dies. Over a thousand of these larvae have been found in the stomach and gullet of a single robin; and from 100 to 200 of them in a stomach have been found in numerous instances. Leather-jackets or the larvae of crane-flies, insects with similar habits to the March flies, also are freely eaten by the robin.

Caterpillars, almost exclusive feeders upon green vegetation, are an important source of food for the robin, and cutworms and armyworms, special grass pests, are included in this part of the dietary. Grasshoppers, and leaf-hoppers, well-known consumers of grass are eaten, and even the minute but notorious chinch-bug is not overlooked. The robin feeds upon most, if not all, kinds of the dung-beetles which make considerable holes and throw up correspondingly objectionable heaps of earth on putting greens. It is an inveterate foe of the destructive white grubs, and of the persistently annoying ants. It feeds upon clover root- and clover leaf-weevils, upon the Japanese beetle, and upon crayfishes, all pests of the golf course.

Except when obtaining the wild fruits of which it is very fond, the robin feeds almost exclusively upon the ground, and thus, with its taste for insects and worms destructive to turf, is naturally adapted to be of great service on golf courses, where its cheery presence should be encouraged as much as possible.

Removal of all tree stumps inadvisable.—Mr. A. C. M. Croome, well known to both British and American golfers, suggests that in many cases the removal of all tree stumps in course construction is inadvisable, for the reason that they form an excellent foundation for mounds diversifying the surface of the course through the green. This has been done at Addington with charming results, producing an almost dune-like effect.

Fertilizer Experiments on Turf Grasses at Purdue University

Some interesting results from the use of different fertilizers on lawns are reported by Prof. S. D. Conner, of Purdue University Agricultural Experiment Station, La Fayette, Ind., in THE INDIANA ACADEMY OF SCIENCE, vol. 34 (1924), page 169. A summary of important features brought out by Professor Conner's work is presented in the following paragraphs:

The first experiment, started in 1918, included the following six fertilizer treatments: (1) Untreated; (2) limestone, 3,000 pounds per acre; (3) commercial fertilizer, 600 pounds per acre; (4) limestone and commercial fertilizer; (5) chicken manure, 1 ton per acre; (6) chicken manure, limestone, and commercial fertilizer. The commercial fertilizer employed in the experiment contained 6 percent nitrogen, 8 percent phosphoric acid, and 2 percent potash.

The second experiment, started in 1922, included the following 10 treatments: (1) Untreated; (2) nitrate of soda, 150 pounds per acre (equivalent to 3½ pounds per 1,000 square feet); (3) ammonium sulfate, 100 pounds per acre (equivalent to 2 1/3 pounds per 1,000 square feet); (4) dried muck, 3,000 pounds per acre; (5) limestone, 3 tons per acre; (6) phosphate and potash; (7) phosphate, potash,

and nitrate of soda; (8) phosphate, potash, and ammonium sulfate; (9) phosphate, potash and muck; (10) bone meal, 200 pounds per acre (equivalent to approximately 4½ pounds per 1,000 square feet).

In these experiments no appreciable effect could be noted from the use of limestone, in spite of the fact that the soil was somewhat acid. Neither was there any noticeable benefit from the use of phosphate, potash, or bone meal. Nitrate of soda and ammonium sulfate both produced a dark green luxuriant lawn the first season. Very little effect from these fertilizers could be noted the second year or still later. The application of muck at the rate of 1½ tons per acre produced no effect.

As a result of these experiments, it is concluded that fertilizer for turf grasses should be high in available nitrogen, a requirement which is best met by nitrate of soda and ammonium sulfate. Dry chicken and sheep manures contain available nitrogen and benefit the grass, but the price of the dried manures per unit of ammonia is so high that they do not do as much good per dollar invested as do fertilizers containing nitrate of soda and ammonium sulfate, which are water-soluble. Used alone, these soluble salts should be applied with care to avoid injury to the grass, as if used in excess or unevenly distributed harmful results follow.

An interesting observation is made regarding the use of city water on lawns. It is stated that the average city water of different towns in Indiana contains lime, and that on lawns that have been sprinkled for many years with city water the lime content of the soil is high and the proportion of weeds is increasing.

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 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 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.

1. Fertilizers for and treatment of fairways built on a sandy subsoil.—We are sending under separate cover a sample of top soil from our fairways. These fairways were built up by spreading about 3½ to 4 inches of this top soil over a sea-sand bottom. What fertilizer would you recommend for such top soil to give the best results? They were seeded with redtop, fescue, and bluegrass about two years ago, and we have been using a mixture of 250 pounds of ammonium sulfate, 400 pounds of acid phosphate, and 250 pounds of muriate of potash, spread at the rate of 900 pounds to the acre. We have also been spreading compost over parts of the fairways. We have also used 4/8/4 at the rate of one-half ton to the acre, with quite good results. Would a quick-acting fertilizer be better for this soil? We do not have much rain during the summer, and this soil dries