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Charles O. Pfeil

A Tribute

By Honorable James Francis Burke

Speaking from the standpoint of the Royal and Ancient Game, it may be said that Charles O. Pfeil, on the 22nd day of December, 1927, died, "in sight of the promised land."

None of the activities to which he devoted his lifetime held a warmer place in his heart than the great outdoor game which in recent years has conquered two continents.

He had a keen perception of its charm as a pastime and its importance as a recreation.

He was impressed with its growing popularity among the great masses of the people. He realized that the startling suddenness with which it was adding to the number of its devotees was not without its dangers.

He feared that its universal popularity threatened the destruction of the finer attributes which for centuries had sustained its dignity and lofty spirit in the realms of sport.

His apprehensions in that regard were aroused by the increasing tendency of many thoughtless recruits of modern days to treat with indifference the rules and etiquette of the game which he felt was gradually depriving it of its charm as the finest sport in the world.

He was a lover of harmony and deplored dissension. He reveled in the thought that old misunderstandings between sections and sectional organizations would some day disappear like mists before the bright messenger of the morning, and that in the sunlight of intelligent understanding and good will the game would assume greater importance and those entrusted with its destinies would find increasing pleasure in the discharge of their duties with the passing of the years.

He wanted no East and no West, no North and no South, no European and no American invidious distinctions drawn wherever golf was concerned.

He reveled in the thought that the Royal and Ancient Game, given to us by the Scots and cherished by those countless ardent lovers in this country, would be free from every vestige of controversy, with one single undisputed authority in the United States, acting in concord with the Royal and Ancient authorities at St. Andrews, the seat of the golf government of the world.

When he died he saw that dream substantially realized, for concord and good will is now prevailing everywhere.

Charles O. Pfeil

Former President of the Western Golf Association, Vice-President of the United States Golf Association, and Nominee for the Presidency of the United States Golf Association for 1928.

Finally, as he was about to don the coveted mantle of the Presidency of the United States Golf Association, a distinction of which he had dreamed in his anxiety to render service, he was compelled to don the shroud instead.

But in his last hours in his home in Tennessee, in those dreams that preceded the parting of the final curtain on the last scene of life, he was happy in the thought that his contemporaries had virtually bestowed upon him the cherished mantle of honor and authority that comes to the few who attain the highest honors in American golf.

Sand Pits in Deep Clay Soil

Dr. Willis F. Manges, Chairman, Green Committee,
Springhaven Club, Wallingford, Pa.

At Springhaven, in the Philadelphia district, we have an unusually flat course for an inland area. We also have a very deep and compact clay subsoil, so that drainage of sand bunkers offers a serious problem. At least it did prior to the fall of 1924. The best proof that it offered difficulties was evidenced by the fact that we had no real sand hazards. Instead, we had mounds and large cross bunkers that stood out like great welts and bruises, obstructing what view was available, presenting a most unnatural appearance, and serving as hazards in more than one sense. Quite a number of our greens had no sand traps at all, and none of them had any except very shallow surface traps that were most unpleasant to get into and out of in wet weather, and especially in the spring of the year, because of the mud.

During the summer of 1924, we had made a survey of our grounds and with this we consulted one of our most popular golf course architects to see what could be done to our course to make it more nearly like a modern golf course. We were not greatly surprised to hear his first recommendation, which was that we sell this property and buy other and more suitable grounds. One of his reasons for this recommendation was the difficulty of draining properly constructed hazards. But it did not suit us to make so radical a change. We wanted to make the present course suit our purposes.

The architect's next recommendation was that we buy some additional adjoining property and change the entire lay-out. This did not suit us because it called for an outlay of a large sum of money and interference with play for at least one whole season. Instead, we wanted him to rebuild a green here and there, and give us some modern hazards, whether they were to be water hazards part of the time or not. This he did not want to do, and so, to avoid causing him any embarrassment, we asked him to suggest a lay-out for one hole. Our thought in this was that, if the members were given one real modern par four hole, they might be willing to authorize a radical change to meet the second recommendation of the architect.

When the sand pits for this hole were completed, it was evident that we would have no luck with them unless we could provide definite drainage. We drained one by means of tile leading to a near-by roadway. The rest did not lend themselves to such a procedure, so we decided to dig a well in the lowest point of each of the others.

Fortunately, we struck a fairly thick layer of sandy soil at a depth of about 5 feet. These wells we filled with stones and cinders, and this was covered with two layers of sod, the grass side downward. We were so delighted with the results that we decided to rebuild another green and set of hazards at once. This was a par three hole and our first effort to lay out a hole unaided by an architect. We felt that the traps were to be the most important feature because there never had been any at this hole, so we decided to have large traps and fairly deep ones. Again we dug wells and were fortunate to find the sand layer.

Instead of making drawings to show the shape and contour of the green, we made a model of it out of modeling clay, and altogether got a result that has been satisfactory in at least three respects. First, the sand traps have been drained well; second, they have punished many a good player who has been a little careless on the tee; and third, this particular putting green has had one of the most perfect putting surfaces that I have ever seen.

The following fall, we, the Green Committee, were pressed by the other officials and members to make more changes. Up to the present we have rebuilt nine holes. In some areas we didn't find the sand layer in the wells we dug to drain the sand pits at the same level as in the former areas. Instead, we met with an unusually dense and thick layer of clay. It was so hard that we could hardly dig into it. We finally made holes here and there to a depth of about 18 inches and loaded them with dynamite. In this manner we finally reached a sand layer at a depth of about 9 feet. At this depth we then drilled another hole several feet deep and put in a light charge of dynamite. The result of the explosion was to loosen up the sand layer and the ground to even greater depth. In one of these wells we used nearly all fairly large stones for filling, while in another we used nearly all cinders. We feel that the cinders are better than stones and that the top two or more feet should be fairly fine cinders. They seem to hold the sod and sand better than larger cinders or large stones.

All but one of the new sand traps have been draining very satisfactorily. This exceptional one has not done well in spite of the fact that we dug three fairly large wells in it. I have come to the conclusion that this trap is fairly close to a spring area and that the wells are possibly a little too deep. We intend to run a tile drain from this trap to a distance of about 200 yards where we can pick up a larger drain that drains our swimming pool.

In several instances, where the first well has reached a fair strata of sand, we have connected other near-by pits to the one containing the well by means of tile. In other instances, we have run a drain from a new pit to a drainage line in an adjacent fairway or to a slope near the pit. The water has left these tile-drained traps very quickly, but then, too, a good quantity of sand has also gone down the pipe. We have been able to recover practically all of this sand, but we hope to have fair control of this by means of heavy burlap being fastened over the intake end of the pipe.

The past season has furnished a very severe test of drainage anywhere, and we are pleased with the manner in which our sand pits behaved.

In one course we wanted a very large area of sand hazard. We required an elevation of at least 4 feet to provide proper visibility. There was at this point a large bunker about 7 feet high and about 20 feet long. This mound was all top soil, so we carted it to the compost pile to be used for topdressing, and then we dug up enough of the surrounding area to make a round mound about 6 feet in diameter and about 4 feet high. The crown of this was made fairly flat and sodded. The sides were sloped enough so that sand could be kept up to the edge of the sod. An area around this mound to the extent of about 2,000 square feet was dug just deep enough to retain a fairly thick layer of sand. Scattered over this area we made numerous small mounds which were completely covered by sand. The drainage from this hazard was entirely a surface matter and, fortunately, one side was a little lower than the other and we have had no trouble at all with it. It has also turned out well from the viewpoint of play.

This brief communication is given from one inexperienced person to those of you who are equally inexperienced with the hope that you may profit by our mistakes as well as our successes.

Physical Soil Factors Affecting Turf Growth

By O. J. Noer

Neglect to investigate thoroughly physical soil relationships preliminary to improving poor turf by fertilizer or other means may lead to failure. Unfavorable soil conditions frequently overshadow everything else, and until corrected defeat any program of improvement. Several years ago an otherwise excellent course possessed two very poor greens. When fertilizer failed to effect improvement, excessive shade was held responsible. Investigation, however, revealed faulty construction to be the major cause. The seed bed consisted of a 2-inch layer of peat superimposed upon 4 inches of beach sand. Fortunately the underlying soil was excellent, so deep plowing to thoroughly incorporate the sand and peat with the deeper soil corrected the difficulty and, today, these greens are the equal of any on the course. While this is admittedly an extreme case, there is great need for more careful consideration of physical soil characteristics, particularly on greens. The use of too heavy top soil during construction often retards and, occasionally, prevents the establishment of good turf. Consolidation takes place and prevents the free entrance of air and water into the soil.

Besides a multitude of small mineral particles and organic matter, soil contains water and air, all of which are essential to normal turf growth. Each cubic foot of good surface soil consists of approximately 50 per cent solid matter, 25 per cent air and 25 per cent moisture or water. The organic matter rarely constitutes more than 5 per cent of the solid soil substance. Turf plants anchor themselves to the soil by means of an extensive root system, and depend upon it for water and mineral food elements. Insoluble plant food elements dissolve in the soil water and both are then imbibed by the minute root hairs. Without energy life is impossible, a rule to which roots are no exception. They breathe to obtain oxygen and release

energy. The process is one of slow combustion, and is similar to the respiratory process of animals.

The water-holding capacity of the soil and the amount of air space depend upon the size and arrangement of the individual soil particles. Differences in the amount of surface depend upon size and determine the capacity to hold available water and affect the rate at which solution of plant food takes place. Careful selection of soil for use on greens with these facts in mind minimizes subsequent maintenance problems.

The general term "texture" refers to the size of the soil particles. Thus, sands, loams or clay soils are said to be coarse, medium or fine textured. For practical purposes the individual particles are arbitrarily grouped into seven classes; namely, fine gravel, coarse sand, medium sand, fine sand, very fine sand, silt and clay. The limits of the various classes are determined by their relative value in affecting the physical properties and crop-producing powers of the soil.

The extreme variation in size is striking. Approximately 25 grains of coarse sand placed end to end span an inch, whereas more than 5,000 clay particles are required to span the same distance. Differences in size also account for the enormous differences in the numbers of particles in a given volume. In one grain (less than a teaspoonful) there are approximately 45 billion clay particles, 65 million silt, 2 million very fine sand and only 2,000 coarse sand particles. Is there any wonder that comparatively small differences in amounts of a particular class of particles often profoundly influence soil properties?

Soils never contain particles of only one size although uniform particles may predominate. Based on texture a soil may be a sand, sandy loam, silt loam, clay loam or clay. Sands contain 80 per cent or more of sand, and the larger the individual particles, the coarser the sand. Only 30 per cent of clay is sufficient to make a soil a clay. The loam soils are intermediate in composition.

Clay is more effective in modifying the texture of a soil than the same amount of sand due to the unusual properties possessed by it.

When clay is puddled, or worked when wet, the minute particles pack so closely that even their layers prevent the passage of water. Moist clay is plastic and can be worked into shapes which it still retains upon drying, and the mass becomes very hard and tenacious. If clay is suspended in water, the small particles remain in suspension almost indefinitely, but by the addition of small amounts of certain substances such as lime, gypsum, etc., the minute particles clot to form larger aggregates which rapidly settle to the bottom of the container. This power to clot occurs in the soil and plays a very important part in the management of soils high in clay. When the clay clots it is in a state of aggregation and the soil behaves as though it were composed of coarser particles. Just as the potter works clay to break the aggregates down into the ultimate particles to make it more plastic, so working clay soils when too wet destroys the aggregates and makes the soil more clayey than before. The soil then becomes more impervious to the passage of water and air, and dries into tenacious hard lumps. To make it tractable is difficult and requires considerable time. This may be accomplished by alternate freezing and thawing, incorporation of organic matter, and is furthered by the action of such substances as lime, gypsum, etc.

While texture is of great importance and determines the ultimate producing power, the arrangement of the individual grains is almost equally important. Texture refers to the size of the particles, but their arrangement determines soil structure. The structural condition influences the circulation of air and water in the soil, both very essential when turf is growing actively. In clean sand each individual particle is an individual unit and has but a chance arrangement in relation to the surrounding grains. In highly fertile soils the particles are bunched and held in groups, granules or crumbs. This arrangement is especially essential in fine-textured soils (clays, clay loams, etc.). Granulation with the formation of crumb structure enables these soils to function as though they were more or less coarse grained.

The spaces existing between the individual particles constitute the air space, more commonly called pore space. Theoretically, in a soil made up of equal sized spheres in contact with one another, the amount of pore space depends solely upon arrangement and not on the relative size. Thus a cubic foot of marbles contains as much pore space as a cubic foot of shot. In columnar order the pore space is about 47 per cent and in oblique order, 26 per cent. If small spheres exist within large ones, the pore space is materially increased and theoretically may reach 75 per cent. This is the condition approximated in well-granulated soils. When there are spheres of several sizes, the smaller ones may so completely fill the spaces between the larger ones that the pore space is almost completely eliminated. This is the condition in puddled clay soils. Working clay soils when too wet forces small particles into the spaces between the larger ones, and the granular structure is destroyed. This frequently happens during construction in wet seasons. The bad effect of several days plowing on heavy soils may be noticeable for several years.

Soil grains are unequal in size and irregular in shape, so the ideal conditions mentioned are only approximated. In the fine-textured soils the small particles do not settle so closely in proportion to their size as do the sands and consequently contain relatively more pore space. The relation of texture to pore space for some soils under field conditions is as follows:

	Per Cent Pore Space
Clean Sand	33.50
Fine Sand	44.00
Sandy Loam	50.00
Silt Loam	53.00
Clay Loam	56.00

Turf grasses, in common with other plants, draw enormous quantities of water from the soil. Most of the water is evaporated from the leaves. Investigation shows that from 200 to 500 pounds of water are evaporated for every pound of dry matter produced. It is safe to say that 5,000 barrels of water are evaporated during the production of 1½ tons of grass, an amount frequently produced on each acre.

Turf roots draw only upon the water which surrounds the individual soil particles. The water exists in the form of a film and is called capillary water. Soils made up of small particles hold the most

water because of the extensive internal surfaces. Loams contain from two to three times as much film water as sands. Soil structure also affects the water-holding capacity. Loosening the structure of sands often lowers its moisture-holding capacity. The individual soil particles are so far apart that formation of a continuous film is prevented. Crumb structure in clays increases the supply. Water is held around the individual particles within the granules and also surrounds the compound granule.

The roots can not acquire all the capillary water held by the soil. Water is most easily taken when the films are thick, and as the thickness of the film is reduced it becomes increasingly difficult to obtain water until a point is reached where the water is held so firmly to the soil grain that the turf begins to wilt. Sands contain only about 3 per cent capillary water when wilting begins, whereas clay loams may still contain 15 to 20 per cent capillary water, but the total amount of water held by sandy soils is so much smaller that the amount available for plant use is small. While light rains following periods of drought have relative high efficiency on sands, due to the small amount of internal surface, they may be wholly ineffective on the heavy soils with thin, tremendous internal surfaces.

The diminishing supply of capillary water in the surface soil is frequently partially replenished by capillary rise. Fine-textured soils have the greatest capacity and can move water to greater heights than the coarser soils, but the rate of movement is often so slow for clay soils that plants perish before water can be brought up from the subsoil to meet the demand. The friction is so great that the actual movement is very inefficient. All things considered, it is the intermediate loam soils which most readily meet the needs of the growing turf for water, provided the water need be moved only over moderate distances.

When soils become dry the water movement is greatly retarded because dry soils resist wetting. Movement is also slower when the films become very thin due to the friction offered by the particles.

Any discussion of physical soil properties is hardly complete without at least some mention of the important rôle played by organic matter or humus. Aside from the fact that it is the great natural source of nitrogen, it exerts pronounced effects upon soil structure and increases the water-holding capacity. Humus acts as a weak cement and holds the soil particles together, thus it serves to bind the coarse-grained sandy soils, and by forming aggregates of the finest clay particles tends to make the heavy clay soils more open. The presence of only small amounts of humus are needed to produce marked changes.

Humus has a tremendous water-holding capacity, but much of the water is held so tenaciously that turf roots can not utilize it; yet it is a well-known fact that soils well supplied with humus resist drought better than those low in humus. The difference is probably not so much in the greater amount of water held as in that the humus soil absorbs a large amount of water temporarily during a heavy rain and then lets it work more slowly down into the soil. Water is thereby retained within reach of the plant roots for a longer time.

It is doubtful if humus should be used as the only soil modifier

on sandy soils, particularly in the warmer sections of the country. Under these conditions it rapidly disappears, being utilized by the soil bacteria. If fine-textured soil is available and used with the humus material, the beneficial effects of the minute mineral particles will persist after the humus disappears.

Soils for use on greens should be selected on a basis of texture and not color. Black color is an indication of humus, but if clay is the predominating mineral constituent, a light-colored loam is much more suitable. Everything considered, the best soils are those of intermediate texture—the sandy loams, loams and silt loams. These require a minimum of supplementary material such as sand or organic matter to make them suitable for topdressing material. They have a large water-holding capacity, are provided with ample pore space, move water rapidly, and quickly develop a desirable soil structure. Sands have too low water-holding capacity and clay soils, even under the best management, are apt to become hard.

Clay soils require relatively large amounts of sand to effect material change in their structure and reasonably coarse sand must be used. Relatively less clay effectively modifies sandy soils. These are the same principles which underlie the grouping of soils into different classes.

It is almost hopeless for the average club to modify the texture of fairway soils by the addition of sand or clay, due to the great expense involved. Soils should be placed in the best possible condition prior to seeding. Heavy soils should be plowed only when moisture conditions are favorable, even at the expense of a few days' delay. If time permits plowing in the year preceding seeding, the structure will be materially improved by alternate freezing and thawing during the winter. A green manure crop, preferably a legume, plowed under, will add beneficial organic matter. If the soil is acid, the acid legumes should be used. When turf is once established and maintained in thrifty condition, it will materially improve structure on heavy soils. As new roots form the older ones die. Decay of the dead roots augments the humus supply, and as the mass of new roots push forward, granulation and development of desirable crumb structure takes place.

Experiences with and Opinions on *Poa annua* in Putting Greens

During this season the subject of *Poa annua* has attracted more attention and caused more discussion than usual. The fact that the putting greens at Oakmont, where the Open Championship was played, are largely composed of this grass and that the weather this summer, particularly in the North, was unusually favorable to its long continued growth probably accounts for the unusual interest shown. Its value as a putting green turf seems to be governed by local conditions, by the kind of turf invaded by it, and by personal opinion as to its own particular merits, concerning which there is by no means lack of controversy.

In the Metropolitan District, Mr. Robert White believes that it not only makes a good putting turf but that from 75 percent to 90 percent of the turf in old greens is composed of *Poa annua* until the middle of

June or the first of July, at which time the majority of the turf in evidence is bent. His observations have led him to conclude that drought is the factor chiefly responsible for the disappearance of *Poa annua* in June or early July.

Another correspondent in the Metropolitan District writes that, "*Poa annua* is undoubtedly properly classed as a weed so far as putting green turf is concerned. I have visited some courses during the past three years where *Poa annua* was a gift from the gods. If it were not for a luxuriant growth of that grass in the early spring the greens would be a sorry sight. I know of several greens that certainly look their best when *Poa annua* is in season. When the *Poa annua* died the turf became terribly thin until crab grass filled in the gaps. The first heavy frost killed the crab grass and the small amount of bent then got its first opportunity to spread."

Major R. Avery Jones, Manager of the Baltusrol Golf Club, has noticed a difference in the habits of *Poa annua* on different parts of the two courses at Baltusrol as indicated below:

"There is considerable variation in the behavior of *Poa annua* on different parts of the two courses at Baltusrol.

"On the higher slopes having a southern exposure *Poa annua* does not entirely die out after seeding. Some persists all through the summer.

"Last year an approach to one of the greens held a heavy growth of *Poa annua* right up to the frost. On the lower ground conditions seem to be less favorable to *Poa annua* and its normal habit there, is to seed between the first of May and the end of June, and then die out.

"In our velvet bent greens *Poa annua* does not make very much headway and with the increase in the development of the velvet bent it is decreasing every year."

In the Philadelphia District it has been frequently noticed that *Poa annua* does not seem to injure the putting quality of seeded greens but that the same can not be said in the case of vegetatively planted creeping bent greens. At the Merion Cricket Club, Mr. Joseph Valentine has observed that where experimental work in fairway fertilization and watering was conducted the growth of *Poa annua* seemed to be stimulated to a greater extent than was Kentucky bluegrass.

Another interesting experience in this district is that of Norman L. Mattice, Manager of the Pine Valley Golf Club, which we quote:

"The *Poa annua* remained very vigorous and strong until the hot wave hit us about the first week in July. Then it died out in less than a week's time and made the fairways look as if they had been hit by brown-patch. However, it disappeared on the greens about the middle of June, so that there were no brown patches appearing on the greens when the hot wave struck us. I feel that wherever arsenate of lead was used rather extensively, or approximately 5 pounds per 1,000 square feet once each month, other grasses crowded out the *Poa annua* early enough in the season to eliminate any bad effects when the hot season approached."

At the Country Club of Atlantic City, Mr. H. Kendall Read has noticed that *Poa annua* improves the old seeded greens, blending uniformly into the permanent turf, but in the vegetatively planted creeping bent greens it tends to form clumps which had the effect of giving the greens two distinct speeds, fast over the bent but slow over the clumps of *Poa annua*.

In the Pittsburgh and Chicago districts *Poa annua* seems to be more popular than elsewhere, and men experienced in course maintenance in these two districts believe that topdressing and watering are the principal factors in its long continued growth, being of the opinion that at least in their districts hot weather is not necessarily fatal to success with this grass.

In St. Louis it is generally regarded as undesirable. It disappears early in the season and its place is soon taken by crab grass and other undesirable grasses and weeds. It is reported that in this district sulfate of ammonia has been of value in lessening the quantity of *Poa annua* found in putting greens. In some cases fairways have been plowed up in order to eliminate it.

The experience of Mr. Spencer M. Duty, the Green Committee Chairman of the Canterbury Golf Club, Cleveland, Ohio, is in many respects the most instructive we have heard of, for the reason that his club has greens of three kinds, seeded greens and vegetatively planted bent greens of both unsatisfactory and satisfactory strains. In the first two cases his experience has been that *Poa annua* was a blessing, but in the case of his finest turf he has very wisely decided that *Poa annua* shall be eliminated as soon as it appears.

In the South where *Poa annua* grows throughout the winter months, and in some sections from early fall to late spring, the problem is entirely different from that of the northern courses. Where permanent greens are in use throughout the year *Poa annua*, or any other grass sown on the dormant Bermuda, has a decided tendency to retard the recovery of the Bermuda grass in the following spring. Where temporary greens for winter play are in use *Poa annua* can not be regarded as injurious, for it reinforces the yearly seeding of northern turf grasses and makes possible the heavy topdressing of the regular Bermuda greens, which prevents such serious competition of *Poa annua* with the Bermuda turf.

Improving Turf on Sandy Soil

By H. Kendall Read, Chairman, Green Committee, Country Club of Atlantic City

There must be a number of old courses in this temperate latitude where the soil is of a distinctly light or sandy texture and where the problem of fairway turf is of first importance. In most cases it is not practicable to throw the course out of use and attack the problem in a radical way. This would be the simple and direct method.

It has been proved beyond doubt that the most satisfactory turf, including bluegrass and bent, can be produced on old fairways of sandy subsoil. It has been done at Pine Valley and the Country Club of Atlantic City and other places. But you will not succeed until you bring about the necessary change in the texture and quality of the topsoil which actually forms the seed bed. You can grow fescue on loose, sandy soil, but I do not believe that you will ever produce a first-class fairway of closely knit turf from this grass. Many clubs have spent a lot of money trying to do this, but I think it is a hopeless job.

I never saw a really first-class fairway in the North that did not contain bluegrass or bent or both in substantial proportion, but neither bluegrass nor bent will grow satisfactorily on loose, friable soil. You are therefore faced with the problem of introducing a binder that will stiffen up the topsoil and bring about a condition

that will be friendly to these grasses. Until you do this, I believe that anything else is largely a waste of time and money.

At our club we have used mushroom soil practically alone on certain areas and have produced quite good turf. This soil contains a small proportion of clay (some more than others), and this, together with its food values, makes it useful. But if your soil is very sandy it would take entirely too much time and labor to produce results from mushroom soil alone. The proper use of clay seems to solve the problem. It would not be possible to lay down any standard practice to cover this use of clay because the conditions are too variable. Sandy soils differ widely and hardly any two clay soils are of the same character. However, I believe that our experience at Atlantic City during the last few years has taught us some things that should be helpful to others.

The soil on the fairways that constituted our principal problem was very sandy with more or less gravel in spots. The only grasses were red and sheep's fescue, which positively refused to knit. The top soil was so light and loose that the shoes of players and the wheels of the mowers left their marks. We simply could not throw these fairways out of play, plow them up and introduce the necessary amount of clay and humus to produce the turf we wanted. I finally located near Philadelphia, Pennsylvania, a very heavy, almost pure clay soil, which seemed to be suited to our purpose. We bought a number of carloads and started our topdressing. This was in the fall, and we used nothing else but the clay. We put it on rather generously—I think a little too thick—chain-harrowed it until thoroughly distributed, seeded bluegrass and redtop four to one — 75 pounds to the acre—and then rolled.

Before this bluegrass could not be found anywhere on these areas, and a number of my friends from the Green Section in Washington helped in the search. There was none. The next season we were much encouraged to find bluegrass making its appearance practically over all the area that had been topdressed. The following fall we gave a light topdressing of mushroom soil and seeded as before. We did not use more clay because it was still in evidence and our dose the previous season was liberal. The clay brought about a remarkable improvement in the mechanical condition of the topsoil. Instead of a soft, shifting sandy top, we had a firm and more permanent topsoil. I think that this mechanical condition is especially important in starting bluegrass and bent.

After our treatment the second year with mushroom soil, the improvement the following season was very marked, and we knew we were out of the woods and on the right road. Bluegrass was now coming up all over and it was only a matter of encouraging it to spread. As a result of the experience outlined above and on others of our 27 fairways, I have formed certain opinions on this troublesome problem:

1. Clay is the basis of the solution.

2. The kind of clay soil that is best depends upon your local conditions.

3. It is better to get soil that is too stiff than too thin, because you can lighten it yourself either with humus (an excellent idea) or by mixing it with your own local soil or with sand.

4. Do not apply the clay too thick. It makes an unpleasant condition in wet weather and takes too long to work in.

5. I believe that better results will be obtained if a little humus, like mushroom soil, is worked in when you first apply the clay.

6. It would probably be helpful to use a little bent with your bluegrass and redtop.

7. When you get the grass started, a light topdressing containing a small amount of clay, together with some humus, applied every couple of years, will encourage spread and continued improvement.

8. Water is always essential to good turf, but is of vital importance with sandy soils. If a reasonable supply can be provided, your results will be much quicker and surer.

Salt Grass

By H. L. Westover

Salt grass (*Distichlis spicata*) is of world-wide distribution and its presence is always indicative of an excess of soluble salts in the soil. It occurs in wet, salty areas along the seacoast and also in considerable abundance on alkaline soils of the West where moisture from seepage or from other sources is abundant. Its maximum tolerance is very high, yet at the same time it will grow luxuriantly where the salt content is too low for other saline plants. Salt grass resembles Bermuda grass in appearance and is often mistaken for it, especially before the seed heads develop. However, the seed heads of the two grasses are so distinctive that there is no reason for confusion once they have appeared. Salt grass may have a sphere of usefulness on some of the golf courses along the coast where salty water collects or on some of the alkaline soils of the West. It has an abundance of underground creeping stolons and it is only necessary to take up sod of the grass, chop it up and scatter the chopped stolons on the ground and roll them in or cover lightly. It should make a splendid turf where there is an excess of soluble salts in the soil even though covered with salt water a portion of the time, as, for instance, at high tide. Seed and material for vegetative plantings are not commercially available, but courses having conditions that favor this grass will ordinarily have little difficulty in locating areas near by where it occurs in abundance.

Salt Grass, Distichlis spicata. Staminate plant and a pistillate panicle, x ¼: pistillate spikelet and floret, x 2½

Who said creeping bent does not like water? The above was photographed on the Baltusrol course, and shows a heavy growth of creeping bent hanging down over the center of a concrete dam, where it has an ample supply of water at all times. Some one has suggested that we christen it the "Niagara strain." Another has suggested that it be called "Baltusrol's dam strain."

Annual Reports of Golf Clubs.—The Green Section is desirous of securing copies of the Annual Report of all United States Golf Association member clubs. The information contained in these reports will be regarded as confidential. Will you kindly send a copy to the Executive Secretary?

Every green committee should exercise its authority and close its course to play whenever, because of heavy rains or thaws, the course is likely to be damaged. A few "nuts," who would attempt to play if the mud were knee-deep, should not be permitted to do damage that can not be repaired.

Every golf course should be maintained on some definite program year in and year out. The past should be kept as the standard, unless a departure is warranted by some good reason. Changes of program should be made sensibly with a clear view of the results that may be expected. There is no sense in trying anything and everything.

Straight rows of trees, except along roads, should be avoided. Irregularly scattered groups of trees are wonderfully effective in beautifying the landscape.

United States Golf Association Green Section Loses Cunningham

It is with much regret that we are called upon to announce the resignation of Mr. George Cunningham, who severed his connection with the United States Golf Association Green Section on December 15, 1927, to supervise two golf courses at Richmond, Va. Mr. Cunningham entered the Green Section service in January, 1926, becoming Executive Secretary, November 1, 1926. The loss of his assistance in publication of THE BULLETIN and his good judgment and wise counsel along matters pertaining to the game of golf will be keenly felt at this time. The Green Section wishes to take this opportunity to extend to Mr. Cunningham best wishes for success in his new field of endeavor.

Annual Meeting of United States Golf Association Green Section

The Annual Meeting of the United States Golf Association Green Section was held in New York City at the Astor Hotel on January 6 and 7, the following program being presented. Mr. Findlay S. Douglas, who is Vice-President of the United States Golf Association, presided:

PROGRAM

January 6, 10 A. M.

Opening Remarks. Chairman Findlay S. Douglas.
Annual Report of the Chairman of the United States Golf Association Green Section. Mr. H. L. Westover, Washington, D. C.
The Service Rendered by the United States Golf Association Green Section to the Golfers of America. Mr. Wm. G. McKnight, President, Baltusrol Golf Club, Short Hills, New Jersey.
How the Green Section Can Be Helped by Clubs, Green Committee Chairmen and Greenkeepers. Mr. Sherrill Sherman, Yahnundasis Golf Club, Utica, New York.
Treating Compost to Destroy Weed Seeds. Mr. D. M. Boude, Manager, Miami Valley Golf Club, Dayton, Ohio.

January 6, 2 P. M.

Physical Soil Conditions Affecting Turf. Mr. O. J. Noer, Madison, Wisconsin.
Feeding Versus Seeding Turf. Mr. Norman L. Mattice, Manager, Pine Valley Golf Club, Clementon, New Jersey.
First Aid to the Beginner. Mr. A. G. Chapman, Chairman, Green Committee, Audubon Country Club, Louisville, Kentucky.
The Proposed Greenkeepers' Convention in 1928. Mr. H. K. Read, Chairman, Service Bureau, Philadelphia Green Section, Philadelphia, Pennsylvania.
"Bobbie" Jones—Motion Picture.

January 7, 10 A. M.

Recent Turf Disease Studies. Dr. John Monteith, Jr., United States Department of Agriculture.
Conditions Which Influence the Growth of Turf. Mr. C. A. Tregillus, Simcoe, Ontario.
Further Experiments in Grub, Worm, and Weed Control With Some Comments on the Trend in Greenkeeping. Mr. B. R. Leach, United States Department of Agriculture.
Fertilizer Experiments on Turf Grasses at New Brunswick, N. J. Dr. Howard B. Sprague, New Jersey Agricultural Experiment Station, New Brunswick, New Jersey.

UNITED STATES GOLF ASSOCIATION

1928 Dates for Championships, and Walker Cup Matches

H. H. Ramsay, Secretary of the United States Golf Association, announces that the Executive Committee at a meeting held in New York City, November 17, decided upon the following dates for the National competitions:

Open Championship:

Qualifying Round, June 11, in various districts; Championship Rounds, June 21, 22 and 23, at Olympia Fields Country Club, Chicago.

Public Links Championship:

July 31 to August 5 at Cobb's Creek Course, Philadelphia.

Amateur Championship:

September 10 to 15, at Brae Burn Country Club, West Newton, Massachusetts.

Women's Championship:

September 24 to 29, at Virginia Hot Springs Golf and Country Club, Virginia Hot Springs, Virginia.

Walker International Cup Matches:

August 30 and 31, at Chicago Golf Club, Wheaton, Illinois.

"The Green Section Bulletins have been sent me and are exceedingly interesting, and I am very glad your Committee have permitted their issue to me. The information has already led my club (Western Gailes on the Ayshire seaboard, about five miles from Prestwick) to proceed with a scheme of experimental plots in a small way."—Mr. A. R. Russ, Secretary of the British Golf Union's Joint Advisory Committee, No. 149 West George Street, Glasgow, Scotland.

"To place a bunker guarding the green on the right, and another bunker at the right of the fairway to catch a slice is to double the penalty for an error. The one bunker at the green would have been quite sufficient."—The Links.

QUESTIONS AND ANSWERS

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

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

1. Comparing available nitrogen in manure, mushroom soil and other organic fertilizers.—I have been trying to check up through different tables the comparative amounts of available nitrogen in manure, mushroom soil and organic fertilizers. Of course, there is no definite standard of the mechanical condition of manure and mush-

room soil on which to base the tables so there must naturally be wide differences in the estimates.

Until lately I have always thought that for fairway fertilization there was more available nitrogen in mushroom soil than anything else in the way of organic fertilizers at an equal price. We get mushroom soil cheaply, about $3 a ton delivered. Since learning the price of Milorganite and the amount of available nitrogen which it contains, I am wondering whether it is not a better fairway fertilizer than the average grade of mushroom soil which can be obtained. Our soil contains too much clay as it is and most of the inert matter in mushroom soil is clay. Of course, good manure is a splendid fertilizer, but here it is hard to get, expensive, and makes the fairways poor to play on for a considerable period. (Pennsylvania.)

ANSWER.—The composition of stable manure varies widely. On the average a ton contains from 8 to 10 pounds of nitrogen, 8 to 10 pounds of phosphoric acid, and 6 to 8 pounds of potash. Manure is said to lose very little of its fertilizing value as a result of having been used in mushroom beds, and unless mixed with considerable soil should contain about the same amounts of the various plant food constituents as given above.

One ton of Milorganite contains approximately 110 pounds of nitrogen, 50 pounds of phosphoric acid, and 10 pounds of potash. In other words, 1 ton of Milorganite contains about 11 times as much nitrogen as manure or mushroom soil, 5 times as much phosphoric acid, and about the same amount of potash. Based on these elements alone, 1 ton of of Milorganite would be worth about 10 times as much as manure. However, in addition to plant food the manure and mushroom soil supply humus, which is of considerable value in improving the physical character of the soil and in making conditions favorable for bacterial activity. Where the soil is in need of humus the benefits to be derived from the application should be taken into consideration in determining the comparative value of the material. Mushroom soil at $3 a ton is generally considered one of the cheapest fertilizers available. If you feel that you are adding too much clay to your soil through the use of mushroom soil this could be overcome by mixing sand with it.

2. Winter protection of young grass.—We planted two greens with creeping bent stolons in October, but the weather has not been favorable for growth since that time and as a consequence the grass has made little progress. Some new growth of young grass is in evidence, however, and we are wondering whether it is advisable to furnish it a winter protection in the way of a covering of straw or leaves. (Indiana.)

ANSWER.—We doubt very much that any winter injury will occur to the young grass you have on your putting greens. A covering of straw or leaves should do no harm, however, provided it is removed promptly in late winter or early spring when growing conditions become favorable. The covering should be held in place by branches strewn over it, else it is likely to be blown away.

3. **How much slope will creeping bent stand?**—Our greens lie with a natural slope of from 4 to 8 feet in 100 feet. Would this be too fast for bent greens? (Texas.)

ANSWER.—It has been our experience that more than a 2 per cent slope is too much for the average creeping bent green. As a matter of fact, 2 or 3 feet in 100 is as much slope as should be considered for any putting green.

4. **Mowrah meal as an earthworm killer.**—Will mowrah meal kill earthworms, or is it necessary to sweep up the worms after they come to the surface? At what rate should mowrah meal be applied? (New York.)

ANSWER.—Although mowrah meal probably does not actually kill the worms it brings them to the surface, and they rarely, if ever, get back into the soil. It is not necessary to sweep up worms after they come to the surface as they soon die and finally dry up. However, where a green is in use, it is preferable to sweep them off, as the remains interfere with play and present a rather unsightly appearance. Apply mowrah meal at the rate of about 15 pounds to 1,000 square feet of surface and water into the soil. For ridding greens of earthworms we find that corrosive sublimate is by far the most economical and efficient chemical. It may be applied either in a water solution or mixed with sand or similar inert matter. Two ounces of corrosive sublimate dissolved in 50 gallons of water are sufficient for 1,000 square feet of green. It should be washed into the soil by at least twice the quantity of water, immediately after application. When applied dry, mix the corrosive sublimate, 2 ounces to 2 cubic feet of dry sand, and scatter the mixture evenly over 1,000 square feet of green. Liberal watering should follow.

5. **Eradicating clover from creeping bent greens.**—Will you kindly advise me as to the best way of eradicating clover from a bent green? At this time we are using ammonium sulfate, which is a slow process. (New York.)

ANSWER.—After clover once becomes established in a green there is no easy way of eradicating it without seriously injuring or killing the grass. The continued and judicial use of ammonium sulfate will go farther toward accomplishing this end than any other method of fertilization that we know of. Clover can actually be killed with a strong solution of ammonium sulfate, but there is danger of killing the grass if the solution is too strong. Clover plants have been weakened and even killed by saturating them with a solution of 3 pounds of ammonium sulfate dissolved in 10 gallons of water. A solution of this strength will usually injure the grass temporarily, but if given the proper attention it should recover very shortly. We would suggest that you make sure that you are not applying carbonates to your greens in topdressing, either through the use of soil or sand carrying a high percentage of lime. Several cases have come to our observation where the amount of lime applied in this way has been more than sufficient to offset the effect of ammonium sulfate so far as its increasing the soil acidity is concerned.

AS WE FIND THEM

Heard a salesman proclaiming to a group of greenkeepers the wonders of his new mower. Oh, boy, what a machine! "It runs like a 17-jeweled watch, never 'scalps' the turf, a child may push it, seldom if ever requires adjustment, no trouble to sharpen, it will stand up under any rough treatment," etc. If pressed, he probably would have claimed his mower could almost think for itself.

Then someone broke up the party by reminding him that when mowers such as he described were produced there would be no need for salesmen to persuade greenkeepers to buy them. The company manufacturing them would have to call in all its sales' force, arm the whole staff and post it about the factory to hold the greenkeepers back.

Do you know the salesman who, in his sales talks, always manages to bring out the information that he is Chairman of the Green Committee of "So-and-so Golf Club"? That point makes a big difference. It proves he is a "practical" man. He tells of the simply marvelous results obtained on his course (practically owned by his company) with the chemical he is selling. "No sir, we don't take any chances with our beautiful greens and we don't try out any of those new-fangled chemicals which have not been tested thoroughly."

Well, well, how convincing! We do admire caution in a C. G. C. In his case, however, if he used other chemicals on his greens would it not remind one of the old vaudeville joke of the proprietor of a restaurant who "has just stepped out for lunch," or of Henry Ford driving down town in a Chevrolet.

When a listener interrupted a fertilizer agent to ask about a competitive product the salesman frankly admitted "it is good stuff and gives excellent results."

We had to take a second look at that fellow. It was a relief to find a salesman who had sufficient confidence in his wares to enable him to speak truthfully of the other man's product.

Those who sell golf clubs large quantities of commercial humus, peat or similar materials at fancy prices still have a prosperous appearance. Their sales talks are far more potent than the stuff they sell. The prosperity of this business is simply another bit of evidence in support of the oft-repeated claim: "People like to be fooled."

After watching some salesmen dispose of their goods to golf clubs one is forced to wonder just how many rainjackets a good salesman might not sell to a golf club in the desert of Sahara.