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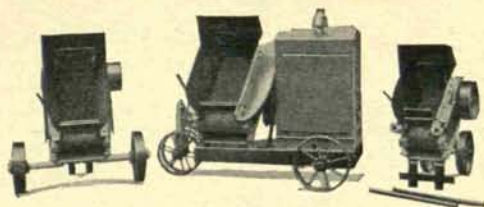
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VOLUME I.

No. 12

Constructing and Keeping Sand Greens

By CHESTER MENDENHALL, Greenkeeper
Sim Park Municipal Golf Links, Wichita, Kansas

AFTER reading an article in the August number of the NATIONAL GREENKEEPER by LeRoy Johnson on sand greens and talking with a number of our local greenkeepers who have to keep them the thought has come to me that others may be interested, so I shall attempt to tell you what little I have learned about sand greens.

I have been keeping sand greens at the Sim Park Municipal Golf Links for the past seven years with fairly good success. The first two or three years I had a great deal of trouble with our greens. They were dug out about four inches below the fairways. This caused them to hold water which would soak under the base of the green. Then during the winter when the ground would freeze and thaw the base would buckle up and become soft and almost unplayable.

Raise Level of Greens and Use Sharp Sand

Four years ago I raised all our greens about one foot above the fairways and have had very little trouble with them since.

The next difficulty I had was with sand. A great deal

of the sand in this part of the country is what is called blow sand. This sand is very fine and when oiled and put on a green soon loses all its life. It becomes packed and solid, making a very poor putting surface. I now use a good grade of sharp plastering sand. This material goes through a washer at the sand pump which takes out this blow sand and dirt, leaving just the clean sharp sand. I find it will stay in fair condition on a green for the whole season. I apply new sand on my greens each spring.



Chester Mendenhall

Crank Case Oil For Surfacing

I have used several kinds and grades of oil for greens—crude oil, fuel oil, road oil and crank case drainings. I find that the latter give me as good satisfaction as any of the rest and are far less expensive. I get my oil from the local bus company. Their oil is changed every four days and I am sure of getting a good grade.

Constructing New Sand Greens

Our soil is very sandy, so to build a new green I haul in heavy soil to raise the green about one foot above the fairways. I make a green about forty feet in diameter, usually sloping the ground up to the green from about ten feet out. After the green has been roughly graded, it is allowed to stand for some time to settle. During this time it is rolled several times to pack. Then I fine-grade the green, leaving it two inches higher in the center than at the edges. This prevents any water from standing on the green.

When the green is graded I leave a ridge of dirt three or four inches high around the outer edge to pre-



Replacing worn sod around Number 18 green at the Municipal Golf Links, Wichita, Kansas

(Continued on page 26)

We Are Converted to Bent

By ALEX McCALLUM, Greenkeeper
Scarboro Golf Club, Scarboro, Ontario, Canada

THERE has been a very wide difference of opinion among the members of the Scarboro Golf Club as to what is the proper grass to use on a putting green, and this wide divergence of opinion has been rather a costly one to the club. In spite of the articles appearing in all golf periodicals extolling the merits of creeping bent this class of grass was the least that appealed to the members, and in order to show them that bent was the grass for our course we had to plant a nursery and show the Green committee what bent would do. To revert back to the beginning it would be well to explain the history of the Scarboro Golf Course during the past five years.

In 1923 the members of the Club decided that the course was not good enough and decided to appropriate \$40,000.00 to carry out an extensive program of work. A very prominent architect was employed to lay out the course and greens, and after the plans were submitted to the members the directors were empowered to go ahead with the work.

Weeds Crowded Out Newly Seeded Greens

Construction went on very rapidly and a number of the greens were ready for seeding in the late fall. From the experience we had in connection with the construction of the greens we could now fill a small sized book with "don'ts," but as this is not the purpose of this article we are only too glad to forget that part of the trouble. The next thing was the selection of seed, and after consultation with a number of "so called" experts seed was obtained from a very prominent seed house. Germination and purity lists were received from the government, and these tests showed the seed to be high in germination and practically free from impurities. Seed was scattered most profusely on the new greens, and everyone looked forward in anticipation of having wonderful putting greens in a year or so. The first showing of the new grass was enough to make us all very optimistic, but after about six or eight weeks our grass gradually began to disappear, and the most flourishing crop of weeds that it was possible to see started to sprout. Hoping that things would turn out for the best the Green committee decided that they would wait and see the outcome.

Up to date we have a very fair covering of grass on our greens, but of what variety no one knows, the grass being of a coarse nature and not at all suitable for a putting surface. Last fall we rebuilt three greens and after much coaxing and persuasion we were allowed to

use creeping bent. These bent greens seemed to flourish from the very start and while they are by no means perfect as yet, we think we will be able to solve our putting green problems by the use of this class of grass.

Sodding Bare Patches with Bent

Large patches on a number of our putting greens died out this spring and we were at our wits' end as to what to do to get them into playing condition. We planted a small amount of bent last fall, and while this had not matted, yet we decided to take it up as sod and place on the greens. After we had laid the sod we put on a very heavy top dressing, and sowed red top over the bent. Results at first were very discouraging but we gave the experiment a full trial. We decided that we would top dress lightly with sulphate of ammonia mixed with a very fine sandy loam, and to this we also added charcoal. We kept watering continually, and we were more than surprised in a very short time at the results of our experiments. The red top of course predominated at first, and is still showing in patches. The bent, however, is growing very rapidly and is pushing the red top out, and we have on those patches now a very passable putting surface. What is more to the point, we have convinced our members that bent is the grass for our putting greens, and we are now empowered to cultivate as much bent as possible, so that when we want to put down a new green we can go to our turf garden and lift enough sod to put it in playing condition in about two weeks.

Our new greens that were planted to bent in the fall also gave us some anxiety in the spring. Weather conditions were entirely against the growing of grass, but we kept on steadily with our applications of fertilizer and top dressing, also watering heavily. At the first sign of warm weather we anxiously waited the results of our work, and I am glad to say that our efforts are being rewarded. While our new greens are yet far from perfect we are getting a nice carpet of grass and we believe that we have reason to congratulate ourselves on the progress we have made, and are looking forward optimistically to the future.

Setting Mowers High for New Bent Grass

Before bringing this article to a close we would like to make some observations on our experiments. In the early part of the season we decided that we would not cut the bent very close as we wanted to get the ground covered as quickly as possible in order to conserve mois-

(Continued on page 28)

Keeping Our Fairways Green

By E. W. VAN GORDER, Course Superintendent
Castlewood Country Club
Pleasanton, California

ALTHOUGH the Castlewood Country Club's golf course is but a year old, and the entire eighteen holes have been in play only since July 1st, it has attracted much attention throughout the state. This has been due to the happy combination of a wonderful natural setting, Cocoos bent greens, a complete hoseless watering system, and, especially, the services of the well known architect, William P. Bell of Pasadena.

Castlewood is located thirty miles east of Oakland on what was formerly the estate of the late Phoebe A. Hearst. The land on which the course is situated comprises oak covered hills which give it a very sporty nature. The layout has been cleverly designed to avoid excessive climbing—a climb on No. 3 handles the first nine, and one on No. 10, the second nine. Numbers 17 and 18 are down hill, and make an easy finish for the tired golfer.

The course abounds in natural hazards, necessitating few traps. Irregular lines and rough grass along the borders lend to these a natural appearance.

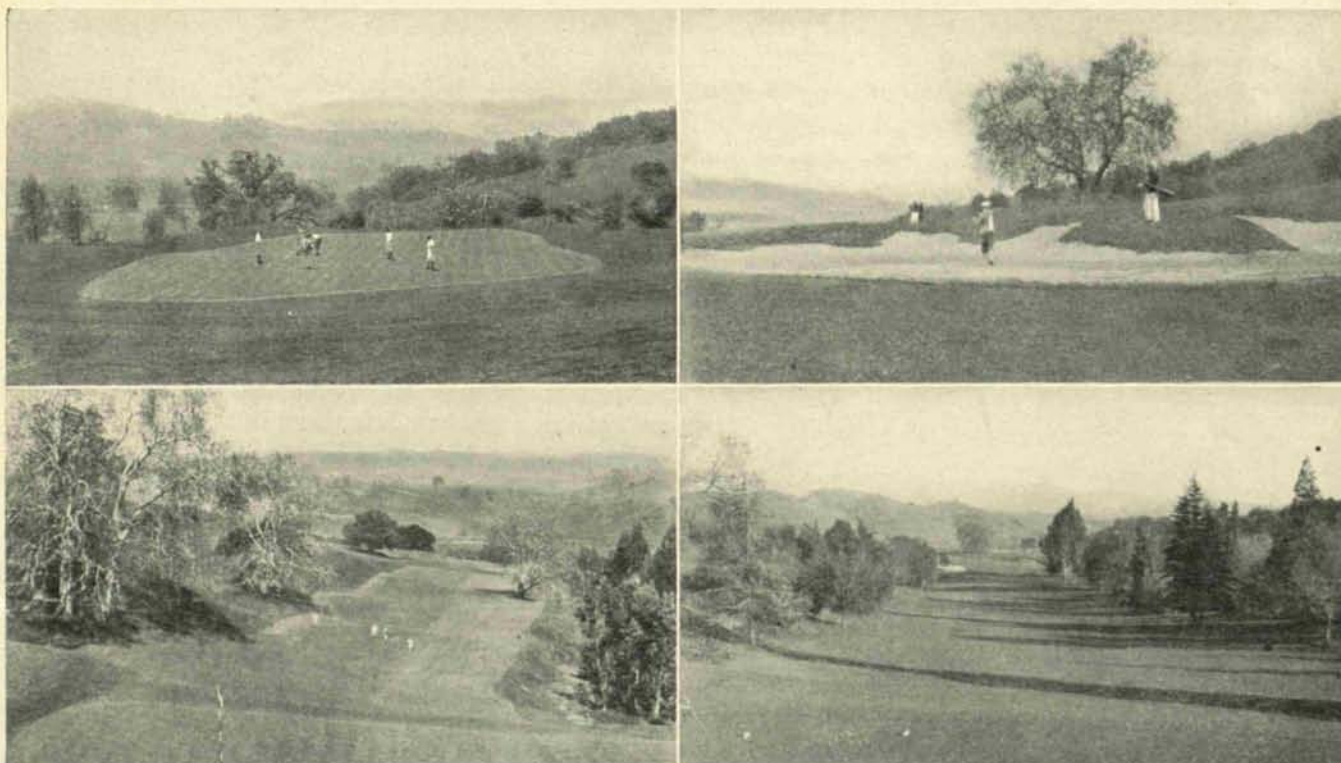
Water Pumping System

Turning to the problems of maintenance, the big question on California courses is water. We are at an ad-

vantage in this respect as we have free access to 90 million gallons a year which will be sufficient for our requirements. The water is delivered to the lower part of the property to be boosted 360 feet where it is picked up by a second pump and carried up 280 feet farther to two 100,000 gallon tanks. We have two pumps below which can be operated separately or together. At present we use only one. The motor is 100 H. P. with a pumping capacity of about 500 gallons per minute. The upper plant consists of a 100 H. P. motor and a 2-stage pump of 750 gallon capacity. All pumps are automatically operated by float switches. Our total reservoir capacity is 242,000 gallons which is about half a night's consumption during hot weather.

Lay-out of Pipes and Connections

The water pressure on the fairways ranges from 90 pounds to 160 pounds. The mains measure 4 and 5 inches with branches to the fairways of 2 inch pipe. Control valves on these branches, where they leave the mains, handle from 3 to 6 sprinklers. A fairway will have an average of 45 to 55 sprinkler connections. These are placed 70 feet apart in triangular formation to insure coverage. We are using Buckner Golf King No. 5 on



Upper left, Number 2 green at Castlewood; upper right, irregular lines and rough grass lend a natural appearance; lower left, looking down to third tee on Number 3, a difficult Par 4; lower right, Number 1 fairway, a perfect picture in the lengthening shadows of afternoon. (A. D. Mills photographs)

the fairways. We have about 150 fairway sprinklers, and while we could do with less, they have paid for themselves by reducing labor and trouble to a minimum. They are easy to handle, each man carrying about 40 in a wheelbarrow. The remainder are left to be used on fairways on steeper parts of the course, eliminating the necessity of moving them with the team. Two men take care of the 15 fairways, watering them every other night. During hot weather I have a man spend part of the day giving additional water to poor places.

I find it much more satisfactory to have the green-men water their own 3 greens. The greens are watered approximately three hours each night except Saturdays and Mondays. Two Golf Kings No. 2 per green handle the greens and tees.

At the present time we are operating with 15 men with the extra time watering bringing the payroll to the equivalent of 18 men. I will be able to eliminate 3 men and much of the overtime during the winter months.

Cocoos Bent Makes Good Putting Surface

Cocoos bent has proven very satisfactory in maintaining a true putting surface and in keeping out weeds and wild grasses. Daily close cutting and occasional top-dressing is all that is required to prevent them from matting. Uniform color is assured by light applications of commercial fertilizer. Weeding has become a matter of looking out for a few stray watercress plants which seem to be the only contamination of the silt loam we use for top-dressing.

Each man cares for 3 greens and tees. One man is kept busy with a Toro power mower, cutting the banks which are very large. We have two such mowers to allow for sharpening and repairs. However, one man can satisfactorily handle the 18 greens and 21 tees, except during the fastest growing weather.

Our problems are those of the average California course, and a well organized crew is an important factor in meeting them.

Planting Bent on Fairways

By HENRY A. MILLER, Greenkeeper
Barrington Hills Country Club, Barrington Hills, Illinois

FOR the last three years I have been planting Washington strain bent on different spots on our fairways, and from the experience we are having with it, it seems to be worth the trouble and time it takes to plant it. The spots that were planted three years ago have developed into quite a large area, and it surely makes a fine fairway from the appearance of the spots we have.

My chairman, Mr. Hart, and I often stopped and looked at spots on hills, hillsides or places where it was difficult to grow grass without being washed out, burnt out or frozen out, and figured how we would grow grass in such places without sodding it with turf. We decided to try bent out of our nursery and see what it would do.

We found after a year the wonderful results we got

after planting some on different places on the course. When it was put there it was there to stay. It seems to do as well on gravel as on good soil. We always plant it in the fall of the year and depend on rains for the start.

Anybody Can Plant Bent This Simple Way

We plant it thus: cut pieces of bent sod into small pieces, say three inches square, loosen up the soil or gravel with a hoe or rake, lay pieces on this gravel or soil about a foot apart and cover with black dirt, enough to hold it in place, and to hold moisture. Then forget about it.

We also replace our divot cuts in fairways in the same manner by digging the divot hole a little deeper, dropping a piece of bent in it, stepping it down a little and covering it with black dirt. In this way we get bent scattered all over the fairways, and in a dry spell those bent spots are always green whereas the other grass is brown. It is the quickest way to get rid of a bad spot on the fairways, or anywhere, that I know of.



Number 1 Hole at Barrington Hills, showing excellent bunkering

NOTICE TO MEMBERS

Read "Around the Office Desk" every month. There's where you will find the news that comes in by correspondence and many things you should know about the work of your association.

The A B C of Turf Culture

Principles Underlying the Practical Use of Fertilizers on Greens and Fairways

By O. J. NOER

BECAUSE of variations in soils, amount of rainfall and climate it is impossible to devise set rules which can be universally applied, yet certain fundamental principles underlying the use of fertilizers on turf grasses have wide application, and if these are thoroughly understood practices best adapted to local conditions are easily set forth. Phosphoric acid, for instance is very important on new seedings to encourage rapid root development and thus insure a uniform turf.

Some materials encourage the growth of fine textured grasses and discourage clover and weeds, while others unduly stimulate clover. Unless the fertilizer contains plant food elements which reinforce soil deficiencies failure attends their use. Thus, if turf needs only nitrogen it is useless to apply other than nitrogenous fertilizers. The more slowly available materials supply plant food over considerable periods and are particularly adapted to use on sandy soils where the danger of plant food loss from leaching is great.

The rate of fertilizer application depends upon the amount of essential plant food contained in the material and its availability. Water soluble nitrogen fertilizers are best applied in small amounts at frequent intervals to avoid burning and loss from leaching, and provide a more uniform supply of plant food. Organic nitrogen fertilizers can be applied in larger amounts because soil processes gradually convert the insoluble nitrogen into soluble and available forms. Thin turf usually is an indication impoverished soil and requires generous fertilization to stimulate spread of existing turf. All factors must be considered when fertilizer programs are being instituted.

Fertilization of Established Greens

Greens are in especial need of fertilization. Frequent watering induces heavy growth and increases the losses of plant food from leaching. Large amounts of plant food are constantly removed in the clippings taken off the greens. Mr. Burkhardt at Westwood Country Club, Cleveland, reports an average of 35 pounds of dry clippings removed daily from each green. This is equivalent to 3500 pounds in 100 days. If the clippings con-



O. J. Noer

Editor's Note: For the past four years Mr. Noer has investigated the value of various fertilizers in relation to golf turf at the Soils Department, University of Wisconsin, under a fellowship established by the City of Milwaukee.

tained 2 per cent nitrogen (heavily fertilized turf frequently contains even more) 70 pounds of nitrogen were removed, equivalent to 350 pounds sulphate of ammonia. The large amount of nitrogen removed from greens during a season is rarely appreciated.

Nitrogen is the most essential plant food element, and fortunately need for nitrogen is most easily recognized. It is responsible for active vegetative growth and dark green color. Occasionally only the tip ends of the stolons on vegetative greens are dark green and the main stems are devoid of color. Here the need is so acute that the plant moves nitrogen from the older portion of the stems to the growing tips.

In order to maintain uniform growth the turf must obtain a uniform and continuous supply of nitrogen. It is not feasible to build up large reserves of nitrogen in the soil because of the danger of loss from leaching and denitrification.

This danger exists even with insoluble organic nitrogen, because it is converted into soluble forms by bacteria in the soil, and if the amount is larger than the turf roots can take up and utilize, loss occurs.

Too much nitrogen tends to produce coarse broad leaves, and a weak succulent turf, particularly if readily available nitrogen is used. Such turf is probably more susceptible to such diseases as brown-patch.

All things considered best results are obtained from moderate applications at frequent intervals rather than occasional heavy applications.

Where good top dressing containing well rotted manure is used very little response is obtained from additional applications of phosphoric acid and potash. Both tend to encourage clover so their use should be based on trials which demonstrate the need for larger amounts than are contained in top dressing mixtures.

All carefully conducted tests indicate that sulphate of ammonia encourages the growth of the finer textured grasses, and discourages clover, and nitrate of soda has the opposite effect. Consequently sulphate of ammonia should be chosen as the source of quickly available nitrogen, and used to produce these effects. Ammo-

phos is an excellent material where additional phosphoric acid is required.

There is also a need for more slowly available nitrogen, to insure a uniform supply. In the past this was supplied by the manure used in compost piles. Near large cities manure is difficult to obtain and many clubs are substituting such materials as cottonseed meal, poultry manure and Milorganite. None of these require long composting and should be mixed with the top dressing just previous to top dressing the green, or they can be spread broadcast over the green and top dressing mixture applied over them.

The amount and character of turf growth must be used as a guide in determining the amount of nitrogenous fertilizer to apply. Because of the danger of burning, sulphate of ammonia applications should not exceed three to five pounds per 1000 square feet in the spring and fall, and one to three pounds in the hot summer months. The organic materials can be applied at rates of 15 to 30 pounds per 1000 square feet. The heavier rates are safe during cool weather and the lighter amounts during the hot summer months. Naturally heavier applications should be made where the turf is poor. Trials on the particular course should be used as a basis for determining the rate and frequency of fertilizer applications.

There are a number of methods of applying fertilizer which give good results. No matter what the method the importance of uniform distribution cannot be too strongly emphasized. Fertilizers do not move laterally in the soil, all movement being vertical. Uneven applications result in uneven growth and unsightly greens.

Sulphate of ammonia is sometimes applied dry, in solution, or mixed with top dressing. The method selected depends upon individual preferences. When applied dry uniform distribution is difficult to obtain, because of the small amount of material used. Some greenkeepers use the small hand type seeder and apparently secure uniform distribution. Thorough watering immediately following the application is essential to avoid serious burning of the turf. When applied in solution the barrel cart sprinkler is most widely used. The sulphate of ammonia solution runs out of the small perforated holes in the horizontal pipe attached to the barrel, but unless the holes are closely spaced uniform distribution is not obtained. In a few instances the sulphate is fed directly into the watering line by means of a proportioner such as devised by Charles Erickson of the Minekahda Club at Minneapolis. The sulphate is quickly applied and the large volume of water eliminates the danger of burning. Frequently the sulphate is applied mixed with the top dressing. This method reduces the danger of burning because the ammonia is taken up and held temporarily by the clay and humus. Care must be exercised to secure uniform distribution of the sulphate in the mixture. Preliminary mixing

with sand or soil to obtain more bulk facilitates mixing.

Sometimes, on newly built greens, fertilizers do not produce marked results. This is usually due to poor soil texture. Sand or humus was not worked into the heavy soil, root systems do not develop in the hard surface soil and suffer for want of needed oxygen. Until this is corrected good turf cannot be expected.

Fertilization of New Greens

Good greens can be obtained without the use of manure provided surface soil of a sandy loam texture is available. Proper soil texture is important, because it is not easily modified after turf is established. Much larger amounts of sand are required to modify the texture of heavy soil than if humus materials are used. Medium to coarse sands are preferable to fine grained sands.

The fertilizer needs of seeded greens are slightly different from those planted with stolons, due to differences in amounts of stored food. The small grass seed contains very little reserve food, whereas the stolon is capable of establishing itself with little outside assistance. Hence seeded greens must receive sufficient phosphoric acid and nitrogen before seeding to insure rapid growth of the young seedling turf plants, and phosphoric acid plays a most important part because of its stimulating effect on root development. Stolon planted greens can be fed from the top in the top dressing mixtures which are applied at frequent intervals.

Phosphoric acid is best applied in quickly available forms such as acid phosphate. From 5 to 10 pounds per 1000 square feet is sufficient. Applications should precede seeding so the fertilizer can be worked into the shallow surface layer of soil. This is important because later surface applications of phosphate do not move down into the soil rapidly. Nitrogen on the other hand moves freely in the soil so surface applications even after seeding are effective. If sulphate of ammonia is used as the source of nitrogen heavy applications must be avoided because of the danger of killing the sensitive young seedling. Usually not more than 5 to 10 pounds per 1000 square feet should be used, and is best worked into the soil a few days before seeding or planting. If organic nitrogen fertilizers are used larger amounts can be safely applied, and should be worked into the soil so soil processes can release the nitrogen.

Fertilization of Established Fairways

There appears to be an ever increasing appreciation of the value of fairway fertilization. In the past attempts were made to improve poor turf with seed alone. If the soil supplies only enough plant food to support the scattering turf plants, how can the new struggling seedlings establish themselves? Had conditions been favorable for growth the existing plants would gradually spread and fill in the bare spots. Where the stand of turf is poor and the soil is not too hard some seeding, in addi-