

in the use of explosives. A copy may be obtained from the Department of Agriculture.

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 given in this column, it is your privilege and duty to write to the Green Section.

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

Average cost of maintaining an 18-hole golf course.—We have just finished the reconstruction of our golf course and should like to get some idea as to the approximate cost of maintaining an 18-hole course, including all labor and supplies outside of the greenkeeper's salary. We are figuring on operating during the coming year on a budget of \$10,000 to \$12,000. (Indiana.)

ANSWER.—From an estimated average maintenance cost of \$18,000 a year, exclusive of greenkeeper's salary, for 18-hole courses throughout the Northeastern States, it would seem that your figures are hardly adequate. It is difficult to quote figures regarding maintenance costs which will be helpful in a general way. Moreover a comparison of maintenance costs on various golf courses is often unfair to one or more of the courses being compared. Soil conditions, the contour of the land, variety of grasses, method of construction, size of the property under the greenkeeper's care, and similar factors, and most important of all the demands of the club membership, influence the maintenance costs to a very great extent. Some clubs demand that the course be in excellent condition the year round. Other clubs prefer to get along at less expense and hence cut down on the number of men employed. Consequently at various times the rough on the course is neglected, the sand traps are not raked daily, greens are not weeded regularly, and perhaps the putting surface becomes irregular at times due to lack of top-dressing. The yearly fertilizing of fairways is a well-warranted expense. Some clubs, however, neglect this item for a number of years, which means that on certain soils the fairways will in time become very poor and the clubs will have to go to special expense to recover their turf. It is thus apparent that a large number of widely varying factors must be taken into consideration in preparing an annual budget to cover the cost of course maintenance.

Value of a chemical analysis of soil.—The condition of our greens and fairways has not been satisfactory to us. We are wondering whether the difficulties we are encountering in producing satisfactory turf are due to an inherent defect in the soil. So that we may ascertain whether or not the composition of the soil is responsible for our troubles, we should appreciate your suggestions as to the value of a

chemical analysis of the soil and the best method to pursue in having such an analysis made. (New York.)

ANSWER.—A chemical analysis of soil is generally expensive, and our observations have led us to the conclusion that the expense of such analyses is not justifiable. Should you have such an analysis made you would then probably have to do what most other clubs have done in such cases, namely secure the services of some one to interpret the meaning of the analysis. Many years ago soil analyses became very popular in agricultural work, but they have since fallen into discard, when agricultural chemists found that the growth of plants depended on the chemicals they could absorb from the soil rather than on the chemicals the soil contained. Chemicals may be present in the soil but be so completely locked up that they are not available to plants. This point was not appreciated several years ago. A similar situation has presented itself in the study of foods for human consumption; a few years ago nutrition experts were talking merely about so many calories in a pound of a certain kind of food, but later it was learned that the amount of energy in food was not the measure of its value but rather the amount of energy that could be absorbed by the body and the maintenance of a proper balance with other essential chemicals, and also the presence of vitamins. We doubt that a chemical analysis of your soil would do you any good.

Preventing the deposit of hard dirt balls when top-dressing putting greens.—The compost mixer we are using is the best machine we have been able to find. It nevertheless invariably leaves a quantity of small, hard balls of dirt on the greens, which cause loud complaints from players. Do you know if there is a mixer on the market that will grind compost sufficiently fine to give a top-dressing material that will not interfere with putting? (Illinois.)

ANSWER.—We do not know of a compost mixer which is any better or will do the work any more economically than the machine you are now using. We suggest you examine the top-dressing material you are using to see if it does not contain too much clay. We find it is best to keep the top-dressing material on the sandy loam side. This may be done by increasing the amount of sand and well-rotted manure in the mixture if you are using silt or clay as a base. We do not know of any machine that will reduce compost to a dust if it is inclined to form balls.

Efficiency of mercuric compounds when applied with a sprayer in brown-patch control.—Are mercuric compounds all equally effective whether in suspension or in solution and do they all have the same corrosive action on spray pump valves? (Virginia.)

ANSWER.—We have been unable to detect any difference in the efficiency of mercuric compounds in the control of brown-patch whether they are applied in the form of dry powder or in suspension or solution provided in each case an even distribution is obtained. Red oxide of mercury and calomel are just as effective when applied with a spray pump if there is a device in the apparatus to keep the liquid thoroughly agitated. Most spray pumps are now equipped with satisfactory agitators. Some of the compounds of mercury have a corrosive action on spray pump valves, corrosive sublimate being by far the most damaging in this respect. Red oxide and calomel, however, are practically harmless to the valves of spray pumps.

Controlling earthworms in putting greens.—What are your recommendations for ridding putting greens of earthworms? (Ohio.)

ANSWER.—The quickest way to rid putting greens of earthworms is to apply bichloride of mercury, mowrah meal, or one of the commercial preparations on the market. Bichloride of mercury is very effective and often the most economical. It is applied at the rate of 3 ounces to 1,000 square feet. It should be mixed with dry soil or other inert material and applied to the surface. Immediately after it is applied it should be watered into the soil, using a fine spray, care being taken not to water so heavily as to cause puddles to occur on the green, for in these puddles the chemical would tend to accumulate in stronger solutions. It is safest to use bichloride of mercury in the spring and fall. During summer the rate should be reduced somewhat to avoid burning the grass. Mowrah meal is used in the same manner, except that 15 pounds is required for 1,000 square feet. On a good many soils, however, complete control of earthworms is maintained by keeping the surface soil poisoned with arsenate of lead. This chemical, when properly applied, does not injure the common putting green grasses, and remains active in the soil for a year or more. The usual rate of application is 5 pounds to 1,000 square feet. After the surface soil of a green has been poisoned it is a common practice to add enough arsenate of lead in each top-dressing to equal the addition of 5 pounds of arsenate of lead a year. It is usually mixed with some inert material before being applied so as to assist in obtaining even distribution. It is generally watered into the turf after being applied; this is, however, not necessary unless there is danger of the material being wasted by wind, since when applied at the rate mentioned it will not burn turf grasses.

Preparation of rotted tanbark for use as a top-dressing.—We are sending you a sample of rotted tanbark of which abundant quantities are available to us at an old dam near our property. This tanbark lies beneath a 1-foot layer of sand and leaf mold. Is this tanbark in its present state suited for use as a top-dressing on our fairways? (Pennsylvania.)

ANSWER.—We have tested your sample of rotted tanbark for acidity and find it is quite acid, showing a pH of 4.5. The material is not of much use for top-dressing purposes unless thoroughly mixed with soil and decomposed more than it is at present. A very good way to prepare the tanbark for top-dressing purposes is to spread it liberally on an area where it may be plowed in and cultivated from time to time. At the same time ground limestone at the rate of 1 or 2 tons to the acre, superphosphate at the rate of 400 to 500 pounds to the acre, and muriate of potash at the rate of 150 to 200 pounds to the acre should be applied and disked into the soil with the tanbark. It would also help greatly to apply as much strawy manure as can be procured and plow and disk it into the soil. This treatment of the tanbark will increase its decomposition, adding to the organic content of the soil as it becomes incorporated therewith, and will give you an excellent top-dressing material. Probably one application of the rotted tanbark in its present state will do no harm to your fairways and perhaps some good; if so applied, the application should be followed with at least 1 ton of rock limestone to the acre.

Controlling the tendency of creeping bent to mat.—Our putting greens are planted to Cocoos bent. This grass has formed such a heavy mat over the ground that our greenkeeper is having difficulty in keeping a good putting surface. Can you suggest means of handling this situation? We use a power putting green mower. (California.)

ANSWER.—After Cocoos bent is established on a green its habit of growth is similar to other strains of creeping bent. The treatment should therefore be similar. When the growth of creeping bent is so heavy that it tends to mat in spite of close cutting, it is well to cut down on the fertilizing. Too heavy fertilizing of creeping bent during the growing season tends to develop a growth which would be too heavy and lush for putting purposes. Greens upon which there is a healthy growth of creeping bent should occasionally be raked to pull up the runners so that the mowers may thin out the turf. Frequent light top-dressings tend to fine down the turf and keep the bent from forming a nap or grain. The greens must be cut close regularly with a mower suited for the purpose.

Providing the top soil of the greens is open and porous in structure, none of the recognized power putting green mowers on the market would be injurious, since their weight is usually well distributed and would be considerably less than the weight applied by the trampling of players. In your case it would seem that the mower has not destroyed the soil texture, since your turf is thickening so well. It might be that the power mower you use will not cut close enough to keep your Cocoos bent from forming too dense a mat.

Rats and field mice in drainage lines.—We are troubled considerably on some of our fairways with field mice occupying drainage lines and continually undermining the fairways. What would you recommend for getting rid of these pests? (Connecticut.)

ANSWER.—Field mice do not ordinarily live in drain tiles, although they may congregate in the lower areas through which drainage lines run. The common house rat frequently gives trouble on golf courses by living in drain tiles and opening burrows to the surface at frequent intervals. In the event they are rats and not field mice that are giving you trouble, it is thought the most practicable method of control would be the forcing of calcium cyanide into the burrows with a dust gun. If you are certain they are field mice, the use of poisoned bait would prove most satisfactory. A suitable bait may be prepared by dissolving 1/16 ounce of strychnine in 1 pint of boiling water and pouring it over as much oatmeal as it will wet, which will be about 2 pounds. The preparation should be well mixed, or until all of the oatmeal is moistened. A teaspoonful of the bait may be placed at such points as are within reach of the mice. Care should, however, be taken to see that the bait is sheltered from access by children, domestic animals, and birds. Detailed information on the control of rodent pests may be found in Farmers' Bulletin 932, "Rodent Pests of the Farm," which may be obtained by writing to the United States Department of Agriculture.

Ridding fairways of dandelions.—There are parts of our fairways that are so infested with dandelions at the present time that very

little grass exists. We must take some steps to get rid of these weeds and are wondering what you would recommend. (North Dakota.)

ANSWER.—The dandelion problem on fairways is a serious one in many sections of the country. There are several methods which have been proved to be effective but have not become popular due to the fact that any of the chemicals which kill dandelions also injure grass to some extent. Therefore areas treated with these chemicals are badly discolored for several days and the treatments are objectionable. Many clubs have found that dandelions become less and less of a nuisance as fairways are improved by some regular fertilizing program. It is true that this weed also thrives on rich soil, but apparently the grass, by feeding, is able to compete more successfully with such weeds as dandelions and ultimately greatly reduces their numbers. In your letter you did not state whether you had fertilized your fairways. If you have not done so we suggest that you first give this method a thorough trial. If dandelions persist in spite of adequate fertilization it would be well to use one of the chemical weed eradicators.

Colloidal phosphate as a fertilizer.—We are offered colloidal phosphate at \$40 a ton in carload lots. We understand it contains about 20 per cent phosphoric acid. What information have you as to its fertilizer value? (New York.)

ANSWER.—We have no information based on experimental results as to the value of this fertilizer. Colloidal phosphate is a natural material obtained as a by-product in the preparation of Florida hard rock phosphate for the market. It is a clay-lime material. The phosphoric acid in colloidal phosphate is not soluble in water, and could not be considered as available phosphoric acid in the sense to which the term is applied to the phosphoric acid in superphosphate. The material is moreover lacking in nitrogen and potash, the former of which is indispensable for best results with turf grasses. In our opinion the price quoted you is out of proportion for this kind of phosphatic fertilizer, especially when the market price of the more readily available phosphate carriers is considered.

Poultry manure.—Can you recommend poultry manure as a fertilizer for golf course turf? (Pennsylvania.)

ANSWER.—Yes. It should be remembered, however, that there are various grades of poultry manure. Fresh manure from the dropping boards is less concentrated than pulverized manure, since before being pulverized the manure must lose considerable moisture. Pulverized poultry manure usually contains some straw, dust, and waste, and analyzes from 2 to 3 per cent nitrogen, about 1.6 per cent phosphoric acid, and .8 per cent potash. There are brands of poultry packing house by-products on the market now that compare very favorably, in analysis and in results obtained from their use, with such fertilizers as cottonseed meal and sewage sludge. These poultry by-products are largely manure mixed with blood and offal from the killing room. The mixture is thoroughly dried and pulverized. It analyzes about 5 to 6 per cent nitrogen, 1.5 per cent phosphoric acid, and 1.25 per cent potash. When purchasing the above mentioned organic fertilizers it is largely a matter of the cost per unit of nitrogen that is to be considered.



Putting green of the 3rd hole on the course of the Cypress Point Club, Pebble Beach, Calif.



Though a man write a better book, preach a better sermon, or make a better mouse-trap than his neighbor, though he build his house in the woods, the world will make a beaten path to his door.

Ralph Waldo Emerson

