

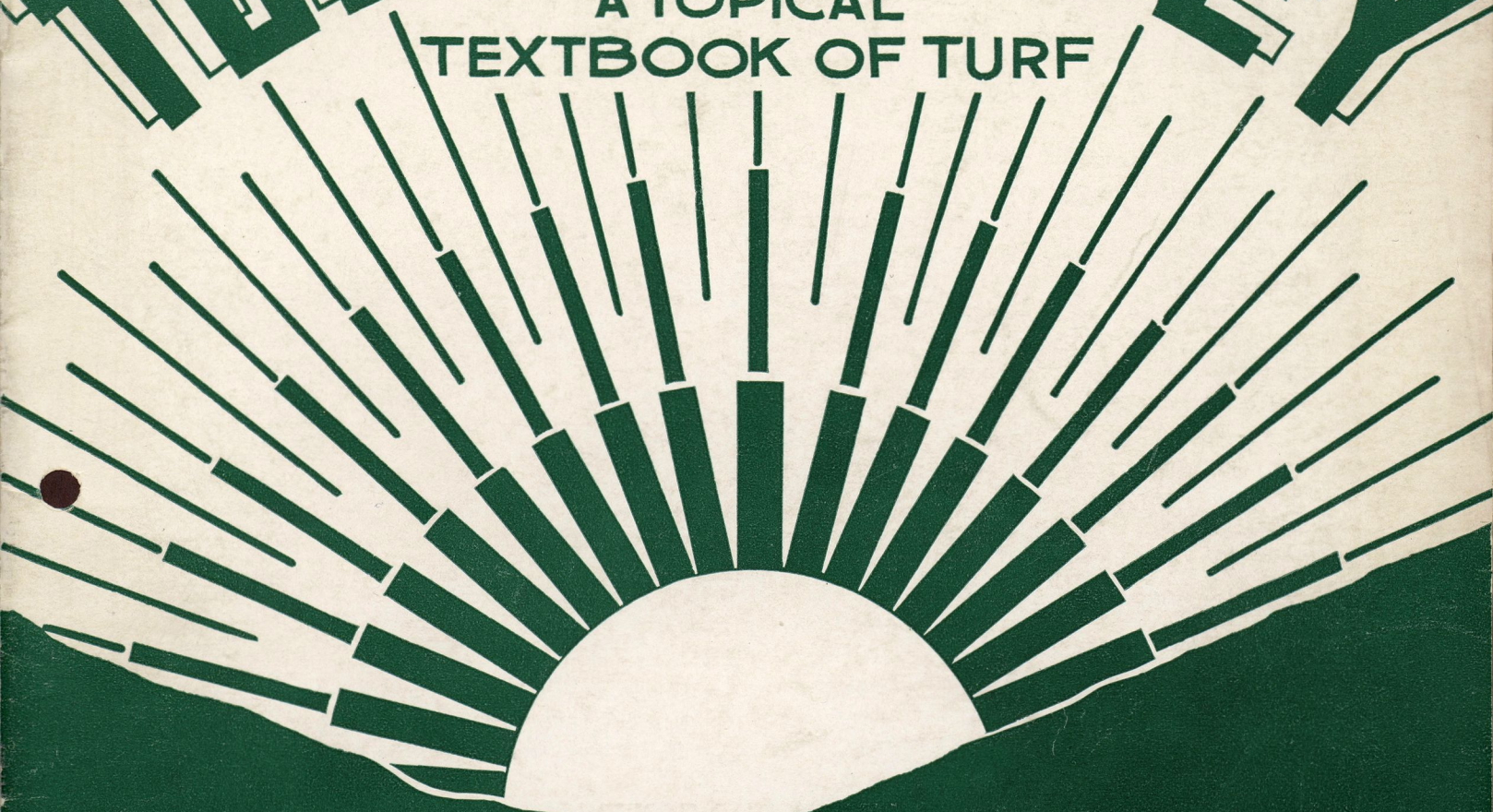
VOLUME I
NUMBER 2

MARCH
1936

The

TURF SURVEY

A TOPICAL
TEXTBOOK OF TURF



GOLF COURSES AIRPORTS
POLO FIELDS CEMETERIES
ATHLETIC FIELDS
PARKS LAWNS ESTATES

A MONTHLY MAGAZINE DEVOTED TO THE INTERESTS
- OF ALL TURF GROWERS IN THE -
- UNITED STATES AND CANADA -



SPRING FLOOD CONTROL

THE Banff Springs Hotel at Banff, Canada, is depicted in the photograph above, its turrets overlooking miles of scenic grandeur, and at its feet the golf course which is one of the most popular recreational features of this resort.

At first glance, the teeing ground in the right foreground seems to have been laid out on a spot chosen by Nature for exposure to every element of danger in her bag of tricks. The swale back of the tee at the foot of the pines, however, is not indicated by the camera. Damage from washouts due to heavy rains and melting snows is largely prevented by this natural drainage ditch, which carries excess water safely beyond and back of the tee to join the river in the same direction of flow as the main stream.

The river bed is broad enough to take care of rising waters without much danger to the lower slopes, and the direction of flow from all points is away from the tee.

The great beauty of such a setting justifies whatever

yearly expense may be necessary in its preservation.

Rivers in mountainous country throughout Canada and northern United States cause excessive damage to property during the spring break-up. Their raging torrents spread blocks of ice, rocks, up-rooted trees and branches, bridges and everything else they can tear loose, all over the surrounding landscape. After a winter of extreme cold and heavy snows, such as the current one of 1935-36, correspondingly heavy damage from floods may be expected. Already the ice break-up is under way here in the Middle West, and many of the main highways at points adjacent to running streams are buried under huge chunks of ice moving along on the overflow. Closed roads and long detours are the order of the day at present writing.

Small creeks which in August show practically no flow at all are apt to become destructive agents of no mean

(To Page 16, please)

THE TURF SURVEY

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Volume I

MARCH, 1936

Number 2

WHAT YOU READ VIZ. WHAT YOU NEED

THIS number of THE TURF SURVEY will be received by an additional 2,000 readers, making 5,000 in all, of which approximately 3,000 are raising turf on park, cemetery, airport, estate, college and university grounds.

From the large number of subscriptions being received from superintendents in charge of these fields, since mailing the Inaugural number, their perfect understanding of the chief purpose motivating THE TURF SURVEY is evident. It is for the benefit of those who did not receive the February issue that we further emphasize the importance of analyzing the general information printed from month to month.

In applying the details of turf management as carried on by those in charge of the maintenance of golf courses, turf growers maintaining lawn and park areas should recognize (1) that putting greens constitute the "billiard tables" of the golf course, and as such are the most expensive single item of turf culture known among growers of fine grasses; (2) that the putting green, due to the requirements of the game, must be kept cut very closely, is subject to excessive wear, and as a whole represents an artificial environment for grass growth.

The programs of topdressing and fertilization of putting greens, plus all other exceedingly delicate methods used in caring for them, are suitable to apply only on such surfaces as bowling greens, turf tennis courts, etc., which are subject to approximately the same conditions of use and game requirements.

You have often heard that the finest turf in the world is grown on golf courses, and this is true for two reasons. First, the demands of golfers all over the country for better putting greens, better fairways, and better teeing grounds became so pressing just prior to 1921, that the United States Golf Association responded to the general outcry by creating a division of research at Washington, D. C., now known far and wide as the Green Section. Second, chairman of Green committees and greenkeepers were from the first actively co-operative with the Green Section in the work of general investigation, thus creating an association between the scientific and the practical until today science and practice in turf investigation stand as one. The greenkeeper recognizes the fact

that between the laboratory and the test plot practice comes into being, and that all recommendations issued from the office of the Green Section have met the test of practical application before they are made available to member golf clubs.

The educational material printed in this magazine is contributed from those sources of original investigation which are, because of long continued endeavor over a period of fifteen years, the most authoritative in existence from which to draw instructive articles on turf culture. THE TURF SURVEY aims to set reliable guide posts for all turf growers to follow. In the application of any information read in THE TURF SURVEY, one invaluable commodity is necessary, COMMONSENSE. During thirteen years spent in constant association with men whose daily work is that described as "close to the soil," we have noted few instances where commonsense is lacking. It is, rather, a mental habit of long standing and dependability.

Growers of turf on lawn and park areas will find that most of the suggestions made in THE TURF SURVEY in relation to fairways may be made use of, taking into consideration possible differences in types of grasses, soils, and climatic conditions. There will be certain items in relation to the maintenance of teeing grounds which may be easily adapted to help solve the problems existing on lawn, park and other similar surfaces. Indeed, some of the information relating to caring for putting greens is of distinct benefit to growers outside the golf field. In specific cases, where a reader is confronted with a problem which is possible to solve by way of correspondence, a cordial invitation is extended for that reader to write the office of THE TURF SURVEY. If you are sending your subscription to insure receiving the coming April number, for instance, do not stop at merely signing your name to one of the subscription blanks on Page 25, but include with it whatever question you would like to have answered through the medium of this publication.

Being of real SERVICE to you is the one and only reason why THE TURF SURVEY exists. We invite you to prove it for yourself.

FERTILIZATION FORESIGHT

PREDICTIONS seem to be to the effect that Winter's grim grip will loosen suddenly this spring, causing an unusual amount of moisture in the surface soil throughout the northern and central states from melting snows and the rains which are to be expected at this time of year.

Turf on fairways, athletic grounds, landing fields, lawns, parks and polo fields, which are necessary to get into condition as soon after the break-up as possible, will present a problem this year as to proper time to fertilize, topdress and roll. Due consideration must be given the type of native soil in relation to the point of time to fertilize and the amount of rolling necessary on the schedule of spring work. Trampling, and the use of wheeled equipment and the roller while the surface is too wet, are injurious to all types of turf beds. Particularly on heavy clays and clay loams "rushing the season" should be avoided.

Heavy clay surfaces are usually rolled but once, and that at such time as they are dried out sufficiently to be fairly firm under the pressure of a foot. Areas of turf which show a brownish color after growth has started in the spring are often the result of the action of frost which has pulled the roots loose. These spots recover after the roller has compacted the plants into firm contact with the soil.

Spring fertilizing of turf on recreation grounds, and other surfaces such as have been described, at the rate of four to six hundred pounds of organic nitrogenous fertilizer plus one to two hundred pounds of sulphate of ammonia to the acre has been found to produce good growth on established turf and maintain it until fall fertilization is in order. There are, of course, individual cases where a heavier or lighter application should be used. Portions of such areas may be thin and patchy, demanding special treatment by cross disking and spreading grass seed mixed with topdressing in addition to fertilizer.

Laying down hard and fast rules as to the amount of fertilizer needed to the acre by all turf areas is impossible to do, as the needs of no two surfaces are alike. After growth starts in the spring, the grass soon speaks up for itself. Turf which has been fall-fertilized usually gets a head start in thickening up, and in such cases the amount of food planned to be applied this spring may be spread in two applications, a month or so apart. Heavy rains which promote fast natural growth early in the season also have a tendency to wash many fertilizer dollars far beyond the reach of turf feeding roots. Dividing the dose of fertilizer allowed for spring application, under ordinary conditions, provides sufficient stimulation to promote early thickening, and guards against the leaching of soluble nutrients which turf cannot speedily absorb until the surface soil is thoroughly warmed up.

Spring seeding is not generally favored. The chief objection as expressed by turf growers is that weeds, for the most part, make exceedingly fast growth at this time of year, often crowding out grass plants at the start and causing endless trouble and expense to eradicate. Added to

the spring weed problem, there is the strong possibility that heavy, beating spring rains may completely wash out new seedings, or distribute the seed in windrows, either of which necessitates re-raking and some re-seeding at a time when other duties are pressing. When such rains occur on new planting, seed topdressing, fertilizer and all are frequently washed away, and the entire job has to be done over again.

In the final contouring of the seed bed, where spring seeding cannot be avoided, such fertilizers as are recommended should be lightly raked into the top one and one-half to two inches of soil. In many instances turf fertilizers have been disked into the surface so deeply that young grass plants with feeding roots almost at the surface were robbed of practically all the food thus applied, during the first few weeks of growth.

Regular fertilization of turf is always good foresight, but fertilizers which are buried beyond the reach of the feeding roots of new plantings constitute a waste of money impossible to regain.

Another practice which inevitably results in fertilizer loss is that of mixing quickly available fertilizers with topdressings some time prior to spreading. Whether or not stored in a dry place, soil mixtures are rarely "powder-dry." Ammonia is the quick "pick-up" for the grass plant, and in ammonium sulphate as well as in most of the ready mixed commercial fertilizers, whether of organic or inorganic nature, this quickly available element is present. Immediately upon coming into contact with moisture, ammonia is released in the form of gas. Consequently, such fertilizers should never be mixed with topdressing until immediately before spreading.

CHEWINGS FESCUE—1936 CROP

By E. E. PATTISON

Director of International Seed Service, Inc.

AT THIS particular time the most interesting seed item is the new crop of Chewings fescue. Interesting because of quality and price. After a bad 1935 crop which was very short, the 1936 crop has done better than normal, consequently prices have become more reasonable and the quality better.

The 1936 crop will not be here for the early Spring planting. Some few shipments are expected in early April but it will be late April before they clear and can be shipped. Those planting in May can reasonably expect new crop seed.

Prices for the 1935 crop which climbed above \$50 per 100 lbs. (wholesale) have reacted to the new crop quotations, and have therefore taken a drop. Good 1935 Chewings can now be bought, depending upon its weight, from \$40 to \$45 (wholesale). New crop for late April-early May shipment can be purchased much more reasonably. There is quite a variation in price, but generally speaking, the wholesale value today is around \$30 per 100 lbs.

GREENKEEPING LESSONS OF 1935

[Paper read by Dr. John Monteith, Jr., at the annual convention of the National Association of Greenkeepers of America at the Hotel Carter, Cleveland, Ohio, February 4-7, 1936.]

IF ONE tries to summarize last year's experience in greenkeeping he becomes immediately aware that no single development stands out as new. This can by no means be interpreted as labeling last year as wasted from the standpoint of turf culture. On the contrary, the season proved to be decidedly interesting even without any new problems or new solutions, simply because of the large assortment of old problems presented from perhaps a slightly new angle or with new intensity. It is quite fitting that the experiences of the past summer be discussed at gatherings of this kind, for they well serve to emphasize the fact that all the problems of greenkeeping are by no means solved as yet, and that even the best cultural methods fail to produce good turf when all factors are not considered.

The extensive loss of turf on many of our golf courses during the past summer naturally made a good many club members raise the question as to what benefit has been derived from all the educational programs and recent scientific improvements in greenkeeping. The criticisms of greenkeepers and greenkeeping methods that were so prevalent during the past season were generally due to the fact that club members in their turf demands made little attempt to distinguish between progress and perfection. Progress in greenkeeping methods in the past few years was clearly demonstrated by the large number of cases where turf was maintained with little loss during the extremely trying weather conditions that prevailed in many parts of the country during the past season. Perfection in greenkeeping, as all of us closely connected with turf culture are quick to recognize, is still far in the future.

CONTRAST IN 1935 WEATHER CONDITIONS

Decided differences in weather conditions were experienced in the various sections of the country during the past season. These differences were clearly brought out in visits made to golf courses in St. Louis and Long Island within a short interval in early summer. At the time of my visit to St. Louis hundreds of acres of farm land in that part of the country were submerged under several feet of water. The turf on the golf courses at St. Louis, as well as in many other districts throughout the Middle West, was at that time showing the usual effect of cool weather and great excess of moisture that had fallen throughout the spring months. The soft lush growth of grass and the shallow root system were ill prepared to withstand the adverse weather conditions which later prevailed in these regions. In the case of Long Island the opposite weather conditions had been experienced. The turf in many places was badly wilted and severely damaged by the long drought. This wide varia-



Here is the Sixteenth green on the course at Jasper National Park, Alberta, Canada, showing a beautiful water carry. A bend in the river has been deepened to provide the water hazard. The items of particular interest in relation to flood control may be noted as the stone breakwater and stone also used to shore up the banks along the main river bed.

tion in weather conditions naturally makes it impossible to discuss turf problems in all parts of the country in any general terms.

It must be acknowledged at the outset that no small group of explanations will account for all of the loss of turf that occurs in an unfavorable season. There are still many factors that as yet are not apparent but which undoubtedly play an important part in turf losses. However, in reviewing the summer's turf injury in a broad way there are several factors that stand out clearly as having an important bearing on the damage that was so prevalent last summer. If we are to gain the most benefit from the experiences during such a season as 1935 we must focus our attention on the more apparent causes of injury rather than on the innumerable smaller contradictions.

ANTICIPATION OF TROUBLE IMPORTANT

The greenkeeping lessons of 1935 might well be classed into two groups. One of these groups included a series of lessons all of which served to further emphasize the importance of the old fundamental principle that greenkeeping methods must be changed to meet new conditions—and changed quickly. The second series of lessons centered about the other old and fundamental principle that good greenkeeping must anticipate adverse conditions and make provisions to counteract them well in advance.

One of the great needs in modern greenkeeping is more flexibility in greenkeeping methods. I do not mean by this more flexibility in the sense of trying this and that, for unfortunately there is still too much of this type of dabbling on some golf courses. I mean rather, a practice of changing major greenkeeping procedure in a way to take care of conditions brought about by changes in environment. This does not mean that it is necessary to get away entirely from fixed schedules, but it does mean that all good schedules should be modified to the necessary degree to meet changing conditions.

It is impossible to predict weather conditions far enough

ahead to be of much use in forestalling major catastrophes in greenkeeping. Fortunately however, there are certain indications in turf which help to point out some of the dangers that may be expected if the weather conditions turn out to be unfavorable. By recognizing these conditions and making provision for them, a greenkeeper is often able to avoid much loss of turf. The development of the proper kind of flexible greenkeeping methods and a keener sense of anticipation of future turf troubles call for a still larger exchange of ideas and observations on greenkeeping than has been the case in the past.

DRAINAGE AND IRRIGATION PROBLEMS SERIOUS

In those parts of the country where the greatest damage occurred to turf, the weather conditions of 1935 were decidedly different than in the immediately preceding years. Heavy rains, long periods of cloudy weather, high temperature, and high humidity presented grass growing problems quite different from those of the preceding years of drought accompanied by hot scorching winds. Not only were there larger amounts of water supplied to greens naturally, but evaporation was far less than in the preceding summers. Therefore the water requirements for turf were quite different.

The years of drought had established certain methods in turf maintenance on courses which proved satisfactory for the conditions that prevailed during those seasons. The unfortunate thing is that these good methods became so well established that they were not changed quickly enough to meet the changed demands of the 1935 season. Take for instance, the case of watering. In wet seasons there is ample proof that it is wise to keep greens as dry as possible. In dry seasons, with the greater evaporation, it is practically impossible to keep most greens too wet. The result is that the watering schedule becomes more and more liberal. When a wet season returns, the habits of heavy watering oftentimes are so fixed that much damage may be done before the situation is recognized. By the time this condition is recognized it is too late to correct the evil that has been done for that particular season.

Recent seasonal differences in rainfall have emphasized the two major phases of the water question; one, drainage, and the other, artificial watering. In periods of drought there is a tendency to feel satisfied that drainage problems on a course have been adequately cared for. Not only is there no inducement for installing additional tile drains in areas that may be inadequately provided for, but there is likely to be a tendency to use a heavier soil for topdressing because of its greater water-holding capacity, in spite of the fact that this soil will puddle badly in wet seasons. Areas that are too wet in the spring may not develop serious problems during dry summers, but nevertheless, efforts should be made to drain such areas as promptly as possible in anticipation of a wet season which may be expected any year. Likewise soil improvement should be continued as far as possible at all times in order to provide for extreme conditions that may develop at any time.

The question of watering turf on a golf course still remains something of a puzzle. In dry seasons large quanti-

ties must be used to keep the grass in a growing condition.

The schedule of watering which is worked out for a period of drought must be changed promptly, however, when the natural supply is adequate or superfluous. Such a statement would seem to be self-evident but nevertheless there are a very large number of cases on record where changes in watering programs have not been sufficiently prompt or drastic.

When the soil is saturated with too much water either from rainfall or excessive sprinkling for a reasonably long time the root system suffers. If this situation prevails for any length of time the root system is soon limited to perhaps the upper inch or so of soil. When this condition exists, grass is particularly susceptible to any sudden change to hot dry weather. The rapid increase in evaporation at that time soon dries out the surface soil on which the short roots of the grass are dependent for their water supply. At such times light frequent waterings are essential to keep the grass from wilting but normal or heavy watering may greatly aggravate the condition by again saturating the soil. In prolonged dry periods the more infrequent and heavy type of watering is to be preferred. In dry weather following shortly after periods of heavy rainfall, exactly the opposite type of watering should be practiced until the grass has made adjustments for the change in weather conditions and has developed a deeper root system. In the summer months when root growth is not rapid the adjustment period may be a very long one. It was apparent on many courses that closer attention to watering was required during the summer of 1935 than during the preceding years when drought continued throughout the season. Under some conditions the soil may be kept saturated for long enough periods to destroy most of the deeper root system even when there is good drainage. However the likelihood of such a condition arising is greatly reduced by adequate drainage, particularly the type that amply guards against seepage water.

RAPID DECAY ORGANICS IN PERIODS DROUGHT

Questions as to fertilizing programs also came in for serious discussion during 1935 along with the watering programs. Wet seasons invariably provide a far better test of fertilizing programs than do dry seasons. In different sections of the country which were under the influence of drought conditions for a period of at least two years some fertilizing programs were continued without any serious warnings developing. In 1935, however, damage occurred which in some cases was due not only to the errors of the fertilizing in 1935 but that of the previous years. One type of injury common on golf courses last season throughout the Middle West can undoubtedly be traced to the use of too much fertilizer, particularly on putting greens. This was especially in evidence where the majority of the fertilizer used was of the organic type. The rapid decay of organic material in soils during periods of hot sultry weather is probably made most apparent by the unpleasant odors that are noticed in the vicinity of greens in such periods. These odors announce the rapid decay of organic materials. At that time much of the nitrogen of such materials is being released in forms that

are available to the plant. Just what happens under such conditions is not altogether clear. The chances are that some of the injury to grass is due to the direct toxic effects of some of these liberated materials, and other injury is due to the too rapid growth of grass occasioned by this sudden release of nitrogen. The experiences of the summer by no means presented evidence against the use of organic fertilizers but simply served as a warning against using them in excess.

Many golf courses when figuring the amount of fertilizers used make no allowance for the amount applied through the medium of normal topdressing. On some golf courses where a good grade of compost is used in liberal quantities there is a large amount of nitrogen added to putting greens during the season in topdressing alone. This is primarily in the organic form and is subject to rapid decay under the same conditions that are favorable for the decay of commercial organic fertilizers. Excessive applications of fertilizers are indicated by a heavy growth of grass during periods of favorable weather. Records of fertilizer applications, properly used by the greenkeeper will tell whether such rapid growth is chiefly due to organic or inorganic fertilizers. It was quite apparent late in the spring of 1935 that the turf on many putting greens in the Middle West was likely to be severely damaged if unfavorable weather conditions developed.

The combination of a liberal amount of fertilizer and a liberal supply of water when weather conditions are favorable will tend to give a thick mat of grass, particularly in the case of creeping bent. The heavy nap on many putting greens in spring serves as a warning of danger ahead. Last spring in too many cases sufficiently drastic methods were not adopted to get rid of this thick nap before unfavorable weather conditions developed.

COMPARISON IN TURF RESISTANCE

The season of 1935 provided further evidence as to differences in the ability of various grasses to withstand adverse conditions. In general the better strains of creeping bent survived better on putting greens than did the other grasses commonly used for that purpose. On many putting greens composed of mixed grasses there were patches of creeping bent which survived in almost perfect condition while other grasses around them were all killed. Under the most trying conditions however, even creeping bent was badly damaged. In spite of losses of creeping bent however, the greater ability of the better strains of this species to withstand weather conditions such as prevailed last summer would seem to justify their more general use on courses where these conditions are likely to be frequently repeated.

Annual bluegrass (*Poa annua*) generally was more severely injured than the other common grasses. The climatic conditions of previous seasons seemed to be particularly favorable for the development of this species of grass, with the result that it had gained possession of large areas of turf on many golf courses. The abrupt change to

(To Page 20, please)



George R. Jacobus

THE P. G. A. ARCHITECTURAL SERVICE

By GEORGE R. JACOBUS, President
Professional Golfers' Association of America

IN ITS efforts to make the game of golf more interesting and attractive to Mr. Average Golfer, and at the same time rendering a definite service to the golf clubs, The Professional Golfers' Association of America has engaged one of the country's foremost golf course architects, Mr. A. W. Tillinghast, who has started a tour of the country visiting the golf clubs where P. G. A. members are affiliated. To these clubs, when requested to do so by their officers, he is giving advice, suggestions and criticisms for improving the courses, bearing in mind at all times that maintenance costs must be kept down, and that all improvements and changes must be made with a minimum of expense and with the regular course crew, when possible.

Many of the improvements being made in courses are the elimination of what are termed "duffers' headaches." In other words, those traps and bunkers which catch the shots of the duffers instead of those of the good golfers. After all, about 95% of the membership at every club is made of the "duffers," and this 95% is responsible for the upkeep of the club and the maintenance of the membership, so making the game more enjoyable for this

95% is important, and the aim of this new service inaugurated by the P. G. A.

As we all know, oftentimes officers or Greens committeemen will recommend changes on the course which they may feel are needed, but in many cases are not practical, because the men making the recommendations are not familiar with course construction and maintenance to the degree that is necessary to reconstruct or recontour a course. Our experienced architect, with a national reputation for constructing some of the country's finest courses, will consult with these officials and help them to determine the extent and nature of improvements necessary.

It is with pride and pleasure that The Professional Golfers' Association offers this service to its members' clubs, knowing as it does that such service is a distinct contribution to the promotion and development of the game of golf, and a definite aid to the clubs in solving their many course problems. A course which is so constructed as to make play enjoyable for the average golfer, with well-kept greens and fairways, is the backbone of the golf club, and the most important single feature of successful club operation.

JUNGLE RECLAMATION

By ARTHUR BOGGS

THE latter part of September, 1935, I was asked to take over the job of preparing the golf course on Wilmington Island, Savannah, Georgia, for winter play. This course is operated in connection with the Hotel General Oglethorpe, and nothing whatever had been done to keep it in condition for four and a half years prior to this past fall.

Can you picture what *your* course would look like, if you just walked off and left it to the elements, and came back four and a half years later? No northern golf course could possibly revert to the jungle as one would in the semi-tropical climate of Georgia. True, your blue grass and fescue would grow tall, lean over, and a mat of dried grasses would cushion the surface everywhere. Weeds common to the locality would take command, and your water system would no doubt have to be rebuilt unless properly taken care of when you left, and all lines originally laid well below frost-line.

You might be able to save some portions of the fairways by turning the course into a pasture, but that would depend a good deal upon general conditions.

When I arrived on the island with a truckload of mowers, tractors, hose, sprinklers and other equipment, last September, I could hardly believe that a course had ever been laid out. I was amazed at the growth which completely covered it from end to end. Pine trees, and a weed called dog-fennel, the latter resembling pampas grass and growing eight to ten feet tall, had taken possession.

After repeated efforts, we began to find the greens, one after another. It was not possible, however, to understand the layout until the whole course had been cleared.

The first job, upon locating each green, was to get it in shape for seeding. After the rough job of clearing off

the growth was done, all the roots were dug out and the greens resurfaced. In the meantime it was necessary to check the efficiency of the existing water system, which was found to be in pretty fair order. We set up sprinklers as soon as each putting green surface was leveled, in order to check both the drainage and the irrigation systems.

Thanks to the original builders, there were only three of the greens which needed draining, and the subsoil in each case was a kind of adobe, very fine, which packed when wet and solidified much like cement when dried out.

Otherwise, the soil we encountered would delight most greenkeepers, being a light and fine sandy loam, almost like flour. Too fine in texture to be just right, but we soon found that by modifying it with sharp sand it became a very satisfactory mixture for grass. Naturally, there was considerable humus present, due to the long encroachment of jungle growth, the sloughing off of plant roots, and the dying down of top growth year after year.

Because it was necessary to produce playing conditions in time for the hotel guests to enjoy the winter of 1935-36, we seeded the greens to quick-growing Italian ryegrass, which germinates in four days under southern conditions. Also in order to insure fast development and thickening of the putting surface, we sowed at the rate of three to four hundred pounds to the green.

After clearing the eighteen greens, when we turned to the fairways it looked like a hopeless job, for here we found a growth of pine, dog-fennel, and practically everything else that grows rampantly on the Georgia coast.

First came the rough clearing of tree growth, then we used a small tractor with side power cutting unit to take off the balance, preparatory to tearing up the surface for seeding.

All vegetation when cut was burned from day to day, as it dried out fast under the hot sun. As soon as a fairway surface was cleared, all possible roots dug out, and rubbish burned, it was disked and cross disked, then followed with a spike-tooth harrow. The spikes not only fitted the soil into a fine seed bed, but workmen followed them constantly to gather up roots they pulled out, because in some sections the rubbish was so heavy it interfered with the progress of the harrow. The main preparation for seeding was done with these spike-tooth harrows, continuing the work until the surface was fully cleared and worked up into a fine mulch.

Italian ryegrass was sown, as in the case of the greens, and the fairways rolled to encourage quick germination. The fertilizer used on both greens and fairways was a mixture compounded by a local dealer which had been found suitable for the type of soil in the district, one mixed on an organic base, and analyzing 11-7-2.

The amount of Italian ryegrass sown over the entire course was 20,000 pounds, and the quality excellent.

A gang of thirty men was hired at the start of the undertaking, all colored boys. With the opening day set for November 30, they stirred plenty of dust during the two short months in which we had to reclaim Wilmington Island from the solid jungle which had crept over it, and restore it to playing condition.

TROUBLE-SHOOTING ON EASTERN COURSES

[Paper read by Dr. Fred V. Grau, Pennsylvania State College, at the annual convention of the National Association of Greenkeepers of America at the Hotel Carter, Cleveland, Ohio, February 4-7, 1936.]

THE term "trouble-shooter" is a modern one coined for a particular purpose and adapted to the green-keeping profession. In describing some of the experiences encountered, we have drawn largely upon the status of the work in Pennsylvania where it is conducted by the Department of Agronomy, Extension Service of the Pennsylvania State College. For some time there has been felt an increased demand for assistance and information on golf course problems. Due to the grave danger of making a long-range diagnosis by remote control, and recognizing the eminence of the greenkeeping profession, the Agricultural Extension Department considered it wise to lend assistance to those desirous of additional information. The work has been felt well worth while not only by virtue of the fact that a worthy cause is being fostered, but by reason of the high type and specialization of the profession that is being aided.

Let it be clearly understood that it is our earnest desire to further the cause of fine turf maintenance. There is nothing personal in anything that will be said here; on the contrary our aim is to point out some of the most outstanding experiences of the past season with the hope that an idea or two may reach those to whom they will be of greatest benefit. In most cases the more serious errors encountered are found on those courses that do not encourage their superintendents to attend turf schools and conferences. We gain by exchange of ideas. For instance, if Mr. Green and Mr. Black exchange dollar bills they each have a dollar bill after the exchange. We have left the Dark Ages behind us and are definitely going forward. We cannot compliment too highly the progressive superintendents who thirst for information and use that information in working out their own solutions. In reviewing the problems of golf courses we will not attempt to give the solution but offer them to you as food for thought since they are of vital concern to all of us.

DRAWBACKS OF POOR DRAINAGE AND AERATION

Perhaps one of the outstanding problems on turfed areas today, not entirely confined to the East, is that of poor drainage and the attendant ills of puddling and poor aeration which induce a shallow root system. Where this difficulty exists there is the tendency, due largely to the demands of the players for soft or resilient surfaces, to use water in excess to provide the conditions requested. This is not new. It has been the subject of talks and articles in leading magazines and research publications over a period of years. The situation still exists on many courses, however. Associated with this condition there is frequently the complaint that there is little response to fertilizers. As you well know, the ability of a plant to respond to feeding is dependent not only upon the supply

of nutrients present but also upon the extent of the absorbing system of the plant.

UP-TO-DATE INFORMATION A NECESSITY

Many of the trouble-shooter's visits assume the status of a school where the principles of turf culture are reviewed in the light of up-to-date methods and recent developments in the research field. This is principally true of the smaller, more isolated courses in the more remote sections of the East where the results of research work are slow to reach. In this event it becomes the sacred duty of the extension representative to impartially make this recent knowledge available and to interpret the results of research on the basis of local conditions, which as we all know, vary widely. This phase of the work is far more important than any other. Those of you who send for bulletins on soil testing will see in some of them in black-faced type "*Interpretation of Results.*" It is this role that the trouble-shooter should assume in order to be of the most help to the greatest number.

NATIVE BENT SOLVES DIFFICULT PROBLEM

Now let us take a look at a course where we were cordially invited to visit and ask questions and make suggestions for improvement. Here we found that we were really asked to comment on the solution which this superintendent had himself found to be his worst problem. A putting green had been located in a low spot below a long steep hillside. Close by, and almost on a level with the green surface, ran a small brook. Large trees were clustered about the green so as to partially shade the putting surface. Only in very dry seasons did this green need water due to the fact that the soil water table was close to the surface. For years it was virtually impossible to hold a turf throughout the year. Unable to rebuild, this superintendent noticed, however, that one particular strain of creeping bent (it had originally been seeded to German mixed) seemed to like the location and insisted upon thriving in spite of the conditions. Patiently he lifted stolons of this strain of bent, replanted them in different parts of the green, and even more patiently watched them slowly spread and form a solid turf. His diligence was rewarded. Today that putting green is covered with a dense turf of an unnamed strain of bent that stands as a living monument to this man who saw and grasped the opportunity offered him. Not once since this unnamed strain completely covered the green surface has there occurred the annual loss of turf which, as one superintendent expressed it so vividly, "looks like a sick cat." We could name other similar experiences which give us confidence to suggest that, where an unknown strain is found doing well where no other pure strain will persist, this unknown

should be developed for that particular condition. This is more especially true where the budget is so limited, or where physical or other circumstances do not permit of rebuilding or so changing conditions to fit the requirements of well-known strains.

ECONOMY IN CHOICE OF FERTILIZERS

Let us examine the facts surrounding another course which is representative of some of the smaller clubs and even some of the larger ones whose budgets have been cut to the bone in order to pay the interest on the mortgages with which the million-dollar clubhouse is plastered. The fairways are usually the first to exhibit the lack of attention and fertilizer. The putting greens are usually maintained in fairly good shape even after buckhorn and moss have taken possession of the areas that one hopes to hit on the tee shot. Obviously, the necessary item is plant food but where is the money coming from? This is a frequent occurrence and quite often we are able to point out that by a wise choice in the purchase of fertilizers, the greenkeeper can save enough on his fertilizer bill alone so that he can afford to fertilize the starved fairways without increasing the budget. We could name many true experiences that exemplify the point which in no way ridicule the profession but point out the great need for continued instruction in greenkeepers' schools and for an increase in the staff of extension men trained in this highly specialized field.

When we speak of the great need for more instruction on course building and course maintenance we are referring now particularly to a private pitch-and-putt 9-hole course on sandy loam, glacial soil. It is hard to believe, but the caretaker (I shall not even raise him to the status of a greenkeeper) regularly seeded the circular greens with Kentucky bluegrass and white clover, kept them clipped at one-quarter inch, and lamented the fact that he couldn't keep a good putting surface as other courses could. I won't have to enlarge upon that case—all other practices were on a par with the selection of the seed mixture.

TURF STARVES IN MIDST OF PLENTY

In another instance in Northwestern Pennsylvania we were called upon to inspect some fescue greens that were spotted and patchy. We found German mixed greens—good ones at that—with only a touch of brown patch. The real problem there was thin, spotted, weedy turf in the fairways while behind the compost shed lay several truckloads of "burnt fish" bones and ashes from a local fish processing plant. As much more of this material as they wanted was available for the hauling. The superintendent was frankly and openly surprised when he was told that this material was rich in phosphorus and had a high fertilizing value. Before we had left the course he had sent a truck to haul "burnt fish."

At a small course in Central Pennsylvania we found the greenkeeper buying fertilizer from a distance which cost him upwards of \$50 a ton for about 20 units of plant food—something like an 8-6-6. Within two miles of the course a local abattoir was dispensing tankage analyzing 5-15-0 or higher at only \$15 a ton. The lesson is obvious

—the greenkeeper was not "on the job" and had passed up an excellent opportunity to improve the course and at the same time to save the club some money.

A STUDY IN BENTS

Another small Central Pennsylvania course had trouble maintaining Seaside bent on one particular green. They seeded and sodded but did not disturb the hard-packed clay which underlaid the few scanty inches of surface soil. The new sod or seed would hold until play started and out it would go—slowly, to be sure, but never was it healthy. Instead of ripping up the green (which should have been done but wasn't, due to the low budget) a change was made to Washington creeping bent, together with spiking and more favorable topdressing, liming and an increase in the amount of phosphorus in the fertilizer. At the latest reports the green was doing well and play was continuous. This same experience can be related on two other courses. This should not be construed to mean that Seaside bent is not desirable—it simply failed under the conditions described. We can point to instances where Seaside bent is used regularly and little trouble of any kind has been found. Drainage and soil conditions, however, are all that could be desired, as well as the fertilizer and topdressing program.

ORGANIC LAYER PREVENTS PENETRATION

A very interesting case encountered in Northwestern Pennsylvania was a fairway problem. The complaint was that, in spite of favorable rainfall, the fairways were continually dry and within a few days after even a very heavy rain the soil would be so dry that the grass would begin to take on that characteristic parched look. The turf was red fescue but it was uneven, spotty, although it was springy. Neither lime nor fertilizer had been applied for years and years. The first plug of turf taken with a pocket knife indicated the reason for dryness—later a soil test helped to confirm it. The pH value was down to 4.0, at which level any self-respecting bacteria that would decompose the organic matter of plant residues would refuse to work. As a result the continual deposit of clippings from above and the accumulation of undecomposed roots and stems below, together with the passing effect of wheels on the surface, had formed a matted organic layer nearly half an inch thick through which water simply refused to penetrate. The effect was that of a "thatched roof." The green committee chairman looked at us in amazement and said: "No wonder all the rain that falls on the course runs into the lake." He had previously told us that during a rain the ditches on the course ran bank full and when the rain had stopped the soil beneath the fiber roof was as dry as ever.

SOIL TEST VALUES AND LIMITATIONS

Incidentally, when the course was built the fairways were seeded to a bluegrass-fescue mixture. Dry summers, grub injury, lack of plant food and the depletion of the available calcium all united to discourage the bluegrass and convert the turf to solid fescue. This is a common experience on Pennsylvania courses. Whereas the fescue turf on this particular course was uneven, there are many courses in the East that have perfect fescue fairways.

These have had a small amount of plant food and some lime and had fortunately (not intentionally) been mowed slightly higher than most fairways are today. No good fescue fairway that we have seen has been the victim of a sprinkling system. We do, however, know of some fescue fairways that were successfully established several years ago—a solid stand of fescue. Nitrogen was fed liberally and the turf was watered. Today the fescue has been replaced largely by the bluegrass and white clover.

These experiences, together with a number of soil tests on these fescue fairways, indicate some of the preferences of good fescue turf. The best fescue turf found was thriving on soil that had a pH value of 5.6-6.0, high enough to permit the active growth of organisms that decompose plant residues, but not so high as to unduly encourage the bluegrasses and clover.

The subject of soil tests on golf courses is an interesting one and merits our earnest consideration. In order to fully appreciate the value and the limitations of soil tests one should have sat through two full days of the reading of papers on this subject and the ensuing discussion at the December meetings in Chicago. From the results of our experiences at Penn State we are forced to draw the following conclusions:

1. In most cases the results of soil tests without supporting data are worthless for diagnosing the cause of turf ailments. By supporting data we refer to management practices, location of the affected area, and other pertinent information.

2. Soil tests as we have them today are most valuable for detecting excesses of plant nutrients in the soil solution although we have not yet satisfactorily established the point at which they become toxic or detrimental to plant growth. Nor will this soon be accomplished due mainly to the very great differences in soils and their natural capacity for absorbing ions and for yielding them to the growing plant. We cannot yet satisfactorily determine the point at which the supply of plant nutrients is so low that the plants are insufficiently nourished. Obviously, either value will be variable due to the varying abilities of different species or strains of plants to tolerate high concentrations or to thrive on very low concentrations. As you well know, Kentucky bluegrass is a heavy feeder and requires a rich soil relatively high in calcium and phosphorus. Red fescue, on the other hand, thrives where the ion concentrations of these elements are so low that bluegrass will not grow. Bermuda grass, although, climatically different, succeeds on soils low in fertility. Some species will tolerate great excess of ion concentrations.

Perhaps one of the outstanding examples of the limitation of the soil tests is that in connection with the disturbance of 1935 which hit several districts in the East and the Middle West. Many soil samples were collected from affected and non-affected areas and analyzed. The only significant difference between them was the relative concentration of nitrate-nitrogen which was usually higher in the affected areas. To have stated that the presence of the nitrate-nitrogen was the cause of the loss of turf would have been ruinous and a grave injustice to those in charge. That it was a contributing factor cannot well be

Announcing...

★ The Treeforum!



... a Division of Inquiries and Replies on Tree Problems.



By arrangement with Mr. H. L. Jacobs, Arboriculturist of the Davey Tree Expert Company, Kent, Ohio, regular monthly contributor of articles on all subjects to do with planting and care of shade trees, this division will form a part of our SERVICE to readers, beginning with the April number.



WHAT IS YOUR TREE PROBLEM?

You are invited to take immediate advantage of this opportunity to discuss any and all matters relating to tree planting, tree preservation, pruning, spraying schedules and identification of tree pests and diseases.



Please mail your inquiries prior to March 15 for replies to be printed in the coming April issue. All sources of inquiry will be held confidential, localities only will appear in connection with inquiries printed.

Send your tree questions promptly. They will be answered immediately by correspondence. Those of general interest will be published in the columns headed "The Treeforum" for the benefit of all readers of this magazine.

Address, "Treeforum Division"

THE TURF SURVEY

1900 Superior Ave., Cleveland, Ohio

disputed. That the species of grass present was a factor is generally recognized. But to separate and correlate the combined effects of soil moisture, high temperatures, humidity, high nitrogen, unbalanced concentrations of plant nutrients, and other attendant factors must be left to those in charge of research.

CLOSE CUTTING AND WEED INFESTATION

At a very up-to-date course in Western Pennsylvania we were called in on a problem of weedy fairways. No doubt about it, the fairways were weedy and the bluegrass was thin. Yes, there had been some fertilizer applied but it didn't seem to help. It wasn't long before we learned that this superintendent was firmly convinced that by cutting his fairways as closely as he could the roots of the grass were strengthened and the bluegrass could then form a more solid turf. You know the fallacy of that theory and so did we, but we had our work cut out for us to point out that recent research and countless experiences—his own included—completely exploded his theory.

PROBLEM OF SILT IN ORGANIC MATTER

Referring again to hard greens we recall the course in Northwestern Pennsylvania that asked for help because they could not seem to have soft greens without the excessive use of water. This proved to be a delicate problem because everything seemed to be done according to Hoyle. The construction and drainage were seemingly good, the fertilizer program adequate, and the topdressing mixture apparently satisfactory. We collected plugs from the greens and took samples of the topdressing mixture as well as some of the fine-looking, black material which was used as a source of organic matter. We found the solution to the problem in the so-called organic matter which analyzed only 13 per cent organic matter and contained nearly 80 per cent of silt. When wet, this material became slimy; when dry it could be cracked like hickory nuts. It was taken out of a swamp where the accumulation of the organic matter imparted a rich black color to the silty mud that collected there. Upon changing to a good fibrous, peaty material there was noted an almost immediate improvement in the condition of the greens.

WORKING WET SOIL BAD PRACTICE

On a course in Southwestern Pennsylvania we were called in to advise on the re-establishment of turf on the greens after all their *Poa annua* left them. Without enumerating all the facts in the case, we were able to point out to them that in spite of the conditions, they had large patches of a well-known strain of creeping bent that had not even been affected by the adverse conditions and were rapidly spreading. This was a clear indication that by propagating these resistant strains at least part of their difficulty would be solved. They were, at this same time, rebuilding a putting green. When we were there it was raining and rain had fallen for a couple of days prior to that. They were then rough-grading the green with a tractor and a ship scoop. Mud clogged the wheels of the tractor, the wheels would spin, and the scoop had to be cleaned with a shovel to clear it. I haven't seen the green since it was built but I think we would all agree that

with all that mud slinging, the physical condition of the soil on that green will not be all that might be desired.

STRONG SOLUTION BICHLORIDE BURNS TURF

We had occasion in June to visit a course that was troubled with earthworms (night-crawlers) on the greens. At the time of our visit the greenkeeper was de-worming with bichloride of mercury in suspension, using a barrel sprinkler. He used a total of three pounds of bichloride on a green of 4500 square feet. We suggested that perhaps that was a bit strong but he thought not. We later heard that he had burned his greens very badly and was considering some other means of worm control.

WEED CONTROL WITH SODIUM CHLORATE

This paper would not be complete without some reference to turf weeds in general and crabgrass in particular. Since this work was begun in earnest by the Green Section there has been a great deal of interest, particularly since reduced budgets called for economy in the use of fertilizers and extra labor. All of the answers have not been found—neither have all the questions been written. The work is progressing, however, and there are new developments each year. During the past year we are able to report many successful treatments with sodium chlorate. Several have used it to advantage on crabgrass infested nurseries. Some are using it successfully in the bunkers. We have record of one course where crabgrass threatened to take a green composed of 80 per cent Velvet bent. Two applications of chlorate at the rate of one pound to 1000 square feet were made in June or July. When we saw the green in early August we noted a 90 per cent control of the crabgrass and complete recovery of the bent.

In several instances in Southeastern Pennsylvania we can report almost 100 per cent control of crabgrass by the following procedure which, you will perceive, is not entirely one of chemical control, but where the chemical is an "assist" in the put out.

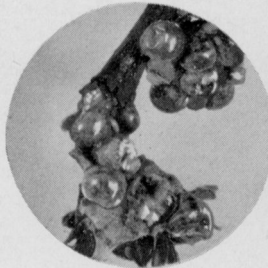
In late July or early August there was made a single application of chlorate on athletic field, lawn, and fairway turf at the rate of 2½ pounds to 1000 square feet. In three weeks the area was raked, fertilized, and seeded. October found the turf in A-1 condition, healthy and green and solid.

GREAT NEED FOR FIELD WORK

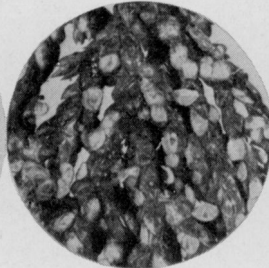
The problem of clover in putting greens is like the poor—always with us. Soil tests in clover patches and in adjoining clover-free patches tell us nothing. We have seen the best results from provision of drainage, good physical condition of the soil, a strong-growing strain of grass, and proper fertilization. Contrary to popular opinion, some of the worst clover greens we have, seem to have occurred where straight nitrogen fertilizers have been used for the last five years.

We have seen the pendulum swing toward fall fertilization on fairways in sections where crabgrass is a problem and where snowmold is not a factor, as the result of publicity on research by the Green Section and others, and advertisements by up-to-date fertilizer concerns. In

(To Page 16, please)



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THE CONTROL OF SCALE INSECTS

By H. L. JACOBS, Arboriculturalist

The Davey Tree Expert Company, Kent, Ohio

YOU hear a great deal about the terrific damage that armies of insects do to farm crops. The destruction by the corn borer, the locust, the boll weevil, the bean beetle, and a host of others runs into losses of hundreds of millions of dollars annually.

You hear less about the damage that insects do to shade trees simply because shade trees do not come under the classification of commercial crops. But the damage is tremendous, and trees that you are responsible for may even now be so infested that important branches, or even entire trees, may decline and die. Hundreds of thousands of valuable ornamental trees have their beauty permanently destroyed by insects every year, and many either are killed outright or slowly die from the effects of insect damage. And the pity of it is that the insect hazard to trees is little realized by most tree owners. They are inclined to accept their trees as plants that can be planted and then left to indefinitely shift for themselves. So it is that before the presence of tree insects is discovered, the condition of the infested trees may be critical or even hopeless.

But why should you worry about tree insects during the winter? Everybody knows that no insects are prowling about now. True enough, but winter is the proper time to control one of the most destructive groups of shade tree pests, the scale insects.

Maybe you are not familiar with scale. But, if you look, you will find it on some of your shrubbery and trees. Scale is very common and extremely injurious. Your search, however, will not reveal the insect itself—in fact, the insect is hidden during almost the entire year. After the newly-born insects hatch out, each one soon picks out a place on the bark, inserts its tube-like beak down into the sap-conducting tissues, and from then on, busily feeds on the plant juices. In just a little time, it is able to form over its tender body a scale-like covering

which seals the insect to the bark. Here it stays, and here it feeds.

The appearance of the roof-like scale that protects the insect varies in size and appearance in accordance with the particular kind of scale insect. For instance, the covering of one looks like a tiny oyster shell; hence, the insect is known as oyster shell scale. Another, because of its appearance, is known as terrapin scale, and still another, having a cottony-looking substance over its body and beneath the scale roof, is called Cottony maple scale.

But the name isn't of so much importance. If you find scale on your trees or shrubs, start worrying about the effects. Of course, no single scale insect is going to do any appreciable amount of harm, but when the insects are matted on the branches by the hundreds, thousands, or even millions, then the combined drain that they place on the sap supply is greater than the tree or shrub can withstand. The branches are robbed of their sap-food, growth is stunted, the health of the plant is impaired, and the death of individual important branches soon follows. Badly infested trees, if given no assistance, are likely to be completely killed.

Now what can you do about it? If you know what to look for, it should be easily possible to inspect your shrubbery yourself. With trees, you may have to call in reliable

(To Page 22, please)

KEY TO ILLUSTRATIONS ABOVE

1. Terrapin scale—a serious enemy of maples and various other trees.
2. Oak Kermes scale—special enemy of oak trees, leaving dead twigs and unhealthy foliage.
3. Juniper scale—often abundant on juniper, red cedar and arborvitae.
4. Euonymus scale—a bad actor that infests trunk, branches and leaves, frequently with fatal results.
5. Oyster shell scale—one of the most common and dangerous of them all.
6. European elm scale—frequently so abundant as to crowd the under surfaces of the branches.

THE TURFORUM

DIVISION OF GREEN SECTION INQUIRIES AND REPLIES

PROTECTING TURF WITH MANURE.—We seldom have a prolonged cold spell and often have a thaw in January that causes a certain amount of growth. We are apt to have a snowfall any time after the middle of October that will disappear in a few hours, yet leave turf badly spotted. Each spring the turf in the district is very spotted and the fungus in some of it is so thick it does not disappear for several days after the snow has melted. Last winter we brought through two plots of bent (seaside and colonial) without injury, by applying 2 ounces of corrosive sublimate in the early part of November, 1 ounce during a January thaw when all snow was off, and 1 ounce the latter part of February when the snow was leaving. What are the advantages or disadvantages of applying a covering of manure on turf during the winter months? Some of the members in our club insist on covering the putting surfaces with 2 inches of green cow manure.

ANSWER.—*Tests by the Green Section staff some years ago demonstrated the ineffectiveness of a covering of straw or other material in controlling snowmold. A covering of manure has somewhat the same effect as straw. Some years there may seem to be some benefits from a covering but in other years when conditions are particularly favorable for snowmold a covering may be disastrous. The method of covering turf with straw, manure or other such material was common several years ago but as soon as the dangers of such a covering became apparent the method was very largely discarded. The only place where a covering is still used on turf in a general way is in the northern strip of the Bermuda grass belt, as for instance, in Atlanta. In that region, however, there is no problem of snowmold and the purpose of a covering is quite different than in the North. In the snowmold region we strongly advise against the use of any such heavy coverings. On the basis of our experimental work we also strongly advise against fertilizing heavily in the fall. We advise the use of calomel or corrosive sublimate at rates of from 2 to 4 ounces to the thousand square feet. This should be applied in the late fall or early winter. If there is any sign of snowmold developing during the winter months in spite of this treatment it is well to make a further treatment of corrosive sublimate at the rate of 1 ounce to the thousand square feet. In your climate where you have frequent thaws during the winter months we think it is wise to apply the mercury fungicide in several small doses rather than in one heavy application, which is effective elsewhere through the snowmold belt. This variation is advisable because of the leaching from the soil of the fungicide during your periods of warm weather due to thawing of snow or to rainfall. Throughout much of the snowmold belt where the ground remains frozen practically during the entire winter the mercury in the soil is not washed away.*

ARKANSAS

CREEPING BENT IN THE SOUTH.—We are desirous of obtaining information regarding creeping bent grasses for the South. What variety, if any, will grow in our section?

ANSWER.—*We do not advise the use of creeping bent grasses in the South for the reason that under most conditions there bent is unable to withstand the adverse growing conditions of summer. However, in the few tests made with it, seaside creeping bent has proved entirely satisfactory in the South for seeding on established Bermuda turf in order to obtain a satisfactory winter turf. For such purposes it has been used chiefly for putting greens.*

ILLINOIS

PRECAUTIONARY MEASURES FOR THOSE WHO HANDLE CORROSIVE SUBLIMATE.—Is there any danger of corrosive sublimate entering one's system through the skin or other part of the body?

ANSWER.—*There is no evidence that corrosive sublimate will enter one's system through the skin. If not taken internally it should cause no harm. In handling it care should however be taken not to get too much of it in the mouth or nostrils. It is one of the common disinfectants used in hospitals, and surgeons in performing operations use solutions of the chemical to wash their hands and disinfect them.*

WHAT IS THE VALUE OF GROUND ROCK PHOSPHATE AND COLLOIDAL PHOSPHATE AS FERTILIZERS FOR TURF?

ANSWER.—*The use of these two materials as a source of phosphoric acid has shown no advantage over other sources. It has been shown that the phosphoric-acid content of ground rock phosphate and colloidal phosphate is of less value to turf than an equal amount in superphosphate and steamed bone meal. The price should be governed accordingly.*

PULVERIZED POULTRY MANURE AS A TURF FERTILIZER.—Pulverized poultry manure has been recommended to us as a turf fertilizer. At what rate should it be applied? Our soil is sandy loam.

ANSWER.—*Pulverized poultry manure is an excellent grass fertilizer. On established turf it should be applied at the rate of 600 to 800 pounds to the acre. When used in construction work 1,000 pounds or more should be applied. This material should not be applied with lime.*

INJURIOUS EFFECTS FROM THE USE OF LIQUID AMMONIA AS A FERTILIZER.—If the ammonia in liquid ammonia is the same as the ammonia in sulphate of ammonia, would it be practical to mix liquid ammonia in the watering system for fertilizing purposes?

ANSWER.—*Although the ammonia in liquid ammonia is the same as the ammonia in sulphate of ammonia, in the latter it is tied up in a chemical combination and is only released gradually and in such a way that it can be taken*

up by the plants without being harmful in moderate applications. Free ammonia, as in liquid ammonia, is very toxic to grass, and where it has been used in water it has injured the turf unless very greatly diluted. It should be possible to dilute it sufficiently for practical use through the watering system.

VIRGINIA

BENEFIT OF LIME TO BENT GREENS CONTAINING SOME CLOVER.—We have some woods loam which we desire to apply to our bent turf, but as it is deficient in calcium we should not care to apply it unmixed with lime. Would the application of lime to our turf in this manner stimulate the growth of clover to a dangerous degree?

ANSWER.—Calcium and magnesium, which are contained in lime, are certain elements which soils require. Some grasses and weeds do decidedly better when ample lime is available in the soil. Usually lime increases the growth of clover. However, we have observed that, un-

der close clipping, certain bent grasses, including Metropolitan bent, do not thrive so well when there is a deficiency of lime in the soil. The mere application of lime in order to give the bent what it requires will not of itself bring in clover. If, however, lime alone is applied the soil will soon become deficient in other elements, such as nitrogen, required by grass, and the grass will accordingly suffer. Clover, on the other hand, is able to draw upon the nitrogen in the air, a faculty not possessed by grasses; hence when nitrogen becomes deficient in the soil it does not affect the clover materially, and the clover commences to crowd out the grass. Our work has shown that where conditions are made favorable for the growth of grass, the grass will compete favorably with the clover regardless of whether lime is supplied or not; consequently as long as adequate nitrogenous fertilizing is maintained on turf there need be no undue worry regarding the use of lime. Since your woods earth is deficient in lime you should by all means mix some with the earth at some time previous to its use.

TABLE SHOWING AMOUNTS OF MATERIALS NEEDED FOR VARYING FORMULAS OF FERTILIZER

Analysis of Material	Desired Percentage in Mixture																
	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	25
5	400	800	1200	1600	2000												
6	333	667	1000	1333	1667	2000											
7	286	571	857	1143	1429	1714	2000										
8	250	500	750	1000	1250	1500	1750	2000									
9	222	444	667	889	1111	1333	1556	1778	2000								
10	200	400	600	800	1000	1200	1400	1600	1800	2000							
11	182	364	545	727	909	1091	1273	1455	1636	1818	2000						
12	167	333	500	667	833	1000	1167	1333	1500	1667	1833	2000					
13	154	308	462	615	769	923	1077	1231	1385	1538	1692	1846					
14	143	286	429	571	714	857	1000	1143	1286	1429	1571	1714	2000				
15	133	267	400	533	667	800	933	1067	1200	1333	1467	1600	1886				
16	125	250	375	500	625	750	875	1000	1125	1250	1375	1500	1760	2000			
18	111	222	333	444	556	667	778	889	1000	1111	1222	1333	1555	1778	2000		
20	100	200	300	400	500	600	700	800	900	1000	1100	1200	1400	1600	1800	2000	
22	91	182	273	364	455	545	636	727	818	909	1000	1091	1273	1455	1637	1818	
25	80	160	240	320	400	480	560	640	720	800	880	960	1120	1280	1440	1622	2000
32	63	125	188	250	313	375	438	500	563	625	688	750	875	1000	1125	1250	1565
48	42	83	125	167	208	250	292	333	375	417	458	500	583	667	750	833	1041
50	40	80	120	160	200	240	280	320	360	400	440	480	560	640	720	800	1000
56	36	71	107	143	179	214	250	286	321	357	393	429	500	571	642	714	893
60	33	67	100	133	167	200	233	267	300	333	367	400	467	533	600	667	834

Contributed by Dr. O. J. Noer,
Milwaukee Sewerage Commission,
Milwaukee, Wisconsin.

A PILE OF CLIPPINGS

The Oakwood Cemetery Association, LaSalle, Illinois, at their recent annual meeting, laid plans to develop a nursery of trees for later planting in the burial tract, and the planting of shrubbery this spring and summer. Mr. F. H. Fairfield is president of the association, and Mr. Clarence D. Charlton secretary-treasurer.

Dr. G. L. Horton and Mr. Clark Lewis constitute the Green committee in charge of the maintenance of Sunny Brae Golf Club at Osage, Iowa, this season. Plans are afoot to construct a clubhouse, and the goal set by the membership committee is 100 senior members by the time the course is open for play.

A baseball diamond on the new 100-acre Red Arrow and River Front Park at Kalamazoo, Michigan, is already completed. Workmen are now diverting the oxbow bend of the river to form a lagoon for winter skating and a summer pond. Many large trees are being transplanted, and a sunken garden will be completed during the summer. An underground sprinkling system is being installed previous to grading and seeding.

Improvements scheduled this spring for the Municipal Airport at Pontiac, Michigan, include drainage, hard surface runways, a steam heating plant, additional bleachers, and general refurbishing of buildings and grounds.

An emergency airport on Grand Island out of Albany, New York, is under discussion by city officials who report that as the project calls only for grading, draining and resurfacing, favorable action is expected. Grand Island offers an excellent location for the use of airmail fliers who do not carry passengers, thus speeding up mail delivery. The spot is an ideal link in the state airways system, providing an emergency landing field where one is much needed.

Oregon State College, at Portland, Oregon, starts a \$77,000 works program this spring. Twelve hard-surfaced tennis courts, sixty-four thousand square feet of cement sidewalks and service approaches, and landscaping around the crew house along the Willamette River, constitute the high lights of the undertaking.

Dr. R. J. Kiker, executive secretary of the Palestine Y.M.C.A., at Palestine, Texas, reports five major improvements scheduled to be put in work this year: A new gymnasium-auditorium, a lighted softball field and tennis courts, renovation of dormitory and residence halls, and installation of sanitary equipment.

An eight-acre school ground at Kittitas, Washington, will be graded and landscaped this season, the project to include construction of two tennis courts. At Pullman, in Whitman County, Washington, an airport will be constructed in addition to park improvements which are already under way.

A new modernistic bath house is planned at Cairo, Illinois, in conjunction with a swimming pool described as "the finest small swimming pool in the state." Considerable landscaping will be done in developing a park enclosed by walls of brick and stucco. Work will start immediately.

Dwight Township High School, near Fairbury, Illinois, is to have new athletic fields this year at a cost of approximately \$31,000. The layout will contain a football gridiron, hardball diamond, softball diamond, and six tennis courts constructed for flooding in winter.

Visitors to Culver Military Academy, summer residents at Lake Maxinkuckee, and general public will be served by a new airport to be constructed at Culver, Indiana, this season. It is reported that one of the major airlines has agreed to stop its transport planes on the local field upon request when completed. This new field is owned and will be operated by the city.

Business and industrial leaders of Dayton, Ohio, have made it possible for the city to provide a municipal airport located at the Vandavia airfield. Two-thirds of the purchase price of the land was subscribed at a meeting called by former Governor James M. Cox, Col. E. A. Deeds, president of the National Cash Register Company, and Mr. E. G. Beichler, president of the Frigidaire corporation. From the enthusiastic backing evidenced, Dayton seems assured to operate a field which will be a regular port for transcontinental planes as soon as runways are constructed.

TROUBLE-SHOOTING

(From Page 12)

sections where such publicity has not penetrated, fall fertilization is practically unknown.

There are still those courses on which lime is not used on the basis that weed control is possible only on a very acid soil. Happily, there is less each year of this type of practice.

We have attempted to present a few of our experiences in trouble-shooting on Eastern golf courses. It is plain that a great deal of the work consists of proper instruction and in interpreting results of research on turf management. It is largely educational work. There are great opportunities for men trained in this specialized type of work. We have had many more requests for aid than we could handle. You are familiar with the old saw about "not seeing the forest for the trees." A superintendent may pass up a lot of things because in seeing them every day he grows used to them. Someone coming in from the outside may be able to diagnose a problem or to sense a difficulty at once. On the other hand, the man who has lived with the course for years and knows every blade of grass on it, is justified in solving his own problems for, if he is alert, he can find the answer himself.

SPRING FLOOD CONTROL

(From Page 2)

power in a spring such as this. One such creek we know of crosses one fairway twice, meanders on through eighteen holes of golf and provides several water holes in its wanderings. Another stream of not much account in the summer washes out a full third of a fairway practically every spring season, because of a narrow bend which has never been straightened to broaden the river at the point where spring floods choke the bend with debris. The overflow takes its yearly toll of top soil, expensive turf, and the greenkeeper's disposition. We predict that the damage this spring will be so expensive to repair that the Green committee will be convinced that a major operation is the most economical way to control the situation.

This is the spring of all springs for a thorough checking of tile drainage systems. "Now is the time for all good men" engaged in maintaining areas of turf to find out how good at removing excess surface water their drainage ditches may be. A watchful eye on all steep slopes at the foot of which expensive turf may lie is recommended, as whatever ditches may have heretofore safely protected lower levels, are likely to need deepening or broadening to take care of floods this year. Wherever such ditches connect with running streams, attention should be paid to clearing and widening at the junction to prevent possibility of a deviation in the direction of flow into the main stream. Shoring up with rocks will help, but in emergencies such as are apt to be encountered this year, further digging out at bends may more quickly release flood waters.



Clubhouse and grounds at the North Shore Golf Club, Chicago. Note the straight lines taken by the mower operator in cutting the lawn, also its weed-free and thrifty growth, both evidences of expert planting and care.

SIMPLE SERMONS ON THE LAWN

NUMBER 1

Lawn Drainage and Contouring

A BUILDING will stand securely no longer than its foundation holds its strength, and a similar truth applies as to the principles underlying the establishment of a thick growth of fine turf that remains a beautiful and unblemished stretch of green from year to year.

There is no cultivated crop grown that demands greater care in providing a circulation of fresh air and moisture around the feeding roots. A thick mat of fine grass is pre-eminent among all crops in the mass of feeding roots produced, as it is also in closely packed leafage.

Fine grass plants, as part of a lawn or park area which is kept cut at a one-inch height or less, develop the larger percentage of their feeding roots within three to four inches of the surface of the soil, and the conditions which exist in the top layer, or seed bed, within six to eight inches of the surface, largely determine success or failure in holding a permanently healthy growth of turf.

THE ACTION OF MOISTURE AND AIR

Grass plants take up no food except in solution, and no solution except in the form of capillary moisture. Capillary moisture is that which clings around the particles of soil near the surface, after gravitational moisture has run off. The grass plant derives no immediate benefit from water which is driven through the surface soil by over-generous sprinklings or pelting rainfall and continues swiftly on its way far below the reach of its feeding roots. The only moisture from which it absorbs both food and drink is that which the surface soil mixture is capable of retaining in the immediate neighborhood of its hungry mouths.

Grass plants draw quantities of fresh air down through the surface when they are thriving and a healthy deep green in color. Let their supply of oxygen be cut off from any cause, and the turf will smother and die just as does a human being when subjected to such treatment.

Capillary moisture and fresh air are the two most vital

needs of all plant life, and it must be kept in mind that the turf crop demands a larger supply of both than any other grown. This is not only true because fine grass produces a far larger number of feeding roots to the square foot of surface than any other crop; its leafage, when healthy, mats densely on the surface, and thus to a certain extent the turf itself retards the natural free passage of air to the soil beneath. The tendency to produce thick leafage under happy conditions is, however, a great protection against extreme heat which would cause excessive drying out of a surface soil supporting a thin and patchy growth.

DRAINAGE FUNDAMENTAL NECESSITY

While a mellow soil of good quality is of much importance in establishing a new lawn, it is not the first fundamental necessity of the lawn that is permanently good from year to year. It is because of its direct beneficial action upon the surface six to eight inches of practically all native soils that under-drainage with tile is stressed as the first and most important principle in promoting a permanently healthy growth.

Contrary to the casual idea of the average person, tile laid under the surface of the lawn operates on a far wider scale in insuring turf health than in merely providing under-ground passages to take away excess surface water, whether such water stands for long periods due to swampy and spongy areas, or remains for too long in pockets or depressions in heavy clay. The expense of draining low wet spots on the home grounds is usually shouldered as an obvious necessity, while in most cases the laying of tile under the entire lawn area in its direct relation to future economy of yearly maintenance is mistakenly dismissed as an unwarranted outlay of money, or completely overlooked.

An investment of any kind is good if it pays regular dividends and continues to pay them. It is bad when

dividends are continually deferred and finally non-existent for periods of time. It is still worse when something is bought at a bargain price and found to be costly to maintain. The "bargain" lawn, cheaply and carelessly established, draws heavily on the pocketbook every season that it is kept in any semblance of green growth.

A system of tile drainage installed on the average home property need not be an unreasonably costly item, even if planned and supervised by a drainage engineer, as it should be. Amateur installations are rarely efficient, and frequently entail greater expense in the end than is represented by the expert's fee. The proper laying of a tile drainage system involves more than dimensions, elevations, contours, connections and outlets. Expert drainage engineering is also soil engineering, and the amount and sizes of tile, positions and number of laterals and sub-mains, connections and outlets, depend largely upon the structure of the native soil and the sub-soil both below and above the lines to be laid. Properly installed, tile underlying the lawn is the underwriter of the turf life insurance policy that is represented in the definite increase of air and water channels it creates in the surface soil above it. The dividends from such an installation are paid regularly every year in the form of money saved in the work of preserving lawn health and beauty.

Tile drainage operates to prevent the packing of the surface soil around turf roots, by holding open sufficient channels to guarantee the free passage of air and water through heavy loams that would otherwise solidify by the action of hard driving rains and later bakings under the heat of the sun. Its effect is constant, and it takes no time off until after the ground freezes. As soon as the frost begins to work out under the sunrays of spring, tile starts to remove the excess water from the surface, and makes possible early spring trampling and working with machinery without resultant turf damage.

DRAINAGE AND EARLY SPRING GROWTH

A soil well tile drained warms up and starts growth far ahead of any average quality of undrained soil in the spring of the year, thus accelerating the thickening of the turf root system and encouraging the natural stooling or spreading of the grass over thin or bare areas which may show up after the frost leaves the ground.

To a greater extent than any other agent is tile drainage responsible for a fast natural growth of fine turf in the early spring. Turf seems to be instinctively self-protective, and will make every effort to heal its own wounds, but it can make little headway with cold, wet feet.

Any soil that holds water for long periods of time close to the surface is a wet soil. A wet soil is a cold soil, and no green crop will make much of any growth on it until the gravitational water has percolated down to the level of the water table, or ordinary water storage level in the sub-soil.

An undrained surface frequently retains for far too long a surplus of water after spring rains have added their contribution to that caused by the melting or frozen ground, and the areas of lawn which are not thereby smothered and killed out, are seriously hindered in mak-

ing growth at the very season of the year in which turf should be getting in its best strides.

AID TO BACTERIAL ACTIVITY

There is a great deal of talk nowadays about bacteria, the microscopic bodies that work on decaying organic matter in the soil, transforming such inert material into nitrogenous food for plants, but one fact about these tiny workers is outstanding in its truth, that they will not work when they are unhappy. What constitutes a happy environment for them is warmth. This they demand in both air and moisture, and they continue with their winter vacations until both are available.

The longer it takes excess water in the surface to evaporate or drain out, the longer these atomic workers remain sluggish and inactive. There is plenty for them to do as soon as the ground thaws, but where soil is undrained and the surface saturated with water, they feel no urge to get on with the job of helping to feed grass plants.

Applied fertilizers of any kind are also slow to take effect until surface water has drained away and warmth penetrates through the turf and well into the soil below.

For the several reasons given in preceding paragraphs, it is easily understood why a good system of under-drainage is the most important insurance policy the turf grower can take out for the mutual benefit of his lawn and his yearly expenditure for general maintenance of turfed grounds.

KEEP PLANS OF INSTALLATION

After drainage tile has been installed on a home property, the owner should secure a copy of the plan from the drainage engineer or landscape architect, so that any future changes, additions or repairs may be made with full and accurate knowledge of the lines that have been laid. This plan should be among the papers that are handed the new owner, should the property thereafter be sold.

The owner should know the locations of the outlets, as it is most important that these openings be kept clear of fallen leaves and any debris collected by storms which may "back up" into the outlets and obstruct them, thus rendering some sections, if not all of the drainage system, inefficient or inoperative. On the average home lot there are seldom more than two or three outlets, and usually but one, therefore unless the property is heavily wooded and located at the outskirts of a town, keeping them clear is a very simple matter. On outlying property, where rabbits and other under-ground burrowing and nesting animals are prevalent, any opening is apt to be infested with them, and drainage outlets are frequently seized upon as homes ready-built for their occupancy. Occasionally rabbits and groundhogs burrow into some section of the tile lines and loosen the joints of the tile, or get caught in the lines and stop the flow.

Where such animals are a menace, all tile outlets should be screened, and wherever burrows are found around the property, an extermination campaign should be put into effect at once to prevent expensive damage to the drainage system.

Anything which prevents or retards velocity in the

flow of water through the lines allows sediment to collect, which will soon fill the tile on flat grades and render it useless.

Washouts are sometimes destructive, and where damage from them or from any other cause shows up, the plan of original installation on hand will save many a dollar and much defaced turf in locating and remedying the real seat of the trouble. Whatever repairs or changes are made, the position should be so marked on the plan as to keep the record of the drainage system up-to-date.

Catch basins are sometimes installed in the tile system, and these should be thoroughly cleaned out at least twice a year, spring and fall.

As a rule, keeping the outlets and catch basins clear of rubbish is the only duty the home owner need be troubled with, once his drainage system has been installed and put into operation by a competent engineer.

USE BEST QUALITY TILE

As a final injunction, which has a strong bearing upon the cost of lawn upkeep, every home owner who is planning to tile drain his grounds should insist upon the use of the best quality of vitrified tile, which carries a guarantee against breakage from the effects of alternate freezing and thawing weather.

Low grade tile, through breakage, consequent filling of the lines and further breakage, causes a never-ending series of repair jobs, and frequently the expense of a re-laying of the complete system.

The advantages of a tile drainage system are undeniable, and the best quality of vitrified shale tile, laid according to the specifications of a technical drainage engineer, is the first safeguard of the future economical year-to-year upkeep of the permanently beautiful lawn.

EDITOR'S NOTE: *The sermon for the coming April number will cover contouring and surface draining.*

THANK you, Mr. Dhonau! The More Subscriptions, the Better "The Turf Survey"!

GEORGE A. DHONAU
Superintendent United Jewish Cemetery
EVANSTON, CINCINNATI, OHIO

February 29, 1936

G. A. Farley, The Turf Survey,
1900 Superior Avenue, Cleveland, Ohio.

Dear Sir:

Enclosed please find check for subscription to the Turf Survey.

I am an associate member of the Greater Cincinnati Greenkeepers' Association, and we have a good live bunch of men. We are having our meeting Monday, March 2nd, and I will remind some of the boys if they have not already subscribed.

I think you have the material for producing a much-needed publication, and I will also take the matter up with the members at the next meeting of the Cemetery superintendents.

I believe the Turf Survey should be in the hands of every man in the country who *tries* to raise grass!

Yours respectfully,

George A. Dhonau.

COST FACTS

By GUY C. WEST
President Greenkeepers' Club
of New England



Mr. Guy C. West

COST systems for golf course cost keeping are many in number. Among those better known are the Murray and Westchester systems. Many greenkeepers have their own systems. A system evolved by the writer in 1922 from systems then in use on various park systems through the country is in use here and there. Any system is good if it is easy to use and if it gives the desired information. A standardized system for all courses is not practical, due to the vast difference in courses. Various clubs have varied systems of bookkeeping, and often cost work on the course is tied in with the club bookkeeping. Then too, greenkeepers vary in their ability and in their desire to keep costs; where one greenkeeper glories in being able to show how much it cost to mow, to weed, to water, to topdress, and all the other maintenance items of perhaps his greens, many others will be more easily satisfied with the total maintenance costs of their greens.

A study of costs at this time is liable to cause grief, unless the unsettled condition of golf clubs is wisely considered. Because of too few men on many courses, many greenkeepers have taken over some of the work formerly done by greensmen as well as their own. This condition is unhealthy, and although such greenkeepers have often kept up their former maintenance standards despite cuts and should be commended for their work, such a condition often is not shown in the costs reports. Any cost study attempted at present should be made over a five-year period at least, and with all facts in mind.

The use of more and better equipment does not always mean lower costs. Possibly it may mean a better standard, or that the operation done with the equipment is done more times. The change from a five-gang hook-up for mowing fairways to a seven-gang will show a saving in mowing time, but the time may not be saved, as the result may be that the fairways will be mowed an extra time per week, taking up the time saved, but resulting in a better standard of maintenance.

Before buying new equipment or before new construction, think over the possible "hidden costs" which may be involved. The addition of a fairway watering system may be well worth while, but it must be remembered that it will mean a greater expense for water per season in many cases, it will mean more mowings per season, and more fertilizer cost. The addition of a new trap to a course may not cost much for construction, but its maintenance

while it is used is the hidden cost to investigate before construction. It is significant that president Charles E. Mason of the Massachusetts Golf Association recently addressed a letter to the president of all member clubs urging them to have all unused traps on their courses filled, as one means of keeping maintenance costs down. Too often in the past have newly elected Greens chairmen, anxious to leave their "monuments" on their courses, had some new construction carried on which left its full quota of large hidden costs for the future.

There are many ways that costs are of help to the greenkeeper. It is his job to convince his Greens chairman of their worth. As he does this there is bound to occur a much better co-operation and understanding between them, which will certainly help all concerned to better efforts.

GREENKEEPING LESSONS OF 1935

(From Page 7)

decidedly unfavorable conditions resulted in general losses of this grass, with the result that large areas where it had become well established were left completely bare. Many such bare areas occurred in putting greens and especially on the borders around the putting greens and on the approaches that had been kept fertilized and watered in previous seasons. Although *Poa annua* has many characteristics that recommended it as a golf course turf under favorable conditions, it still exists as a perennial threat on most of our golf courses and should be discouraged in every possible way at least until more practical methods are available for maintaining it.

The great difference in the ability of creeping bent and *Poa annua*, for instance, to withstand adverse weather conditions undoubtedly accounted for much of the criticism that greenkeepers encountered during the past summer. Losses of turf on many courses was attributed solely to poor greenkeeping methods by golfers. This charge was often supported by the evidence that on another nearby course the grass remained in excellent condition. No allowance was made for the fact that in the case of the former course the turf contained a large proportion of *Poa annua* and in the latter case it was chiefly a good strain of creeping bent. The failure of players, and unfortunately in some cases greenkeepers, to recognize the important difference in the behavior of these two types of grasses led to many unpleasant situations during the summer. The puzzle was made more confusing by the fact that the *Poa annua* turf throughout the spring was in especially fine condition. The sudden change from one extreme to the other naturally led club members to suspect careless or faulty greenkeeping methods. Of *Poa annua* it can undoubtedly be said with greater assurance than with any other common golf course grass that "pride goeth before a fall." In anticipation of sudden and extensive losses of *Poa annua* the greenkeeper whose course is heavily infested with *Poa annua* should be particularly on the alert to avoid excesses of water and fertilizer in seasons when there is special likelihood of damage.

Preparation for anticipated losses of turf through the

maintenance of turf nurseries is an item that has been generally neglected in recent years. This neglect in most cases, had been caused by curtailed budgets. The season of 1935 gave conclusive evidence of the importance of at least a moderate provision for turf replacements from a well-kept turf nursery.

FURTHER STUDY OF TURF DISEASES ADVISABLE

The most common diseases of putting green turf are more troublesome in wet than in dry seasons. Therefore, the change from seasons of drought to one of excessive rainfall called for a decided change in the application of disease control measures.

The schedules used in applying the mercury fungicides during seasons of drought proved wholly inadequate through the past summer. It was surprising in how many instances brown patch was permitted to continue to invade turf simply because applications had recently been made and it was not yet time for the next application. Intervals of two or three weeks between applications of fungicides have long been recognized as inadequate under adverse weather conditions and 1935 provided another lesson on this subject.

The past summer also brought out the need for a better understanding of the different types of turf diseases and the particular remedies to apply to each. One of the best ways to fight diseases is to anticipate them at least to the extent of trying to recognize the symptoms of the more common ones. A relatively brief time devoted to the study of the published descriptions of these symptoms no doubt will be found to be time well spent the next time these diseases are encountered.

THE IMPORTANCE OF AIR CIRCULATION

During wet seasons the loss of turf in areas protected from normal air currents is always greater than in dry seasons. Turf in air pockets in 1935 was therefore, in general more severely damaged than in preceding drought years. Many of the putting greens and tees where little air circulation occurs, are so located that it is impractical to make provision for adequate natural air circulation. There are, however, a large number of areas on golf courses where a little careful pruning of trees would serve to greatly reduce many of those injuries to turf that are so commonly associated with excessive moisture. During recent dry years the greater evaporation has served to reduce the amount of damage to turf that has occurred in such air pockets. This reduction has had the effect of diverting attention from the importance of air circulation. In many instances openings through trees had been made a few years ago to provide for better air movement but during a series of dry seasons as the value of such provisions became less apparent the trees and underbrush were often allowed to grow until they had again provided an effective barrier against normal air currents. The large number of examples of benefits from such wind openings that were provided during the past summer should serve as a warning to greenkeepers to give this matter more serious consideration than has been the case in the past.

During the past summer additional evidence was obtained on the question of the value of air currents in turf

maintenance. Propeller-type-fans delivering air currents from two to twelve miles an hour were found to greatly reduce the losses due to brown patch and certain other ailments. The fanned turf was more vigorous and durable than the check areas receiving only natural air currents. In some of the tests an increase in growth of from ten to forty per cent was recorded. The soil temperature was found to be from three to five degrees lower in the fanned areas than in the check. During long periods of excessive rainfall, however, the fans failed to prevent all injury to turf. The experiments with fans served to add emphasis to the many observations concerning the advantages to be gained from cutting openings through trees and shrubbery to allow for better air circulation. These experiments also indicate practical possibilities for providing air circulation in places where no suitable provision for natural air movement is feasible.

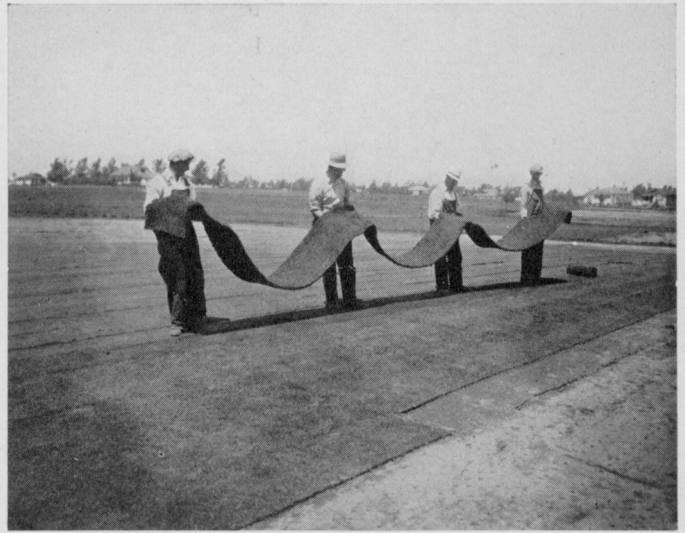
THE TURF NURSERY

EMERGENCY repair work, due to the ravages of the winter months which are evident on every side as spring opens up, is taken care of at a minimum of labor, time and expense, if a well established and cared for turf nursery is available from which to cut strips for laying wherever areas are so badly damaged that a major repair job is unavoidable.

There is winter-kill, which often destroys good-sized patches of turf on low spots where surface drainage is lacking. Then there is snow mold, causing surfaces so badly scarred that re-seeding or re-turfing is the only economical way out for the turf grower. Washouts often demand refilling, with re-seeding or re-turfing. Here and there chickweed, or some other spring weed pest begins to take hold and spreads faster than the grass can grow to combat it. Chickweed is mentioned in particular because wherever it has become a problem, the labor expense in hand-weeding is often so great that complete cutting out of the infested spots, and the removal of an area several inches wide surrounding the growth, is the method of eradication most economical in the end.

Greenkeepers have long recognized the turf nursery as one of the best forms of insurance they maintain. Usually their nurseries consist of plantings in row form, and also surfaces which, planted broadcast, are kept weeded and cut to be immediately available for use in whatever emergency may arise.

It is a good plan for any grower maintaining large turfed surfaces to plant a nursery of the same types of grasses as planted originally. In contemplating the matter of changing the type of grass originally planted, say from a grass seed mixture to one of the vegetatively planted bents, the most economical step to take is to plant a nursery of the chosen bent from which, the following fall, the first-year growth may be cut and broadcast over such surfaces as desired. Many turf growers have made a start with a small nursery, and from this source they



The strength of the root system on well grown Washington strain stolon-planted turf is well proved by this photograph. Commercial nurseries keep such acreages closely cut, watered and hand weeded, to produce clean strips cut one inch thick for shipment throughout the growing year. Illustration by courtesy of the Illinois Grass Company, Homewood, Illinois.

have re-planted extensive areas, making the change gradually from year to year.

On all new and extensive projects, demanding the sowing or planting of acreages of turf, providing seed is sown, a turf nursery should be sown from the same mixture; acreages planted vegetatively, protected from the beginning by a nursery planted with the same type of bent, may be repaired or added to at will and at the least cost from then on. Turf of one kind or mixture repaired with another is not of attractive appearance, and due to the fact that one type of grass often cuts more easily and cleanly than another, such repaired surfaces are often difficult to cut evenly with surrounding surfaces. There is also the question of disease resistance to consider, particularly in relation to the vegetatively planted bents, as some types are considerably more susceptible than others.

A turf nursery seeded to a mixture of fine grasses needs



Women employed in the delicate work of hand-weeding stolon-planted Washington strain turf. They have been found to be extra careful in doing such work, and in localities where it is possible to secure their services, they are rarely unemployed during the growing season. Illustration by courtesy of the Illinois Grass Company, Homewood, Illinois.

the same care as that which is given the lawn or park area of which it is destined to become a part, namely regular spring and fall fertilization with light top dressings well brushed in, weeding, cutting, and rolling in accordance with the type of soil and weather conditions. As strips are cut for use, top soil should be used to fill up to level, and the cut areas re-seeded to insure a continuous supply.

Planting a vegetative nursery is a simple operation, but there are certain fundamentals of management in the handling of established vegetative nurseries and permanent areas so planted which differ from the procedures usual in maintaining seeded surfaces. The first problem in starting the vegetative nursery is to secure stolons from growth which is not more than a year old. Quotations are made by commercial growers on a basis of row footage to be planted, or the number of square feet desired to plant by the broadcast method.

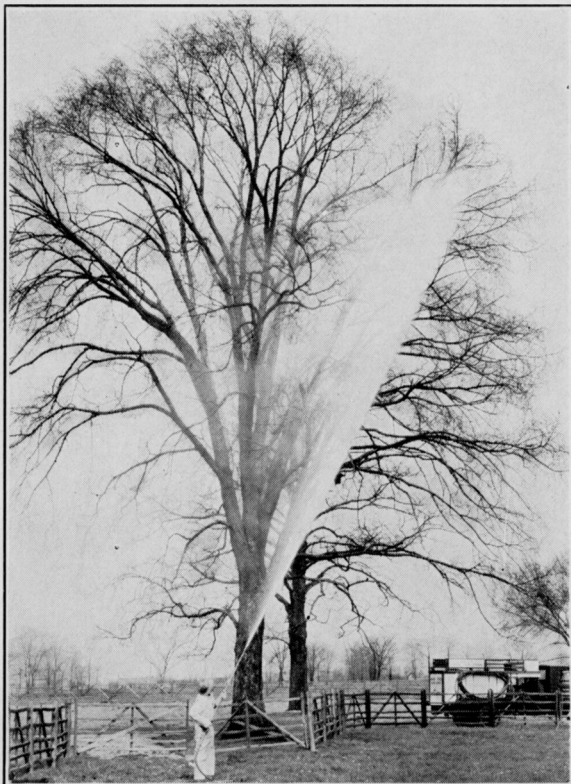
The Washington and Metropolitan strains continue to give satisfaction, and are more disease resistant than other named strains. Velvet bent, which makes one of the most beautiful turfs known, is slower to spread, but experimental plantings in process during the past few years tend to disclose the fact that this type of bent strikes an exceedingly strong root system, is resistant to disease, and produces an upright growth of fine color and texture.

The land upon which a vegetative nursery is to be established should not be too rich. In fact, it is better to be somewhat poor in food value, as vegetative bent too heavily fertilized becomes coarse in texture, with runners upon which the nodes are far apart. Growth in the early stages may be encouraged by light applications of sul-

phate of ammonia or a turf fertilizer of approximately a 10-6-4 analysis spread and watered in after some development of runners is seen. The rows should be kept free of weeds, and runners allowed to develop for cutting and broadcasting before the end of the first year. Fall planted nurseries, like all fall turf plantings, cause less trouble from weed encroachment, and make fast growth of stolons to be sown the following season. Because of its tendency to spread rapidly, thus crowding out weed growth, the broadcast method for spring planting of vegetative bent is preferable to starting a spring nursery by the row method.

A spring-planted nursery of Washington or Metropolitan bent sown broadcast, the stolons kept well watered to prevent all possibility of drying out until a root system has been established, and thereafter cared for by close cutting and judicious fertilization, will produce a thick mat of turf within a period of approximately two to three months.

In order to keep the growth over the entire area throwing out fresh runners, strips from such a planting should be cut in alternate sections, the denuded sections filled to level with top soil and sown with stolons as at first planting. Prompt planting after cutting the strips for use on the grounds largely prevents weed growth, as well as excessive drying out, and provides a constant source of turf supply throughout the growing season. In addition to these measures in keeping the vegetative bent nursery virile, the entire area should show a full coverage of grass each fall, which should be disked and cross disked the following spring, topdressed with a light application of fertilizer, and such topdressing well brushed in, followed with light rolling.



To secure good and economical control of scale insects it is necessary to use powerful equipment that can thoroughly and quickly cover trees of all sizes.

CONTROL OF SCALE INSECTS

(From Page 13)

tree surgeons to make the inspection for you since the insects are too small to be visible from the ground. In any event, the important thing is to positively determine whether or not scale insects are present.

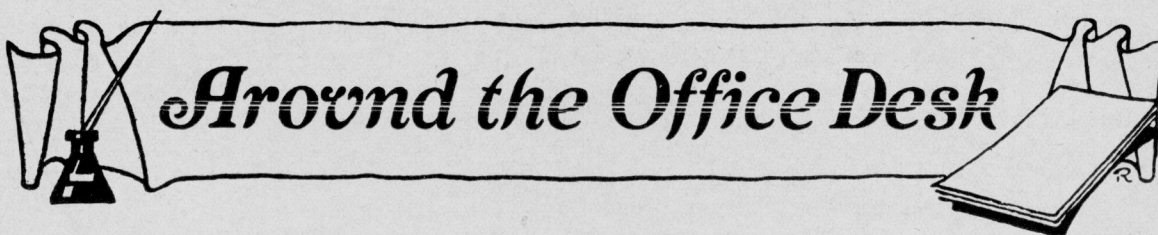
If you find just a mild infestation, get after it. If neglected, the insects will multiply their numbers tremendously later in the year. If you find a bad infestation, arrange for immediate spraying.

Winter spraying may sound unusual. It is, insofar as most insects are concerned. But, with scale, a special problem arises. The spraying solution that destroys the scale is injurious to foliage. So, control measures are given during the dormant season while the trees are not in leaf.

A number of excellent spray preparations are available. Lime sulfur is good, but should be avoided where trees are near buildings. The material spots paint badly. Oil emulsions are non-injurious to paint and are equally effective. Therefore, use the oil emulsions for spraying near buildings.

Now, since the insect is covered with a self-made pro-

(To Page 26, please)



Around the Office Desk

THE "star" letter received at the office of THE TURF SURVEY since mailing out the first number will be found on the outside back cover this month. Mr. Bauman is not personally known to us, therefore his remarks are colored by nothing whatsoever except his appreciation of the contents of the February Inaugural issue.

Letters expressing keen interest, goodwill and co-operation arrive in every mail. Here is what Mr. A. G. Chapman, formerly chairman of the Green committee of the Audubon Country Club, Louisville, Kentucky, has to say: "Congratulations! Am glad to subscribe, and am sure of getting my money's worth. I believe you will relieve a bad hiatus in the business, to the benefit of all Green committees, greenkeepers and turf growers in general, advertisers and golfers as well. All power to you!"

Canadian subscriptions received are gratifying in number as the days roll on, and we select from some of the messages coming down from over the border one from Mr. John J. Cameron, manager of the Scarboro Golf & Country Club, Scarboro, Ontario. Mr. Cameron writes, "It was with a great deal of pleasure and interest that I read sample copy of THE TURF SURVEY received today. I have felt for a long time that a commercial paper devoted to grass culture was very much needed, and I feel sure that your efforts in this respect will be a great success."

Professor Lawrence Dickinson took away with him from our booth at the recent annual convention of the National Association of Greenkeepers of America all the copies of the February number we could spare, and asked to have the balance of twenty-three mailed to him for distribution among the students enrolled for the greenkeepers' school, operated each year under his direction, at Massachusetts Agricultural College, Amherst, Massachusetts.

The series of articles on tree problems, written each month by Mr. H. L. Jacobs of the Davey Tree Expert Company at Kent, Ohio, bids fair to become one of the most popular in reader interest, as we noted at the convention that numerous visitors were attracted to the tree page immediately upon opening the magazine. We got in touch with Mr. Jacobs at once, asking if he would be in a position to conduct a "question and answers" column on this important

subject. Mr. Jacobs will "be very glad indeed to give specific information to any reader of THE TURF SURVEY who will send in problems for analysis." We therefore made the announcement that a section called the "Treeforum" will be started as soon as inquiries from readers are received. This is but another evidence of the quality and quantity of service the Davey personnel renders to all lovers of trees who come to them for help.

From Mr. Perry Maxwell of Tulsa, Oklahoma, we have the assurance that he will contribute an article covering creeping bent turf as grown in Oklahoma. Establishing creeping bent, a true northern grass, under climatic conditions which have never been considered suitable for this type of grass, should prove of much interest to those readers who wish to make experiments with bent under like conditions. Mr. Maxwell pioneered in producing bent greens where none had been grown before, and his report will be backed with first-hand experience.

Edward B. Dearie, Jr., well known in the Chicago district for his work in constructing golf courses over a period of several years, telegraphed that due to sickness the opening chapter of a series on course construction from his reliable pen will not be available for printing until April. Sorry, Eddie, and know you will have the copy in our hands by March 15, with illustrations, bells, and a grandstand approach!

One of our most interesting visitors during the convention came in the person of Mr. George Megown, who told us something about his work on the famous F. H. Buhl farm at Sharpesville, Pennsylvania. Mr. Megown is getting together some detailed information which will appear in the coming April or May issue. The recreational attractions are varied at the Buhl farm, and therefore we suggested that Mr. Megown choose his own subject.

Early in the summer season, possibly by June, a series of articles on the subject of golf course architecture will become a feature of THE TURF SURVEY. Busy as he is, Mr. William P. Bell, famous throughout many of the western states as a golf course architect, has agreed to furnish our readers with this series. Our letter of early January followed him through three states, finally reaching him

on February 10. Considering the demand for his services, Mr. Bell could have paid THE TURF SURVEY no higher compliment than to contribute this valuable information at a definite sacrifice to himself.

Already our first request for suggestions from readers is bearing fruit. Mr. G. W. Barnes of Banff, Alberta, writes that he has constructed quite a lot of small sand greens. He feels that he can learn more about them, and asks to have some articles on this subject appear as soon as possible. Mr. Barnes, you may expect articles on both sand and cottonseed hull greens to appear beginning with the April number. We have been seeking the right sources from which to secure detailed information on many specialized subjects, among them all sorts of artificial putting surfaces. Reliable material is now in work for us, coming from Texas, Oklahoma, Nebraska, Colorado and New Mexico.

The only greenkeeper we have ever met who was born in a clubhouse is Mr. H. J. Moran, now with Sleepy Hollow Country Club, Scarborough-on-Hudson, New York. From our conversation with him at the convention we drew the inference that had he had anything to do with choosing his place of birth, it would still have been a clubhouse. Golf is just as much a part of him as his head or hands,

both of which he must have used to good advantage, as he seized upon his birthright as soon as he could talk, and has never let it get away from him. We don't yet know what it will be, but something signed H. J. Moran is due for an appearance pronto in THE TURF SURVEY.

Mr. Chester Mendenhall, who for thirteen years has been a helpful friend, has had wide experience in the Oklahoma and Kansas sections of the country. One of his hobbies is making plantings of trees and shrubbery which are native to his district. We have asked him to describe the plantings which he has put in at his course, Mission Hills Club, Kansas City, Missouri, and expect to publish this article with illustrations in the near future. Now you're committed, Chester, and you've never let us down!

"Why don't you ever come up to Detroit?" "A lot of people up Detroit way wonder why you don't come up." "If you'll come up to Detroit, you'll get all the material you can use for months." "Better come up this spring and stop with us. We'll get you around." The consensus of opinion seems to be that we should go up to Detroit. Practically all the greenkeepers from that section at the convention insisted that we should by no means overlook Detroit. Well, we plan on being in Detroit the week end of March 7 with a pair of rubber boots in the back of the old car, notebook, typewriter, eyes and ears all in good working order.

The 1936 Annual Convention of the National Association of Greenkeepers of America, to which we have referred several times in these preceding paragraphs, was an outstanding success. Exhibitors were busy every hour throughout the four days of the meeting, and all available space was occupied by the leading manufacturers and dealers catering to the golf trade.

Limited space forbids reporting full details of the convention, but there is no limit to the extent of appreciation we wish to express personally to Mr. Leo J. Feser, of Wayzata, Minnesota, for his fine work as editor of the Greenkeepers' Reporter from the Inaugural number to and including the issue of February, 1936. A splendid record of unselfish service which will always be remembered!

We extend to Mr. John Anderson, new president of the National Association of Greenkeepers of America, our cordial good wishes for a successful administration, and our assurance of co-operation in extending whatever publicity program may be instituted by the association this year.

(To Page 26, please)



Now offered in shades of red, orange, yellow, pastel pinks and cream, the Fantasy Zinnia as a cut flower, lends its beauty to almost any decorative scheme.

EARTH'S GREEN CARPET

Turf is the foreground of practically every beautiful man-made outdoor picture in America!

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Check or money order attached, \$2.00



The California Blue Moon Aster

WILT-RESISTANT ASTERS

Seed of most of the old-favorite types of asters from wilt-resistant stock is now available,—the American Branching, Crego and King prominent among them. The King aster is one type which lasts longer after cutting than any other class, and is most attractive with petals which are long, narrow and folded, appearing somewhat quilled. Kings are mid-season bloomers, and the other types mentioned come in three seasons of bloom, early, mid-season and late.

“Astermums” is the name given a new strain of exceptionally strong branching growth. The flowers resemble large chrysanthemums, and grow on stems fifteen to twenty inches long. This new aster comes in a full range of shades, and is one of the most valuable for cutting.

One of the most graceful and beautiful of the asters introduced last year, and emphasized for attention this season is the new California Blue Moon. It is a sunshine type, with short quilled centre of white, and fringe of blue outer petals. As a contrast to the delicacy of the Blue Moon, the group of aster plantings should include some of the new Giant Peony Flowered type. These are not of the branching aster family, but the blooms are immense on long stems, and come in a most complete color range. No annual flower extends the flowering season longer than the aster, and few grown from seed are more decorative. Whether or not grown from rust-resistant stock, asters are more apt to show clean foliage if transplanted into new ground each year, ground upon which asters have not been grown previously.

AROUND THE OFFICE DESK

(From Page 24)

To Mr. Victor George, of Lafayette, Indiana, a vote of thanks is due. Mr. George began counting up the subscribers he can get for THE TURF SURVEY in his immediate district, got as far as nine, so we added one more copy of the February issue for good measure. It seems that superintendents of parks, cemeteries and estates in his part of the country are well known to him, and he was immediately convinced that THE TURF SURVEY is what they have been looking for. We are, of course, in perfect agreement!

Every reader on the list of 5,000 turf growers who will receive this second issue of THE TURF SURVEY is requested to read carefully the opening article entitled, “*What You Read Viz. What You Need.*”

CONTROL OF SCALE INSECTS

(From Page 22)

tecting scale armor, how can spraying do any good? It was originally quite a problem. The answer is that the oil emulsion not only coats the scale covering but, like any oil, it has the capacity to creep into difficult places. It creeps under the edges of the scale's protective coating, and kills by contact.

It is as easy as that, except that, where trees are involved, it isn't so simple to secure thorough spray coverage of all the branches. And, unless you get complete coverage, the job is half done and the results will not be satisfactory.

Spraying shade trees to control scale requires the use of modern, powerful spraying equipment, good spraying material, honest mixtures, and skillful application by trained, experienced men who know their business.

Trees are living, growing things that reflect the care that you give them. They cannot ask you for assistance when trouble comes. They have to rely upon your interest in them and upon your observance of their difficulties. Unknown to you, they may be seriously infested with scale insects now. If you are responsible for the welfare of trees, you will protect your own interests by playing safe. Have the trees inspected if you suspect the presence of scale insects. Have them sprayed if they need it. Scale-infested trees are likely to slowly die. Spraying to control scale insects will preserve the health of trees and give them an opportunity to provide the fine beauty and the rich shade that mean so much to attractive surroundings.

IMPORTANT NOTICE!

This is a complimentary copy, unless your subscription has already been mailed. If you wish to receive the coming April number, *do not delay!* Send your subscription TODAY.

Blanks on Page 25.

NOTICE TO READERS

YOU are cordially invited to write the office of The Turf Survey, 1900 Superior Avenue, N. E., Cleveland, Ohio, expressing your opinions and needs in relation to the reading matter which you would like to have appear in the pages of this SERVICE MAGAZINE from month to month.

The Turf Survey offers all turf growers in the United States and Canada an opportunity to discuss individual problems in open meeting each month, and such inquiries and suggestions as are received will be given prompt and careful attention. The division of this publication entitled The Turforum is one in which member clubs ask the advice of the U.S.G.A. Green Section on specific problems of golf course maintenance, and each question is answered in such a manner that all readers of The Turf Survey may receive the benefit of expert advice from month to month. In applying any information given in The Turforum, localities from which the inquiries were sent should be noted, and differences in soil and climatic conditions taken into consideration.

Arrangements have been made for educational articles to appear in following numbers of The Turf Survey covering subjects listed below. Subjects allied to turf growing are infinite in variety, therefore many others will appear in addition to the following partial list:

- Soil Modification
- Top Dressing Mixtures and Methods of Spreading
- Fertilization of Several Types of Turfed Areas
- Seeding and Stolon Planting
- Planting and Maintenance of Turf Nurseries
- Cutting and Laying Turf
- Drainage and Irrigation
- Turf Weeds, Diseases and Insect Pests
- Golf Course Construction
- Care and Repair of Machinery
- Golf Course Records
- Planting, Rehabilitation and Maintenance of Lawns
- Building and Maintaining Sand Greens
- Planting and Care of Native Trees
- Concrete Construction
- Selection, Planting and Care of Shrubbery
- Planting and Maintaining the Cut Flower Garden
- Road Building
- Turf Maintenance Short Cuts

Please Distribute Subscription Blanks on Page 25. Thank You!



WESTWOOD COUNTRY CLUB

CONWAY ROAD - ST. LOUIS COUNTY

CLAYTON
MISSOURI

February 24, 1936

LEO S. BAUMAN, CHAIRMAN
GROUNDS AND GREENS COMMITTEE
720 OLIVE STREET
ST. LOUIS

The Turf Survey
1900 Superior Avenue, East
Cleveland, Ohio

Attention: G. A. Farley

Gentlemen:

On Saturday, while visiting our club, my grounds-keeper showed me a copy of your new magazine. After reading the different articles and editorials, I could not help writing you and telling you what a distinct place a magazine of this type has for not only golf clubs but also any one who is interested in the raising of turf.

Since the passing out of the bulletins which were previously sent out each month by the United States Golf Association, under the direction of Dr. Monteith, we have had no information whatever regarding problems in different parts of the country.

It has been my pleasure to have known Dr. Monteith for a great many years; and I have worked with him considerably, as only seven years ago, we built our new club and were faced with rather a bad situation. I am very glad to state at this time that we have whipped our course into shape; and we believe it is one of the best golf courses in the Middle West.

I have given our cashier one of your blanks so that you could enter our subscription; and it will be my great pleasure to pass the balance of the blanks that are in the February issue to friends of mine here in the St. Louis District.

It so happens that I am not only Chairman of the Grounds of our own club; but I am also Chairman of the Grass Section of our entire St. Louis District. I am also Vice-President of the St. Louis Golf Association. Any help that I can give you at any time to make your magazine a success, don't hesitate to call on me.

Sincerely yours

LSBauman:CD