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A MONTHLY PERIODICAL TO PROMOTE THE BETTERMENT OF GOLF COURSES

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"And I know of no more gratifying achievement than when I coaxed grass to grow in spaces that had been barren for almost a century, more soul-satisfying to me than anything I ever did during the forty years I wasted in paper making."—Charles Chapin, 69690, in "House and Garden."

Standard Cost Analysis

The pressing need of standard cost-analysis sheets for use on golf courses in connection with turf construction and maintenance has been brought to the attention of readers of THE BULLETIN already on several occasions. In the August, 1921, number of THE BULLETIN (page 146) the Green Committee pointed out that "if one 18-hole course is maintained for, say, \$15,000, and another for \$25,000, the difference should be accounted for, and if both accounts were kept on the same basis it would be easy to see where the differences occur;" and that "when we can establish a standard system of bookkeeping we will be in a fair way to eliminate useless expense."

The matter is again brought forward in a letter under date of March 3, 1923, from Mr. Irving Hill, of the Green Committee of the Lawrence Country Club, Lawrence, Kans. Mr. Hill writes as follows:

We presume the Green Committee have considered getting up standardized forms for this work and selling them to the various clubs, using a standard set of general subdivisions with perhaps no minor subdivisions for the small 9-hole courses like ours, but with provisions for breaking these general heads up into as many subdivisions as the larger clubs might desire. If action of this kind were taken reasonably promptly and with a good system recommended, it would seem to offer an opportunity to bring about uniform cost accounting in golf-course work, so that local green committees would have no difficulty in obtaining comparable figures from other courses as to speed and expense of cutting fairways, rough, and some other general work where conditions do not vary enough to keep these figures from being comparable and of value.

The Green Committee will be very glad to undertake to furnish these standard cost-accounting forms to golf clubs provided it develops that there is an actual demand from the clubs for the forms. The selection of a "good system," as suggested in Mr. Hill's letter, is, however, one that will require some time, and it is not thought that a suitable system can be selected and the forms prepared and distributed prior to the opening of the season 1924.

To enable the Committee to meet the wants of the clubs in this direction, it is requested that all clubs that will agree to purchase from the Committee a set of standard cost-accounting forms during the winter of 1923-1924 write to the Committee at as early a date as practicable advising specifically what forms are desired.

Suggestions of suitable forms are also desired. These suggestions may be submitted by sending to the Green Committee samples of forms desired. Or reference may be made to any of the forms printed on pages 125, 126, 131, 132, 287, and 288 of the 1922 BULLETIN.

If a quantity of any one or more forms should be desired by a number of clubs it is to be supposed that an economy could be effected by having the forms prepared by one firm under the direction of the Committee, and having the distribution of the forms made from Washington, D. C. In any event the Committee would be willing to undertake to furnish these forms at actual cost of manufacture and distribution.

Controlling the Japanese Beetle

The putting greens on a number of golf courses in New Jersey and eastern Pennsylvania have suffered severely for some years from the ravages of the larva of the Japanese beetle. No entirely satisfactory means has been discovered for controlling this pest. So serious is the damage done by the beetle, from the agricultural standpoint, that the Bureau of Entomology of the United States Department of Agriculture has established a station at Riverton, N. J., for special experimental work in the control of the insect. Mr. C. H. Hadley is in charge of the department's work at the Riverton Station. An interesting question in the possible means of controlling the Japanese beetle has been brought up in a recent letter received from Mr. W. W. Smith, Chairman of the Green Committee of the Riverton (N. J.) Country Club. Mr. Smith's inquiry was referred to Mr. Hadley for attention. The inquiry, together with Mr. Hadley's reply, are here presented:

Philadelphia, Pa., January 20, 1923.

Green Committee, U. S. Golf Association,
Washington, D. C.

GENTLEMEN:

I am interested in obtaining information as to the possible damage to greens by spraying while the sun is shining. The reason I am prompted to make this inquiry is due to the fact that our course is in the Japanese beetle-infested area, and unless we develop some means of keeping the beetles from leaving their eggs in the greens we are likely to lose most of the turf.

As a Japanese beetle flies only between the hours of 9:30 a. m. and 3:00 p. m., it has occurred to me that by spraying the greens with a very fine spray between those hours it would keep the beetles off. It is my thought that the spray should be as light as possible, and I am anxious to determine what damage, if any, would be caused by the action of the sun upon the dampened greens. It will be necessary to carry on this spraying, if it finally develops that it is advisable, during the last two weeks of June and the month of July.

Yours very truly,

W. W. SMITH,
*Chairman Green Committee,
Riverton Country Club.*

Mr. Smith's letter was at once referred to the Bureau of Entomology of the United States Department of Agriculture for attention with regard to the problems raised in connection with Japanese beetle control. With regard to the possible damage to the turf from spraying during midday, Mr. Smith was advised that while no considerable turf experiments on the problem had ever been conducted, the probabilities are that little, if any, damage would result to the turf from the suggested procedure, although it is generally conceded that watering early in the morning or late in the afternoon is preferable to midday watering, principally because of the more favorable conditions for the absorption and retention of the moisture by the ground.

Riverton, N. J., February 5, 1923.

Mr. W. W. Smith, Chairman of the Green Committee,
Riverton Country Club, Riverton, N. J.

DEAR MR. SMITH:

A copy of your letter of January 20, addressed to the Green Committee of the U. S. Golf Association has been referred to me with the request that I write you regarding the probable effect of spraying while the sun is shining upon the Japanese beetle.

There are several points to consider in this matter. In the first place there is to be considered the question of what spray you might use. A spray of water

alone would probably have an opposite effect from that desired; in fact, the beetles would to a certain extent undoubtedly be attracted to the greens if a fine spray of water was being applied, especially if the surrounding turf was quite dry.

Now, if a chemical spray were to be used, it is a question whether we know of any chemical which would be sufficiently repellent to the beetle to be effective without at the same time injuring the grass. In repelling the beetle we are concerned, in this case, with the question of making the turf distasteful to the beetle for egg-laying purposes. Our experience has shown that arsenate of lead is quite repellent to the beetle so far as the question of the feeding of the beetle is concerned. On the other hand, it is quite doubtful whether this material would act as a repellent from the standpoint of preventing deposition of eggs. It might be assumed that a repellent which would make the turf distasteful to the beetle for egg-laying purposes should be decidedly odorous material. In this case the probabilities are that the odorous material would be perhaps equally effective with individuals desiring the use of the greens for purposes of playing golf.

Should the question of color of material be considered, we do not have definite data as to the attractive or repellent effect of the differently colored materials upon the beetle for egg-laying purposes. We do know that, so far as feeding is concerned, the difference between black and white and the difference in coloration of other materials apparently have no influence on the question of whether or not the beetle will feed. In other words, color apparently does not play a very important part in the question of the repellent effects of spray materials so far as the feeding of the beetle is concerned. It is doubtful whether there would be any appreciable influence from variation in color of materials which might be used to treat a green so as to prevent deposition of eggs. Furthermore, it can be seen that the application of a very white material for the purpose of keeping insects away from a green might interfere with the use of the green for playing purposes.

So far as corrosive materials are concerned, which might result in the destruction of eggs as soon as or shortly after they are deposited by the beetle, it is quite probable that there would be a similar destruction of the grass from the use of such corrosive materials. You will perhaps recall that last summer on several of the greens, your greenkeeper scattered bluestone quite heavily, and so far as could be determined this material had no appreciable effect in preventing deposition of eggs.

We have, as you are aware, done considerable work the last year or two during the season along the lines of preventing or remedying injury to greens from the Japanese beetle. We feel now that we have something at least in the carbon bisulfid emulsion treatment, devised by Mr. Leach, of the laboratory, which, if not entirely satisfactory in all respects, will certainly help to reduce the injury to greens, and it is our hope to further perfect the method during the coming beetle season.

I understand that you will probably have a conference with us in the near future regarding means of ending injury to the golf course from the beetles, and if you so desire we can at that time take up this matter in greater detail than is possible in this letter, and can probably arrange for cooperative work during the coming season.

Very truly yours,

C. H. HADLEY,
*Entomologist in Charge,
Japanese Beetle Project.*

PROFESSIONAL GOLFERS' REGISTER

A register of professional golfers is maintained by the Professional Golfers' Association. Clubs desiring the services of a competent professional are invited to make their wants known to the Secretary, Professional Golfers' Association, 366 Fifth Avenue, New York, N. Y.

BACK NUMBERS OF THE BULLETIN

Volume I (1921) has been reprinted and may be obtained in one cover for \$2.25,

Top-Dressing

LYMAN CARRIER

Greenkeepers are not entirely in accord with regard to the matter of top-dressing. While the practice is steadily growing in favor and more golf courses have compost piles in the making than ever before, there are some skeptics who feel that the matter is being carried too far and that dire results are happening or are going to happen to the greens from such treatment. Some of the members of the Green Section have suggested that a historical and theoretical account of top-dressing might be advisable. It is in response to that suggestion that the following article has been prepared.

The top-dressing of grasslands is a very ancient farm practice. The Romans appreciated the value of manures and used them freely. Columella, who lived during the first century A. D., described fully the common animal manures and their relative values, and adds, "Nor am I ignorant that there is a certain kind of land, and some places in the country wherein neither cattle nor fowls can be kept; yet it is a sign of a slothful husbandman, even in such a place as that, to be destitute of dung; for he may amass and put together any kind of leaves, and collections of any other things, out of thickets and highways; he may cut down ferns, without doing any injury to his neighbor; yea, he may even do him service by it, and mix them thoroughly with dirt and sweepings of the courtyard; he may sink a pit, such as we directed to be made in our first book, for laying up dung in, and gather into it, in one heap, ashes and dirt of the kennels, sinks, and common sewers; straw and stubble, and other things that are swept out of the house."

There is no evidence that the old Roman had motorized golf courses in mind when he wrote this, but many greenkeepers are now practicing methods which agree quite closely with the recommendations which he gave. No information has come down to us to show whether the farmers in any of the civilizations earlier than the Roman practiced top-dressing or not. The Roman methods of farming were adopted by many neighboring peoples and had a very pronounced influence on European agriculture. The Roman agricultural writers were widely quoted during the sixteenth century in the northern European countries, where the old Greek and Roman classics were looked upon as the fountain heads of all worth-while knowledge.

A quotation from Hartlib's *Legacie*, which was published at London in 1651, is illustrative. "An old writer (Columella) saith that his Grandfather used to carry sand on clay, and on the contrary to bring clay on sandy grounds and with good success, the Lord Bacon thinking much good may be done thereby; for if Chalke be good for loamy land, why should not loame be good for chalky bankes." Hartlib also asserts that "all things that will rot, if they were stones, would be dung." English and French agricultural writers after the time of Hartlib continued to advocate the use of compost for top-dressings, especially for grassland. Each particular writer favored certain materials, just as greenkeepers today have their individual preferences for this or that fertilizer. Some favored muck from swamps; some, rich loam; some, composts of manure and soil; while others, probably from observing the vigorous growth along highways,

strongly recommended the use of dust of roadways. Barnyard manure, then as now, was known to be very helpful to growing plants.

These agricultural writers had rather vague and woozy theories in regard to the reasons for the beneficial effects of these materials, but all seemed to agree that there was great virtue in the mixing together of different kinds of soil. "Clay on sand and sand on clay" was a catchy slogan used over and over again. Mortimer in 1707 says, "As Clays are an improvement to Sand, so Sand by the same reason is an advantage to cold Clays, in that it warms them, and unlocks their binding quality."

These old English farmers went to great trouble to procure their favorite manure. Another quotation from Mortimer is an instance: "Soot also is very good both for Corn (any grain crop) and Grass, especially what grows on cold Clays or Lands much run over with Moss; but Sea-coal Soot is the best by much. They commonly allow 40 Bushels to an Acre, but some Lands will require more: It produces a mighty fine sweet Grass, and destroys Weeds and Trumpery. Wool-nippings and tarred hempen Roaps cut small, and untwisted, are beneficial for Land. Raggs are a very great improvement of Chalky binding Lands. (Clays) Many Loads of them are fetched from London to Dunstable which is 30 Miles, only to lay on their Lands. They cost about 4d. per Bushel at London. They chop them very small and sow them just after the sowing of the Corn, allowing 4 Sacks to an Acre, each Sack containing 6 Bushels."

The Europeans who settled America came imbued with European farming methods including top-dressing. The New Englanders near the coast adopted the Indian method of fertilizing with fish, but in the middle colonies of New York, New Jersey, and Pennsylvania, where fish were not available, manuring and top-dressing with soils and composts were in common practice. Woods earth and soils from ditch banks were favorite materials. In New Jersey the greensand marls were hauled long distances for farm use.

Deane (1790), one of the earliest agricultural writers after the American Revolution, says:

"Composts ought to be different according to the different soils on which they are to be laid. A soil that is light and loose requires a compost that is heavy, or one which has a large proportion of the mud of deep ditches, swamps, or ponds, and cow dung. Clayey and heavy lands require a compost, in which something that is light and warm predominates, as lime, the dung of horses and sheep, etc.

"Composts may be made of common earth, turfs, the dirt of streets, straw, mud, together with dung, lime, marle, ashes, weeds, salt, or oily substances, and any kind of animal or vegetable matters. They should be well mixed, and lie one year, one summer at least, in heaps, and be several times shoveled over to promote fermentation and putrefaction.

"They should be kept, if practicable, in a temperate degree of moisture. If they lie too wet, they will turn sour, and not putrefy; if too dry, there will be no fermentation at all. * * *

"A compost of clay, turf, ditch-earth, with lime, soot, or ashes, is an excellent dressing for grasslands. The time to lay it on is in autumn. Neither would it be amiss to do it in the spring; only as carting it on would be apt to injure the surface when it is wet and soft."

A visitor in 1769 to John Bartram, a colonial Quaker farmer who has the honor of having started, about 1730, near Philadelphia, the first botanical garden in America, gives us this information: "He next showed me his orchard, formerly planted on a barren sandy soil, but long since con-

verted into one of the richest spots in that vicinage. 'This,' said he, 'is altogether the fruit of my own contrivance. I purchased some years ago the privilege of a small spring, about a mile and a half from hence, which at a considerable expense I have brought to this reservoir; therein I throw old lime, ashes, horse dung, etc., and twice a week I let it run, thus impregnated. I regularly spread on this straw, and whatever damaged fodder I have about my barn. By these simple means I mow one year with another fifty-three hundreds of excellent hay per acre, from a soil which scarcely produced five-fingers (a weed). * * * With the banks of my meadow ditches, I have greatly enriched my upland fields * * *. When I want to break up my clover fields, I give them a good coat of mud, which hath been exposed to the severities of three or four of our winters.' "

This history is given for the reason that no better proof can be advanced that an agricultural method possesses merit than that it has been in general use by farmers over a long period of time.

The general practice of top-dressing with composts and soils in European countries and America declined less than one hundred years ago. It is worth noting, however, that the farmers of Japan and China still rely on this means of maintaining the productivity of lands which have been farmed for at least forty centuries.

The first influential writer to discredit the old custom of top-dressing



Spreading Compost on Grass Turf

was Jethro Tull, of England, about 1740. Tull was a pioneer advocate of tillage in England, notwithstanding the methods of farming which he advocated had then been practiced by the white farmers in America for more than a hundred years and by the American Indians for untold centuries before. The main feature of the "Tullian System" was thorough working of the soil. Tull preached that tillage was manure and that any soil would be productive if its particles were in a sufficiently fine state of subdivision. He invented the first grain drill, designed to put wheat and other small grains in drills so that they might be cultivated; also several "horse-hoes," the beginnings of modern cultivators.

The next shock to the top-dressing practice came from Germany. Baron von Liebig, one of the greatest of the early nineteenth century chemists, conceived the theory, from analyzing plants, that all the benefit which crops derived from manures is due to the mineral elements which these manures contain. According to Liebig, a farmer might better burn his litter and manure provided he scattered the ashes on the land than to go to the labor of hauling the unburned material to the field. This theory had an influence on agricultural thinking and practices perhaps never since accomplished by the work of any other scientist. While the main features of Liebig's contentions were soon disproved by field tests, the value of mineral fertilizers was demonstrated, and the great commercial fertilizer industry of the world stands as a monument to the "Liebig theory."

BENEFITS FROM TOP-DRESSINGS OF COMPOST

It has been amply demonstrated that turf grasses on soils of ordinary productivity can be maintained indefinitely by the use of chemical fertilizers alone. But the continued use of commercial fertilizers without any organic manure produces a solid, hard condition of clay soils which is not desirable from the golfing point of view. There is no better way to loosen a hard, impervious soil than to incorporate a large amount of decaying vegetable matter with it. This effect is secured if the decaying organic matter is on top and only the leachings soak into the soil, as any one can see who digs into and observes the friable condition of the soil under a compost pile.

Another benefit which comes from top-dressings is the mulching effect which they give to the turf. Plant roots feed as near to the surface of the soil as the heat of the sun and the moisture in the soil will allow. The upper layer of soil is usually rich, especially in sod land, and the plant food there is continually becoming available. A thin mulch which keeps this upper layer moist adds to the feeding ground of the grass plants. A top-dressing of inert material like pure sand often has an immediately beneficial effect on the grass.

A covering of dark substances, like charcoal, muck, or black earth, absorbs more heat from the sun than light-colored materials and will actually raise the temperature on light-colored soils a few degrees. This is sufficient to produce a favorable effect on the growth of grass in early spring when the ground is cold.

Of course, the plant food which compost carries is a direct benefit to the grass. In well-rotted compost the plant food is in a readily available condition and the grass soon takes on a healthy dark green appearance after it is applied.

In the case of creeping bent and Bermuda greens, top-dressing buries the rooting stems or stolons and gives a much better putting surface than is obtained without it.

DANGERS FROM TOP-DRESSING

It is difficult to think of any serious trouble which may arise from the use of good top-dressing if ordinary care is exercised. Of course, any practice, no matter how good it is, can be overdone, and it is possible to cover the grass sufficiently to smother it out. Green leaves must have sunlight in order to manufacture the material that goes to make up the roots, stems and leaves of the plant. Very frequent or heavy applications may cut off too much light.

It has been suggested that there might be danger from a too liberal use of compost producing a coarse-textured turf. The experience of the writer indicates that fineness of turf comes from crowding of the plants in the sod. Some of our selections of creeping bent are very coarse in the nursery rows but produce turf of fine texture. Any thing that increases the number of plants and thus increases the crowding appears to make the grass finer instead of coarser. The most heavily fertilized plats in our fertilizer experiment have the finest texture of all. While we have now no data bearing directly on this point we feel that the undernourished greens greatly outnumber those that are too highly fed.

The most serious injury which the writer has ever observed from top-dressing has come from the use of materials that do not decay and mix with the soil but remain in layers. Take for instance much of the commercial "humus." It decays very slowly and does not penetrate the soil as will sharp sand, nor is it washed down into the soil as is clay on sandy soils. Fortunately a great deal of the humus which has been used on putting greens has been blown away or was washed off the green by rains. Occasionally we find turf in which a layer of humus or coarse, smooth sand has been buried a half inch or more below the surface by subsequent top-dressings. Any one can test the effect for himself where such a condition exists. That layer will be found to be the weak place in the sod.

Low-Priced Golf at Pittsfield, Mass.

FREEMAN M. MILLER

One of the newest members of the Green Section is the Pittsfield Golf Club, Pontoosuc Lake, Pittsfield, Mass. The story of the organization and plans of the club furnishes a striking example of what a little money and large faith and cooperation can do for wholesome outdoor sport.

In the spring of 1920 the Pittsfield Boat Club acquired an 85-acre farm largely to control a 15-acre pine grove and pavilion on Pontoosuc Lake. Having no particular use for the remaining 70 acres and aware of the fact that they were remarkably well adapted for a natural golf course, 80 members of the boat club entered into an agreement to form a low-priced golf club, and the officers of the boat club were authorized to make a low rental of the tract to any organization which might be formed to carry out the project. The boat club further manifested its interest by

advancing money in the fall of 1920 for preliminary work on the golf course.

On March 18 of the following year, the Pittsfield Golf Club was organized with a capital stock of \$10,000, divided into 1,000 shares of \$10 each. Twenty free memberships were offered to the twenty people who would render the most efficient assistance in promoting the new organization, and the membership was doubled. The belief that a low-priced golf club was a real asset to a community, and especially to a thrifty city of 45,000 population, located right in the center of the Berkshire Hills, induced a score of individuals to subscribe \$100 each for 10 shares of stock, which subscription entitled them to a free membership in the club for four years. An 18-hole course was laid out and played for one month, after which all effort was concentrated on nine holes. In 1921 the club showed a deficit of \$2,000. The following year all available money was expended in improving the first nine holes, and in 1922, with 163 members, the club paid all expenses and reduced its debt \$700. This year it is hoped to again double the club's membership and to put into playing condition part or all of the second nine holes. The dues for the first year were \$10 flat, except that if any person bought a \$10 share of stock he received a 20 per cent reduction in yearly dues. Under the contract, boat-club members were admitted at half rates. Now the dues are \$10 per year, but every male member is required to buy one share of stock at \$10. Transients are charged \$1.25 per day or \$5 per week, with no fee to exceed \$10. Hundreds of transients have played the course, and all were surprised to learn that it had been developed at an expenditure of less than \$10,000. The club house, where meals are served, is equipped with showerbaths and with steel lockers, and the club has a sizeable caddy-house. Bathing and tennis will probably be added this season. At the club's annual meeting, one Scotchman who belongs to three other clubs and who played golf three times a week from the age of 10 to 30 years, playing practically every course in Scotland, said, "I had been led to believe that the Pittsfield course was decidedly crude and unplayable, and was most pleasantly surprised when I played it. The land is far more likely for a golf course than anything I have seen in this section, and is more like a Scotch golf course than anything I have seen in all New England. It gives the average player consideration, the one thing needed to stimulate golf and the thing which has made the game what it is today."

"Rules of Golf" Booklet

The "Rules of Golf," printed in accordance with the rulings and interpretations as adopted by the Royal and Ancient Golf Club of St. Andrews, can now be obtained at the following prices. Inquiries should be addressed to U. S. Golf Association, 55 John St., New York, N. Y.:

25 booklets,	15	cents	each.
50 booklets,	14½	cents	each.
100 booklets,	14	cents	each.
200 booklets,	13½	cents	each.
350 booklets,	13	cents	each.
500 booklets,	12½	cents	each.
750 booklets,	12	cents	each.
1,000 booklets,	11	cents	each.
1,500 booklets,	10	cents	each.

Service and Winter Care of Motor Equipment

AMOS F. MOYER

Good points for the attention of the chairmen of green committees are brought out both in the December BULLETIN by Mr. J. S. Clapper in the article "Service—Who is Responsible?" and in the January BULLETIN by Mr. C. C. Ross in the article "Winter Care of Motor Equipment." There seems, however, to be little reason for one writer to question the statements of the other, as I am sure that they have the same purpose in view, namely, that the equipment should be cared for and not neglected until serious trouble develops.

Mr. Ross's viewpoint of leaving "well enough alone" is one of good advice to the average driver of an automobile and should be well taken when applied to some operators of tractor equipment. The carrying out of Mr. Clapper's suggestion as to the examination of bearings, pistons, piston pins, valves, valve seats, etc., should of course be done by a person competent to judge conditions and apply the proper remedy whenever needed. Since the tractor is put to much harder service under more unfavorable conditions than an automobile, such a competent person should be available to every club, preferably the operator of the machine. There is great danger in waiting until some indication is given that trouble exists, such as loose bearings, carbon deposit, and pitted valve seats, if incompetent operators are to be left to themselves to judge. Reasonable intelligence should be the proper guide in determining just how far to go in examining and overhauling the tractor at the end of the season. The age of the tractor and general condition apparent may influence the procedure in such cases as removal of pistons, although the examination of parts should always extend as far as possible at the time the motor is opened, and a decision reached as to whether any hidden difficulties are likely to exist demanding further removal of parts. If a tractor has had nothing more than very light use for an entire season, there will be ample reason for going as far as dropping the oil pan and removing the cylinder heads, as foreign matter drawn into the tractor motor will by that time have formed a muddy sediment in the bottom which can not be thoroughly removed by ordinary flushing, thus requiring the removal and washing out of the pan with gasoline or kerosene. For flushing without removal of the pan, kerosene should first be used, and this in turn flushed out with clean oil before closing the drain and refilling.

Removal of the cylinder head is the only means for scraping away the carbon which is almost certain to have accumulated on piston heads and in the combustion chamber. Negligence in the removal of this material will cause damage to the bearings through preignition, and loosened particles of it lodging on the valve seats cause burning and pitting of valves and seats, which can quickly damage these parts to the extent of rendering subsequent repairs far more difficult and more expensive than need be. Pitted valve seats cause overheating and warping of the valve heads, reducing compression and loss of power in the tractor.

Should we not give the tractor consideration for the hard work it does under adverse conditions and look after these matters at least once a year rather than depend alone upon an operator to report conditions which he may not understand and which can lead to extensive damage?

Simple Chemistry for the Golf Course¹

R. A. OAKLEY

Part I

Persistent requests for a simple discussion of the chemistry of materials with which the greenkeeper has to work are offered as justification for an article on the subject. Chemistry is a science in which almost all intelligent persons are interested either directly or indirectly. Chemical phenomena occur about us every day. Perhaps if we understood some of the common chemical reactions better we would be able to utilize them to greater advantage. Furthermore, a knowledge of them brings with it a reward of satisfaction which is sufficient in itself. Chemistry plays a tremendous part in the world in which we live. In fact, life and what goes on about us, to a very great extent, are the results of one chemical change after another.

Elements.—To understand more fully the materials which are used in our regular golf course work we must think of them all as chemicals. Any form of matter is a chemical. Matter may change in every conceivable way; it may pass beyond our recovery, but it is never lost. Matter is indestructible. We need not concern ourselves with the question of what is the simplest form of matter. We have heard of atoms and molecules and ions, but we will leave them for the chemists to struggle with and will start with the element, which is the simplest form that we can well appreciate. Examples of elements are oxygen, hydrogen, nitrogen, gold, silver, copper, sulfur, and chlorine. They may occur commonly as gases, liquids, or solids. There are upwards of seventy elements known and described in chemistry. While the substances we see every day are composed of elements, it is rarely that we see the elements themselves. They are usually found in combination with other elements in one form or another. For example, oxygen—the most abundant of all elements—is a colorless gas; likewise is hydrogen; but when these two combine they form water, the liquid of the universe.

Chemical Compounds and Mixtures.—When one element combines with another in a true chemical combination, as in the case of oxygen and hydrogen in the formation of water, we have what is known as a chemical compound. The oxygen and hydrogen can not be separated except by chemical means; but if we stir some chalk into the water we get a mechanical mixture which may be separated into its component parts, simply by allowing the mixture to stand until the chalk settles to the bottom of the vessel. We should understand clearly the difference between a true compound and a mechanical mixture. It is very important, and a knowledge of it will help us very much in our work. Not all elements will unite directly with all other elements to form chemical compounds. Sulfur does not combine with chlorine, one of the constituents of common salt. Numerous other examples might be cited.

The Elements Classified—Acids, Alkalies, and Salts.—It is difficult properly to classify the elements into their natural groups, but for our purpose we may divide them into two general divisions, namely (1) acid-forming elements and (2) base or alkali-forming elements. Strictly speaking, not all base-forming elements are alkalies, but the alkalies make

¹This is the first installment of *Simple Chemistry for the Golf Course*. The second installment will appear in an early issue of THE BULLETIN. It will treat of the various chemicals, including earthworm eradicators, weed killers, fungicides, insecticides, and fertilizers.

up a very important proportion of the bases, and for our purpose the two may be generally regarded as the same. Some of the common acid-forming elements are sulfur, nitrogen, chlorine, and carbon. Most of the bases or alkali-forming elements are metals, such as sodium, calcium, magnesium, copper, iron, lead, and zinc. Some elements are both basic and acid, but again it may be said that the general classification here given is satisfactory for our simple consideration of the subject. Our common inorganic acids are sulfuric acid, hydrochloric or muriatic acid, nitric acid, and carbonic acid. Our common inorganic bases or alkalies are caustic soda, caustic potash, quicklime, and ammonia.

When an acid and an alkali are combined in proper proportions one neutralizes the other. A chemical change takes place, and what is known as a salt is formed. When the word "salt" is mentioned we at once think of the salt used to season food. This salt is a very common one. It is chemically known as sodium chlorid, and is formed by combining caustic soda and hydrochloric acid. When we see or hear of the word "salts" we think of Epsom salts or Rochelle salts, but there are a great many other salts, such as bluestone and copperas, and they are quite as important as acids or alkalies.

If we wish to know whether a certain chemical is an acid or an alkali we may find out in a general way by testing it with litmus paper. If it turns blue litmus paper red it has acid properties; if it turns red litmus paper blue it has basic or alkaline properties. If it does not change the color of either it is neutral. This is not a very accurate test, but for our purpose it is quite satisfactory.

Chemical Changes.—The chemical change that takes place when two or more chemicals come in contact with each other is called a reaction, and the chemicals themselves are called reagents. The simplest and most common reaction is caused by the uniting of oxygen with other elements. Broadly speaking, this reaction is called oxidation. Burning or combustion is a very common form of oxidation. Decay is likewise a form of oxidation. Rusting is another form.

In our common every-day practice in greenkeeping we use, or at least should use, considerable compost. Oxidation plays a very important part in the decaying of the organic matter and the general breaking down of the materials put in compost piles before they are suitable for use as a top-dressing for turf. There are many other chemical changes, of course, as when water is added to freshly burnt lime. We are all familiar with what occurs when these two substances come together.

Chemical Symbols and Formulas.—The chemist has symbols, or abbreviations, for each of the elements. The following are some of the common elements and their symbols:

Oxygen, O; hydrogen, H; nitrogen, N; carbon, C; sulfur, S; manganese, Mn; chlorine, Cl; iodine, I; calcium, Ca; magnesium, Mg; mercury, (*hydrargyrum*), Hg; phosphorus, P; silicon, Si; copper (*cuprum*), Cu; iron (*ferrum*), Fe; lead (*plumbum*), Pb; zinc, Zn.

When the chemist desires to express the name of an element or compound, or to indicate a chemical reaction, he does so by means of these symbols. Instead of writing the word "water," for example, he uses the formula H_2O . This not only means water but it indicates that the substance water is composed of two parts of hydrogen and one part of oxygen. Formulas for some of the common substances or compounds are

as follows: Carbon dioxid, CO_2 ; nitrate of soda, NaNO_3 ; limestone, CaCO_3 ; bluestone, or copper sulfate, CuSO_4 ; sulfuric acid, H_2SO_4 ; hydrochloric acid, HCl ; common salt NaCl .

Chemical Terms Defined.—For a more complete appreciation of the subject of chemistry, particularly writings on the subject, it is necessary to have quite clearly in mind what is meant by the various special terms that are commonly used. A few of these terms and their simple definitions are given here. The order in which they are given is without reference to their relative importance.

Analysis.—The determination of the composition of a substance. This is called qualitative analysis. If the proportions of the parts that make up the substances are determined the analysis is called quantitative analysis.

Synthesis.—Unlike analysis, which is really a tearing apart, synthesis is a building up. A synthetic compound is one that is artificially made from simpler parts or substances.

Effervescence.—When vinegar comes in contact with soda, gas bubbles up from the mixture. This bubbling is called effervescence. The gas in this case just cited is carbon dioxid, one of the most common gases occurring in nature.

Solvent.—Anything that dissolves another substance or compound—that is, puts it into solution or in liquid form—is called a solvent. Water is the greatest known solvent.

Reagent.—Any chemical that is used to treat or mix with another chemical or substance is a reagent. The effect produced is called a reaction.

Dehydrate.—To remove the water from a substance, as in the process of drying fruits or vegetables.

Anhydrous.—Free from water. When the crystals of bluestone (copper sulfate), which naturally contain water, are heated to a sufficient degree they break down and turn white or a greenish white. The substance is then free from water and is called anhydrous copper sulfate. Lime free from water is called anhydrous lime or quicklime. When water is added it is called hydrated lime.

Emulsion.—A combination of one or more oils with water or a water solution of some substance.

Precipitate.—To cause to fall; for example, as water from the clouds in the form of rain or snow. When certain liquids are mixed together a solid substance is formed, which falls to the bottom of the vessel in which the mixing takes place. This substance is called a precipitate.

Saponification.—The reaction that takes place when lye and fat are boiled together in the making of soap.

Supplies of Creeping Bent Stolons for Vegetative Planting

The indications are that supplies of bent stolons will be available from commercial sources for planting in June, 1923. Nurseries of these stolons planted in midsummer and given careful attention should be in excellent condition to go through the winter.

Testing Seeds for Germination

A number of clubs have sent samples of seed to the Green Committee with a request that the samples be tested for germination. The Green Committee has not facilities to conduct these tests. The testing of seeds for germination can well be done by any greenkeeper on his own grounds. He will save valuable time by making his own tests, as seed-testing laboratories during the seed-buying season are generally crowded with work, and samples sent in for testing often must wait their turn. The following simple method of testing seeds for germination is reprinted from page 134 of the April, 1922, number of THE BULLETIN. The Green Committee is always glad, however, to examine samples of seed submitted by member clubs for identification and purity determination:

Germination tests are usually made on the basis of pure seed; that is to say, 100 seeds are taken from a sample and the percentage of germination is based on the number that prove to be viable; therefore, a sample might have a germination percentage of 90, even though it contained only 10 per cent of pure seed, the remainder being inert matter. In selecting the seed for the test, however, an effort is made to get a sample that is representative of the bulk; in other words, caution is used not to pick out the plumpest and best-appearing seeds. Usually 100 seeds are selected for a test, so that the number of plants resulting represents the percentage of germination. The unit of measurement selected, however, is purely arbitrary, and if one knows what is desirable in the way of a stand from the seeding of any particular grass, it is quite easy to make a test by less exact methods. For instance, with creeping bent for putting greens it has often been said that an ideal stand of seedlings is about seven seedlings to the square inch. If seed of the bents sown at the rate of one-quarter ounce to a test plot of 5 square feet accomplishes this result, we would regard the germination as satisfactory. This same rate of sowing would also apply in the testing of redtop seed. For fescue or bluegrass the rate for a test plot of 5 square feet would be one-half ounce of seed.

Spraying to Kill Chickweed

L. W. KEPHART

In the course of experiments on killing chickweed conducted by the Department of Agriculture at Arlington Farm, Va., some thirty different chemicals were used, including such well-known weed-killers as salt, iron sulfate, sodium nitrate, and various oils and arsenicals. Best results were secured with a 2 per cent solution of sodium arsenite applied as a spray. When properly used this solution can be depended upon to eliminate all species of chickweed from bluegrass turf. It is not satisfactory on the finer bent grasses and fescues. Where these grasses are used on greens the best way so far discovered to get rid of the chickweed is to dig it out with a hole cutter. On bluegrass fairways the spray kills 90 per cent of the chickweed in one operation and also kills or badly cripples other turf weeds, like dead nettle, bugle, knotweed, and sorrel. It is also injurious to white clover. The tips of the grass are burned slightly, but the injury is not serious, and in a few days has disappeared. It must be borne in mind that killing the chickweed usually leaves large bare spots, and these, if not seeded at once, grow up in crab grass and other weeds. Since there was no bluegrass there any way, this expense is a normal one and can not be charged to the spraying.

The best time to spray is about the first to fifteenth of April, or from the middle to the end of September. The chickweed is most abundant in

the spring and more can be killed at that time, but the fall spraying gives a better opportunity for reseeding. The main point is to spray the chickweed at the time when the greatest possible quantity has germinated but before any of it goes to seed. Spraying must not be delayed until the weed is ankle deep, or the spray can not be driven down into it.

The solution is made by dissolving 8 pounds of sodium arsenite in 50 gallons of water. Sodium arsenite can be obtained from any wholesale dealer in drugs and chemicals, and also from firms handling prepared weed-killers. The present cost is about 30 cents a pound in small lots. Care should be taken to get sodium arsenite, and not sodium arsenate.

The solution is applied with some kind of pressure sprayer. For small jobs one of the small knapsack sprayers is very satisfactory, but where several acres have to be covered it pays to use a wheelbarrow sprayer operated by two men, one to pump and one to spray. Care must be taken to apply the solution as a fine mist, and no more than just enough to wet the foliage. If the liquid is poured on indiscriminately it is almost certain to kill the grass and may make the spot more or less permanently sterile. From 100 to 400 gallons of solution are required per acre, depending on the quantity of chickweed present.

Caution. Sodium arsenite is a violent poison, and should be handled accordingly.

Troubles of the Greenkeeper

J. J. McNAMARA, *Pittsburgh Field Club, Aspinwall, Pa.*

The greenkeeper has some task on a golf course. There is the weather. No matter if it rains, or the sun shines, the members expect the greens to be always the same—no long grass in the fairways or rough. It is the greenkeeper's duty to see that it is cut. Players on most golf courses are out from the first thing in the morning until dark in the evening, which gives the greenkeeper little chance to get the work done without interfering with the players. The men working on the course must never get in their way or make any noise with their machines, or talk. As the saying is, they must not move their toes in their shoes for fear it would take the attention of the players off the ball. The greens on most courses in this part of the country have to be watered either morning or evening. Work around here is plentiful, and the laborers are independent. I always find it very difficult to get men to water the greens at night, and therefore it has to be done during the day, which makes more trouble for the players.

According to some members, the greens should never be top-dressed, weeds taken out, or anything else done while play is in progress. Those very players who are the most fussy about being disturbed always expect the greens to be in first-class condition. I suggest that each green be roped off and a temporary hole made while weeding and top-dressing is done, as the work can be performed much faster and thus save expense, as otherwise the men have to stand around a good part of the time waiting for the players.

The greenkeeper has all sorts of grass diseases and insect pests to watch. And another trouble is to get men that know anything about work on a golf course, as most courses are built in some out-of-the-way place where few working people live. The work lasts only six or eight months for

most of the men, and it is not often that the same men return the next year, thus making it necessary to train a new gang. Yet it is the cry of most grounds committees to pay the lowest labor wages and expect good results. From my experience of twenty years with labor on golf courses, I believe it is better to pay a couple of cents more per hour than the average laborer receives than to pay a couple of cents less. The extra cost will pay the club in the end. There are two or three new golf courses in this vicinity which cost from \$75,000 to \$150,000 each to build. Not one of these has a greenkeeper. Either a millman or one of the farmers who sold the ground to the club has charge, because the club will not give a greenkeeper an adequate salary or furnish him sufficient funds to keep up the course. Anyone who knows anything about the running of a golf course knows how soon \$4,000 or \$5,000 can be spent without obtaining any good results, with the present price of grass seed, fertilizers, and labor.

The Care of Golf Course Machinery

L. A. FERGUSON

We note that there is a tendency lately to bring to the attention of those charged with the upkeep of golf courses, the advisability of keeping mechanical equipment in good operating condition, and those responsible for starting this movement are to be commended.

The development of golf in the last few years has made many great changes in grass cutting methods. A quarter of a century ago the idea of keeping large areas of grass in good condition was scarcely thought of. Really fine work was done only on certain limited areas, which could be generally classified as front-door yards, while today many large clubs, country estates and public parks are mowing as much as one hundred and sixty acres of very finely cultivated grass, used as fairways, lawns or parade grounds. In short, grass cutting is now an industry, and a man's-size job if properly done.

Mr. Marshall deserves particular commendation for his remarks in the November issue of *THE BULLETIN*, and if every greenkeeper would take his statements seriously there would be much less annoyance and delay caused by so-called "defective equipment," and the results obtained would be more satisfactory all around.

Responsibility for the condition as it has existed undoubtedly rests as much with the manufacturer and dealer as with the user. Some manufacturers have allowed their products to go out into the field with very little instructive literature, many seeming to think that their obligations were entirely fulfilled by furnishing a price list of repair parts. Dealers many times appear to have felt that when the outfit was safely delivered on the club grounds that their responsibility ceased.

The fact remains undisputed that every club today has a considerable investment represented in power-driven machinery of one kind or another, and this machinery should be given a chance at least to deliver what is in it, and the only way this can be done is by keeping it up to par at all times. The interests of the maker and user are mutual, and both should foster a spirit of cooperation.

One of the most important points to be handled is that of lubrication.

Any machine needs lubrication to function properly; and the more attention given to this matter the better the operation of the machinery. Proper means of lubrication should be provided for all moving parts, and suggestions should be given as to the correct lubricant to be used. In return for this the user should carry out these suggestions.

Keeping the equipment clean is another vital point. No piece of apparatus can perform properly that is covered with a month's accumulation of grease and dirt. Grit will get into bearings and shorten their life. Oil holes will become stopped up, so that regardless of the amount of oil used it will not reach the point for which it was intended.

Adjustments are also very important, particularly with grass-cutting units. Bearings should be gone over carefully at stated intervals (every day is not too often) and all wear taken up. Adjustment of revolving cutter blades should also be checked up, and the blades kept in such condition that they have an even contact with the bottom knife throughout their entire length.

At times it is necessary to touch up the blades with a file, or grind them with emery and oil. If there is a competent service man in the vicinity, it is always advisable to let an experienced man handle such matters, but the lack of an expert need not entirely preclude the possibility of taking care of minor repairs. All lawn-mowing equipment is comparatively simple, and an inexperienced man with a little practice can turn out a very fair repair job.

If in doubt at any time as to what is the correct thing to do, write to the maker. He is, or at least should be, very glad to render any assistance within his power. Even if it takes a little time to get the information, it is much better to correct a difficulty a little late than to pay no attention to it.

It is not the purpose of this article to outline a lengthy course of procedure, as the various types of machines used make the field too broad. It is simply to get users of such machinery as is always in evidence around a golf course to think of it as a piece of machinery which represents an investment of the club's money and to encourage a disposition to protect that investment and show as much economy in its upkeep as is possible under the conditions, which we all know are very severe at best.

Some U. S. Golf Association Decisions on Rules of Golf

Question.—A player prior to taking his stance steps on a small bush, bends the bush back, and plays his ball while standing on the bush. Has he the right to do this?

Answer.—The player has no right to step on the bush, as this was an indirect manner of improving the lie of the ball and was unnecessary in taking his stance. See Rule 15.

Question.—If a ball lies in a bunker within twenty yards of the hole (said bunker being included in definition of ground within the twenty yards), and after being played strikes the pin, does this alter the case and waive the penalty of two strokes in medal play competition?

Answer.—No; the fact that a bunker is within twenty yards of the hole does not alter the case and does not waive the penalty. See Rule 32 and footnote.

Question.—Can a player either in match or medal play lift a ball from a hoofprint in the fairway and drop it without penalty, for a better lie?

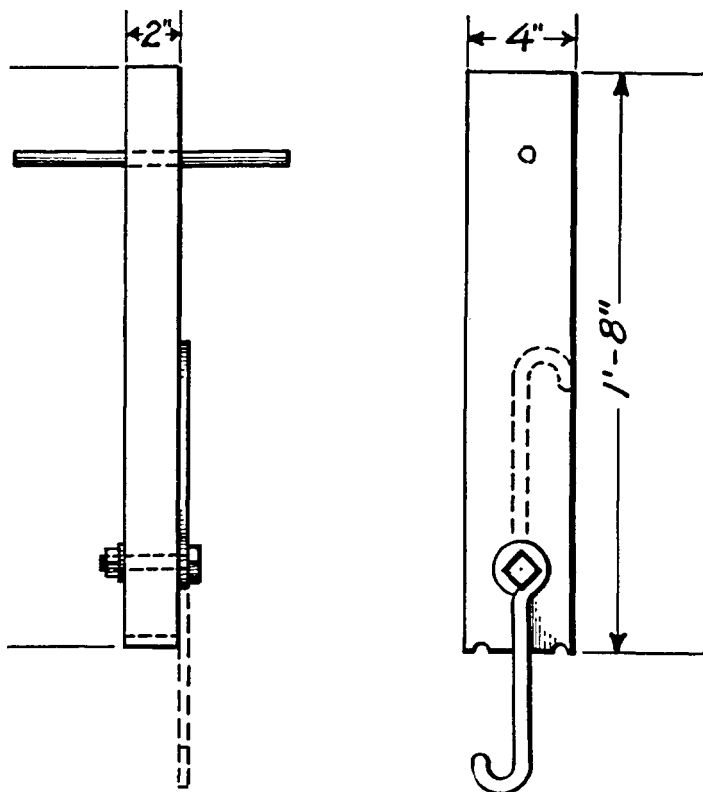
Answer.—There is no ruling which allows a player either in match or medal play to lift a ball from a hoofprint in the fairway and drop it without penalty. See Rule 6.

Tool for Changing Cup

HARRY PRYKE, *Greenkeeper, Calgary Golf and Country Club, Calgary, Alberta*

The accompanying diagrams represent a simple three-in-one tool, easily made, which we have found much better for changing cups than the carrying around of a hammer, piece of pick handle, and hook separately.

The tool is a piece of 2" by 4", 1' 8" long, with a part of an old sledge hammer shaft thrust through one end and a hook bolted near the other end



in such manner that it can be lowered for thrusting into the hole to lift the cup and folded back onto the block of wood when not in use for such purpose. The edges of the block at the hook end are chamfered so as to engage the rim of the cup when pressing it into the new hole. When the hook is folded back the block may be used for tamping the earth back into the hole.

SUBCOMMITTEES OF THE UNITED STATES GOLF ASSOCIATION.
APPOINTED BY THE EXECUTIVE COMMITTEE FEBRUARY 9, 1923

RULES OF GOLF COMMITTEE—Howard F. Whitney, Chairman, No. 15 Broad St., New York City; James Francis Burke, Findlay S. Douglas, Robert A. Gardner, Cornelius S. Lee, Charles O. Pfeil, Wynant D. Vanderpool, George

H. Walker, Frederick S. Wheeler, M. Lewis Crosby, J. Frederic Byers, Alan D. Wilson.

CHAMPIONSHIP COMMITTEE—Robert A. Gardner, Chairman, The Rookery, Chicago, Ill.; Edward S. Moore, Thomas B. Paine, Charles O. Pfeil, Henry H. Wilder, Alan D. Wilson.

MEMBERSHIP AND REINSTATEMENT COMMITTEE—Cornelius S. Lee, Chairman, 55 John St., New York City; Robert A. Gardner, Edward S. Moore, Wynant D. Vanderpool.

AMATEUR STATUS AND CONDUCT COMMITTEE—Cornelius S. Lee, Chairman, 55 John St., New York City; Robert A. Gardner, Thomas B. Paine, Wynant D. Vanderpool, Henry H. Wilder.

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IMPLEMENTS AND THE BALL COMMITTEE—Wynant D. Vanderpool, Chairman, 766 Broad St., Newark, N. J.; Robert A. Gardner, Cornelius S. Lee, James D. Standish, Jr., Henry H. Wilder, Alan D. Wilson.

ELIGIBILITY LIST COMMITTEE—James D. Standish, Jr., Chairman, Ford Building, Detroit, Mich.; Cornelius S. Lee, Wynant D. Vanderpool.

GREEN SECTION COMMITTEE—Alan D. Wilson, Chairman, 321 Walnut St., Philadelphia, Pa.; Lyman Carrier, Dr. Walter S. Harban, E. J. Marshall, Dr. R. A. Oakley, C. V. Piper, Wynant D. Vanderpool.

INTERNATIONAL MATCHES AND RELATIONS COMMITTEE, WALKER CUP—Howard F. Whitney, Chairman, 15 Broad St., New York City; Robert A. Gardner, Cornelius S. Lee, Paul Moore, Morgan J. O'Brien, Jr., Wynant D. Vanderpool, George H. Walker.

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The Green Committee is always glad to publish in The Bulletin items of interest from greenkeepers in connection with their work on golf courses.

Commercial concerns frequently refer to the Green Section in their advertisements. There is no objection to this provided the reference is not worded so as to imply that the Green Section sponsors or endorses the product or service which is offered for sale. The Secretary of the Green Committee endeavors to keep on file an up-to-date list of firms and individuals who have the things to sell which are needed in the making or upkeep of golf turf. These addresses are given out on request, as a matter of convenience to the buyer. It should be clearly understood, however, that the Green Committee does not endorse or recommend anyone's service or any firm's product, and will not be a party in any controversy which may arise between buyer and seller. It is only by a strict adherence to this policy that the Green Section can be of most service to its constituents.

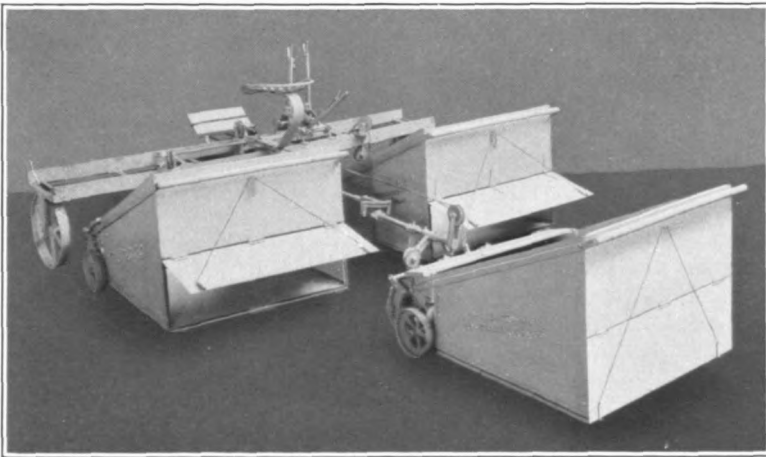
Crab Grass

HUGH I. WILSON, *Merion Cricket Club, Haverford, Pa.*

One of the greatest difficulties that exist in growing a fine turf on golf courses is the control of crab grass.

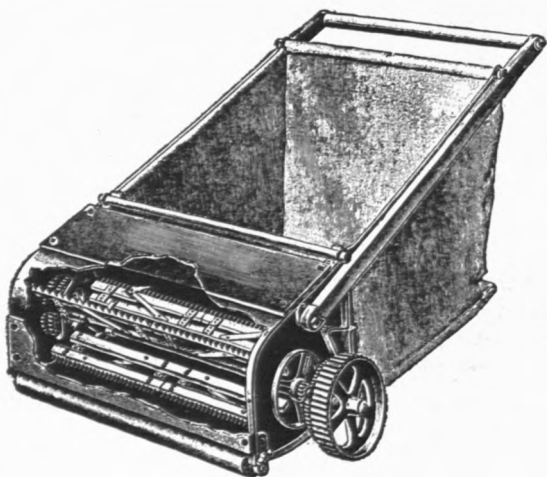
As far as the greens are concerned, the safest and best method is to cut the crab grass plants out of the turf when they are very small, some time in June. We have found by experience at Merion that the amount of crab grass on the greens has decreased materially each year by cutting the weed out; and if that is done early enough the greens will not be injured and will be perfectly playable. We had a good illustration of the evil results of failing to follow this practice, during the war time, when we discontinued work on our west course; and since then it has taken us three years to get the greens back in the shape they were in before we discontinued the cutting out of crab grass and other weeds.

For the control of crab grass on fairways and tees, a lawn-mower company has devised, at our suggestion, a triplex lawn cleaner, based on the hand lawn cleaner, which was used to gather up leaves, sticks, etc., and which covers the same area as the triplex lawn mower. In the accompanying illustrations are shown the complete triplex sweeper, one of the sweeper units with the front cut away to expose the cylinder or revolving rakes, and the working parts of the machine, namely, the steel wire teeth, the divided rake head, hinges, retaining springs, shaft, small gears, and the radial arms with a curve designed to give the best suction and the most effective throw.



On both ends of the shaft are the ratchets, or pawl cups, in which the pinions operate in conjunction with the ground wheels. The rake heads are divided and hinged, and supported by flat steel springs, to prevent breakage to them or injury to the turf, when any foreign substance is encountered. In each pinion are two pawls, working independently, and the machine can be driven from either side. The rakes are 3 feet wide, thereby giving, with the overlap, a sweeping width of $8\frac{1}{2}$ feet. Our method of

using the cleaner has been to run it over the fairway in order to make the seed heads stand up, then follow with the lawn mower, and then the lawn cleaner again, which gathers up from 80 to 90 per cent of the seed. We tried it late in 1921 on some of the fairways, and it showed a very beneficial effect. It not only gathered up a great deal of the seed, but it re-

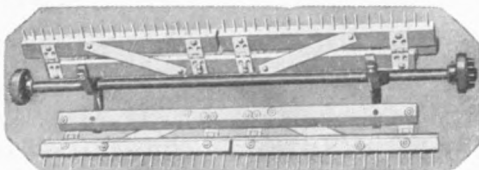


duced the individual plant of crab grass from an area of say 8 inches square to 2 inches square, thereby giving the good grass more of a chance to spread in the fall and not be smothered out. There is, of course, plenty of the crab grass seed still left on the ground after the cleaner is used, and it will thus be impossible to eradicate all of the grass.

Last year we gave the cleaner a more thorough test, using it both on our east course and on our west course. Unfortunately there

was only one machine in existence, while two are necessary for the two courses, as the grass should be cut before the seed ripens, otherwise much of the seed is beaten off onto the ground in the gathering. The results of last fall's work were not very definite, owing to the very severe drought, but we are hopeful that this spring and the coming fall will show a marked improvement.

I am very hopeful that other clubs will test this scheme, or improvements on it, and see what results they get. The cost of the machine is not great, and if the results are as we hope it will be well worth while, as it will give the permanent grass a chance to grow. It is already proved that it makes the playing surface much better—that is, not so spongy and soft in the fall, but more like the spring and summer conditions. We have not yet reached a stage where very definite statements can be made as to the efficacy of this process, and it is hoped that the experiments of other clubs along the same line will establish the fact whether or not the method is efficacious. We will have two machines this year, and by next year ought to have some definite information on the subject to announce through THE BULLETIN.



We shall be glad to answer any questions with regard to the machine and to show the machine in operation to any interested visitors.

New Member Clubs of the Green Section

Pittsfield Golf Club, Pittsfield, Mass.
Country Club of Rochester, Brighton, N. Y.
Winged Foot Golf Club, Mamaroneck, N. Y.
New Brunswick Country Club, New Brunswick, N. J.
Greene County Country Club, Waynesburg, Pa.
Coshocton Town and Country Club, Coshocton, Ohio.
Oberlin Golf Club, Oberlin, Ohio.
Madison Golf Lakelands Club, Madison, Ohio.
Colonial Country Club, Memphis, Tenn.
Mattoon Country Club, Mattoon, Ill.
Crawford County Country Club, Robinson, Ill.
Lawrence Country Club, Lawrence, Kans.
Country Club of Havana, Havana, Cuba.

Questions and Answers

All questions sent to the Green Committee will be answered as promptly as possible in a letter to the writer. 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 Committee. 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. **Soil preparation and seeding of new putting greens.**—Can you advise me the best procedure for building a new putting green? The ground is good garden loam and well drained. What fertilizers and seed would you recommend for our location?—(New Jersey.)

There are a great many methods of constructing a putting green and we shall attempt to give you only general recommendations on the subject. It is generally considered advisable to work in a considerable amount of well-rotted manure before seeding. Men who have had considerable experience use from 15 to 25 loads of manure to an ordinary-sized putting green of about 6,000 square feet. This manure should be thoroughly mixed with the soil. It is cheaper to do it with a team and a disk harrow than with forks, and the results are fully as satisfactory. We would also recommend the use of about 10 pounds of bone meal to each 1,000 square feet of green. We do not advise the use of lime, as we have found that it is not necessary for growing fine turf grasses, and lime encourages clover, crab grass, and a number of other weeds that are very troublesome. The best grasses for putting greens in your location (and, in fact, the only ones which are entirely satisfactory) are the bents. We would recommend either German mixed bent seed or Rhode Island bent seed. Be sure to have your seed analyzed when you buy it, as a considerable amount of redtop seed has been sold as bent seed, and redtop is very unsatisfactory as a putting-green grass. The best time to seed in your location is about September 1. You might get fairly good results from seeding early in the spring if you can get your ground ready in time, but we advise a late summer seeding in preference to spring seeding.

2. Renovating putting-green turf.—Our greens were built 10 years ago, and have suffered from drought due to the fact that only last year we installed a watering system. Our soil ranges from a clay loam to a heavy black loam. Will you please outline a method of renovating the turf now on the greens, which is, indeed, in a rather deplorable condition?—(Alberta.)

Get all the well-rotted manure you can and make a mixture of one-third manure, one-third rich loam top soil, and one-third sharp sand, such as builders use. Screen the mixture and apply about 3/16 inch of top-dressing on the grass in early spring. At the same time apply ammonium sulfate at the rate of three to five pounds to 1,000 square feet of surface. The top-dressing should be spread evenly and worked into the turf by the back of a wooden rake or long bamboo pole, or by dragging a door-mat back and forth across the green. Water the grass as needed, say two or three times a week when you do not have rain.

3. Applying corrosive sublimate for earthworm extermination.—Will you please furnish us with the best method of using corrosive sublimate for extinction of worms on our greens?—(Ohio.)

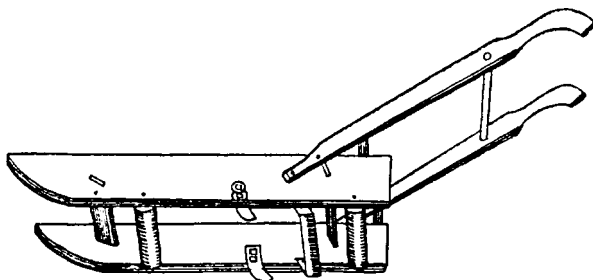
It has been our experience that the easiest way to apply corrosive sublimate to greens is to mix it with dry sand, scatter this over the greens, and then water it in with a hose. Some greenkeepers prefer dissolving it in water and applying it in a liquid form. There is a barrel outfit with a spreader pipe at the bottom covering a strip of 6 feet in going across the green that makes the operation a little faster than can be done by a sprinkling pot. It is necessary to get an even distribution of the poison, or there is considerable danger of burning the grass. It should never be used at a heavier rate than 1 ounce to 100 square feet of surface. We have found that this application is perfectly safe in the spring here at Washington, although we get some burning from as heavy an application as that in midsummer. In hot weather we usually cut the application down to about one-half ounce to 100 square feet of green. If a thorough job of watering is done there is less danger from burning than if it is not watered in sufficiently.

4. Renovating turf.—We were surprised to hear the other day the statement made that some putting greens in the East have had no new seed put on them for years. Without doubt, through ignorance and wrong advice in the past, greenkeepers have committed blunders in their anxiety to produce good putting greens and fairways; but we would like to know whether the statement above made to us is correct. We can well imagine how a creeping bent green would require no new seed but how about bluegrass, fescue, and redtop? These grasses, in our experience, are not free from thinning out and becoming more infested with weeds, the eradication of which necessitates new seed or new sod.—(Minnesota.)

There is no question in our mind that most of the seed that has been put on old turf has been money thrown away. We have seen some evidence of creeping bent seed being used on old redtop turf and gradually changing the turf from redtop to bent; but to put redtop seed on redtop turf or bent seed on bent turf we consider money wasted. In practically all cases it is possible to thicken the stand of grass by the judicious use of fertilizers and compost.

5. A home-made sod cutter.—We want to make a sod cutter, as we do not feel that we can buy one ready-made. Can you furnish us with a working-plan for a sod cutter that can be made at a low price?—(Massachusetts.)

There is no reason why sod cutters could not be made by any blacksmith, but the price of those on the market has usually been low enough to justify buying the ready-made ones rather than having a club make up its own cutters. We have no detailed plans for the construction of a sod cutter, but from the accompanying illustration there should be little difficulty in building one. The sled is usually about 3 feet in length with rollers at each end approximately 3 inches in diameter. The knife is



made of a strip of metal about $2\frac{1}{2}$ inches wide and $\frac{3}{16}$ -inch thick and which is pounded out to a sharp cutting edge on one side. The ends of the knife are bent at right angles to the blade, so that it can be bolted to the sled. There should be several bolt holes so that the knife can be raised or lowered according to the thickness to which you want to cut the sod. A pair of old cultivator or plow handles complete the equipment.

6. Weeds checked by proper use of fertilizers.—Heretofore we have mulched our greens every winter with partly decomposed manure that has weathered in the river bottoms, and we have reached the conclusion that this covering has been responsible for a large portion of the weeds in our greens, and that winter covering of greens is not absolutely necessary. To prevent the importing of weed seeds into the greens we intend to top-dress them at various times during the spring, using 100 pounds of bone meal to the green (about 3,600 square feet), omitting the application of top-soil, and establishing a true putting surface by raking, dragging, and light rolling. Our approaches, which are also infested with crab grass, have never been top-dressed. Owing to poor water pressure we were forced last summer to resort to some daytime watering, the two watering shifts being from 8 p. m. to 4 a. m. and 4 a. m. to 12 noon. Would day watering cause weeds, or have the weeds been washed out of the soil on the greens and been deposited in the terraces?—(Missouri.)

It has been our experience that a large amount of weed trouble can be avoided by composting manure and soil for at least a year before applying it as top-dressing to the greens. This usually destroys all the weed seeds, and it makes it much better to handle. No matter how careful one may be in not using anything which has live weed seeds in it, there will be a crop of weeds just the same. Crab grass seed is very easily scattered about and is probably spread by birds, who eat large quantities of it, and it is also tracked on the greens by the players. The watering could hardly be responsible for spreading the crab grass seed: a heavy rain would do more in washing seed from one point to another on the course than would ordinary watering. It has been our experience that ammonium sulfate is about the only fertilizer that has any effect in discouraging the growth of weeds and that will at the same time improve the texture of the grass. It has been demonstrated that the continued

use of ammonium sulfate (not over 20 to 25 pounds to a 6,000-square-foot green) will discourage the growth of clover, crab grass, plantains, and dandelions. We have never observed any injury to bluegrass by this treatment, but on the contrary have found it to be very helpful. We would advise you to try one or two applications of ammonium sulfate this summer in addition to the bone meal. The first application should be given when the grass starts growing in the spring. Applications of lime in compost encourage the growth of the weeds above mentioned and offset for some time the beneficial effects from the use of ammonium sulfate. We have never found that lime is necessary for growing bluegrass, provided the soil is rich.

7. Fertilizing Bermuda greens.—Kindly give your opinion on the following plans we have made for fertilizing our Bermuda greens. We will first apply dehydrated lime at the rate of 175 pounds to a 2,500-square-foot green. Following this, in about ten days, we will apply about 75 pounds of bone meal to the green. We shall also probably use 50 pounds of cottonseed meal to the green in conjunction with the first top-dressing we apply at about the time the grass begins to grow. We have used practically no fertilizer for the past two years. We believe that by liming we will materially reduce the number of runners, which is one of the big objections to Bermuda greens.—(Arkansas.)

The lime will do no good; but it will do no harm. We believe the bone meal and the cottonseed meal will be very beneficial to the grass. It has been found by a number of greenkeepers who have experimented with the growing of Bermuda grass for putting greens that it pays to top-dress the grass quite heavily in order to keep the runners buried so that they will not deflect a ball; and this is the only method that has been discovered that shows promise for overcoming the chief objectionable feature of Bermuda grass for putting greens.

8. Adaptability of bent and fescue to "sour" soil; effect of ocean spray on grass.—Our course is at the seashore. It is bordered by salt meadows. At one time the soil of a couple of our greens was said to be sour. The greens are fescue, bent, and redbtop. These flourish in acid soil. If that is so, would a sour condition of the green injure the above types of grass? In other words, what difference is there in sour and acid conditions of the soil?—(New Jersey.)

The terms "acid" and "sour" as applied to soil mean the same thing. In agricultural language it is generally taken to mean a soil that will turn blue litmus paper red and which has to be limed before it will grow red clover, alfalfa, etc. In our experience we have never found a soil so acid that it would not grow bents and fescues. We have even grown bluegrass on so-called sour soils, by applying plenty of plant food, without the use of lime. It has also been found that a turf on sour land is freer from weeds such as crab grass, white clover, dandelions, plantains, etc., than is a turf on an alkaline or neutral soil. For this reason we recommend that very little, if any, use be made of lime on a golf course; it does help in the decay of a compost bed, but other than for that purpose we would not use it. From what we know of your situation we do not think your greens near the salt meadows are what are generally termed sour. We believe the trouble is due to too much salt from the ocean. The greens may have been flooded during storms, and on these greens it would be very difficult to grow grass. Even if the salt water did not rise over them, there may have been enough spray from a storm to deposit too

much salt for the turf plants. This condition will correct itself in time if no more ocean water hits the greens. We believe it would pay you, if you think that the ocean water is causing the trouble, to dike along the meadows so as to be sure that the water does not come up over these greens. One flood a year would be enough to prevent grass growing successfully on such greens.

9. Correcting heavy growth on the rough.—We have a few very heavy spots of rough, in which balls are easily lost, so that the game of everyone on the course is delayed by hunting for balls. It is our idea to eliminate these spots by using sheep's fescue. We believe the correct thing to do is to plow the spots, cover heavily with sand and harrow the sand in, and then plant to fescue.—(Massachusetts.)

The method we would advise in treating your rough on which the vegetation is too heavy is to plow it shallow—say 4 or 5 inches in depth—and remove this sod and put it in a compost pile. If you can mix some manure with it at the same time it would be advisable to do so. After the ground is scalped in this manner then seed to fescue. Sheep's fescue is probably the best thing to use, although the ordinary red fescue is a little finer in growth and makes an excellent rough in your locality. By this means you could produce a lot of valuable compost for treating the rest of your course and reduce the productive power of your rough so that it will not be troublesome. We believe you would find this much cheaper and more satisfactory than to haul on enough sand to cut down the growth of the grass.

10. Soap suds as an earthworm exterminator.—We have read that the application of ordinary soap suds to turf is effective in bringing earthworms to the surface. Would you advise its use for this purpose?—(Ohio.)

Soap-suds solutions have been used for this purpose with fairly satisfactory results. They are not, however, as satisfactory as solutions of corrosive sublimate or applications of mowrah meal.

11. "Aldehyde" from grass cuttings.—To what extent does the aldehyde formed from grass cuttings injure the turf?—(New Jersey.)

If there is any aldehyde formed from grass cuttings, no chemist has ever been able to detect it. We fear you have been listening to some "turf expert."

12. Preventing injury to putting greens from wheelbarrow wheels when applying top-dressing.—Is it necessary to lay planks or boards on the greens to prevent the wheel of the barrow from scarring the turf?—(Maryland.)

The tires of ordinary wheelbarrows average about $1\frac{1}{2}$ inches in width. These will cut badly into the turf and should never be used on a putting green without the protection of a plank. If you will have a blacksmith make a tire out of $\frac{3}{8}$ -inch metal 3 to $3\frac{1}{2}$ inches wide, this can be shrunk over the old tire. When thus equipped it is possible to wheel ordinary loads of dirt across greens without injury. The load should be dumped over the wheel and not tipped out sideways, otherwise the edge of the tire will mar the turf.

Meditations of a Peripatetic Golfer

"Over-do" should be placed among the things not to do.

A correspondent admonishes that "a little learning is a dangerous thing" and then says he has sold golf clubs "humus (peat) by the carload."

Cases of winter-kill should be studied to learn the cause. Is it faulty drainage or something else?

Is an undrainable bunker ever an asset to a golf course? If not, why have so many been built?

Note the weeds that survive the winter. They are the ones that need attention. A season in the compost pile will render them innocuous.

He will not use manure for fear of introducing weeds. Yet rich meadows have fewer weeds than poor ones.

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.

The greenkeeper who never experiments is only half a greenkeeper.

It will soon be time for the worm to turn—over on his back, when the corrosive sublimate or the mowrah meal hits him.

More important than making two blades of grass grow where one is growing is to grow blades of the proper species.

Let us unlimber the turf machinery. It will soon be time to get into action, and delay may mean the loss of the battle.

Judicious use of fertilizer will do more to thicken up a thin stand of grass than the best methods of reseeding.

Why have a green committee if its membership must be changed every year?

The degree of difficulty of a golf hole is not a safe criterion of its excellence.

Building a new golf course on clay soil in wet weather! No real farmer would ever be so foolish as to work clay soils when they are wet.

A really good fairway mower should cut the grass evenly—not alternately long and short, so as to give it a corrugated appearance.

Anyone can have good putting greens in May, June, or October, but the real test of the greenkeeper is in the period from July to September.

A flivver of some sort will do a lot of odd jobs on the course and pay for itself in a short time.

If a machine proves unsatisfactory in any way, write to the manufacturer at once. Tell him first before you tell anyone else.