

like, and it should also be capable of furnishing power to operate saws and do the work now done by stationary gas engines.

In the early stages of the development of the equipment, little attention was paid to economy of operation, and it goes without saying that the most successful tractor will be the one that will operate with the smallest consumption of gasoline and oil and against which the smallest charges for repairs and depreciation must be made; in other words, the successful tractor must not only have the widest utility but be the most economical as to initial costs, operation, and maintenance. The next important step in the development of this equipment, in our opinion, is the redesigning and proper construction of the mowing equipment to stand the speed, use, and abuse that will be called for. Better materials and better construction must be put into the mowing equipment.

The day may not be far off when a horse will be a strange sight on a golf course, but it is not believed that the best type of tractor and mowing equipment will be worked out short of several years of trial and experiment. (Contributed to elicit discussion.)

## 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.

### *Keeping Tees in Good Condition*

We are indebted to Mr. Walter J. Travis, Garden City, N. Y., for the following helpful suggestions submitted in the way of a comment on the answer to question 10, page 47, of the March 23d number of the BULLETIN.

Your advice makes no allowance for wind or weather conditions; it makes the hole inelastic, and consequently monotonous—unless there are several tees. Even then, definition 4 and rule 2 are dead letters; or else the back part of the tee is useless.

“Grass tees may easily be kept in condition by moving the plates before any sign of wear appears—by starting at the front and working backward, never forward, except the whole length of the tee. Short-hole tees suffer most; but if the divot marks are covered frequently with loam mixed with seed (preferably fescue, which is more wear-resisting than the softer grasses, such as bents), the scalps will heal rapidly and the tee generally be maintained in good condition. A tee is almost as important as a green. If the tees on a course are kept in good shape one may be sure to find the greens well cared for; they are unfailing barometers, as it were.”

1. *I have sent you by parcel post today a sample of a fluid which is being sold as an inoculating fluid for soils and seeds, and great things are claimed for it. I would like to have this sample tested and to know what good, if any, it will do to our putting greens and fairways. They claim this is a germ inoculation for either seed or soils. M. S., Iowa.*

The sample you send is a liquid culture of bacteria useful under certain conditions with some of the leguminous crops, such as beans, peas, and clovers. It has no effect whatever on the growing grasses and is usually not necessary in growing white clover. There are many of these liquid cultures on the market. They contain bacteria which attack the roots of peas, beans, clovers, and other legumes, causing the formation of nodules on the roots and enabling the plant to utilize the free nitrogen of the air. Legumes growing under this condition thrive much better than when these bacteria are not present. The soil where legumes have been growing generally carries sufficient bacteria for inoculating the roots, but when the legumes are planted on new soil it is necessary to mix into the new soil earth from a field where the legumes have formerly been grown, or else artificially supply the bacteria by means of prepared cultures. The liquid is of no use whatever on your putting greens and fairways.

2. *Kindly send as soon as possible full information regarding the eradication of clover from putting greens. F. W. H., Michigan.*

We know of no highly satisfactory method of eradicating white clover from putting greens. Many writers recommend the use of sulphate of ammonia for this purpose. Particularly is this true of English writers and English greenkeepers. So-called turf specialists very generally recommend sulphate of ammonia for the eradication of white clover. However, our experiments so far have not made us very enthusiastic over the method. In fact, for the most part our results have been quite negative. Nevertheless we propose to continue the experiments, and we still have tests under way which we hope will throw some light on the subject. We think there is little doubt that a fertilizer tending to produce an acid reaction in the soil, especially in clay soils in the northeastern part of the United States, favors the growth of the bents and turf-forming fescues against white clover and other plants. A summary of experiments in this line conducted by the Rhode Island Experiment Station, Kingston, R. I., is contained in the article entitled "Ammonium Sulphate" in No. 3 of this volume of the BULLETIN. Why not treat half of one of your greens regularly with ammonium sulphate and leave the other half for a check? In this way you should get some first-hand information.

3. *We are having a hard time in eradicating ants and would be glad to have any suggestions you can make. L. W. M., New York.*

While numerous experiments have been conducted in the eradication of ants no very satisfactory methods have resulted from the standpoint of efficiency and practicability. The best method we have found is to inject a small quantity of carbon bisulphide into the burrows by means of an oiler with a long stem and a spring bottom, such as is used by engineers. Success has also been had with a solution of potassium cyanide; but those who have tried both prefer the carbon bisulphide. This liquid is readily volatile and forms a gas that is heavier than air, and because of this it sinks into the lower chambers and kills the ants with which it comes in contact. If you wish to try the solution of potassium cyanide we would suggest one ounce of 98 per cent potassium cyanide to one quart of water; the two should be carefully mixed and the solution liberally injected into each ant hill for which purpose an oiler may be

used. Potassium cyanide is a very poisonous substance and great care therefore should attend its use. There are some experiments now under way which we trust will result in the development of better methods of killing ants than are now used.

4. *We have decided to seed to creeping bent if it is possible to procure the seed. As we will not seed before August or September this year we wish to ask you if in your opinion it will be possible to procure the seed from this year's crop. We are under the impression that this seed is harvested at or about the same time as our own bluegrass, and if that is the case would it be possible for the bent seed to reach this country in time for our needs? We are being urged to buy what little seed of this kind that we can now, though we are not satisfied that the seed is of average good quality, nor do we believe that the price of \$1.40 per pound is a fair or reasonable one even at this time. H. A. L., Ohio.*

We would suggest that you secure quotations and samples of South German mixed bent seed and then submit the samples to us for examination. Names of dealers who have recently had good stocks of this seed will be submitted on application. The German seed crop of the season never reaches up early enough in the fall to be use during the same year.

5. *There is a great deal of moss and some sorrel in our fairways. We have been using crushed lime rock and are planning to put on additional dressing this spring. However, this appears to bring in white clover; in fact, our fairways are very largely white clover. Should we continue the crushed lime rock treatment? E. B. P., New Hampshire.*

The conditions are very exceptional on golf courses where we recommend the use of lime at all. The presence of sorrel and of moss is much more due to poverty of the soil than it is to any acid conditions. In fact, we know of many acid soils which have excellent turf, but the soils are such as can be regarded as rich or moderately rich. We are sure that by the use of appropriate fertilizers your moss and sorrel trouble will disappear. Some mosses, however, come in shaded places and illy drained places. Correction of the drainage, and in some places of too great shade, is the remedy. However, for shady conditions in New Hampshire you can get most beautiful turf either with red fescue or with *Poa trivialis* (rough-stalked bluegrass).

6. *The writer would like to know whether you have had any experience in building greens with sterilized soil in a manner similar to what the tobacco growers use. Roughly speaking, they steam the soil under a pan until a potato will bake about 6 inches below the surface. This is done to eliminate all weed seeds and to kill any fungus and bacteria which may be in the ground. It would seem as though this might save a very considerable amount of work after the greens are seeded and come up, in keeping the weeds out; but I would like to know whether you have had any experience with greens handled that way, and, if so, what your opinion of it is. V. W. B., Connecticut.*

Sterilization of soil for tobacco beds, which, after all, is only partial sterilization, was primarily for two purposes, one to destroy weed seeds and the other to destroy fungus diseases, insects, nematodes, etc., which might be present in the soil. The oldest plan for doing this was simply by

burning trash piled over the seed bed, a plan still used in some regions. The plan now generally adopted by progressive tobacco growers is by means of a steam pan, under which hot steam is kept in contact with the soil for some time. In the Connecticut valley contractors sterilize soil for 50 cents to \$1.00 per 100 square feet. At the rate of \$1.00 per 100 square feet, that would mean \$100 to sterilize a large putting green.

Still another method of sterilizing soil is by using formaldehyde, using 1 gallon of formaldehyde to 50 gallons of water and then applying 2 quarts of this to each square foot. Before applying this the soil should be prepared for seeding, and it is better to apply the liquid in several applications than in one. After applying the liquid the surface needs to be covered with wet bags or blankets so as to confine the gas for 24 hours. After these bags or carpets are removed the soil must be allowed to air for 8 to 10 days so the formaldehyde can evaporate. The cost of the formaldehyde treatment is very considerably greater than that of the steam-pan treatment. All of these methods are described in detail in the U. S. Department of Agriculture Farmers Bulletin No. 96.

In our judgment the expense involved is vastly greater than any possible benefits than can accrue. Temporarily it may be helpful, but not to a degree to justify the expense. Sooner or later organisms that live in the soil are sure to return and weed seeds are carried on to the greens by the feet of golfers, and by other means.

Notwithstanding this adverse opinion, it would be an extremely interesting thing if your club could see its way clear to try out the scheme on one or more greens and give us all the benefit of the results you secure. After all, a real experiment is the only way to get the right answer.

7. *Our soil is medium heavy loam with clay sub-soil; rather acid. For our new fairways we are ordering Kentucky bluegrass and redtop exclusively. Is anything else indicated for this kind of soil for this climate? E. B. P., New Hampshire.*

For your fairways it is all right to seed a mixture of 4 pounds of Kentucky bluegrass and 1 pound of redtop. Kentucky bluegrass may not be adapted to your conditions without liming, and we would not advise you to use Kentucky bluegrass unless it will take care of itself. The dominant grass in New England is Rhode Island bent, and our judgment is that regardless of what you seed your fairways to, in two or three years' time they will be Rhode Island bent with more or less white clover, but on account of the availability and cheapness of the seed bluegrass and redtop are the things to sow.

---

#### *The Vitality of Weed Seeds in Manure.*

Several years ago the Maryland Agricultural Experiment Station conducted some experiments with a view to determining the length of time various seeds remain viable in barnyard manure. Results of these experiments were published in Bulletin 128 of that station. It was found that one year is sufficient to devitalize practically all of the common weed seeds when manure is kept in piles under ordinary conditions and that six months kills a large majority of the seeds. However, no chance should be taken. When in doubt, make the box test referred to in the article on humus-making materials in Bulletin No. 4 of this volume.