautiful courses in the world.

The hoseless system enables this club to irrigate the course with less than half the men it would take to operate a hose system. The saving of labor and hose much more than pays the interest on the investment, or rather the added cost of this system over the hose system, to say nothing of eliminating the human element and misplaced sprinklers which so often happens with men using hose and portable sprinklers while watering at night.

The Hoseless System

A hoseless system is similar to a hose system, except that instead of having hundreds of hydrants strung along the fairways and thousands of feet of hose, there is a valve for each unit of seven hoseless sprinklers. The valve is outside the fairway and the pipes leading out into the fairway from the water main are installed so that each outlet is an equal distance from all other adjacent outlets. That is the outlets are on the staggered or equilateral plan. The distance apart runs from 75 to 100 feet according to the amount of pressure in the system. The outlets are installed practically flush with the soil so that the mower does not find them. Some clubs set their sprinklers up by screwing them into the outlets, but the most up-to-date and convenient method is to use quick couplings. These couplings have a female member which has a hinged cover or lid to keep out grass cuttings and trash and is installed flush with the soil. Then the sprinkler is equipped with the male member of the coupling and has a small lever to press down and lock the sprinkler end to the ground connection. This can be done in an instant and the sprinkler can be taken off the system in the same time by simply raising the lever.

When irrigation is desired a man goes out with seven sprinklers and sets them up on a unit and opens the valve. He then sets up as many units as the water supply will take care of. When this is done, he returns to the first unit and moves these sprinklers forward to the next vacant unit and so on around the course. Most California courses have a water supply that will take care of an entire fairway at a time, which simplifies matters very much. Tees are watered by using the adjustable concealed head of special golf course type. They are installed flush with the soil and as the tees are played "off or from" there is no objection to having one or two of these heads in a large tee. All that is necessary then, to irrigate a tee is to open a valve. This eliminates dragging hose and sprinklers to the most inconvenient spots on the course.

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What Do Your Green Men Know?

By M. F. WEBBER

Greenkeeper, Groesbeck Municipal Golf Links, Lansing,
Michigan



M. F. Webber

WHEN you visit a strange course the first thing you inspect is the greens; and what you see tells you that the man who cares for a certain green is educated along that particular line of work, or that he has missed his calling. In the latter case perhaps the greenkeeper is at fault for not starting this man out right.

If this green man does not know his business or is not interested in the greens that are intrusted to his care, you will see a green that is brown and worn around the outer edge and you will see that it has been cut unevenly by a mower that has not been properly adjusted and there are skips caused by not overlapping, tiny brown spots where the oil has dripped from his machine, and weeds and more weeds. Possibly you will see where a few weeds have been taken out. It will be plain enough for there is the big hole that would be a fine place to set the cup.

It is very easy to at once spot the work of a green man who is not so expert—What's the answer? Who is to blame, the green man or the greenkeeper? The greenkeeper must take the blame, for it is up to him personally to instruct his green men. He must get out and demonstrate just how it should be done and why.

I well remember my first job on a golf course some twelve years ago. The greenkeeper gave me a machine and told me the numbers of the greens I was to care for. One of the green men showed me where to go and all I found out was what I learned from him. After cutting three greens I was nearly ready to quit. The grass was long and the mower was adjusted too tight and it seemed

that what I thought was going to be a fairly easy job was turning out rather tough. But I thought I would like the work and it was not long before things became better. The point is that no one told me anything about the work I was going to do. The second day the greenkeeper came around and asked if everything was all right, and I supposed it was, for it seemed that way to him. If a man is started out that way, he will either get interested in his work and make things better for the club members and himself or he will hang on a few weeks and quit. Then a new man will go through the same process and the green suffers as well as the greenkeeper and the members. So give the new man a little of your time. He will be more satisfied and will give you more and better work.

Choosing and Instructing a Green Man

A good green man must be strong and able to move about quickly—not old—and above all he must be interested in his work. Give him certain greens and if he proves okeh, keep him on those greens. If he likes the work, he loses interest if he is moved about from green to green.

In a week you will know if he is the right man. The first thing he must learn, is to know his machine. Let him take it apart and clean it, show him about oiling and how little it takes to keep it properly lubricated. Have him wipe the mower clean after oiling so it will not drip on the green and leave those brown oil spots. Show him how to adjust the cutting bar and impress upon him the importance of always having it properly adjusted so it will do a clean smooth job. Now get him out on the green. Tell him about making two cuts around the outer edge of the green, then a straight cut across the green and when he gets to the edge impress him with the idea of raising the mower slightly, running it off the green for turning and getting a straight cut started for the other side. How much more beautiful a green looks that has a straight clean cut compared to a cut that zig-zags and skips. He must be sure and overlap enough so not to leave a ridge. The grass box should be emptied when half full, especially if the grass is wet. Show him how to push the mower so he can make a straight cut. I've seen men pushing a mower at arm's length, as though they were trying to get it as far away from them



Looking toward Number 5 green and Number 6 tee at
Groesbeck Municipal Golf Links, Lansing, Michigan

as possible and the result is always the same—a zigzag uneven cut. The handle should be well up to the body and the elbows well back to have perfect control of the mower. If he has to mow when the green is wet and there are worm casts, the roller must be cleaned every round. If possible avoid cutting the greens when wet, but if you must do so, go over them with a pole after cutting and scatter the small bunches of wet grass. In moving the machine from one green to another, have him pick out the smoothest route, thereby prolonging the life of the mower. When the new man gets broken in, have him cut the green as fast as possible. He will do a cleaner job and the mower will work easier when pushed along at a steady pace—a good fast man will cut his green quickly and not mark it in the least, whereas a slow plodding man will leave his mark every time. Some greenkeepers will not let a man adjust a machine that he uses every day. In fact I once knew a green man who had used a machine all season and could not adjust it. If anything went wrong this man would have to run all over the course looking for the foreman, so he could get things working again. I say that if a green man is not trustworthy enough to adjust a machine that he uses every day, it is time he was shifted to another job. The mower should be adjusted after cutting each green, if you want every green uniform.

Weeding

This is one job that I believe has been sadly neglected. Not that they didn't get the weeds out, but how they got them out. Have you ever seen a gang of men or boys weeding a green? Some have pocket knives, some butcher knives, some table knives and, with apologies to Heinz, I think there must be "57 varieties."

In bent greens I've found that the majority of weeds cause little trouble—close cutting takes care of them. But those weeds deserving immediate attention are dandelion and chickweed—and the chickweed must come out first. One thing I impress on my green men, is that they must get the chickweed or it will get them and the green also. Chickweed is easy if you get it under control the very first thing in the spring. Then it shows up very clearly and is easy to see before the grass starts its heavy growth. I've found that an ordinary three tined kitchen fork is the ideal tool for removing chickweed. With a fork a fair sized patch of chickweed can be removed and hardly leave a mark.

As you all know, in a small patch of chickweed the main root is in the center of the plant and runners radiate from this center making a circular patch, so that all that is necessary is to take your fork and loosen the outside runner up and out of the grass. Go clear around the weed and be sure that you raise every runner, until you have them all up in a bunch. Now push your fork under the center root and give it a slight twist to loosen the root, then the whole weed can be lifted out, hardly

leaving a mark. A little patience and hard work in the early spring will practically eliminate the weed for the season. We have so little chickweed in our greens at the present time (June 25), that it hardly pays to look for it. So when the men are mowing and happen to see a small patch, they stop right then and get it out. I believe the most disagreeable sight a greenkeeper can imagine, is a green filled with those circular spots of chickweed anywhere from an inch to a foot in diameter. And when they reach the latter stage, you may as well put in a new green, for you would have to tear the green up to get the weed out. So I advise any new greenkeeper and especially so if he has new greens, to get the chickweed and get it quick or it will get the green. It is practically impossible to completely eliminate dandelion. But if your green is at the stage where you can spot this weed only now and then, you can be satisfied.

Weeding is a continuous job and the green man must be impressed with the fact that he must keep everlastingly at it. There can be no let up.

I believe, mowing his greens, weeding and caring for his machine is the important job of the green man, but he should also be able to properly care for his approaches and traps and know how to top dress a green and why. In fact he should know all about every operation on and around his greens. And, if he is the right man for the job and has been properly instructed, he will not only save the club money, but he will help keep the members smiling about their fine greens and last, but not least, he will save the greenkeeper trouble and worry.

How Many Green Men and What They Do

On ordinary grass greens, I believe three or four greens will keep a man busy. But on Bent greens, one man can properly care for six greens. Here we have bent greens and three green men. Each man cares for six greens. Here's the way one man handles his six greens. Starting at 6:00 a.m. he oils his machine, which has been properly adjusted the preceding day after he finished cutting his greens. He then takes his machine and pole and goes to his first green, leaves his machine there and starts poling his greens. As he goes from one green to another, he changes the water in the tee boxes (the water is changed every morning). He also cleans up paper around the tee. In about one hour he has his greens all poled and by that time his first green is ready to cut. He usually has his six greens cut by 10:30 a.m. These are average size greens. He then thoroughly cleans his mower and gets it properly adjusted for the next morning. Then until noon he cleans up around his greens or weeds. After lunch he rakes his bunkers. Each man has about sixteen bunkers to care for. After the bunkers are finished, he weeds or does some special work until quitting time. Twice a week after his greens

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A Chat With Our President



John Morley

OUR Slogan, "Every Member Get a Member" is bearing fruit. Nothing succeeds like success.

BY the time this issue is in your hands we shall have passed the first half of the golfing season. Up to this time Nature has for the most part been kind to the greenkeeper. It is the last half of the playing season which tests the ability and courage which the greenkeeper must possess. If he knows how to assist Nature during the next three months, he is indeed a greenkeeper.

WE have not heard lately from our friend John MacGregor of the Chicago Golf Club, but that is probably because he is a very busy man in this weather, as he waters all his fairways.

WE should not forget that the winds and waves are always on the side of the ablest navigators. John Pressler of the Allegheny Country Club, Sewickley, Pennsylvania, recently had a horse show on his hands. John needed some help for his compost pile.

MACK BURKE, formerly at the Scioto Country Club Columbus, Ohio, is now helping to construct the new Hills and Dales golf course at Canton, Ohio.

DON'T all answer at once, but which is the most important in hot dry weather, fertilizer, air or water?

IS it a good thing to use compost during periods of heavy humidity?

HOW can you tell the difference between Washington and Columbia strains of bent?

THE Philadelphia district can boast of one good host in Joe Valentine of the Merion Cricket Club. I shall never forget the fine hospitality I received at his hands when I visited as a total stranger the beautiful course he keeps.

WHILE watching the players at the recent National Open at Oakmont Country Club, I felt the pat of a hand on my back. In looking around I greeted Mr. W. C. Fownes, Jr. That gentle pat was a friendly greeting to the members of our association.

*Books cannot always please, however, good;
Minds are not always craving for their food.*

IHAVE received a number of favorable comments on the articles written by Mr. Noer. Don't destroy the magazines containing these chapters on soils.

WE have a good many greenkeepers of the east in our association, but we would like to have a lot more.

CHRISTOPHER BAIN of Oakwood Club, Cleveland, is now assistant to the treasurer. Chris is a good accountant, and doesn't mind a little extra work.

IT is not what we eat that makes us strong, but what we digest. It is not what we read that makes us wise, but what we remember.

WANTED—The name of a course that has a stiff clay soil, with good putting greens that have no drains under them.

IWOULD like to see poems in our magazine from our assistant secretary and from A. E. Lundstrom of the St. Charles Country Club, St. Charles, Ill.

CHARLES JARMAN of Brookside Country Club, Canton, Ohio, is bringing his greens up to perfection since he got rid of the fescue. When he cut the fescue to please the players, his old greens went all to pieces.

FRED KRUGER of the Olympia Fields Country Club, Chicago, has four courses on his hands. Fred

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The National Association of Greenkeepers of America

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When Brown-patch Appears

By JOHN MONTEITH, JR.

Associate Pathologist, United States Department of Agriculture

IN the June number of THE NATIONAL GREENKEEPER it was explained that brown-patch disease of turf was caused by a fungus feeding upon the blades of grass. This fungus or mold is a plant and therefore influenced by a great variety of favorable and unfavorable soil and climatic conditions just as are grass or other living plants. It is well known that golf course grasses have a fairly definite range of temperature most favorable for their growth. In cold seasons grass is checked and finally becomes dormant, whereas in periods of excessive heat it is likewise checked. However, the extremes of heat and cold, as well as the most favorable temperature, vary with the different grasses.

Thus Bermuda grass and *Poa bulbosa* which may both be used in the same piece of sod appear at different seasons due chiefly to this difference in response to temperatures the former producing the turf during the summer months but becoming dormant during the winter months when *Poa bulbosa* succeeds it. Grass often does not receive enough fertilizer; and occasionally it is given too much. Most growing plants may be checked by an insufficiency or an excess of water. Likewise there might be cited any number of conditions which most greenkeepers well know may alone or collectively affect the growth of grass.

Influences of Soil and Climate

In the same manner the plant (fungus) causing brown-patch is influenced by various soil and climatic conditions. A condition which is most favorable to growth of a certain grass may also be most favorable to the growth of a fungus, but frequently the effect is opposite. Moisture is an example of the latter. Periods of excessive rain, watersoaked soil, heavy dews and little sunlight are unfavorable to grass, and cause it to develop a growth which greenkeepers usually speak of as "soft". Although such a period is unfavorable to growth of grass, it is most favorable to the growth of most fungi. Under such circumstances if other influences, such as temperature for instance, are favorable for the growth of the brown-patch fungus, the disease will soon appear.

From the standpoint of control of brown-patch it is



John Monteith, Jr.

Mr. Monteith's field in his connection with the U. S. Department of Agriculture is the investigation of forage crop diseases, and for several years he has been conducting experimental work on the identification, cause and cure of the diseases of golf turf on plots furnished by the United States Green Section for this purpose. In a later article Mr. Monteith will describe the methods he has used in controlling Brown-patch and the results of his careful experiments. Prior to the scientific investigation for which Mr. Monteith is responsible, many putting greens were completely destroyed by this turf disease.

therefore apparent that if one could keep all the conditions of soil and climate such that they would be most favorable for the growth of grass and unfavorable for the growth of the fungi causing brown-patch, there would be no such disease. Obviously such ideal conditions cannot be maintained throughout the summer in most sections of the country since they involve so many complicated conditions; including moisture, temperature, fertilizers, sunshine, air circulation, drainage, proper soil texture and many others.

But even though one can not control all of these it is often possible to greatly reduce the damage caused by brown-patch simply by modifying one of these factors to throw the balance in favor of the grass. These possibilities will be merely suggested in this article without giving any discussion of the various methods available to greenkeepers for such modifications. In many cases any changing of these conditions is practically impossible due to local circumstances, but in other cases a greenkeeper who carefully examines his course may

find that some attention to these matters may greatly check and at times entirely prevent brown-patch on his most troublesome green.

There are several chemicals which prove effective against brown-patch disease but, as in the case of human diseases, it is more desirable to first give careful consideration to the various conditions influencing the health and vigor of the grass; using chemicals (medicines) as a last resort. For this reason some of these environmental factors affecting brown-patch will be mentioned first.

Original Construction Flaws Contribute

In dealing with turf diseases the construction and maintenance of a green is of primary importance. If the location and soil of a green are unfavorable for the growth of grass, the injuries caused by diseases are of much greater consequence for the damage may not only be more severe but it will be more lasting due to the slow development of new grass to hide the scars. For this reason the construction of a green may always have a bearing on the severity of brown-patch on that partic-

ular green. Poor soil; poor drainage, both surface and sub-surface; layers of sand, ashes, clay or other unsuitable material near the surface; steep mounds which dry out quickly; and many other construction flaws all serve to contribute to lack of vigor of grass and therefore indirectly have a bearing on damage by brown-patch.

This is not meant to imply that expensive construction is always best for it is well known that some of the most elaborately constructed greens in the country are from the standpoint of grass maintenance, far inferior to many where the construction consisted simply of the ordinary procedure of plowing and harrowing.

The drainage problem is an important one in brown-patch control for the fungi causing this type of disease are directly affected by moisture. This is especially the case with large brown-patch. Where drainage was not considered in the construction plans or where provisions are inadequate, it is usually a relatively simple matter to correct this mistake without too great an interruption of play. It must be remembered that, regardless of tile or other sub-surface drains, surface drainage is of utmost importance especially in the heavier types of soil. It cannot be assumed that a green is well drained simply because it is on high ground. Frequently a high green

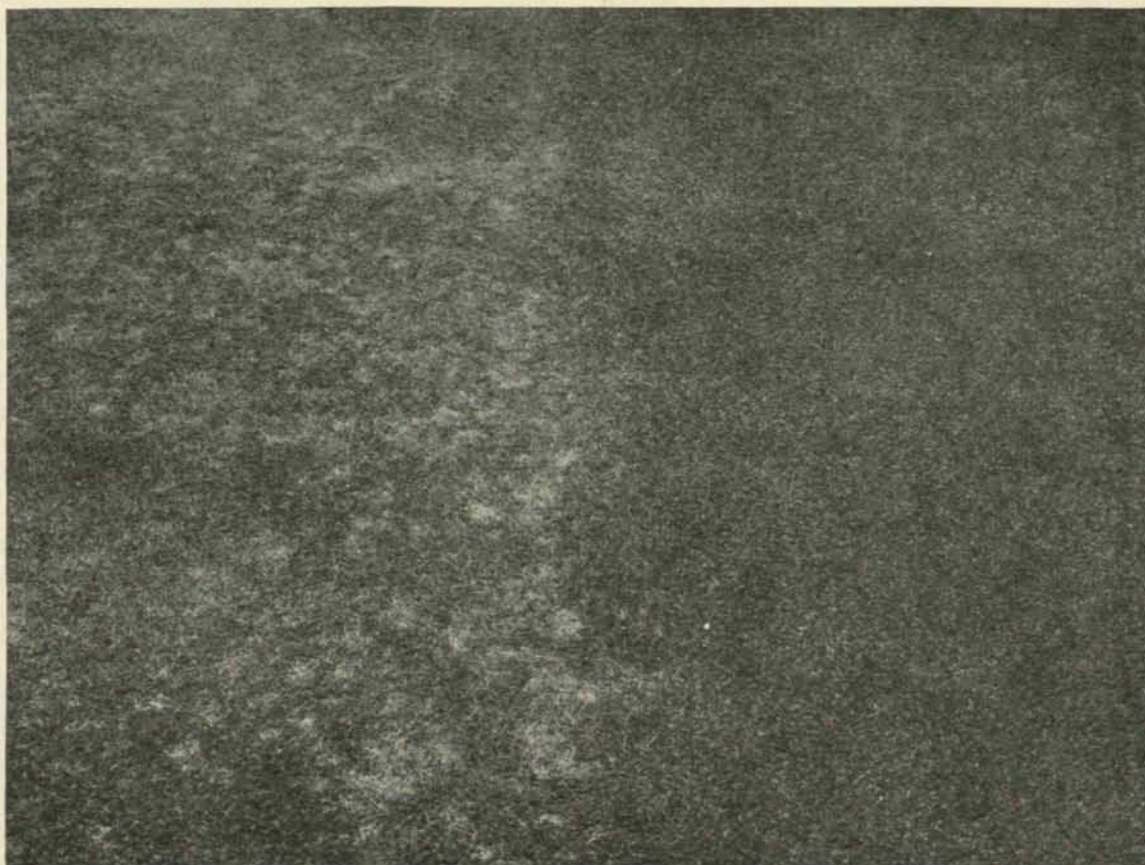
even on a steep hillside is badly water-logged because no provision is made to carry off the water that seeps out from the soil above.

Open Up "Air Pockets"

Provision for "air drainage" is another item frequently overlooked in building greens and this results in the so-called "air pockets" where during hot periods the absence of breeze and the high humidity is distinctly noticeable as soon as one walks into such an area. Such humid conditions are extremely favorable to the large brown-patch fungus. In many cases it is practically impossible to correct this difficulty but there are many greens which could well be ventilated by cutting out a few trees or branches from the direction of the prevailing wind.

Early Morning Watering

Damage by brown-patch can frequently be greatly reduced by modifying the watering of greens. Since these fungi are helped by water, especially in the form of heavy dew, it is desirable to remove dew from the grass as early as possible during periods when the brown-patch fungi are active. A light sprinkling early in the morning will wash the large drops of water from the grass blades and cause them to dry more quickly. Evening sprinkling on the other hand will moisten the grass



Two strains of creeping bent growing under identical conditions. The resistant strain at the right remained healthy during this attack of small brown-patch

early and create favorable conditions for fungi during a longer period than would be the case if the turf remained dry till dew settled upon it. Therefore, whenever practical it is more advisable to sprinkle greens early in the morning whenever brown-patch is developing. Otherwise greens may be watered at any time, day or night. General early morning watering is not recommended for brown-patch control for the reason that many times when the disease is spreading the greens already have too much water and additional sprinkling would serve to further aggravate this water-soaked condition. On such occasions the common method of "whipping" the greens with bamboo poles to remove the drops of dew is preferable. Dragging a rope or hose across a green serves the same purpose and will usually cause the grass to dry more quickly than if left undisturbed.

Fertilize After Checking, Not Before

The proper use of fertilizers also is important in fighting brown-patch. Excessive use of those which will produce a soft growth of grass during a period when the disease is active will usually result in greater damage. On the other hand, after the disease has been checked a light application of fertilizer to stimulate the grass quickly will produce enough new blades to soon hide the browned scars. Long grass, at least as long as can be allowed on greens, apparently is as susceptible as closely clipped turf so, from the standpoint of disease control, there is nothing to be gained by changing the regular mowing schedule.

Varieties Grass Resistant to Disease

Another means for reducing the damage caused by brown-patch is that of using resistant varieties of grass. In many of our agricultural crops there have been developed during recent years varieties which are better able to withstand attacks of disease. Some of these specialized varieties have made it possible for farmers to produce crops where seed of the common varieties is practically worthless. So far there has been little done in developing grass resistant to diseases. There are, however, a number of strains of bent and fescue which show striking possibilities for future development along these lines. The two most commonly used strains of bent which show marked resistance to brown-patch are the Washington and Metropolitan, as distributed by the Green Section of the United States Golf Association. There are others which show promise. Some of the so-called resistant or "immune" strains have never been sufficiently tested and most of them probably are little better than average in this respect.

It is perhaps well to define more clearly what is meant by resistant strains. To be classified as "resistant" to a disease, a strain of grass need not be "immune." When

various strains of grass are grown side by side on the same soil where they receive the same fertilizers, watering, clipping and in every other way are treated in the same manner, it is apparent that some of them are regularly the first to be affected by brown-patch and that others are usually the last to be affected. Those which are first attacked and most severely injured are classed as the most "susceptible", whereas the last to be affected are most "resistant."

In mild attacks of disease the resistant varieties frequently are in no wise affected, but when brown-patch is especially active it is able to injure even the most resistant strains that are at present available. There have been strains of grass advertised as "immune to brown-patch" but so far we have not seen a strain possessed of such marvelous qualities. Nor is it likely that a fine turf grass capable of withstanding attacks of the brown-patch fungus under all conditions will be developed in the near future; if indeed it is ever likely to be accomplished.

For the present we can hope only for resistant strains which will be able to withstand mild attacks of disease and which are capable of quick recovery when injured by severe attacks. Such resistant varieties when given the proper soil conditions and when properly cared for will greatly reduce the need for chemicals in checking brown-patch during the greater part of an ordinary summer.

Climatic Conditions Affect Control

In spite of all precautions in construction and maintenance of greens, there are times when the climatic conditions are such that the brown-patch fungi are given every advantage, and disease is sure to develop unless further precautions are taken.

As in the case with most of our other plant diseases, there are certain chemicals which are poisonous to the fungi causing brown-patch but which are harmless to grass, at least in the concentrations needed to check the fungus. In controlling many orchard and vegetable diseases it is customary to spray or dust with mixtures containing some compound of sulphur or copper. The first attempts to control brown-patch naturally included some of these mixtures. Unfortunately, sulphur compounds at once proved ineffective against brown-patch and also were poisonous to grass.

The Danger in Use of Bordeaux

Mixtures containing copper (especially Bordeaux mixture) were found to be effective against large brown-patch but were of little value against the dollar-spot type. Bordeaux mixture soon became generally used on golf courses. It was later found that the copper contained in this mixture accumulated in the soil from year to year and finally there was sufficient of it to become extremely poisonous to the roots of grass. As a result, on most