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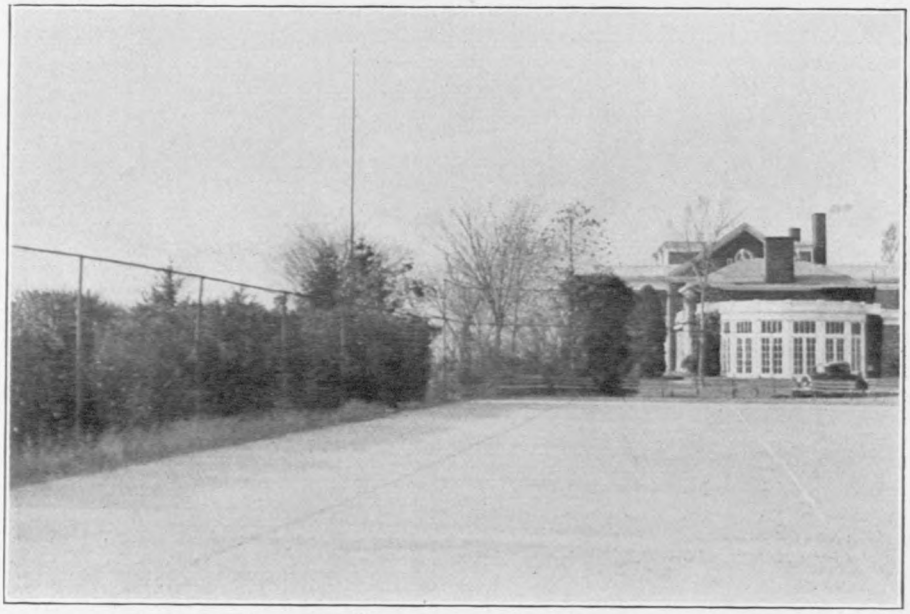
Building Clay Tennis Courts

By Kenneth Welton

The plan of a tennis court or series of courts is standard except that there may be variation in the extent of space between courts and at their sides and ends. As far as the playing surface of the courts is concerned the architecture is negligible. However there is ample scope for landscaping in planting or arranging a suitable setting for the courts. There are also certain factors controlled by the landscape which may either help or hinder the players.

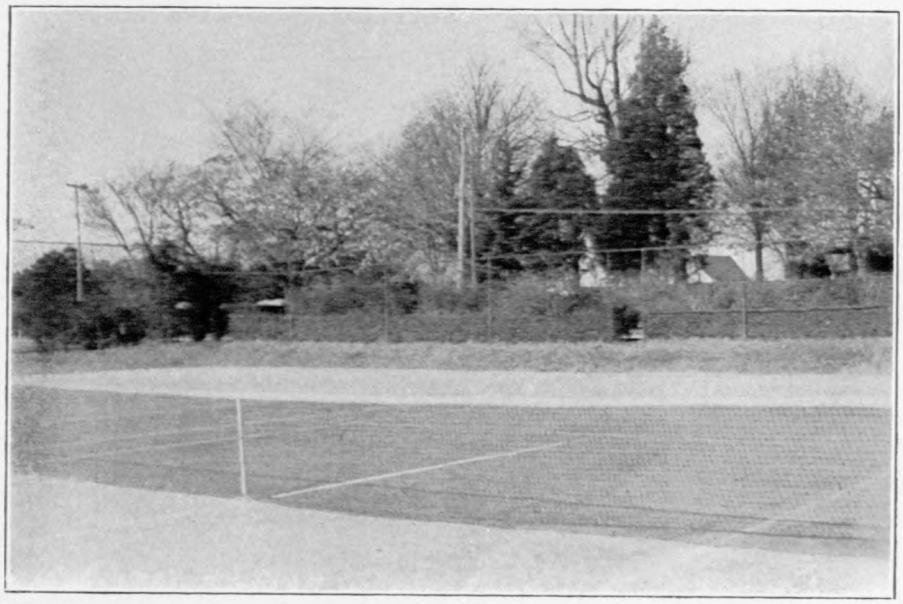


Tennis courts adjoining the club house of the Country Club of Virginia, at Richmond. The bank of shrubbery outside the fence at the left provides the players with a dark background and incidentally screens the parking area.

Tennis courts are usually enclosed with neat wire fences and are preciseness exemplified in their smooth surfaces and clean-cut angles and lines, but this very formality of appearance may jar decidedly with the natural beauty of some locations. A court set boldly on the landscape can be somewhat of an eyesore. Groups of trees at some distance from a court are pleasing while solid borders of low shrubs at either end and groups along the sides harmonize a court with its natural landscape.

Broken or flickering shadows, such as might be cast by leaves and branches, are disconcerting to tennis players. Visibility is reduced somewhat by spotty shadows, since the ball blends readily with them. Branches and shadows in motion also affect the player's vision by attracting his attention from the ball. Therefore large trees should be at sufficient distance as not to overshadow the courts. The more compact, low shrubs which may closely surround the courts do not have this disadvantage, and apart from their landscape value serve as a dark background against which the ball appears in bold relief.

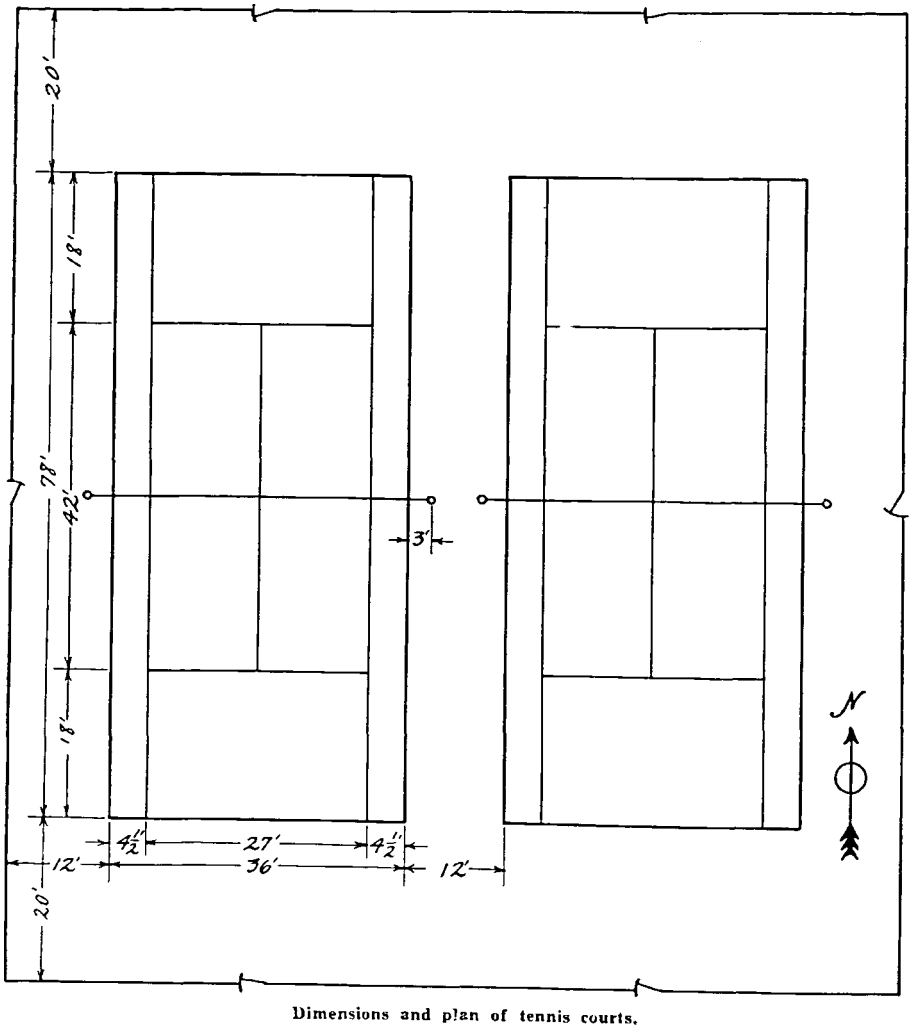
Tennis players may be subjected to great strain by the glare of the sun in their eyes. In building courts it is well to consider this fact and to lay out the courts so that the minimum amount of direct sunshine reaches the player's eyes at the time of day when most play may be expected. The trouble from the direct rays of the sun is worst in the early morning and late afternoon, when the sun is low; hence courts with the long axis running north and south are most satisfactory. However, where numerous courts can be constructed, they should be oriented so that one or more give ideal conditions, in so far as the sunshine is concerned, at all hours of the day. The exact orientation which is ideal for any place or period of the day can be readily computed. The factor of light shining directly into the players' eyes while facing the net should also be considered if electric lighting is installed for night play.



Trees and shrubbery about tennis courts greatly improve playing conditions and add to the beauty of the landscape. Their graceful outlines help to conceal the bold monotony of the courts and the artificiality of fence posts and electric wire poles.

Usually fairly level ground is selected as the site for tennis courts, and when the depth of the excavation for the foundation or base is planned allowance should be made so that the finished surface of the courts will be some inches above the elevation of the surrounding ground level. This elevation of the surface will assist in the drainage and will also prevent surface water from overflowing the courts. When courts are cut into sloping ground, a gentle swale or open ditch should be constructed on the hillside to protect the courts from surface water from higher elevations. Sometimes a stone or concrete wall is used for this purpose. In any case a line of tile should be buried on the upper part to a depth the elevation of which is not greater than the elevation of the courts. The tile trench should be filled with rubble or cinders to within 6 or 8 inches of the surface and the remainder finished with soil. Such a tiled trench will catch water

which might seep through the soil from higher elevations and which would tend to keep the soil in the courts saturated for some time after heavy rainfall. Dirt removed by grading work from the area to be occupied by the courts can be used to good advantage for filling low spots in the immediate vicinity of the courts and for filling outside of the fence line.

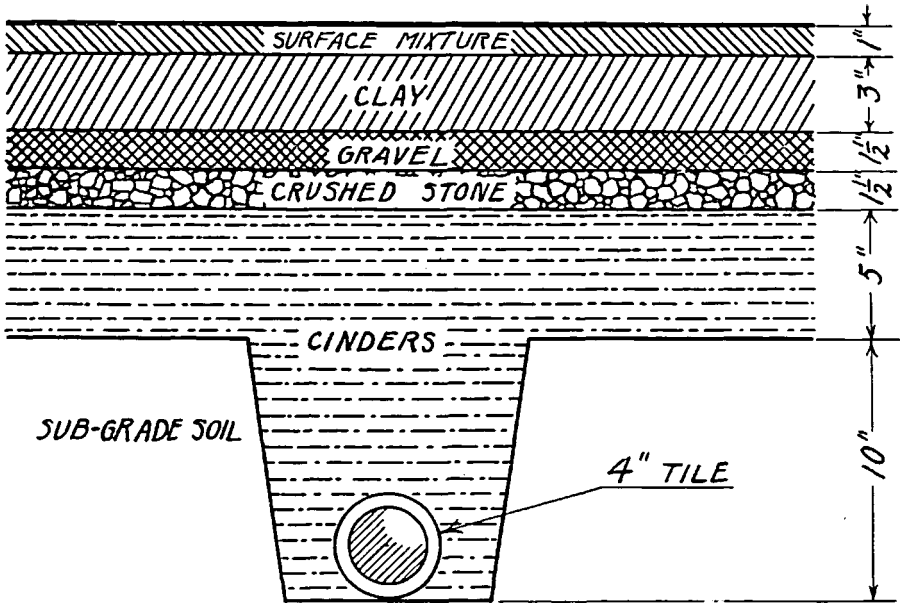


Dimensions and plan of tennis courts.

The most common surface grading of tennis courts is from end to end. The courts are level from side to side and drop 4 inches from one end. To have the courts level from side to side with a drop of 2 inches at either end from the center is also frequently considered desirable to provide surface drainage.

For localities having climates no more severe than that of Washington, D. C., where the thermometer seldom drops below 10 degrees Fahrenheit, a very deep or heavy foundation is not necessary; a simple cinder foundation 6 to 8 inches in depth is all that is required

if adequate drainage has been provided. However in more northerly locations where extreme winter conditions may be expected, it is wise to put in a much heavier base. Several inches of 1½-inch crushed stone should be laid over the cinders and finished off with a layer of washed gravel. It will take 8 inches of cinders to make a 6-inch fill after they have been wet down and rolled with an ordinary broad-wheeled tractor or heavy roller.



Cross-sectional diagram of the structure of a clay tennis court.

Tile drainage lines should be laid 10 feet apart in clay and silt soils but can be 15 feet apart in loam and sandy loam soils. The tile should be laid deep enough so that the top of the tile is at least 6 inches below the surface of the subgrade. Four-inch laterals should be used, which will require a 6-inch main. All laterals and main tile lines should have a drop of at least 1 inch in 5 feet. The joints of the tile should be covered on the upper side with strips of tar paper to keep the tile from filling with sediment during settling. The tile should be well packed with cinders and the trench filled to the subgrade surface with the same material. The laterals should be of glazed tile, while vitrified sewer pipe should be used for the main. The joints of the main should be cemented, but the joints between the tile in the laterals should be left open.

No water outlets should be placed within the tennis enclosure. There is always considerable drip or spilling of water around these outlets. Apart from the untidiness of such damp areas they are of much annoyance to the player, since balls which inadvertently roll near the outlets become wet or covered with mud. When outlets are left outside the fence there is no need for water piping under the courts and hence a source of possible danger is eliminated. A broken pipe under the courts may cause considerable damage to the surface.

If hose connections are placed at either end of each court outside the fence almost any part of the court may be watered without un-

necessary dragging of hose over the playing surface. There should be at least one drinking fountain to every group of courts, and the fountain should be placed in a shady place in order to keep the water as cool as possible. Drinking fountains and hose connections should be placed near gates. No water pipes should be buried in the immediate vicinity of electric light wires.

Net posts should be set before the clay base is laid. The distance from the surface of the court to the top of the pulley through which the net cable runs must be exactly 3½ feet, and the pulley should be so fixed that the top of the post is not more than ¼ inch higher than the top of the pulley. Posts should be anchored 3 feet deep in the soil by being set in concrete.

A base of 3 inches made from clay which will pass through a ¾-inch mesh should be laid over the cinder or stone drainage base. Previous to laying the clay the drainage base should be well settled and rolled and should be true to grade. The clay soil used for this purpose should be about 1/3 clay, 1/3 silt, and 1/3 sand, and a careful physical analysis should be obtained before using the soil. Clubs can experiment with different mixtures of clay and sand which they may have available, but it has been found that a mixture of 1/3 of each of pure clay, silt, and fine sand makes the most lasting and satisfactory surface. The clay base should be wet down, settled, thoroughly tamped and rolled, and the grades checked, before the finish or surface coat is laid.

The surface layer should be of the same materials as the clay base. It should however be passed through a ¼-inch mesh before being laid. The surface layer, as indicated in the accompanying diagram, should be 1 inch thick when rolled. This layer should be carefully spread, allowing 25 per cent more bulk for shrinkage after rolling. It should be sprayed with a fine spray and rolled until solid. Some sharp, fine sand may be dusted over the surface if it is somewhat sticky. Any small depressions that show up in the surface after a rain should be marked and gradually brought to grade by light top-dressings of the clay surface mixture. Tennis court surfaces are sometimes colored or tinted various shades to reduce the glare from reflected light. This treatment also aids visibility. It is always well to consult those having experience with colored courts as well as those handling the material before undertaking this treatment.

Dusting the courts with chloride of calcium helps to bind the surface material and make the courts wear better. This treatment also darkens the surface and prevents glare much as coloring does.

Fences should be at least 10 feet high entirely surrounding the courts. Posts of 2-inch wrought iron pipe 13 feet long extending 3 feet in the ground and set in concrete do very well for the framework. The fence should be galvanized wire of 1-inch mesh. If wire is used to hold the netting at the bottom it will soon become stretched from one cause or another and will allow balls to get under it. For this reason something solid, such as a 2-inch by 4-inch wooden sill or iron piping should hold the bottom of the netting between the posts; it should be placed sufficiently above the ground to allow surface water to escape readily, but close enough to the surface to prevent a ball from passing beneath. There should be gates in all sides of tennis enclosures for the convenience of the players. The fence should be painted some inconspicuous color, such as dark green.

Covering Bermuda Greens for Winter Protection

By Howard Beckett

Capital City Club, Atlanta, Ga.

Our experience during the past 10 years at the Capital City Club has led to the conclusion that the only grass that will come through our summer months with a vigorous growth and furnish a fairly good putting green, at a maintenance cost that is not prohibitive, is Bermuda grass. It is a hot-weather grass, making its greatest growth from June until October. Its care over winter, however, presents a problem. It is very sensitive to cold, being killed to its roots with the first severe frost, which occurs here about November 10, and if unprotected during severe freezes being so severely injured that about 95 per cent of the grass is killed out entirely. This severe winterkilling of Bermuda greens is doubtless due to the fact that under putting green conditions the grass becomes shallow-rooted, on account of constant close cutting, the roots being only from ½ to ¾ inch below the surface of the soil. During the winter these greens are nearly covered by an abundance of annual bluegrass (*Poa annua*). This has generally been allowed to grow unchecked on the dormant Bermuda turf during winter, to be scraped off in the spring when new growth from the Bermuda grass could be expected. This practice has not proved satisfactory, as much reseeding is necessitated and frequently the season for Bermuda grass is nearly half over before a suitable turf can be produced. Besides, with the scraping off of the annual bluegrass in the spring a great deal of the fine soil and fertilizer that had been applied to the greens the preceding season is removed.

Here in the South, where the temperature during winter is subject to sudden and at times extreme variation, and where a great deal of winter play is still demanded, it is almost impossible to play the same green the year round and have good greens. We have consequently installed double greens on all our holes. The winter greens are planted with winter grass in September and are ready for play by the time our summer greens must be abandoned, which is about the middle of December. This gives us an opportunity to protect the Bermuda greens when they are out of play during the winter, and at the same time to keep the annual bluegrass from invading them.

We have a great many pine trees on our course, which shed their needles in the fall. Most of these needles have been lying on the ground for years. We gathered enough needles in the first year of our experiment to cover one green about 6 inches. When this covering was removed the following spring the green was entirely free from annual bluegrass and the Bermuda grass runners were in excellent condition. The green was then given a heavy raking and some commercial fertilizer was applied, and was ready for play sooner and was in much better shape than the other greens on our course. We have accordingly been covering all our greens for the past three winters. During the past summer our Bermuda greens were in wonderful condition, the texture of the turf being finer than heretofore and the subsoil being as soft as a cushion. We have thus been enabled to play our regular summer course weeks in advance of the time that was possible during seasons when we had left the greens uncovered.

Changing Grasses on Putting Greens

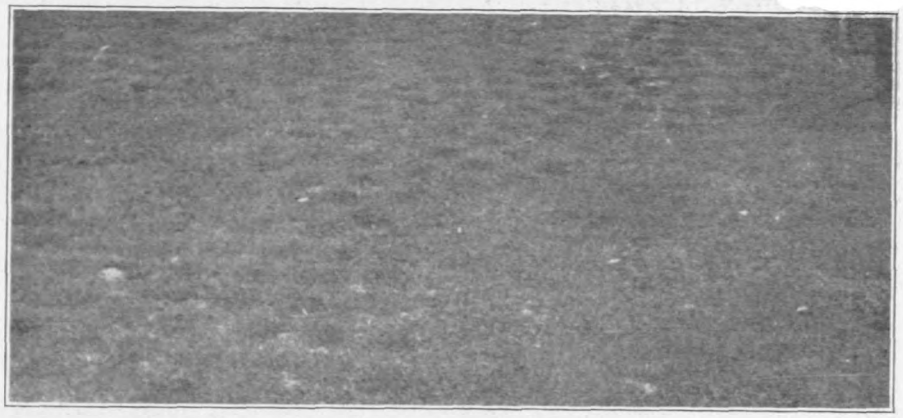
By John Monteith, Jr.

During the past few years a number of golf clubs have been interested in the possibility of establishing new turf by sowing seed on old turf of an undesirable strain of creeping bent. On many courses the Virginia strain has proved entirely unsatisfactory and the club officials have been looking for some grass seed which could be sown on such greens and which could be expected to ultimately drive out the Virginia bent. Other courses have used a finer bent of the Columbia type and have found that this too was undesirable.

Raking a green planted with stolons of Virginia bent preparatory to seeding with seaside bent (the 16th green of the Country Club of Buffalo). The mat of old stolons was removed from this green in late August by vigorous raking and cutting. The seed was then planted and top-dressed.

We are frequently asked whether sowing seed of redtop, German mixed bent, Rhode Island bent, seaside bent, or some other grass would ultimately change the character of the turf. Unfortunately there is little experimental evidence available to furnish a reply to such inquiries. It has been repeatedly shown that the various strains of creeping bent planted with the stolon method will crowd out mixed bents, redtop, and other grasses produced from seed. The aggressiveness of the creeping bents planted with the stolon method usually results in the smothering out of even old, established grass plants produced from seed planted many years ago. In any turf there is always a competition between the various desirable grasses as well as against the weeds. The more vigorous grass ultimately survives. Since old, established turf of redtop, fescue, Rhode Island bent, and German mixed bent grown from seed has repeatedly proved to be

incapable of competing with creeping bents grown from stolons, it seems entirely unlikely that seedlings of these grasses would in turn be able to offer much resistance against vigorous, established creeping bent. Nevertheless we find many courses where attempts are being made to change the turf by sowing large quantities of redtop, fescue, Rhode Island bent, and German mixed bent. So far we have yet to see a green where this procedure has produced the desired results. There is however one variety of creeping bent, of which seed is available on the market, which has a better chance of surviving in the struggle against established turf of stolon-planted creeping bent. This is the seaside bent, which is sometimes sold under other names. When sown in a new seed bed this grass produces a very thick and desirable putting green turf. It spreads by means of stolons, just as do the other creeping bents, and therefore it is able to offer more effective competition against other strains of creeping bent than is offered by grasses which do not creep in this manner. A few instances are known where seaside bent has been sown and has become established on a creeping bent turf. In all cases where it has become



Metropolitan bent plugs planted in areas on a Richmond green where Virginia bent was too thin. From these circular plugs the Metropolitan bent will in a few weeks crowd out into the surrounding areas. It will soon entirely replace the Virginia bent.

established the stand has not been uniform, having resulted in a somewhat patchy appearance on the green. Nevertheless these results have shown enough promise to justify the expectation that by repeated attempts this grass may be able to entirely replace the old type of turf. In any case the use of seed for such purposes is uncertain, depending largely on the season and on the condition of the established turf. The Virginia type, especially, is apt to be injured badly by zonate eye-spot and to be somewhat feeble during the latter part of the summer and early fall. If seed of seaside bent is sown in late summer so that the seedlings may become established during the period when the Virginia bent is not able to offer much competition it is likely that the new grass can become sufficiently established before the Virginia has recovered enough to choke it out. On the other hand, after seaside bent seed is sown the weather conditions may change and be entirely favorable for the rapid recovery of the Virginia bent. In such cases there is very little likelihood that the seaside bent will ever get beyond the seedling stage. In any case

it is merely a gamble, with the odds usually very greatly against the seedlings. However it is a gamble which many courses regard as worth taking rather than to resort to the more drastic method of tearing up the sod and replacing with new sod grown in a nursery. The latter treatment of course is more dependable and probably would prove not much more costly in most cases. If seaside bent is desired, a good turf of this grass can be established in a nursery bed and transferred to greens at a time when play on the course is not heavy.

The new strain of creeping bent planted in rows across a green of Virginia bent on the old course of the Country Club of Virginia. The stolons of the new strain of bent were planted in rows in the spring and soon crowded out the old grass.

Another method of changing the quality of turf is to plant stolons of a more desirable strain of creeping bent. The Washington and Metropolitan strains have repeatedly crowded out weaker strains of creeping bent. As a rule these strains will very quickly replace Virginia bent if they are planted with the Virginia or even after the Virginia is well established. One method of planting is to rake old turf very severely and scatter the chopped stolons of the Washington or Metropolitan strain on the old turf, as if it were a new seed bed. This operation is followed by top-dressing, rolling, watering, and otherwise caring for the new turf as if the old turf were not present. After the new stolons are established they will gradually crowd out the old grass. Still another method is to make incisions in the old turf and in these press stolons of the desired grass. In changing the turf by planting stolons of a different strain of bent the green is put out of play only for a short time while the work is being done.

Brown-Patch and Its Control at St. Louis

By A. J. Goetz

Algonquin Golf Club, Webster Groves, Mo.

The seriousness of brown-patch diseases as a problem in golf course maintenance varies greatly. With some clubs they are a major problem; with others scarcely a problem at all. The successful handling of these diseases, as with many other problems of golf courses, must be governed largely by local conditions; and on the judgment and experience of those in charge, much will depend.

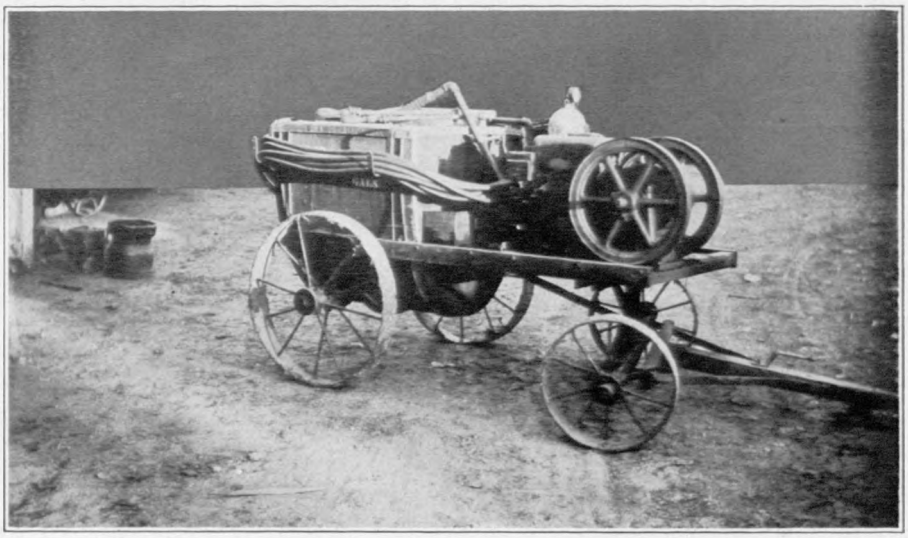
At Algonquin we have found that bent is the grass best suited for putting greens and that it is affected by brown-patch no matter how the soil is prepared or how the grass is handled. Our regular greens are seeded German mixed bent grass. Of our 18 temporary greens, about one-half are German mixed bent and the remainder are the Virginia strain of creeping bent. Most of our tees are creeping bent of different strains. Our practice green of 12,000 square feet consists of three plots, of German mixed bent, creeping bent, and seaside bent, respectively. We also have considerable areas of creeping bent of different strains in the fairways. We have been testing creeping bents, velvet bent, and other grasses for a number of years. Our tests indicate that the creeping bents are much more resistant to large brown-patch than are other grasses commonly used on putting greens. The Washington strain of creeping bent appears to be more resistant to large brown-patch than any of the other 25 strains we have tested; on the other hand, it appears to be the least resistant to small brown-patch. The soil of our greens is a clay loam.

Large brown-patch makes its appearance at St. Louis about May 15 and continues until about October 1. Between these dates it presents an incessant problem, especially serious during the three months of hottest weather. It is the chief problem on some golf courses in the St. Louis district, and, strange as it may seem, on some courses only a short distance from these, with similar grass and soil conditions, it rarely appears. The rapidity with which it develops, the frequency of its appearance under certain conditions, and the serious damage it may cause within two or three hours, make it by far the most serious problem we have at Algonquin.

Small brown-patch makes its appearance about two weeks earlier than large brown-patch and lasts from two to three weeks later in the fall. It is more or less of a problem on all courses in the St Louis district, but is not nearly so serious as large brown-patch, since its attacks do not appear so suddenly, giving more warning and thus enabling one to treat the greens before much damage results. Control measures may be relied upon to keep the disease out of the greens for a much longer period than is the case with large brown-patch; yet if treatment is delayed or improperly conducted when the first warnings appear, the results may at times be disastrous.

Both types of brown-patch are prevalent on our greens at Algonquin, the large brown-patch being the more serious. Prior to 1925, before treatments with mercury compounds came into use, it was expected as a matter of course to play on bare ground on our greens after the first of July, due to the ravages of brown-patch. Mercury treatments were inaugurated at St. Louis early in the season of 1925. Semesan was first tried, in applications of 1, 2, and 3 pounds

to 1,000 square feet, to determine whether the heavier applications would give protection for longer periods. It was found that the heavier applications did not materially add to the length of time the turf was protected. Our study of the problem at length led to the conclusion that better results could be expected if efforts were made to apply the chemical directly to the blades of the grass and not to the ground, since the disease attacked the blades and not the roots of the grass. So we began to experiment with a spray pump instead of the barrel sprinkler as a means of applying the chemical. We used the same concentration of Semesan, that is, 1 pound to 50 gallons of water—spraying this quantity on about 6,000 square feet of turf. With the spray pump this was enough to wet the grass on the 6,000 square feet thoroughly, while with the barrel sprinkler we could cover only 1,000 square feet with 50 gallons. It was found that such an application would effectively check an attack of brown-patch; and that while it did not give protection for quite as long a time as the heavier application, yet with more frequent applications the disease could be kept under better control at a greatly reduced expense.



Power sprayer used for the past few years at the Algonquin Golf Club in applying brown-patch fungicides.

At about the same time, experiments at the Arlington turf garden were directing attention to the use of corrosive sublimate (bichloride of mercury) and calomel (chloride of mercury) in the control of brown-patch. We began to use these chemicals in a small way. We soon found that the dose used at Arlington was too strong for the grass on our greens, producing in some instances severe discoloration, especially so when applications were repeated at short intervals. We continued these tests through the seasons of 1927 and 1928, gradually reducing the dose, especially of corrosive sublimate, as this seemed to be particularly effective in the treatment of large brown-patch. We finally decided that 1½ ounces of corrosive sublimate to 50 gallons of water was about the right dose for an area of 6,000 square feet; and

that is the dose we have used during the past season, 1929. It is a 1 to 4,400 solution. We used this solution throughout the worst part of the past season with satisfactory results and at a great saving in cost of the chemical used.

We have found that a heavy rain following an application is apt to result in an attack of large brown-patch no matter what treatment is used. During periods of hot weather with frequent rains and high humidity, large brown-patch becomes a trying problem indeed. Under these conditions we think an application of 1½ ounces of calomel to 1,000 square feet is the best treatment to hold the disease in check until the weather settles, since calomel is less soluble than corrosive sublimate and therefore less liable to be washed away. The calomel should be applied dry, mixed with sand to provide an even distribution. This treatment was used on one course within a few miles of Algonquin where only small brown-patch and no large brown-patch appeared throughout the season. In this case applications at such intervals as appeared necessary served to prevent damage over the entire season.

A comparison of costs of the various treatments we have relied upon at Algonquin based on present costs of labor and material will show how we have reduced the expense of handling the problem. According to our figures, the cost of labor in applying the chemical to the greens with a power sprayer is 1/6 the cost in applying it with a barrel sprinkler. The cost of the necessary corrosive sublimate is 1/10 the cost of the chemicals previously used. A single application as used at Algonquin a few years ago cost a total of $288 for the full set of greens. With the new system, employing a different method, different chemicals, and a reduced rate of application, the total cost for the same set of greens is $7.60.

The working out of this problem has called for a great deal of painstaking labor and careful observation, but we feel that results have justified both. The light dose of corrosive sublimate can not be applied by any other means than a spray pump; but in our case the saving in the cost of treating greens has paid for the equipment many times. We are using a sprayer rated at 12 gallons to the minute against 300 pounds pressure. We can spray our 20 greens in about 4 hours, 2 men doing the work. The machine cost us about $850 complete. Power sprayers cost from about $300 to about $850. A hand sprayer may be purchased for about $60 complete. Where much use is required, the better machine will result in saving much labor and enable one to treat the greens much more quickly, which is a very important consideration when brown-patch is active.

The results we have obtained from 1½ ounces of corrosive sublimate applied to 6,000 square feet we think about equal the results obtained from 1 pound of Semesan (chlorophenol mercury) applied to the same area in the treatment for both large and small brown-patch.

We have found the effects of calomel to be more lasting in the treatment of small brown-patch than either corrosive sublimate or Semesan. The latter however are much more effective in the treatment of active large brown-patch except when the weather conditions are such as to render the use of soluble materials impractical. Under such conditions calomel may be useful in holding the disease in check until the weather clears. In applying calomel we mix 1½ ounces of

calomel with 1 quart of sand. The sand should be just moist enough so the calomel will adhere to it when scattered on the green. If the sand is too dry the calomel will dust out and drift with the wind. If the sand is too wet the mixture can not be scattered well. In either case an uneven distribution results. The calomel must be thoroughly pulverized and thoroughly mixed with the sand. One quart of the mixture is measured out to be scattered on 1,000 square feet of surface. Men who can scatter the mixture and do a good job of it are scarce. Unless it is evenly distributed good results are not to be expected. A good plan is to scatter one-half of the mixture each way, following the marks left by the mower in cutting the green. We have not found it necessary to water such applications in. We do not believe that calomel can be distributed as evenly with the spray pump as it can be by hand.

For the benefit of those who may wish to try the application of a solution of corrosive sublimate by means of a spray pump I shall describe in detail the method we employ. We use 5 one-gallon glass jugs as containers for our concentrated solution. The following utensils are used in preparing the solution: 1 three-gallon granite pail; 1 granite funnel; 1 wooden stirring paddle; 1 pint bottle; 1 planed board 10 by 24 inches; 1 small scale which will weigh accurately; 1 china cup or glass tumbler for handling the chemicals. The corrosive sublimate must not be allowed to come in contact with metal when preparing or storing the solution. One of the glass jugs is filled with water to about 4 inches from the top. One-half pound of chloride of ammonia is put into the pail; this is used solely as a solvent for the corrosive sublimate, as without its use it is impossible to dissolve the latter. The water from the jug is then poured over the chloride of ammonia in the pail. One pound of corrosive sublimate is placed on the planed board, and with the bottle as a pestle is reduced to a powder by mashing the lumps. The powdered corrosive sublimate is then dumped into the pail containing the water and chloride of ammonia, and the mixture is stirred until both chemicals are thoroughly dissolved. The solution is then poured, through the granite funnel, into the glass jug. Should this not fill the jug, water is added until it is filled, and a stopper is inserted. This gives 1 gallon of stock solution. The jug is placed in a square box, large enough to contain the jug with a couple of old sacks wrapped around it to prevent breakage in hauling. After the solution is prepared the utensils are washed.

A pint bottle is used to measure out the solution. As 1 pound of corrosive sublimate is contained in the 1 gallon of solution in the jug, the solution weighing approximately 128 ounces, 1½ ounces of corrosive sublimate are contained in 12 ounces of the solution. To measure out 12 ounces of the solution, the pint measuring bottle is placed on the scale and filled with 12 ounces of water by weight. With the edge of a file, a mark is cut into the side of the bottle to show the height of the 12 ounces of water in the bottle. When the bottle is filled to this mark with the solution, a solution of 1½ ounces of corrosive sublimate is obtained. This quantity of solution is sufficient for a barrel, or 50 gallons of water. When the pint measuring bottle is completely filled, a solution of 2 ounces of corrosive sublimate will be obtained. It is possible that in some cases a 2-ounce solution in a barrel of water will not discolor turf. Should however discoloration result, the

strength of the dose may be readily reduced. Greens quickly recover from discoloration produced when this light dose is sprayed on the grass, as the roots of the grass are not injured as is liable to happen when stronger doses are used and watered in.

When ready to begin spraying, ¾ pint (12 ounces) of the stock solution, measured out in the graduated bottle, is added to each 50 gallons of water in the tank. Before starting to spray, the solution should be thoroughly mixed into the water in the tank. Fifty gallons of the mixture are sprayed as evenly as possible over 6,000 square feet of surface; this is not watered in, but the spray is allowed to dry on the grass. Best results may be expected when the grass is dry. If the greens are wet it is advisable to brush the water off the grass and allow it to dry before spraying, unless an emergency should render such delay inadvisable.

Care must be taken in using corrosive sublimate, as it is a deadly poison. There must be no leaks in the hose or anywhere about the sprayer, as severe burning of the turf may result from leaks.

After the day's spraying, the solution is drained from the tank and the tank and hose are thoroughly washed out by pumping clear water through for several minutes. None of the solution should be allowed to remain in the equipment over a period of several days.

The brass barrels with which spray guns come equipped will not withstand the action of corrosive sublimate. We have accordingly substituted iron pipe for the brass barrels, constructing a double-nozzle spray on each of our two lines of hose. After using the solution throughout the season we have not observed any damage to the equipment aside from the damage to the barrels of the spray guns.

We spray our greens on Saturdays during the worst of the brown-patch season regardless of whether brown-patch is evident or not; this is to give the greens protection from an attack over Sunday. This has served its purpose throughout the past season, except on one occasion, when unfavorable weather necessitated our spraying a few greens on Sunday. Ordinarily during the worst part of the season, which lasts with us for about three months, spraying twice a week has served to keep large brown-patch under control; only occasionally has it been necessary to spray the greens more often. Under this treatment small brown-patch has never appeared. The only time we have small brown-patch on our greens is early in the season or late in the fall, before and after the prevalence of large brown-patch. It is, however, found to occur on our creeping bent tees and temporary greens, which are not treated as often as the regular greens, and also on the bent in our fairways, which receive no treatment. It would be interesting to many to see brown-patch at work on the bent grass in these fairways where it has been planted and is growing in places without fertilization or artificial watering.

Success in controlling turf diseases, as in other problems of golf course maintenance, depends greatly on the use of careful methods. Haste and carelessness, with resulting uneven distribution of the chemicals applied, are very apt to bring failure.

A grassy hollow is often more effective than a sand trap, always more attractive in appearance, and never as expensive to build and care for properly.

QUESTIONS AND ANSWERS

All questions sent to the Green Section will be answered in a letter to the writer as promptly as possible. The more interesting of these questions, with concise answers, will appear in this column. If your experience leads you to disagree with any answer given in this column, it is your privilege and duty to write to the Green Section.

While most of the answers are of general application, please bear in mind that each recommendation is intended specifically for the locality designated at the end of the question.

Determining the value of commercial fertilizers.—How does the * * * Company's Fairway Fertilizer compare in value with cottonseed meal? (Delaware.)

ANSWER.—Commercial fertilizers should be judged chiefly by their guaranteed analysis, allowance being made for the difference in price of the nitrogen, phosphoric acid, and potash. We believe the information you desire can be obtained from the June, 1928, number of the Bulletin, notwithstanding the particular brand of fertilizer to which you refer was not directly referred to in that issue of the Bulletin.

Destruction of birds by house cats.—A number of our birds, robins and cowbirds in particular, are being destroyed every day. The destruction takes place at twilight or early morning. It is due to some kind of animal, the whole body of the bird being eaten, feathers and legs only being left, as evidence. We have thought it might be weasels, rats, or hawks. Had it been only one or two birds killed, we would not bother you, as small birds are prey to animals at any time, but we have had so many destroyed each day that in our helplessness we thought you might give us an expression of opinion and suggest a possible correction. (Pennsylvania.)

ANSWER.—We suggest that you be on the lookout for cats prowling about your course. In cases such as yours it seems to be the usual thing to direct all suspicion toward some of the wild animals, whereas our old friend the house cat is granted all the privileges of the outdoors and is usually regarded as "too quiet and gentle" to arouse even the slightest suspicion. A weasel ordinarily does not consume the body of its prey; rats would probably not be operating out on your course during the early morning and early evening; and hawks would no doubt fly away with their victims as soon as possible. Of course there may be other wild animals killing the birds, but before you hunt for wild animals you had better check up on your cat population. Birds and cats apparently do not flourish together. Since a choice must be made and birds are useful as well as interesting about a golf course, we advise you to add a shotgun to your golf course equipment and to stage a few cat hunts early in the morning when the cats are likely to be prowling about and when players are few.

Injury from shallow surface soil on hard clay or silt.—We are sending you three pieces of sod from three different greens on our course. During the past season each of these greens suffered several attacks of what appeared to be brown-patch. These greens have not received any lime. Several other greens on our course were treated with lime in April, and they have suffered less from brown-patch. We should be glad to have your advice as to whether or not these greens could be expected to improve with applications of lime. We are using a 7-9-2 fertilizer on our greens in spring and fall. Is this a well balanced fertilizer? (Missouri.)

ANSWER.—We have tested the soil of the samples of sod which you have sent us and find the soil in all three of the samples to be neutral in reaction, all testing around pH 7. With this condition we should not expect that lime would be of any particular benefit to these particular greens. The soil of your No. 1 and No. 2 greens is a clay loam, and we find that the soil immediately below the turf is packed or puddled. This condition has greatly restricted the root development of the grass, the turf lying on top of the hard clay like a thin blanket. The separation is further accentuated by a thin layer of peat which lies just below the turf. The condition of your No. 3 green is similar except that the surface soil is a silt and not a clay. We feel that the correct treatment for these greens is to remove the sod, put on a layer of coarse sand, then a layer of well rotted manure or other organic material, then plow these into the soil, and follow with a thorough disking. This treatment would give you a bed of good, friable soil to a depth of 6 or 8 inches. The mixing of sand and manure into the soil would put it in good physical condition. The area could then be rolled and hand-raked and the sod replaced. While this work is being done such tile drainage as might be found necessary should be installed.

The 7-9-2 fertilizer which you are using is what would be called a complete fertilizer in general agricultural practices. For turf growing purposes however a fertilizer higher in nitrogen than either phosphorus or potash is to be preferred. The use of a complete fertilizer on putting greens in early spring and fall is desirable, but during late spring and summer we advise the use of fertilizers of high nitrogen content and containing little or no phosphorus or potash.

Results of mixing strains of bent in putting greens.—We have both Columbia bent and Washington bent stolons in our nursery. Would there be any harm in mixing the two strains in planting them on our greens? (Kentucky.)

ANSWER.—The treatment you suggest would prove very unsatisfactory. The Columbia strain of creeping bent is not sufficiently resistant to disease to give satisfaction in putting greens; moreover, it forms a rather stringy, light turf which is not conducive to good putting. The Washington strain is so superior that in all likelihood it would eventually crowd out the Columbia strain, but while this is taking place you would have patchy greens, as the Columbia would become thin and diseased at times when the Washington would be in good condition. Furthermore, when the Columbia remains thin from one cause or another white clover and weeds are certain to gain a foothold before the Washington strain has a chance to occupy the thin spots.

Value and use of commercial humus.—We are sending you a sample of some humus which we can buy for $7.50 a ton delivered. We are also sending you a printed circular giving its analysis. We should appreciate your advice as to the value of this material for use as a top-dressing on our greens. We seem to be unable to procure any other good top-dressing material, finding that the preparation of compost is a rather irregular and uncertain proposition. (Missouri.)

ANSWER.—The types of peat or humus of which you send us a sample are valuable chiefly for their content of organic matter and possess practically no fertilizing value, since the nitrogen, phosphorus, and potash which they contain are in a very insoluble or inactive form and could not be rendered available to the plant except under special treatment. The price of your material is therefore, in our opinion, out of proportion to its value. Good garden loam may be procured much more cheaply; and by mixing 100 pounds of sulphate of ammonia, 100 pounds of acid phosphate, and 25 pounds of muriate of potash with 4 or 5 tons of garden loam, a very good top-dressing material would be obtained, provided of course the material were comparatively free from weed seeds and of a good physical structure. Good loam could probably be obtained by you for from $2 to $3 a ton. Also strawy manure of any kind is far more valuable than peat or commercial humus. The plant food in the manure is not only more readily available, but the manure aids bacterial action in rendering soil constituents available as plant food, and also is practically 100 per cent organic matter. Peat has nevertheless a place on the golf course when good loamy soil can not be procured and when sufficient manure is not obtainable. In the construction of compost piles or soil beds, peat may largely replace manure, which is generally used. It is, however, well to use some fresh manure in the compost pile or soil bed along with the peat in order to stimulate bacterial action. Frequent cultivation of such a mixture of peat, soil, and manure renders the peat more available and develops a fair soil structure by thoroughly mixing the constituents. Often natural beds of peat can be located nearby a golf course.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, OF THE BULLETIN OF THE UNITED STATES GOLF ASSOCIATION GREEN SECTION, PUBLISHED MONTHLY AT WASHINGTON, D. C., FOR OCTOBER 1, 1929.

District of Columbia, ss:

Before me, a notary public, in and for the District of Columbia, personally appeared Kenneth Welton, who having been duly sworn according to law, deposes and says that he is the associate editor, managing editor, and business manager of The Bulletin of the United States Golf Association Green Section, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in Section 411, Postal Laws and Regulations, to wit:

1. That the names and addresses of the publisher, editors, managing editors, and business managers are: Publisher, United States Golf Association, 110 East Forty-second Street, New York, N. Y.; editors, managing editors, and business managers, John Monteith, Jr., and Kenneth Welton, Washington, D. C.

2. That the owner is the United States Golf Association, a corporation organized and existing under the law not for profit and having no capital stock.

3. That there are no outstanding bonds, mortgages, or other securities.

(Signed) KENNETH WELTON, *Associate Editor.*

Sworn to and subscribed before me this 1st day of October, 1929.

(Signed) F. E. SINGLETON.

(My commission expires May 4, 1933)

Federal Tax Burden on Outdoor Recreation

Prompt Action Urged Toward Endeavoring To Obtain Repeal of Harmful and Unjust Federal Tax on Dues and Initiation Fees in Golf Clubs

TO MEMBERS OF THE UNITED STATES GOLF ASSOCIATION, SECTIONAL, STATE AND DISTRICT GOLF ASSOCIATIONS:

The Federal Revenue Act of 1928 continued in effect the war tax of 10 per cent on dues and initiation fees to social, athletic and sporting clubs and added a new war tax which had not theretofore been in force, to wit, a tax equal to 10 per cent of any amount paid as the purchase price of shares of stock, bonds or other securities, ownership of which is a condition precedent to membership, *irrespective of the person to whom the payment is made.* Thus, if a golf club is organized and financed by the sale of shares of stock to the members a tax of 10 per cent of the cost of these shares must be paid to the Federal Government. If, as is usual, ownership of a share of stock is required in order to qualify for membership, then when a resigning member sells his stock to an incoming member the latter must again pay to the Federal Government 10 per cent of the purchase price as a tax. It follows that if a complete turn-over in club memberships occurs in ten years the Federal Government will have received in that space of time taxes equal in amount to the total cost of buying and building the club properties. This feature of the act is particularly oppressive and burdensome. Moreover the statute results in discrimination between old clubs which have completed their permanent financing before the tax was put in effect and new clubs being presently formed and which have not completed their financing. Instances of hardship resulting from the added tax which have come to the attention of the United States Golf Association are, for example, a club which assessed each of the members to pay off its capital indebtedness secured by a mortgage. A tax of 10 per cent had to be paid on this assessment. In another case a club had sold $50,000 of 5 per cent bonds for the construction of a course and club house. 250 members paid dues of $100 each upon which the Federal tax is $2,500, the exact amount of the bond interest. In 1929, the club defaulted on its bond interest which it could have paid had it not been for the tax. This default resulted in serious injury to the club's credit. Instances of this kind can doubtless be multiplied and the Association requests it be advised of further cases where hardship has resulted from the imposition of the tax.

It is the belief of the executive committee of the United States Golf Association that the entire tax on athletic and sporting clubs is fundamentally wrong in principle and that it would be a better policy on the part of the Government to promote rather than to tax health-giving outdoor sports. The old objection to the removal of this tax, that golf is a rich man's game, would certainly not be advanced at this time by anyone at all familiar with the development of golf in this country.

At the last regular Congress when the revenue act was under consideration, the Association endeavored to secure the elimination of this tax on dues and initiation fees. The chairman of the finance committee of the Senate and other members of that committee were consulted and letters were sent to certain senators and representatives urging favorable action. These efforts at one time promised success, but in the end the tax was continued with the added burden referred to above. This is sent in the hope of obtaining the cooperation of all member clubs of the United States Golf Association and of sectional, state, and district golf associations in urging their representatives and senators to bring about a repeal of this tax, and this Association earnestly urges that each such club and association and the members thereof use every effort toward this end by sending letters and telegrams urging the repeal of the act at the coming session of Congress. As Congress convenes on December 2, prompt action is essential. The Association would greatly appreciate receiving copies of all such letters and telegrams so sent and any replies that may be received.

UNITED STATES GOLF ASSOCIATION,
PRESCOTT S. BUSH, *Secretary.*

In our century science is the soul of the prosperity of nations and the living source of all progress. Undoubtedly, the tiring daily discussions of politics that seem to be our guide are empty appearances. What really leads us forward are a few scientific discoveries and their applications.

Louis Pasteur