probable, judging by many experiments, that the very fine clay material of the soil, usually called 'colloid,' is responsible for most of the changes that take place in fertilizers. The larger soil particles are comparatively inert. The colloidal material shows little affinity for chloride, sulphate, and nitrate; hence these fertilizer constituents are subject to considerable losses in regions where the rainfall is heavy. On the other hand, reactions take place between the colloids and other (basic) fertilizer constituents, such as sodium, potassium, and ammonium. If the colloid takes up some of the potassium of a fertilizer, it releases to the soil water an equivalent quantity of one of its own constituents, usually calcium or magnesium.

"The fact that there is an exchange of constituents between fertilizers and the soil colloidal material explains why a change in fertilizer treatment is sometimes beneficial. If a soil is fertilized for a series of years with a single fertilizer, the clay or colloidal material may become loaded with a single constituent and have less of other elements to release to crops. Soils on which crops are likely to develop nutritional disturbances following too heavy applications of lime or fertilizers (sometimes called 'weak' soils) seem to be those which contain a small quantity of colloid, or a colloid of low exchange capacity. The so-called 'strong' soils, on the other hand, seem to be those which contain colloids that insure a high capacity for exchange."

Caring for Trees on the Golf Course

Golf courses are at first generally blessed with an abundance of handsome forest trees. As the virgin underbrush is cleared from the woods to make room for fairways and putting greens, the trees, however, are robbed of the natural layer of decomposing vegetation which is the source of their food and water. Fertilization and irrigation must be resorted to in most cases if these native trees are to be retained in locations where the turf is kept cut short, as on fairways and tees and near putting greens. Often subirrigation is necessary to save trees in such locations, and it has been practiced successfully on some courses. Where subirrigation is impracticable or not deemed necessary, additional surface water beneath the trees can and should be applied. Soil beneath a tree is generally drier than soil in the open, due to the double draught on the moisture supply by the tree and the surface vegetation, and also to the interception by the branches of the natural rainfall coming from showers. There is also a double draught on soil nutrients beneath trees, and for this reason additional fertilization is called for in such locations. On the golf course this additional fertilization can perhaps best be attained by more frequent application of fertilizers under the trees. Of greater value perhaps are top-dressing with compost and, in early winter, spreading a mulch of thoroughly rotted animal manure on the ground over the spread of the roots of the tree. This mulch should be allowed to remain on the ground over the winter. Any residue that may remain the following spring may be raked away if it is deemed objectionable. Trees must also be kept pruned if they are expected to thrive. Dead branches should be carefully removed to make room for new growth and to prevent the spread of decay. No annual budget of a golf club is complete unless it includes an item to cover tree surgery, tree replacement, and general care of the trees.

"The high level of excellence of American putting greens, sustained under much more adverse conditions than prevail in any part of Great Britain, has long been appreciated as a particularly fine achievement of their greenkeepers."—*Golf Monthly,* Edinburgh, November, 1928.