THE BULLETIN

of the

UNITED STATES GOLF ASSOCIATION GREEN SECTION

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Contents

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How Cooperation Helps the Greenkeeper

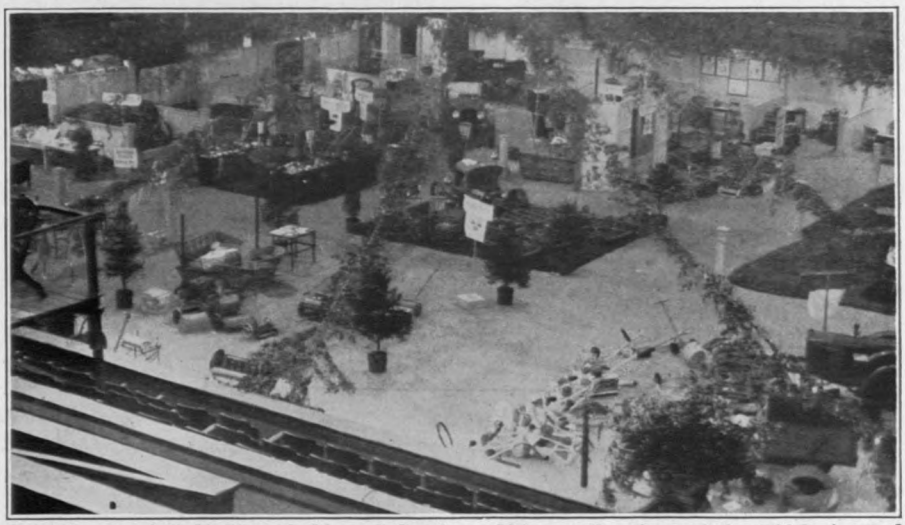
By Ganson Depew

Address given at the National Greenkeepers' Convention February 4, 1931

I appreciate very much the gracious invitation extended to me as chairman of the Green Section of the United States Golf Association and member of the executive committee of the Association, to address the National Greenkeepers' Convention. I bring to you the cordial greetings and best wishes of our Association; and may I also say that it is a very great pleasure to meet you and speak on the subject which has been assigned to me, namely, cooperation.

It is a word which from the earliest days of civilization has meant progress and has enabled the world to attain the standards of living and achievement which are seen today in the most enlightened nations. Without cooperation we would be mere animals, fighting each other for our very existence, which in brief is the survival of the fittest. Almost all the evils with which man has been afflicted may be traced to a lack of cooperation, in which each individual has sought to promote his own interests and happiness at the expense, or at least independently, of others, and which has always resulted in wretchedness and ruin of all. Mankind has been slowly climbing toward the goal of achievement and success; poets have sung this, preachers have taught it, and men have fought for it. The movement of humanity under cooperation has always been onward. During the centuries which have passed since the formation of the earliest human associations for mutual interest and protection and for the fostering of higher ideals and the satisfying of human needs, mankind has groped as if in partial darkness and without a steadying compass, but all the time getting closer together. The pleasure of the dance is largely due to the measured harmonies of motion, to the measured harmonies of sound. We find happiness in associating with those to whom we are attached, and in cooperating with others in those pursuits and aims in which we have a common interest. The benefits of cooperation are seen in associations for the common welfare, when without expectation of reward, except the consciousness of benefiting others, some enterprise is undertaken for the public good. In some of the higher forms it takes the name of patriotism and becomes that spirit of devotion to one's country of which history furnishes so many signal examples. It was this sentiment which ages ago animated Leonidas and his immortal Spartan band, inspiring these intrepid defenders of Thermopylae in sacrificing themselves to stay the march of Persia's invading host, and which led the charge of the Light Brigade into the jaws of death. It was exemplified in our Revolutionary War when our men and women won their independence from England's trained soldiers. It was seen in the dark days of our Civil War, when only the union of states saved our nation from dissolution. It was manifested in the defense of Verdun in the last Great War, when the French, standing like the Rock of Gibraltar, said, "They shall not pass"; and later when the combined efforts of the Allies ended the conflict. It is vital in the union of capital and labor in promoting the industrial progress and welfare of a country. And it operates in the widest kind of way in those nations of the world where only the consent of the governed holds millions of people together, and sometimes to band themselves with other nations in a common cause.

I have come to you today to speak especially of cooperation in a matter in which we are all vitally interested, namely, the better upkeep and more economical maintenance of golf courses. Its importance becomes evident when it is realized that golf in this country has more than 4,000 clubs and 2,000,000 players including patrons of municipal and public links, and nearly a billion dollars invested in courses, club houses, supplies, and implements of the game. Some years ago the United States Golf Association, in the interests and development of golf, for which purpose it was formed, decided to do what it could to promote the general betterment of playing conditions. This led to the establishment of its Green Section for experimental and research work. It had its inception in 1915, when we asked the United States Department of Agriculture for aid in solving turf problems. This was gladly and generously given in the way of funds,



Greenkeepers' Golf Show held at Columbus, Ohio, at the time of the Fifth Annual Convention and Golf Show of the National Association of Greenkeepers of America

grounds, and valuable advice. In 1921 the United States Golf Association Green Section was established under a cooperative agreement with the Department of Agriculture, which continued in charge for a time. In 1927, on account of the increasing work, the Green Section assumed direct responsibility in an enlargement of the activities and in finance. The Arlington Turf Garden, near Washington, was established by the Department of Agriculture, and later, with the funds of the United States Golf Association, the Mid West Turf Garden, near Chicago, came into existence. Still later the 24 coordinated experiment and demonstration turf gardens were located in various parts of the country. Only a whole-hearted cooperation between the Department of Agriculture and our Association made all of this possible. The United States Golf Association and the greenkeepers of America owe a debt of gratitude to Dr. R. A. Oakley and Dr. C. V. Piper, of the Department of Agriculture, for their invaluable assistance in organizing the Green Section and for their research work in the early days, and also to Dr. K. F. Kellerman and his staff in their continuance of the work. Can it be said that these Govern-

ment officials have not been animated by the highest motives and a sincere desire to help greenkeepers and golf clubs in promoting better turf conditions? Such an assertion could be made only by a short-sighted man. Likewise, can the motives of the officials of the United States Golf Association be impugned in working along the same lines?

For many years, as chairman of the Green Section, one of the past presidents of the Association, Wynant D. Vanderpool, has ably and unselfishly given his services, assisted by his efficient aids, Dr. John Monteith, Jr., and Kenneth Welton. That the Green Section will continue to receive the whole-hearted support of the United States Golf Association is shown in the address of Herbert H. Ramsay, who, when elected president of the Association in January last, after seven years of very active and loyal service on the executive committee, said, "There is no more important work affecting the game of golf than that being carried on by the Green Section."

Since the Green Section was established I fear there has been a feeling on the part of some greenkeepers that it was doing something to usurp their privileges and was treading on forbidden ground. Nothing is further from the truth. Its work, on the contrary, was intended to be a help to those who knew very little about the conditioning and proper maintenance of new golf courses continually springing up, and to give greenkeepers of experience valuable information obtained from experimental and research work. There was absolutely no thought or intention of forcing anything on greenkeepers or clubs. At a large expense the Green Section simply offers its advice and experimental work to anyone who wishes to use them or ignore them if it seems best. It does not interfere with greenkeepers in conducting their own experiments and making use of the results obtained. It has never dictated in the slightest degree to any greenkeeper or to any greenkeepers' association.

The cooperation from golf clubs and greenkeepers where our gardens are located has been most cordial, enabling the Green Section to obtain very valuable reports on the treatment and growth of the various grasses at widely separated points under different climatic conditions, which should be of great value to all greenkeepers, especially those employed in the particular districts where the gardens are located. Further cooperation has been seen in the numerous well-attended gatherings of golf club officials and greenkeepers held at the various gardens, where it has been possible to observe and discuss the way in which different grasses, fertilizers, and treatments have acted. At many of these meetings the members of the Green Section's staff have cooperated in attending to explain the work.

A concrete case of cordial cooperation has been the generous provision of laboratory and greenhouse facilities by the Botany Department of the University of Chicago, with special attention paid to a study of various methods of cutting grass and the influence of these methods on its growth and permanency, which brings into question the proper height for cutting on fairways and putting greens, as well as economy of upkeep, disease resistance, and other questions. It is hoped and expected that with this cooperation we can definitely settle some of the disputed questions and correct some of the faulty practices now in use on golf courses.

Another evidence of cooperation has been the invitations from the

Pennsylvania State College, the University of Wisconsin, and the Michigan State Agricultural College to take part in their programs of short courses of instruction for greenkeepers. Still further cooperation, assisted by funds from the Green Section, is the experimental turf work at the Pennsylvania State College and at the New Jersey Agricultural Experiment Station. It was the active cooperation of the New Jersey State Golf Association and the Greenkeepers' Association of New Jersey which induced the legislature of the state to appropriate $5,000 annually for this work. Other states and universities are now taking up turf problems.

The cooperation between the Green Section and the member clubs of the United States Golf Association in the way of correspondence and service is one of our greatest activities. Not only are soil and seed samples examined and reports rendered, but the Green Section staff visits on request a large number of golf courses to give advice to clubs and greenkeepers on the turf problems submitted. During the past year many clubs in as many as 24 states were visited, and this number would have been considerably increased had the personnel of the staff been larger.

In the publication of the Bulletin of the United States Golf Association Green Section the spirit of cooperation is again in evidence. Unfortunately, on account of illness in the editorial staff and important work in other fields, the Bulletin has been somewhat delayed in its issuance, but it is expected that in the future it will be promptly printed and circulated.

It is interesting to know that in February, 1929, a Board of Greenkeeping Research was established for the scientific investigation of greenkeeping problems by a Joint Advisory Committee of the Golf Unions of England, Scotland, Ireland, and Wales. Its director, R. B. Dawson, acknowledging my congratulations in the issue of their most attractive journal, said, "Like yourselves we are finding experimental work of increasing value not only in advising clubs as to treatments but in adding to the general knowledge of turf culture." Thus is now seen in Europe further cooperation in the general work and problems in which we are all interested.

In further cooperation are the activities of your splendid National Association of Greenkeepers of America, organized primarily, as was the United States Golf Association Green Section, for the betterment of turf conditions. You are very fortunate in still having at your head the founder of your Association, a man of vision and experience who has given his time and effort to the interests of greenkeeping, a man commanding the respect and affection of every one who knows him—John Morley. In still further cooperation is the publication of your interesting magazine *The National Greenkeeper*, with its instructive articles on turf maintenance and ably edited by Robert E. Power. To them and others in your organization, as well as to state and local associations throughout the country, the greenkeepers and the golf clubs are indebted for valuable advice and suggestions in the betterment of golf courses. May I take this opportunity to congratulate the committee in charge of the splendid golf shows you have at your conventions, which have added much to their interest and pleasure, and for which in recent years your hard-working chairman, Fred J. Burkhardt, is responsible?

The comprehensive nature of the work of the Green Section can perhaps be better understood when I tell you that our Association now expends annually nearly $42,000, which is $9,000 more than is received in dues from member clubs. It realizes that golf is a game of pleasure and that a golf club, to be successful and self-supporting, must have an adequate membership, which can not easily be had if links are not kept in first-class condition. An increase in the number of clubs means, of course, more employment for greenkeepers. If a greenkeeper values his job, he should be glad, for self-interest alone, to receive the reports of the Green Section; and if, in availing himself of its experiments and research, he can give his club a finer golf course and save money in its maintenance, he can command a higher salary. Greenkeeping today is a profession requiring technical and scientific knowledge.

The work of the Green Section is still in its infancy. It does not claim immunity from error or that its advice is infallible. But it does feel that progress has been made and valuable information obtained, which have greatly helped the golf clubs in the way of better links and reduced expense of maintenance. There is still, as you all know, much to be learned, especially in leaf-spot disease, turf-insect control, and fairway improvement; and as we learn from continued experiments and research, the great waste of money now going on will be materially lessened in the knowledge of the best methods to follow.

May I briefly state some of our future problems, which we hope to work on if further funds are made available? Insects continue to be the greatest source of trouble on many golf courses, such as the mole cricket in the South, ants, grubs, cutworms, army worms, grass webworms, and many others; and until adequate information on their control is obtained through research and experimental work large sums of money will continue to be spent each year in the war against insects, but without results.

Most of our experimental work has been in the preparation and treatment of putting greens; but fairways are as important as putting greens, and few clubs have perfect fairways. This brings to the front problems which in most cases have been unsolved, such as the following: best methods of preparing, fertilizing, and seeding various soils in different climates; time of application of fertilizers and their rotation; best use of water, particularly in connection with the sprinkling systems which most clubs are establishing; best height of cutting; control of weeds, particularly clover, which is encouraged to spread by the application of an excess of water; renovation of poor, weedy turf; perpetuation of good Bermuda turf; treatment of brown-patch; methods best suited for effecting the recovery of turf from the deplorable conditions resulting from the drought of the summer of 1930. Systematic study and experimentation is necessary to obtain information which will enable one to solve and successfully meet these problems. In all of these matters the greenkeepers, working in cooperation with the Green Section, can be of the greatest assistance, and through our combined efforts success will be attained. The Green Section not only seeks your help and experience, but is glad to make use of them in its own field of activity. Golf can not get along without greenkeepers. Few realize the time and effort the greenkeeper

puts in from early morning until late at night to create better turf conditions. But there is this difference between the Green Section and yourselves, namely, that golf clubs have not the necessary funds to enable greenkeepers to conduct intelligent and scientific experiments and research on a scale as large as that on which the Green Section proceeds, and in addition they are unable to give the results the same wide publicity that the Green Section does. We appreciate the value of your work and hope you in turn appreciate ours and that you feel, in fairness and good will, that the sole desire of the Green Section and of the United States Department of Agriculture is to help you as best they can.

Only in a hearty and cordial cooperation between us all can the best results be obtained. We are all interested in producing the finest fairways and putting greens possible. If this is accomplished, the existence and cost of the Green Section will have been justified, as will also your Association of greenkeepers and others, and you will have a just pride in the golf links of which you have charge. An honest difference of opinion will of course prevail at times as to the best methods to pursue. But in any event let us unselfishly work together without jealousy or friction, in the spirit of the utmost harmony, to make golf, which we all love, the most enjoyable of games, with better conditions of turf at a minimum expense as our ultimate goal. In brief, let the fullest cooperation be our watchword for the future.

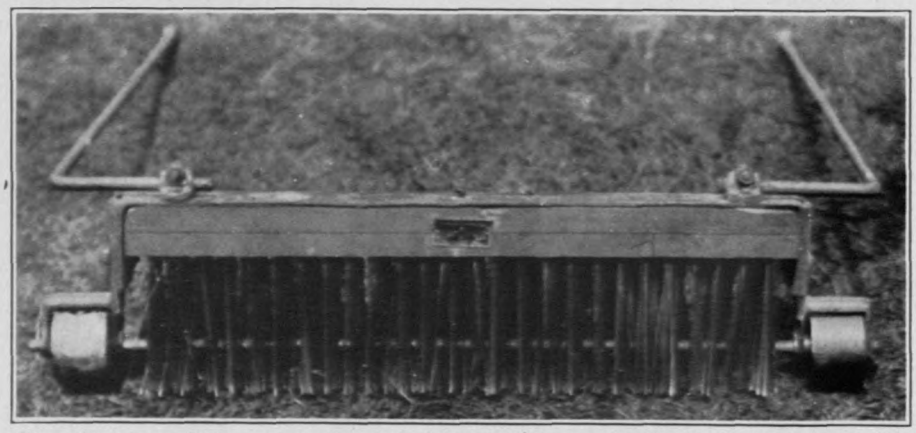
Ammoniating Superphosphate

Demonstration of the cheap process of adding ammonia to superphosphate, a new development which is proving of practical benefit to farmers and the fertilizer industry, was the feature of an exhibit by the Bureau of Chemistry and Soils at the annual meeting of the National Fertilizer Association held June 8 to 10, 1931, at White Sulphur Springs, W. Va. The small-scale apparatus, constructed in the Fertilizer and Fixed Nitrogen Research unit of the bureau, carried on the process of ammoniating superphosphate in the main lobby of the Greenbrier Hotel and drew groups of visiting chemists and executives of fertilizer companies in whose business this process has been one of the most important and revolutionary of recent developments.

In the miniature apparatus which was shown at the exhibit, anhydrous ammonia, contained in a small steel cylinder under a pressure of 150 pounds, is released in gaseous form at regular intervals and in small amounts, to be absorbed by the superphosphate which is visible in a revolving glass drum. A manometer filled with colored liquid was so arranged as to show the pressure of the ammonia released from the cylinder and the decrease of pressure upon its release for absorption by superphosphate. Commercially the ammoniation of superphosphate is carried out in one step rather than gradually, as shown in the apparatus, sufficient ammonia being added to the superphosphate to correspond to 1½ to 2 per cent of the superphosphate. The availability to crops of the phosphoric acid in superphosphates, or superphosphate mixtures, when higher percentages of ammonia are used is under investigation by the Bureau of Chemistry and Soils, and is a development of much interest to the fertilizer industry.

An Improved Mower Brush

Brushes attached to putting green mowers are gradually coming into more general use, especially on turf that has a marked tendency to produce an excessive growth of stolons, such as Bermuda grass and some strains of creeping bent. If the turf can be lightly brushed ahead of the mowers many more of the objectionable stolons are removed from the turf than would be the case if the grass were mowed when it is trampled down by players or pressed down by the rollers of the mowing machines. The brush attachments are more common with the power mowers than with the hand mowers, but even the hand mowers are now occasionally equipped with brushes.



The efficiency of the mower brush is increased by equipping it with casters. The casters are adjustable and thus the pressure of the brush on the turf may be regulated. The axle running between the bristles increases their resistance

One of the objections encountered in one of the common types of brush attachments is that the long bristles tend to bend backward as the brush is being pushed over the turf and this defeats the purpose of the brush. One method for overcoming this objection was devised by George T. Cunningham for use on the Metropolitan bent turf on the putting greens of the courses of the Country Club of Virginia, in Richmond. The accompanying illustration shows the additions which were made to the brush attachment furnished with the power mower used by Mr. Cunningham. A strip of 3/16-inch steel with the ends 3/8 inch thick was screwed on the top of the brush. This strip was bent over the ends of the brush. The ends of this steel strip were provided with slots ⅛ inch deep, in which were fitted the extra brackets and casters taken from a discarded hand mower. A bolt through the brackets and side irons makes it possible to raise or lower the rollers and hence the height of the brush may be carefully adjusted. A half-inch axle runs through the brush between the caster wheels. This axle is about an inch from the ground and holds the bristles in front of it from bending too far back. The resulting increase in the resistance of the bristles makes the brush much more effective in raising the runners of creeping bent or the seed heads of annual bluegrass (*Poa annua*).

How We Built Our Oiled Sand Greens

By Wright D. Taylor
Live Oak Golf Club, Weatherford, Tex.

In common with golf courses in this section of the country, where rainfall is inadequate for the maintenance of grass putting greens, our club, being unable to install a sprinkler system, was confronted with the problem of the proper construction of sand greens. The sand greens as first built were very unsatisfactory because the heavy rains churned up the sand, washed it off, and floated the lighter fuel oil out of the sand onto the fairways. This not only interrupted play, but necessitated a continuous outlay for labor and material in replacing sand and oil. In the winter of 1926 the sand greens were rebuilt, and we now have no trouble from the loss of sand and oil by wind and rain.

Our course is located on a high ridge or divide with headings of small draws or valleys leading out from the ridge. The soil on the ridge is rather poor, with layers of stone underneath, and the grass is poor. In the draws we have a good black soil and a splendid turf of curly mesquite grass. This grass occurs mostly here on black soil of a tight nature, although on gravelly land it seems to thrive well but the turf is not as thick as on good soil. In very dry weather it does not die, but becomes yellow and remains dormant. Our annual rainfall is 32 inches, heavy rains usually occurring 3 to 6 weeks apart in June, July, and August, with warm to hot, clear sunshine during the period. In March and September we usually have considerable wind.

Our sand greens are 42 feet in diameter and are built on the native soil. In rebuilding them 3 barrels of rather heavy fuel oil are first put on the base and allowed to soak in for a few days in order to kill the vegetation and to help keep the base from absorbing the oil out of the sand on the green. The base is tamped smooth and almost level, leaving the top of the cup about ¾ inch higher than the outer edge of the sand green 21 feet distant. The purpose of this slight rise is to keep as much water as possible out of the cup. It really helps rather than retards good putting. The cup holes, which are 3 feet deep, are filled to the bottom of the cup with small stones so as to permit quick drainage of any water in the cup.

For about a foot around the cup the hard base is leveled with the top of the cup so that in play the sand can be dragged on this to a depth of ⅛ to ¼ inch, which is sufficient to permit a ball to run true if struck true. This also prevents the players creating a saucer-like depression of several feet around the cup resulting from their dragging sand away from instead of toward the cup and dragging the sand too firmly. This hard ground around the cup also, to a large extent, prevents sloughing of the side walls of sand into the cup and creating a hole at the top that is much wider than the regulation 4¼-inch cup.

In our case we obtain a mixture of limestone gravel and sand washed into ravines. We first screen out the rough particles through a screen of 8 meshes to the inch, and then screen out the dirt and very fine sand through a screen of 24 meshes to the inch. It is this dirt and very fine sand which, in our opinion, is the chief cause of

sand greens becoming packed by rains and players. The portion of the material saved for use is about 20 per cent of the whole. This is then thoroughly worked in a mortar box with heavy oil or residuum until the sand has absorbed all the oil it can. At first thought this amount of oil might seem to be too much; but after the sand is spread, much of the oil will pass down into the base, and that on the surface dries out to such an extent after a few days that it will not stick to the players' shoes. The screening of and working oil into the sand should be done when the material is thoroughly dry, as it can be done much better when in that condition and at far less cost, the process being a tedious one at the best. As this residuum is a rather heavy oil, it can not well be worked into the sand in cool weather. In this case it should be well heated or thinned with a very small amount of light fuel oil. The sand is spread only 1 inch deep on the green, because only a light smoothing of the surface is required to permit a ball to run true, and it is deep enough to cause a ball to stick to the sand green if it hits the near side from a good distance—up to about 50 yards in case of a mashie shot of fair height. A few weeks later, after rains and play tend to pack the sand, the surface will need to be regularly roughed up to a depth of about ¾ inch and dragged with a mat. We use light drags made of two pieces of half-round 1¼-inch moulding nailed together, with a flat handle of about ¼ by 1¼ inches.

Our sand greens have sodded dirt rims and are built sufficiently high to accomplish their purpose of keeping outside water off and washing rains from removing sand and needlessly floating the oil. To facilitate play the rims are tapered several feet outward to a feather edge, leaving the surface a rather gentle swell. Rain water on a sand green is drained off through one or two 2-inch gas pipes set into the rim of the green, which, after a rain, quickly drain off the water, soon putting the sand green in a condition for play.

Prior to July, 1930, we had not begun to remove the dirt and fine sand from the material used on the greens, which we consider to be the chief cause of packing. The old sand greens, prior to that time, had nevertheless gone a long time without requiring reoiling and were splendid greens when properly roughed up and dragged with a mat. The sand greens we reconstructed in July, 1930, by removing the dirt and fine sand, appear after a year to be as good as they were the day they were finished, which is certainly enough to satisfy anyone.

We attribute the satisfactory results we have had with our sand greens largely to the coarser sand which we use, but especially to the heavy residuum from oil refineries or cleanings from old fuel-oil supply tanks of steam users which we use in place of the ordinary light fuel oils. There is little oil in the residuum to dry out and float off, and it serves its purpose of holding the sand together. Our sand greens will not need to be reoiled more often than once a year, and probably less often.

Greens at the foot of a hill should be protected from surface or seepage water from the hill, by ditches or underground drain tile. A foot or two of crushed rock under the ditch will help greatly to improve the drainage.

Artificial Manure

There has been for some time a scarcity of farm manure for agricultural purposes which has been felt even by golf clubs. Since the desirable farm manures are no longer obtainable, various methods have been devised to manufacture "artificial manure" by a process of rapid decomposition of such rough organic material as straw, leaves, cornstalks, and grass clippings. Most of these methods are dependent upon a plentiful supply of moisture and nitrogen in an available form to assist in the decomposition process. The organic material is saturated and nitrogen in a soluble form is mixed through it as it is piled. Lime and superphosphate are sometimes added. The lime (calcium carbonate) in some cases hastens decomposition, and the superphosphate increases the phosphoric acid content of the manure and also assists in decreasing the loss of ammonia during decomposition.

The Bulletin of the United States Golf Association Green Section has from time to time referred to these processes, and in the Bulletin for June, 1924, and September, 1930, methods are described in sufficient detail to enable the greenkeeper to apply them on the course. The Bulletin for November, 1929, contains a brief review of Bulletin No. 573, entitled "Artificial Manure from Straw," issued by the New York State Agricultural Experiment Station, Geneva, N. Y.

Two bulletins have recently been published by the Iowa Agricultural Experiment Station, Ames, Iowa, dealing with the production of artificial manures, and with the effects of the manures on the soil and crops. The bulletins are technical in character, but the results of the work, from which we will quote, have considerable practical value. In fact they are, on the whole, of more value to the greenkeeper than to the farmer, because the large amount of water required in the process of decomposition is often more readily available on the golf course than on the farm.

Credit for the first practical work in composting raw organic materials with chemicals and water is given to Hutchinson and Richards in the following quotation from Iowa State College Research Bulletin No. 126, "The Production of Artificial Farm Manure," by F. B. Smith, W. H. Stevenson, and P. E. Brown:

"Hutchinson and Richards in England were the first to develop a really practical method for the production of an artificial farm manure. They treated alternate layers of straw with ammonium sulphate and limestone, making heaps 10 feet square and 5 feet high for each ton of straw. Water was added in sufficient amounts to bring about thorough decomposition of the straw in a minimum period of time. The process was later improved by the use of a phosphate with the ammonium sulphate and lime. It was patented and is now controlled in this country by the American Adco Company."

By their own experiments Smith, Stevenson, and Brown found that it was desirable to provide soluble nitrogen in some form to hasten decomposition. "It seems very desirable," the bulletin states, "that some reagent supplying soluble nitrogen be employed in preparing composts from straw, cornstalks, or other similar materials, in order to hasten the decomposition processes, and permit of the earlier production of a well-decomposed manure. Such a reagent will also increase the fertilizing value of the manure produced because

of the nitrogen added. Artificial farm manure may be produced by composting straw and such materials without the addition of any reagents, but the process advances much slower and the manure formed is of less value when applied to the soil."

These investigators call attention to the necessity of keeping the piles moist. "These experiments on the production of artificial farm manure," they write, "show that a good grade of well-decomposed manure may be made by composting straw or cornstalks with certain chemicals, provided a sufficient supply of water is added to keep the compost heap moist. The addition of a proper amount of water is essential for the best decomposition of the materials and for the production of the best grade of manure."

Even though the manufacture of artificial manure has been practiced for some time, there still remains a doubt in the minds of many as to its value compared with farm manure. In the second Iowa State College Bulletin referred to above, Research Bulletin No. 127, the research workers, F. B. Smith and P. E. Brown, show that similar results may be expected from the use of artificial manure and farm manure. The results of their work are shown in the following quotation from this bulletin:

"From the results as a whole it is apparent that the proper composting of straw and cellulose residues may permit the production of artificial manures which will give similar effects on bacteriological conditions in the soil and on crop yields to those occasioned by farm manure. There is a similar stimulation in the nitrification process and in the numbers of organisms, and while nitrate assimilation is also stimulated by the artificial manures, the influence on this process is no greater than that produced by farm manure. While, therefore, there may be a reduced content of nitrates in the soils following the addition of these artificial manures, there is no greater reduction than that brought about by farm manure. As farm manure has a well-known beneficial effect on crop growth, it is apparent that there need be no deleterious effect from well-decomposed artificial manures either on crop yields or on soil conditions in general. In fact it would seem that quite as large beneficial effects should be exerted, and any increase in nitrate assimilation and decrease in nitrate content is more than offset, from a crop production standpoint, by the increased nitrification which is occasioned."

1931 Official Edition of the Rules of Golf

The United States Golf Association announces the publication of the 1931 Official Edition of the Rules of Golf. The booklet contains recommendations, form and make of golf clubs, etiquette; special rules for match play competitions; rules for three-ball, best ball, and four-ball matches; special rules for stroke competitions; rules for par and bogey competitions; together with interpretations as passed by the Royal and Ancient Golf Club of St. Andrews and the United States Golf Association.

In quantities of 25 booklets, or less, the price is 10 cents each, but in larger orders the price is scaled down to 6 cents for 1,000 copies or more. On orders of 200 or more copies the club name will be printed on the cover. Wall cards containing complete Rules of Golf are available at 50 cents each. Orders may be sent to United States Golf Association, 110 East 42d Street, New York, N. Y.

QUESTIONS AND ANSWERS

All questions sent to the Green Section will be answered in a letter to the writer as promptly as possible. The more interesting of these questions, with concise answers, will appear in this column. If your experience leads you to disagree with any answer here given it is your privilege and duty to write to the Green Section. While most of the answers are of general application, it must be borne in mind that each recommendation is intended specifically for the locality designated at the end of the question.

Treatment of putting greens containing considerable annual bluegrass (Poa annua).—Annual bluegrass is giving us considerable trouble in our greens. Some greenkeepers object to it and try to get rid of it while others do not seem to mind it. What are your suggestions? (New York)

ANSWER.—Annual bluegrass makes up a large percentage of the turf on some of the most famous golf courses in the country. It is at its best in spring and fall. When a green contains also bent grass, there is a gradual change in late spring and early summer from a large percentage of annual bluegrass to a large percentage of bent. The bent predominates during summer, and in fall the annual bluegrass returns in abundance. Greenkeepers who have mixed annual bluegrass and bent greens have varying success in bringing the bent grass in as the annual bluegrass disappears in hot weather and in keeping the annual bluegrass in good condition during the seasons when it is most in evidence. Apart from general observations, little is known regarding the best method of culture for annual bluegrass. It is possible to have very fine annual bluegrass putting turf in spring and fall. The grass adapts itself fairly well to most cultural methods. Often it is necessary to cut annual bluegrass greens twice a day. The grass requires frequent watering, but not to the extent of keeping the soil saturated. Also frequent light applications of fertilizer are advisable; it is better to apply small amounts of fertilizer every two weeks than large amounts once a month. If the annual bluegrass produces a great deal of seed and becomes bumpy, the turf can be improved by dragging it with steel mats, followed by close cutting, in order to eliminate as many of the seed heads as possible. Also a light top-dressing at that time will improve the putting surface.

The undesirable feature of annual bluegrass is that it may become weak or even die out very quickly in summer. The fact that it can not be depended upon to provide good turf in certain sections of the country through summer seems important enough to some clubs to endeavor to prevent it from becoming established in their greens, particularly by paying special attention to means of preventing this when the greens are first planted. No doubt large quantities of seed of annual bluegrass are carried to putting greens through top-dressing material. Also seed of it may be washed from plants on higher elevations, to a putting green, unless sand traps or grassy hollows are provided to catch the surface wash before it reaches the green. When annual bluegrass has become thoroughly distributed in a putting green and makes up a large percentage of the turf, there is no practical method of getting rid of it apart from removing the turf and replanting the green.

Value and use of marsh muck.—We are sending you a sample of a fertilizer said to consist of dried and screened leaf mold to which a small amount of gypsum has been added. Surprisingly good results are claimed by the use of this fertilizer. It is offered at the same price we pay for activated sludge, which is $30 a ton. How does it compare in fertilizing value with activated sludge? (Michigan)

ANSWER.—The material you sent is not leaf mold but marsh muck. It contains considerable woody material and hence has a high percentage of organic matter. It is very well decomposed and evidently has been under cultivation for a number of years. It is an excellent source of organic matter, but does not compare with activated sludge as to fertilizing value. The latter contains 5½ per cent nitrogen, 2½ per cent phosphoric acid, and up to ½ per cent potash. Marsh muck in its native state may contain about half as much nitrogen as activated sludge, but its nitrogen is in so insoluble a form that it is of little value to growing plants. Muck contains only a trace of phosphorus and potash, and its fertilizing value as far as these are concerned is negligible. The addition of gypsum to the muck gives it some calcium and sulphur. Peats and mucks of this kind are generally sold at about $10 a ton, and although $30 a ton is a fair price for activated sludge the material you sent is not worth anything like that price. Peats and mucks are valuable chiefly for their organic content, and can be used to great advantage, if the price is right, for mixing in soil beds or placing in compost piles in order to bring up the organic content of top-dressing material. A certain amount of such organic matter mixed, together with sand, with heavy clay soils, will greatly improve the physical texture of the clay; and mixed with sand, such organic matter will raise the water-holding capacity of the sand.

Objections to layer formations in building putting greens.—Our soil is a very heavy clay. We have exhausted the supply of our best lighter loam but have an abundant supply of muck available. It has occurred to us that this muck might be advantageously used in building our new greens. Our plan is to lay down first a gravel bed of about 8 inches for drainage purposes, and then on top of that a layer of about 18 inches of muck. This we will then let settle over winter, and in the spring will roll it down with rollers as heavy as can be handled. The top 6 inches, or seed bed, will be a screened mixture of muck and clay loam, which will also be rolled, and then lightly raked before seeding. We should like to have your suggestions in the matter. (New York)

ANSWER.—The idea of building greens with layers for various reasons received considerable attention years ago, and in almost every case greens built along these lines have proved unsatisfactory and have since been torn up and rebuilt. Experiments in soil physics clearly indicate that layers of gravel, peat, or muck, especially in putting greens, are injurious on account of their interfering with the natural fall and rise of soil moisture. In constructing your greens we would suggest that you build up the base with your natural soil, installing tiles for drainage purposes since your soil is heavy. The top soil on the fill should be made to a depth of at least 6 inches. Considerable organic material and sand should be disced into this top soil so as to obtain a fertile soil of a sandy loam consistency.

No. 11 hole (185 yards), Burning Tree Club, Washington, D. C.

It is well to emphasize the material benefits that come from well-directed scientific research, because the work requires material support. Nevertheless, a narrow view of the purposes of science tends to defeat its object. Scientific investigations are sometimes most fruitful when directed merely toward the discovery of fundamental principles. Hence the ultimate justification in utility may be remote rather than immediate. Results will come, which can not be reckoned in advance. Results achieved as an unexpected by-product are often more important than those originally contemplated.

Arthur M. Hyde