The change in the source of power for turf equipment was one of the great accomplishments in this field. Prior to the time of power equipment, good turf management was restricted to a very small area. With the advent of power driven cultivation equipment, which came around 1946, the cultivation of turf became a standard management practice. Other developments which have advanced the field of turf have been planters for vegetative materials and machines for seeding steep slopes, improved mowers, seeders, sprayers and fertilizer distributors.

A 3-Phase Contract to Protect the Club

By GEORGE W. COBB
Golf Course Architect, Greenville, S. C.

I am afraid that many architects feel that the design of a course is the only thing that concerns them. Consequently, there are many cases in which the entire construction phase is tossed in the lap of an assistant, a construction supt., contractor or even an individual club member or a group of members.

We break our course building contracts into three phases. The first is the preliminary layout of holes; the second is setting

up of specifications for building; the third is personal inspections while the course is being built.

I think that the second and third phases are so important that it is clearly stated in the contract that the client is not obliged to proceed with either until he is satisfied with what has been done before. He has immediate call upon my services to straighten out any detail which is not to his liking. I know of quite a number of courses where a designer's name has been attached to the layout although he has done nothing more than route the holes. Architecture, to my way of thinking, is not as simple as that.

It can't be divorced from construction. The overseeing of the building of tees, greens, fairways, and particularly the installation of the course drainage system are far more important functions of the architect than the mere drawing of the design. If he doesn't take the trouble to frequently visit the building site and see that everything is going according to his plans, he has no right whatever after the damage is done to utter those famous last words: "They didn't build it according to my layout or directions."

Nutrition—A Disease Control Factor

By ELIOT C. ROBERTS
Associate Professor of Agronomy,
Iowa State University

Fungus produces disease symptoms in grass plants by feeding on contents of the cell. When a fungus pathogen (organism) infects turf it does so in two stages—through entry into the interior or tissue, and by establishing itself so that it can feed on substances produced by the plant. Resistance to the disease may occur at either or both stages.

Structural characteristics of the leaf or root surface may favor or repress invasion of the fungus. Waxy coating of the leaf for example, may make it more difficult for a fungus spore to work its way in. Presence of hair on the leaf surface has been known to have a similar effect. The number, size and positioning of stomata (a tiny breathing pore) on the surface of the leaf may also favor or discourage penetration. Another factor is structure of the cell walls on the leaf surface.

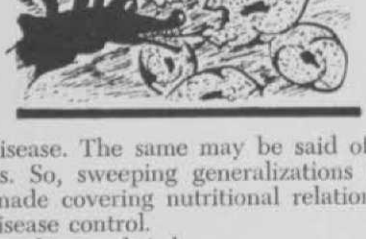
Fungus may enter a plant as the result of various mechanical, chemical or insect injuries. Root damage, such as from nematode infestation, invites invasion.

Inner Workings

Production of certain organic acids, sugar, tannin, etc. within cells protects the grass plant against fungus. These materials counteract enzymes produced by the organisms. It is believed that high carbohydrate content in relation to nitrogen and presence of compounds such as magnesium sulphate and potassium phosphate within the cell modify the efffect of enzymes generated by fungus. If these en-

zyme substances go unchecked, they not only slowly kill the cell but break down structural material between cells. This enables the fungus to spread through the entire plant.

Different species and strains of turf have varying nutritional requirements for strong growth and by-product resistance



to disease. The same may be said of soil types. So, sweeping generalizations can't be made covering nutritional relationship to disease control.

But this much is known:

Nitrogen in proper amounts promotes vigorous growth that enables turf to outgrow the slowly developing fungus infections. In excessive amounts, though, nitrogen stimulates production of thin walled cells that become easy prey to invasion by harmful organisms.

Phosphorous reacts with carbohydrates to produce building blocks for new cells and tissues. Because of this function, growth stimulation brought about by nitrogen when phosphorous is deficient, results in poorly balanced nutrition and the likelihood of increased disease susceptibility.

Speeds Up Synthesis

Potassium in adequate amounts speeds up synthesis of essential disease resisting and growth substances in grasses. Deficiencies of it weaken cell walls and lay them open to penetration by disease organisms.

Calcium strengthens intercellular areas and helps to contain the spread of fungus in a plant. Its balance with potassium is important. It also neutralizes acids and possibly other growth by-products. Calcium deficiency in turf is not common although it must be conceded that weak turf is often tied in with acid-heavy soil conditions.

The secondary elements, magnesium and sulfur, and the minor elements, iron, boron, manganese, copper, zinc and molybdenum, are known to have important regulatory functions within the plant. It is reasonable to assume that their presence in adequate amounts favors disease resistance.

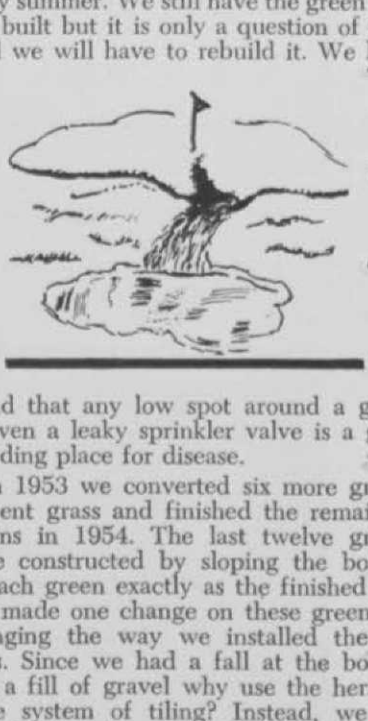
What should be kept in mind so far a good growth, and resistance to disease ar concerned is that it is not the presence o nitrogen, potassium and phosphorous i adequate amounts that is so important a the proper balance and absorption of thes elements in relation to one another.

Drain Green Over Its Entire Width

By CHARLES DANNER
Supt., Richland CC, Nashville

One of our six new greens was built s that excess water was channelled off th green in a narrow area. It didn't take lon to find out that excess water must be drained off the green over the entire widt of the front or sides and not channelled of Another green was built with ample su face drainage with a one way fall towar the front which drained excess water dow to a flat fairway. The result here was th the front approach would become slopp during wet weather. This was a goo breeding place for disease.

This green has been our problem bab every summer. We still have the green as was built but it is only a question of tim until we will have to rebuild it. We hav



found that any low spot around a gree or even a leaky sprinkler valve is a goo breeding place for disease.

In 1953 we converted six more gree to bent grass and finished the remainin greens in 1954. The last twelve gree were constructed by sloping the botto of each green exactly as the finished to We made one change on these greens b changing the way we installed the ti lines. Since we had a fall at the botto and a fill of gravel why use the herrin bone system of tiling? Instead, we pu one tile line along the low front and sid