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UNITED STATES GOLF ASSOCIATION GREEN SECTION

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Miscellaneous Fertilizers

By H. L. Westover

In the November, 1926, issue of THE BULLETIN, commercial fertilizers were discussed in some detail, consideration being given largely to products that are most commonly used to increase plant growth. There are many materials that at one time or another have been used as fertilizers and concerning the value of which inquiries are frequently received. It is the intention to discuss rather briefly in this article some of these products.

In an effort to reduce losses to a minimum it is the policy of most manufacturing concerns to utilize all by-products that can be economically prepared and marketed. In this connection fertilizers have come in for their share of attention and by-products from woolen factories, packing houses, oil mills, etc., that are of little further value for other purposes, are often utilized as fertilizers. These by-products vary in composition, some carrying a high percentage of plant food elements while others are very low in such constituents. However, the total amount of plant food alone should not be taken as a criterion of the value of the product for fertilizing purposes since it may be and often is in a form that is not available to the plant. For this reason it is not safe to purchase these unknown or unusual fertilizers except upon guarantee of available plant food regardless of the total amount. For convenience the fertilizers discussed in this article have been placed in three groups as follows: Nitrogenous fertilizers, phosphatic fertilizers and potassic fertilizers.

Nitrogenous Fertilizers

Dried Meat or Meal.—Dried meat or meat meal consists of materials produced in the process of rendering dead animals, meat refuse, and waste products from the manufacture of meat extracts. In the rendering process, hoofs, bones, meat, etc., are placed in tanks and subjected to steam pressure for the purpose of securing the fat. The residue is then dried and ground and sold as meat meal. When relatively pure meat meal contains 13.0 to 14.0 percent nitrogen and varying amounts of phosphoric acid depending upon the quantity of bone associated with the meat. Meat meal compares favorably with dried blood as a fertilizer. At one time it was of considerable importance but is seldom heard of now.

Leather.—Leather in the form of scraps is a waste product of various industries. The nitrogen content of leather meal prepared by the steaming or roasting process ranges from 7.0 to 9.0 percent and the phosphoric acid content from 0.5 to 1.0 percent. Decomposition takes place so slowly that it is of little value as fertilizer and is

not worth the cost of transporting any distance. It is sometimes used as an adulterant of dried blood. Leather meal can be changed into a more available form by treating with sulphuric acid, but the cost is usually prohibitive.

Horn and Hoof Meal.—Horn and hoof meal are by-products of slaughter houses that are sometimes steamed, dried, and finely ground to prepare them for use as fertilizers. They contain 10.0 to 15.0 percent nitrogen and about 2.0 percent phosphoric acid. The plant food elements are so slowly available that the material is of little value as a fertilizer.

Hair, Bristles and Feathers.—Hair, bristles and feathers contain about 15.0 percent nitrogen, but decompose so slowly that they are of little value as a plant food. Tannery hair contains more or less foreign matter and water which lessens the nitrogen content. In such hair the percent of nitrogen ranges from 5.5 to 8.0 percent. Hair and bristles have been used to adulterate the more readily available nitrogenous materials such as dried blood or tankage.

Clean feathers contain about 15.0 percent nitrogen but sweepings from feather warehouses contain only about 6.5 percent, indicating the presence of much foreign matter.

Wool Waste.—Wool waste consists of by-products of such industries as carpet making or manufacture of woolen cloth, etc., which may be utilized in the manufacture of commercial fertilizers. It is sometimes available in large quantities and at low cost. Pure wool contains about 15.0 percent nitrogen, but wool waste is usually mixed with more or less cotton and because of this the nitrogen content may vary from 0.5 percent to 7.0 percent. The nitrogen in the waste is extremely slow in its action in the soil though it may be made directly useful as an absorbent of other wastes, such as liquid manure, and as an ingredient of compost. Use of these materials untreated is only desirable when they may be obtained at very low cost. When dissolved with acid or steamed the nitrogen is made more available though the cost of such treatment is usually prohibitive.

Shoddy and Felt Refuse.—Shoddy formerly referred to short fragments of wool rejected in woolen industries. Now the name is often applied to both silk and wool wastes. It usually contains from 4.0 to 12.0 percent nitrogen averaging 6.5 percent. Felt is about the same general character as shoddy. These materials decompose so slowly in the soil that they are of little use in growing turf grasses.

Soybean Meal.—During recent years there has been an enormous increase in the production of soybeans in the United States. The beans are utilized in considerable quantities by oil mills. After the oil has been extracted the soybean cake is ground into meal, which is utilized largely as cattle feed, though to some extent as a fertilizer. The plant food elements in soybean meal rank a little higher than cottonseed meal, containing about 7.0 percent nitrogen, 1.5 percent phosphoric acid, and 1.8 percent potash.

In experiments on turf grasses soybean meal has given very good results and is seemingly equal to cottonseed meal for this purpose. Whenever soybean meal can be purchased at a lower price than cottonseed meal there is no reason why it should not be used. Much of the time, however, the demand for these materials as a cattle feed increases the price to such an extent that they can not be economically used as fertilizers.

Cocoa By-products.—Until a few years ago the only cocoa by-product in the United States having a sufficiently low market value to be available to the fertilizer manufacturer was the shells with such waste material as cocoa dust and sweepings. Due to the enormous demand for cocoa butter, two additional by-products, cocoa pressed cake and solvent extracted cocoa, are now available. The latter is the residue after the fat has been extracted from the pressed cake. The shells contain about 2.5 percent nitrogen, about 0.75 percent phosphoric acid and approximately 2.5 percent potash. The average pressed cake contains nearly 4.0 percent nitrogen, about 1.5 percent phosphoric acid, and a little less than 2.0 percent potash. Solvent extracted or defatted cocoa has a little less than 4.5 percent nitrogen, about 1.8 percent phosphoric acid and a little over 2.0 percent potash. The ground cocoa cake is said to be satisfactorily used as a filler and conditioner in mixed fertilizers and a part of the defatted by-product is used for the same purpose. As the latter by-product is nearly fat free it contains a somewhat greater percentage of plant food and therefore has a higher value as a fertilizer than the average unextracted cocoa. The quality or solubility of the nitrogen of the solvent extracted residue is a little lower than that of cocoa cake. While the experience with these cocoa by-products as a fertilizer on turf grasses is very limited it would seem that they should give about the same results as other organic fertilizers of similar availability and composition.

Sewage Sludge.—In a few cases near some of the smaller towns where land adapted to irrigation is readily available untreated sewage is profitably utilized in raising crops. In the case of large cities, however, this system of sewage disposal and utilization is entirely out of the question. In recent years great progress has been made in handling sewage and there is now available a product known as "sewage sludge," which is obtained by chemical treatment of raw sewage. This product is so low in fertilizing constituents that it is seldom worth handling. As a result of later studies in sewage disposal what is known as "activated sludge" which has given a very good account of itself as a plant food, is now being produced. "Activated sludge," however, may vary in composition, depending somewhat upon the amount of coarse vegetable matter that is incorporated with the fine precipitated material. Some of the best activated sludges have 5.5 percent nitrogen, 2.5 percent phosphoric acid, and a little less than 0.5 percent potash. Milorganite is the name applied to an activated sludge that is being manufactured by the Sewerage Commission of the City of Milwaukee.

Garbage Tankage.—This material is obtained by drying city garbage which consists of mixed animal and vegetable refuse. As a rule, the grease is first extracted after which the residue is dried. Its composition varies greatly. It may contain 2.5 to 3.0 percent nitrogen, 1.5 to 3.0 percent phosphoric acid, and 0.7 to 1.5 percent potash. It is regarded as a low grade of plant food, and since its composition and availability vary, should be purchased only on guarantee of analysis.

Soot.—The deposits formed in boiler flues and chimneys when wood and soft coal are burned consist chiefly of fine particles of carbon deposited on the chimneys during the imperfect processes of combustion. The carbon condenses gasses and sometimes becomes rich

in ammonia which it has absorbed from the gaseous products of combustion. The nitrogen content may range from 0.5 percent to 6.0 percent, the average being 3.2 percent. It also carries a small amount of potash and phosphoric acid. Soot improves the physical condition of heavy soils and on account of its dark color is supposed to absorb heat, thus forcing crops and increasing bacterial activity. Its value is as much due to its physical effect on the soil as to its fertilizing constituents.

Spent Hops.—Spent hops consist of the residue from the brewing industry. Ordinarily they contain only a trace of potash, a small amount of phosphoric acid, and about 5.5 percent nitrogen. They are reported to have been satisfactorily used in making compost for putting greens. Applications of spent hops to heavy soils are said to have worked very satisfactorily in rendering them more friable. Because of their fibrous nature, spent hops decompose rather slowly.

Spent Tea Leaves.—Spent tea leaves may contain a little less than 2.0 percent nitrogen, 0.5 percent phosphoric acid, and a little more than 1.0 percent potash. It is probable that they would be of some value for the humus they supply but their use is not justified unless they can be purchased at a very low cost.

Phosphatic Fertilizers

Bone Tankage.—Bone tankage is made from the residue after boiling cattle heads, feet, clippings, cartilage, and other refuse animal matter. It consists almost entirely of bone with small amounts of meat. The nitrogen content varies from 4.0 to 12.0 percent and phosphoric acid from 7.0 to 20.0 percent. The agricultural value is modified to a considerable extent by the degree of fineness. The bone in tankage has the same agricultural value as steamed bone of the same degree of fineness.

Bone Black.—This material also known as animal charcoal and bone charcoal is a product manufactured from bone which finds its chief use in sugar refineries. It is made by heating carefully selected bone in airtight vessels. The fat, nitrogen and water are removed leaving a phosphate of lime and carbon. It is then ground into a granular condition and becomes bone black. When used repeatedly in sugar refineries it becomes useless for the purpose and is sold as a fertilizer for direct use or to be made into a superphosphate known as dissolved bone black. Good bone black may contain 32.0 to 36.0 percent phosphoric acid. It decays slowly in the soil and at the present time is not used to any extent directly as a manure.

Bone Ash.—As the name implies, bone ash is made simply by burning bones in the open air. The nitrogen is of course wholly lost. The remaining portions contain 30.0 to 35.0 percent phosphoric acid. It was formerly imported from Argentina but is now practically out of the market.

Potassic Fertilizers

Tobacco Waste.—Tobacco waste appears in three forms, stems, stalks and dust. Stalks include the above-ground portions of the plants exclusive of the leaves. The stems include leaf stalks and ribs that make up the skeleton of the leaf together with such portions of the leaf as are rendered useless during handling. Tobacco dust consists of fine particles that result from handling, together with more or less dirt. Tobacco waste is rich in potash and contains some nitro-

gen. The nitrogen in the stems varies from 2.0 to 3.0 percent; in the stalks from 3.0 to 4.0 percent; and in the dust from 2.0 to 2.5 percent. Phosphoric acid is usually present in small amounts running between 0.5 and 1.0 percent. Potash occurs in the stems in amounts ranging from 5.0 to 10.0 percent, and in the stalks in amounts ranging from 4.0 to 5.0 percent. Tobacco waste is sometimes burned and the ashes used as a fertilizer. Such ashes are rich in potash but the nitrogen is lost. When ground fine tobacco waste is a valuable source of nitrogen where immediate availability is not required.

A few golf courses have reported good results from the use of tobacco waste as a fertilizer. Unless it can be purchased at a reasonable figure its use is not advocated. The nitrogen is of course beneficial to turf grasses but ordinarily the potash is not required, at least in such amounts, and furthermore, it may have a tendency to increase the weed problem.

Seaweed.—Seaweed is highly regarded in the Coast States as a source of potash for certain cultivated crops. The different kinds vary in fertilizing constituents. Some are relatively high in nitrogen and others in potash. It has been said that one load of manure is equal to two and a half loads of fresh seaweed or one and three-fourths loads that have lain in a pile for a month. Seaweed may be used to advantage in the compost pile when it can be obtained for the cost of carting provided the distance is not too great. Decomposition may be hastened by mixing with some manure and ammonium sulfate.

Velvet Bent at the Mountain Ridge Country Club, West Orange, N. J.

By A. D. Burton, Greenkeeper

A few years ago the Mountain Ridge Country Club decided to build nine new holes and remodel the old ones. At that time bent seed was not obtainable so the greens were sown with a mixture and with the idea in mind of getting bent into them later.

The architect had a nursery prepared, and as the old fairways and rough had a lot of velvet bent in them, sod was taken from these and planted in the nursery in rows about four feet apart. We had a hard time in selecting our stock on account of the men being unfamiliar with grasses, and as much of the selection for the nursery could not be supervised all kinds of grasses such as redtop, red fescue, and rough-stalked meadow grass were planted with the bent.

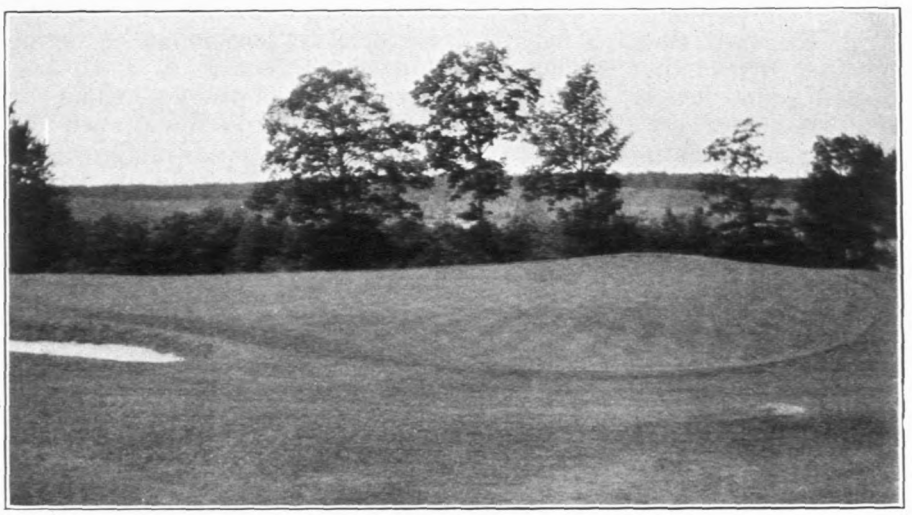
At that time I was working for the architect but when we finished construction I was retained by the club as Greenkeeper so the care of the nursery came under my charge.

I had a new plot of ground prepared for which additional selections were made. These stolons were planted and covered as advised by THE BULLETIN and that fall we had about 8,500 feet of nursery planted to all kinds of velvet bent. Later many of the coarser varieties were weeded out and the plot kept mowed down to nearly putting green length. This turf was fertilized with ammonium sulfate in May, June and July, and was a nice piece of turf.

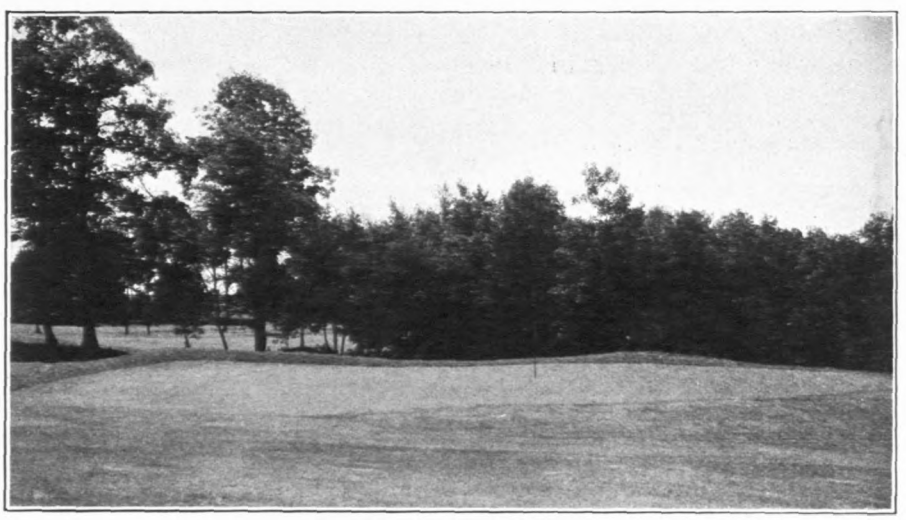
That fall we planted 13,000 feet more which grew well with the exception of that planted late in the season. For this planting the selection of bent to be used was made entirely by myself.

The sod from the oldest nursery was used to patch greens and also in enlarging one green.

Last fall I lifted the turf of mixed grasses from the No. 10 green as I was not satisfied with the soil condition. I found three inches of humus under the turf so I dug it out and dumped it on a compost pile to be used later in topdressing. This green was then sodded with velvet bent from the two-year-old nursery but it was necessary to finish the job with sod from the second nursery which was only one year old.



The tenth green at Mountain Ridge C. C. This green is composed entirely of velvet bent



Another velvet bent green, the fourth, at Mountain Ridge C. C.

The No. 4 green, where humus was also discovered and removed, was also sodded with velvet bent from the second nursery, but in this case the work was done so late in the fall that the temperature was

below freezing at night. This job was finished on November 28. The turf came through the winter well but required a lot of rolling in the spring to get it level enough for a putting surface.

No. 10 green, which is of sod three years old, two years in the nursery and one year on the green, was fertilized with a total of 112 pounds of ammonium sulfate from May through September and top-dressed four times. It has never had brown-patch, nor has No. 4.

In growing velvet bent it is possible to get turf by planting pieces of sod, but they must be small and closely planted because they thicken out in clumps and do not spread rapidly.

Velvet bent makes a beautiful sod of even texture and a better putting surface than creeping bent, does not require so much top-dressing, nor does it throw out runners on top of the green like the coarser types of creeping bent but thickens out into a fine carpet.

At the recent meeting of the Green Section in Washington discussion arose as to velvet bent's ability to heal. I would like to say that that depends on the operation. I have a man patching my greens who makes a very neat fit. Careful watering is required after patching. If this is done it heals as quickly as any other grass. Sometimes the plugs that are put back when the holes are changed are scarred. That is caused by the men filling the hole too full and then pounding away at the plug. This, of course bruises the turf, and then you have a scar. The same thing happens if your plug is a little too high for the mower will scalp it but if care is taken to make a neat patch the trouble is overcome.

On three of our mixed bent greens brown-patch attacked the coarser bent this summer most seriously, which explodes the theory that these coarser strains are less susceptible than the velvet bents.

We have not lost any velvet bent by winter kill.

In our section, northern New Jersey, I find velvet bent rather slow in making a start, but as the warmer weather approaches it comes along well and continues to do well although crab grass will invade it to some extent and must be weeded out.

I have some velvet bent which reseeded itself in the nursery. It is growing well and if it continues to do so I will develop it separately.

NOTE.—We have seen the two velvet bent greens of which Mr. Burton speaks in this article and can vouch for the beauty of their turf. While they are not of a single strain of velvet bent in either case, they are composed of plants so well matched in color that the general effect is one of uniformity. Plants of a dark bluish green color have been selected for these greens.—EDITORS.

Selection of Course for Walker Cup Matches, 1928

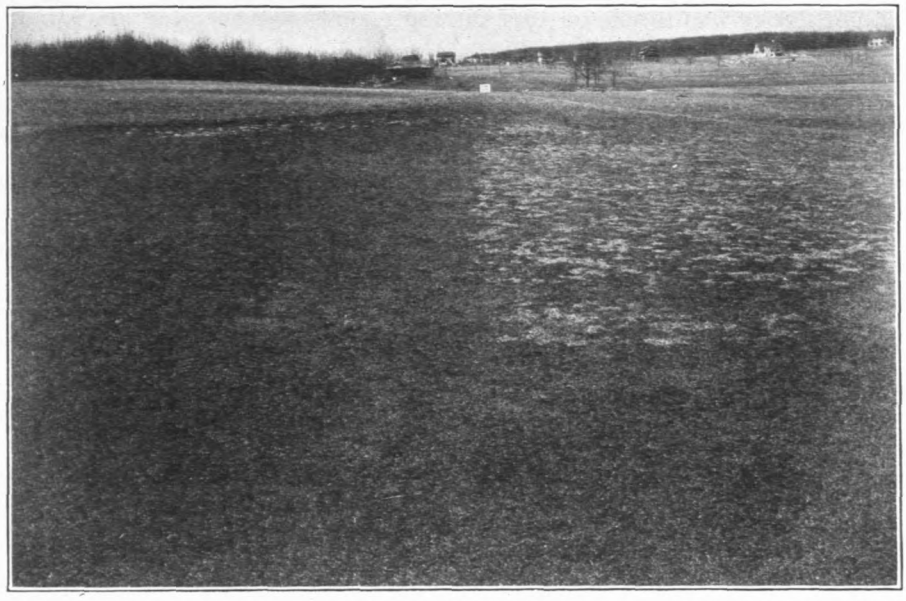
H. H. Ramsay, Secretary of the United States Golf Association, announces that the Executive Committee, assuming that the Walker Cup competition will be held in 1928, has selected the Chicago Golf Club at Wheaton, Ill., as the course for the competition. The committee received an offer from the Bob O'Link Golf Club of Highland Park, Ill., for the international matches but the competition was finally awarded to the Chicago Golf Club, which is one of the charter members of the United States Golf Association.

This is the first time that the Walker Cup matches have been played away from the Atlantic Coast and the golfers of the Chicago district are keenly interested in the event.

Preventing Snow-Mold Injury on Greens

By John Monteith, Jr.

Since the publication of a discussion of winter injury of turf in the April, 1927, issue of THE BULLETIN, a number of inquiries have been received from northern clubs as to the best method for controlling snow-mold disease. No further work has been done on this problem since the article referred to above was published, so there is no additional information available. It is the purpose of this brief article simply to remind greenkeepers in the region where this type of injury is common that now is the time to apply chemicals to prevent losses next spring. As previously reported, we were able to entirely prevent snow-mold damage at Madison, Wis., by application of corrosive sublimate in October. Two and three ounces per



Control of snow-mold by corrosive sublimate. The dark healthy grass on the plats shown here illustrate the effectiveness of the two-ounce and three-ounce corrosive sublimate treatments, as contrasted with the spotted turf where the snow-mold fungus was active during the late winter and early spring. Photograph taken on the Nakoma Golf Course, Madison, Wisconsin.

1,000 square feet kept the turf free from this disease. An application of one ounce per 1,000 square feet gave entirely satisfactory control, although there were a few minor spots in the area so treated. We do not know how generally effective such applications will prove to be, but from our experience in brown-patch control we expect to find that the tests in Wisconsin will serve as a reliable guide for treating greens under a wide variety of climatic and soil conditions. Experiments have already been arranged on a number of courses to test this control method more thoroughly during the coming winter.

Many clubs wish to prevent this injury as much as possible and have asked that we recommend some treatment for them to follow this year. Based on the experience at Wisconsin last winter, we advise the use of corrosive sublimate at the rate of 2 ounces per 1,000 square feet, to be applied at any time before the ground freezes.

Many clubs use corrosive sublimate during the fall months for eradication of earthworms. Where this has been done late in October there will be no need for additional treatment for snow-mold control. Since we do not know whether the 2-ounce treatment will be sufficient under all conditions, we suggest that part of one or more greens be treated with the 1-ounce and 3-ounce rates. This will serve as a guide for future applications. The chemical may be applied in a solution by means of a sprayer or sprinkling can, or it may be distributed with small amounts of sand or compost and thoroughly watered in.

It is to be expected that calomel or the chlorophenol mercury compounds, Uspulun and Semesan, will prove equally effective against this disease, if used in equivalent amounts (10 ounces of Semesan or Uspulun is equivalent to the 2-ounce treatment of corrosive sublimate or calomel). However, since corrosive sublimate at these rates is not dangerous to use on turf during cooler weather, and since it is so generally used for earthworm eradication, there apparently is no object in using the more expensive chemicals.

In applying corrosive sublimate it should be remembered that it is for the control of snow-mold disease and not for all types of winter injury. The differences between this disease and "winter kill" have been pointed out in the April BULLETIN. For this latter type of winter injury, applications of chemicals are worthless.

Golf Course Architecture and Construction

Analysis of Layout

By William S. Flynn

While there is no rule as to the number of the various types of holes to be incorporated in an eighteen-hole layout yet there are certain customs that most architects follow.

In fact these customs have been handed down from the forefathers of golf and like many other things that have come down through the ages they have their value.

The rule most generally adhered to is to have four holes of the course one-shotters. To the majority of golfers the one-shot holes are the most interesting and there is no real reason why there should not be five one-shotters particularly when such holes provide interest in the play and are of varying character.

On the other hand a course with three outstanding one-shotters is much more desirable than one with four mediocre ones.

It was also formerly thought that each course should have a three-shotter in each nine. Today however, the thought prevails that one good three-shotter is sufficient unless some outstanding natural feature warrants putting in a second.

Good three-shotters are the exception rather than the rule and unless the player has a specific thing to do on each shot other than slug, this type of hole becomes monotonous.

The principal consideration of the architect is to design his course in such a way as to hold the interest of the player from the first tee to the last green and to present the problems of the various holes in such a way that they register in the player's mind as he stands on the tee or on the fairway for the shot to the green.

The best way to whet the appetite and improve the game of any golfer is to offer an incentive and provide a reward for high class play, and by high class play is meant simply the best of which each individual is capable.

Placing a premium on accuracy with due consideration for length should be the aim of all men who design golf courses, for accuracy in the play signifies skill and skill is generally the master of brute force.

It is impossible in considering types of holes for a course to suggest any positive sequence of alignment for each layout should be designed to fit the particular ground on which it lies, although anything at all can be done with ground that is dead level and there are places in this broad land where clubs are compelled to use such terrain.

Flat ground has its disadvantages but it is the only ground that permits laying out holes where the sequence and lengths can be planned arbitrarily.

In discussing types of holes it is perhaps better to consider the question from the competitive or tournament play standpoint rather than from the everyday play, because in this connection only par golf is involved.

In fitting the course to all classes in everyday play it is necessary to maintain relative values in the holes. This can only be done by using two and in some instances three tees to a hole the various players using the tee that fits their particular game.

The value of a hole is immediately lost when the 200-yard driver uses the back tee on a normal 420-yard hole. It is impossible for him to get home in two, whereas had the forward tee 40 to 50 yards ahead been used he would then have played a long iron or spoon shot to the green with a resultant thrill of satisfaction and at the same time be within his limitations.

A great many players are averse to using forward tees perhaps because they were originally christened "ladies tees" but regardless of that fact it seems that a great deal more enjoyment could be had if golfers used the tee on the various holes that really suited their game.

A little card tacked on their locker door with the following inscription might go a long way toward correcting their prejudice against the so-called "ladies tees."

GOLFERS, ATTENTION!

"In order to accommodate all classes of players your club has gone to the expense of building forward, intermediate and back tees on many holes. These tees are kept in order and markers are placed on each one. Except in tournaments please use the tee that fits your particular game and enjoy the course."

What holes should go to make up the average good course of today? The term average good course is used because it doesn't seem possible that any club will ever be in a position to build a course that might be considered ideal, a superb test of golf, because there are so many conflicting opinions in the average membership. The frame work of the course may be wonderful but its unfinished condition in regard to development of bunkering or scheme of play removes it a certain degree from the ideal.

The United States Golf Association might develop, sponsor and subsidize sectional courses, say six in all, which could be used for all major championships and which could be developed to the nth degree.

Should these courses be operated on a membership basis it would be understood that the conduct of the course would be entirely under the jurisdiction of the national Golf Association.

The above courses could be developed by arrangement with existing clubs or could be built entirely new, the latter perhaps being the better plan.

In this way it would be possible for the best architects collaborating with the Golf Association to develop these courses and thus establish a standard from which other clubs might profit.

Under this arrangement it would also be possible to modify or improve each course for any condition that might come up in relation to the development of the game such as the ball question or other important factors that might have a bearing on the case without creating controversy among the members.

Experiments supervised by the United States Golf Association Green Section might be carried on under actual playing conditions and the experience gained distributed to the member clubs.

In a measure this would eliminate the misnomer "championship course" as used at present. There would actually be six championship courses and not the great number that are now so-called perhaps by an overzealous architect or enthusiastic members.*

Getting back to the average good course it does seem that from 6,200 to 6,600 yards should suffice for length.

Dividing this up into holes there would be say four short holes ranging from the mashie to the full wood shot.

One real three-shotter not merely a hole somewhere over 500 yards.

Two drive and full wood shot holes, one with a big carry on the drive as the premium with an easy entrance to the green, the other with accuracy on the drive but with the premium on a big carry for the second shot.

One drive and high spoon shot, accuracy off tee and carry to the green.

One drive and full cleek shot to narrow entrance and slightly terraced green.

One drive and high midiron carry to green.

Two drive and full midiron run to green with narrow entrance.

One drive and high mashie iron carry to green.

One drive and mashie to narrow entrance.

One drive and mashie all carry to green.

One drive and mashie niblic to island green.

One drive and run up on narrow terraced green straight way.

One drive and runup, elbow or cape type with premium on length of drive.

The above list is not at all arbitrary but covers generally the possibilities in an eighteen-hole layout.

With the exception of the short holes, assuming four to the layout, a golf course consists of 14 drives plus the par second and third shots and the object should be to provide holes of proper length to accommodate the more important clubs after the drive has been made.

* The above suggestion by Mr. Flynn is interesting and well worth consideration. The United States Golf Association has not at present any such scheme in view, but it has been informally discussed by members of the Executive Committee as individuals.

It naturally follows if this play is carried out that holes of character and variety can be had.

The problems which should be developed on the various holes in the order of their importance are first—accuracy; second—carry; third—length, which includes carry and roll.

The premium on accuracy should carry the greatest reward for this is the essence of any game.

Carry while slightly less valuable than accuracy is important in that it promotes boldness.

Length may be considered least important but this becomes quite a factor when a player is able to mould all three tests together.

In applying these problems or tests to the layout through the medium of bunkers the architect has a great opportunity to display versatility. On one hole he may have a big diagonal bunker off the tee where the player takes as much risk as he feels capable of carrying and is rewarded in his shot to the green commensurably with his first effort.

He may have a comparatively easy drive off another tee, and yet, if the ball strays slightly from the center of the fairway, his second shot to the green becomes increasingly hard.

By arranging the green bunkers in such a way as to invite play in from one side or the other he can also put a premium on placing the tee shot on the proper side of the fairway. When a test of length off the tee is presented the best type is the cape or elbow where it takes a really big tee shot past a corner to permit reaching the green in par.

The problems may be diversified using one test off the tee on one hole, the same on the second shot of another hole; sometimes two of the same kind on the first and second shots of a hole; perhaps all tests, accuracy, carry and length on another but always juggling so as not to get sameness on succeeding holes.

While bunkers are thought by many to be put in as penalizers they are primarily installed to present a problem or a mode of play. If bunkers were used merely to punish bad shots there would have to be a complete revision of them on most courses.

The worst shots in golf are generally bad tops and wide hooks or slices and the player generally has sufficient penalty in these weaknesses, particularly when greens are properly protected.

America has developed a more or less stereotyped shot to the green that is the high all carry shot. This has been brought about no doubt by the fact that fairways and particularly approaches have gone unwatered during the summer when the ground has become hard. It is much simpler to play a high carry shot to a soft green which gets water than to attempt a pitch and run to a green with a cement like approach.

In the first case when all greens are watered a constant condition prevails but in the case of the runup approach the ball hits and is liable to bounce anywhere.

In order to cultivate the pitch and run, the runup shot and the long iron or wood with run it is necessary to present a suitable playing condition on the approach and this can best be brought about by the architect insisting on a water system for fairways and by the greenkeeper making generous use of it.

Natural topographical features should always be developed in presenting problems in the play. As a matter of fact such features are much more to be desired than man made tests for they are generally much more attractive.

One natural hazard, however, which is more or less of a nuisance is water. This is not nearly as bad when it parallels play and forms a picturesque landscape feature of the course. But when water is between the objective (the green or driving area) and the player it may be that the man who plays only a foot short of the objective is much worse off than the one who makes a very poor shot that does not reach the water.

In the first place the player is penalized a stroke with no chance of recovering it whereas the second player having played a worse shot gets by without penalty and may regain lost ground with a fine second shot.

Water hazards absolutely prohibit the recovery shot, perhaps the best shot in the game. On the other hand how valuable these streams are when the greens and fairways need water.

Topdressing

By H. Kendall Read

Good putting greens can not be expected without proper topdressing. Moreover, you will not get the best results from fertilizers or treatments unless they are properly applied. It is very apparent that some clubs are not using the best methods. I am referring simply to the method of making the application and I do not refer to the mixing or preparation.

There are two common errors: 1. The dressing is applied too thick. 2. If the proper amount is used, it is not thoroughly worked down to the roots. In either case the green is left in an unsatisfactory condition and remains so for days. The Greenkeeper and Chairman are both condemned for something which could easily be avoided by a little care. I believe it is better to use an under amount than an over amount of topdressing at one time. There is no difficulty in making a fairly even distribution over the green, the most common error is not thoroughly working it in.

A very effective tool for this purpose is a home-made board scraper. I do not say it is the only tool to use but I do know it gives quick and most satisfying results. It is easily made by attaching a handle to a board about 2 feet long, 4 inches wide and 1 inch in thickness. The bottom edge should be beveled so that when the scraper is held in proper position, the lower edge is even with the ground. With scrapers of this character, the topdressing can be pushed and pulled until it practically disappears. Any material which can not be worked in, out of sight, is pushed off the green altogether and used on the approach area or elsewhere.

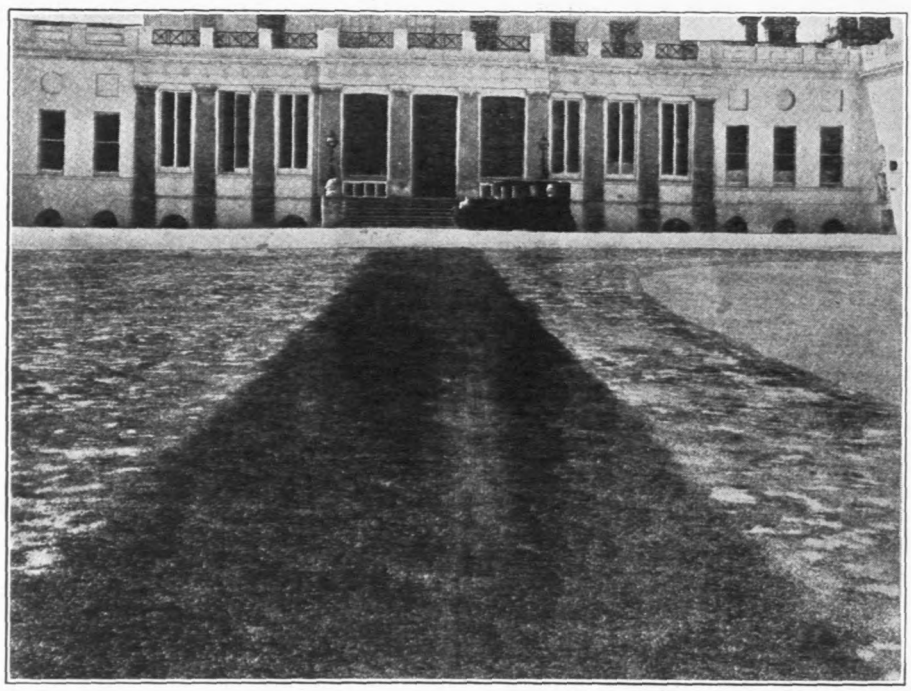
If a green is properly topdressed with an amount of material which is not excessive, most players would not know it had been touched and in most cases it should actually putt better immediately afterward than it did before. Careless topdressing not only causes discomfort, but frequently does actual harm by smothering the grass.

With a lot of penal bunkers staring one in the face from the tee, there is no mystery—only misery.

Effect of Acid-reacting Fertilizer in Experiments at Stoke Poges

"Reference has already been made in these pages (March 10, p. 187, Vol. LXXXI) to the now well-known fact that greenkeepers in the United States have managed to produce perfect putting greens on their golf courses in spite of the fact that a continental climate is less favorable to the growth of grasses than is an insular climate, such as our own. The progress made in this direction in America is, indeed, so great that unless we take care the pre-eminence of this country for its lawns may go the way of our one time pre-eminence in the games played on them. The method which has led to the remarkable excellence of the golf greens in the United States is based on the recognition—we might almost say discovery—that the fine grasses suitable for golf greens thrive best in an acid soil; that is, under conditions which are repugnant to most cultivated plants. This discovery has been applied to the perfecting of golf greens and courses by taking advantage of the well-known fact that certain artificial fertilizers, such, for example, as sulphate of ammonia and ammonium phosphate, augment soil acidity. To bring this about liberal and repeated applications of one of these fertilizers are applied to the greens, the fertilizer being spread evenly and washed into the soil. Having regard to the results already obtained in the United States and in Canada, it seemed desirable that experiments should be made in this country in order to ascertain whether the method would prove successful here. Mr. Norman Hackett had already applied the method on the Keighley Golf Course with marked success (see *Golfing*, September 6, 1926), but a need still remained for further tests. Mr. Lane Jackson, Hon. Secretary of the Stoke Poges Golf Links at Stoke Park, Slough, who has an unrivalled knowledge of golf and of greenkeeping, was good enough to put certain greens, fairways and lawns at the disposal of Nitram, Ltd., for the purpose of experiment. The experimental areas were selected in April of this year and have been treated with successive dressings of sulphate of ammonia, similar neighboring plots being left untreated in order that they might serve as controls. The dressings of sulphate of ammonia mixed with twice their volume of sand, were put on at fortnightly intervals at the rate of 5 pounds per 1,000 square feet. Of the control plots, one received an equivalent amount of sand only, and the other nothing at all. Beside the plots on the golf greens and fairways there were others on the croquet lawn and on the lawn leading from the club house to the first tee. Our illustration shows the striking effect of the successive dressings of sulphate of ammonia on the last-named lawn. Daisies have been so checked on the treated plot that not one flower is to be seen. By June, the observer in charge of the experiment reported that the strip was by that time free from daisies and all other weeds. The result here is the more valuable inasmuch as it shows that the method of supplying uniform successive dressings is much better than the weed-killing method of making heavy applications of sulphate of ammonia irregularly over daisy patches. That was done on either side of the strip and was effective in killing out the daisies but resulted in patchiness which the illustration shows in striking manner. Careful records of the weed flora and state of soil with respect to acidity are being kept, and will be published in due

course. Already, however, the "painless extraction" of weeds by the sulphate of ammonia treatment is in evidence. Counts over measured areas of the plots under experiment show that in two months the treated patches lost 50 percent of their weed flora, whereas on sanded or quite untreated control plots the weed population had in every case increased. Accurate soil-acidity determinations are also being made, and there is evidence that the repeated dressings of sulphate of ammonia have already increased the soil acidity. This interim report of the results of the Stoke Poges experiment would appear to show that where water is available our greens and lawns may be improved rapidly by successive dressings of sulphate of ammonia or other "acid" manure. Applied at the rate already indicated, there is no risk of damage unless watering is neglected. Even where water is not available, the method may be employed provided that the dress-



ings are applied at the advent of showery weather. We hope that not only greenkeepers but also those in charge of the green swards in London parks and in college courts and quadrangles will take note of these simple means of improving their lawns. The lawns of certain colleges in our old universities, once our pride and the cynosure of every American eye, are now, alas, in many cases, fallen into the sere and yellow. It is time that they, too, were renovated, and if final results of the Stoke Poges experiments confirm the conclusion reached in this interim report there is a ready and simple means of doing it." —*The Gardeners' Chronicle*, London, July 23, 1927, p. 61.

A natural lake of clear water on a golf course is a thing of beauty. An artificial pond of muddy or stagnant water is an abomination.

Experience of the Kirtland Country Club with Creeping Bent Greens

By Arthur Boggs

In the fall of 1923 we planted 18 holes with Washington bent stolons; we have gone through the usual rank growth of fluffy conditions found in this type of grass.

On the advice of the U. S. Green Section we checked the rank growth by the use of poor soil which produced a slower and finer growth.

By the use of sharp rakes and topdressing the fluffy condition was entirely overcome.

This season we have been using wire push brooms once or twice a month before topdressing.

We have found that a green with much slope produces a grain or nap when raked or brushed corrects this condition but leaves such a fast putting surface that it is impossible to hold a long putt near the hole from the top of the green. By allowing the green to grow a little longer than the others you have an untrue surface and we have proved that this type of grass has to be cut short if you want a true putting surface.

There are a great many things to be said in favor of this type of grass, and most important:

1. All greens should be made with as little slope as possible.
2. The maintenance cost is much less than any other type of green.
3. It will stand more punishment and abuse.
4. With the intelligent use of sulfate of ammonia your weed problems are solved.
5. You are able to keep 18 putting surfaces just alike in texture and color.
6. With a well drained and properly constructed green any number of golfers can play on it during the wet weather without injury to the grass or the putting surface.
7. A ball that is hit true on a line for the hole will drop.
8. It is true that a golfer coming from a seeded green has trouble adjusting his putting touch, as Washington strain creeping bent green requires the most accurate kind of a hit and he earns every putt.

The objections to this type of green comes mostly from golfers that are used to a slow putting surface and greens that have a mixed grass.

1. Too fast a green is the first objection.
2. When the ball rims the cup it does not fall in.
3. There is nothing on the green to give you the line such as a weed or different color that is found on mixed seeded greens.
4. On a sloping green it is impossible to hold a ball putting down hill.

We have five greens out of 18 that have severe slopes and this fall before grading and remaking these greens we are going to plant them with creeping bent seed to try and slow them up. If this mixture will do the work the greens will be left as they are and we will have avoided the expense of regrading.

Municipal Golf.—City officials and individuals interested in the promotion of municipal golf will be interested in a recent pamphlet entitled *Municipal Golf,* which discusses the construction and administration of municipal golf courses and contains a number of tables giving facts about the cost of operation and dues and charges. This 48-page pamphlet may be secured from the Playground and Recreation Association of America, 315 Fourth Avenue, New York City.

The Service Bureau of the Metropolitan Golf Association, cooperating with the New Jersey State Golf Association, will hold an exhibition and demonstration of golf course equipment on October 27 at the Shackamaxon Country Club, Westfield, N. J. The demonstration of equipment will include tractors and fairway units, compost machines, power mowers, hand mowers, greens mowers, greens topdressers, greens sweepers, sprinklers, and worm eradicators. This should prove a most instructive meeting, and will doubtless be largely attended by greens chairmen and greenkeepers of the Metropolitan District.

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. How best to utilize manure.—We are able to obtain manure in considerable quantity from a neighboring riding club and are anxious to have advice as to the best method of utilizing it. There is considerable bedding straw in the manure, and we are considering the construction of pits, to be covered with latticework, on which the manure may be dumped and sifted through into the pit so that the straw will be removed. (Connecticut.)

ANSWER.—Manure may be best utilized by a golf club either as an ingredient of topdressing or a source of liquid manure. The expense involved in the making and application of liquid manure is perhaps greater than in composting the manure and applying the compost; the use of liquid manure, however, gives excellent results. Liquid manure pits and the use of the material have been discussed in THE BULLETIN on the following pages: Page 327, December, 1922; page 147, May, 1923; page 278, November, 1923. In using manure in topdressing, it should first be composted until it is well rotted. This will require about a year's time. The rotted manure may then be used as an ingredient of your topdressing material. Not more than one-fourth of the topdressing material should consist of composted manure, the balance being preferably a clay or sandy loam, as the nature of your soil may require. As your topdressing material should be sifted before being used, it is not necessary to remove the straw from the manure when composting it.

2. Value, use, and testing of swamp muck.—Part of our course is a reclaimed swamp with very rich black dirt on the surface and swamp muck underneath; it is very low and poorly drained. We presume this swamp muck will prove to be rather sour. How much other material should we mix into this swamp muck to be on the safe side? We have great quantities of peat on our course and are thinking of mixing it heavily with manure and chopping the whole thing up and mixing it thoroughly with the soil by means of constant disking, the idea being to increase the spring of the soil. (Connecticut.)

ANSWER.—Some swamp mucks and peat are bad, being toxic; others are good. You can readily test muck or peat by putting some of the material in a box and seeding it to redtop or other grass seed, and then keeping it well watered and in a warm place. If the seedlings develop and have a good color, the material is all right; if, however, the seedlings quickly turn yellow, the material is toxic. We would suggest that you use your muck or peat only in compost heaps, which should consist of about six parts good top soil, one part manure, and one part peat. You should not allow the percentage of muck or peat in your compost heap to exceed 25.

3. Alfalfa eradication from the rough.—We have a considerable quantity of alfalfa which grows in what will be our rough, and we desire to exterminate it. What is the best method of killing alfalfa? (New York.)

ANSWER.—With regard to killing alfalfa in your rough, it is rather difficult to do this, especially if you have a thick stand of it. To get rid of an alfalfa plant you must cut it off to about 6 inches underneath the surface of the ground. If you have scattered plants this can be done very readily by the use of a mattock, cutting off each individual plant and removing the top that is cut off. If the stand of alfalfa is so thick that this would be rather expensive as regards the labor cost, your only other recourse would be to plow up the rough and rake the alfalfa plants out with a spike-tooth harrow, removing the plants—root and all—and hauling them away.

4. Plugging greens with creeping bent sod.—We are putting in 3-inch plugs of creeping bent into a green 18 inches apart. Do you think this will eventually spread over the whole green? (Michigan.)

ANSWER.—In this manner the creeping bent will eventually, though slowly, cover the entire green. Much more rapid results have been obtained by simply scattering stolons of creeping bent over a green, and then topdressing.

5. Prevention of Bermuda and wild grass growth in sand bunkers.—What can we use to keep Bermuda and wild grass from growing in sand bunkers? Is there a solution we can use for this? (Tennessee.)

ANSWER.—The cheapest weed killer of all is common salt, and this applied liberally will kill Bermuda or any other grass. Other substitutes used are mineral oils of various kinds, but these are highly undesirable in bunkers, as they will cake the sand. Another very common weed killer is sodium arsenite—probably the most effective of all but more expensive than common salt, which should prove entirely satisfactory.

Don't raise the tee above the ground level, unless necessary to secure visibility or drainage. It's easier to grow and maintain turf on the ground level.

The first essential of a putting green is good drainage. Very often it can be improved later by more drainage. Now and then still more drainage is advisable.

It is money well spent to send your greenkeeper to see other courses and talk with other greenkeepers.

When your fairways begin to look weak, get busy with fertilizers. Top-dressing weak places is always good practice.

Too much manure can be as unsatisfactory as none at all.

The greenkeeper can not change his crops as does the farmer, so he should change the soil by topdressing his turf with compost.

The problem of weed seed in compost is best solved by making the compost a year in advance.

Starving the turf to make it tough is the most hopeless of all theories of greenkeeping.

If you have a new idea about greenkeeping, test it out by all means. But test it first on a very small scale.

Progress in better greenkeeping can be gained only by experimental research. It can't be done by theorizing.

An important consideration is to avoid any kind of topdressing that will make a compact surface layer. Too much manure or clay or sand on clay will each tend to make a bad surface layer under certain conditions.

Golf playing, golf architecture, golf course construction, and greenkeeping or turf culture are four widely different subjects. It is a rare man indeed who is expert in more than one of them.

There is one test that always gives a clue to the carefulness of the greenkeeper. It's the replaced plug after a hole is moved. If the plug is nice and green, no one notices it at all; if it is brown or dead or does not completely fill the old hole, someone has probably been in too great a hurry. Recently we saw nine dead plugs in one green.

On rich soil sheep's fescue will sometimes make a solid turf; on poor soil, scattered bunches of grass ideal for the rough. Skin the turf for compost and then seed sheep's fescue if you want an ideal rough.

Watch your putting greens on a very rainy day; then you can tell which ones need better surface drainage.

Good turf can not be maintained on a putting green unless both the surface drainage and the under drainage are good. It seems very hard for some people to appreciate the importance of good drainage, although probably 50 percent of putting green troubles are due to lack of it.

The first essential and the greatest need of a putting green is ample drainage.

The secret of good landscaping is to avoid straight lines.