With the surface drainage properly taken care of, there was no difficulty in producing and maintaining an excellent turf on the greens. At the same time, it is necessary to weed, renovate, reseed, topdress, and sand the greens systematically and occasionally sweeten the soil with pulverized charcoal.

During severe hot dry weather, the greens are "dusted" with sifted compost and watered freely two or three times a week, and if the turf is kept healthy, thick, and strong,—there is not much room for weeds, and the annual crab grass.

The advantages of building greens as above are many. They play better; worms are less in evidence; the greens are open for play much earlier and later in the season; they behave properly in bad weather—that is, they drain freely in wet periods; the surfaces keep in good condition; and in dry hot weather, the soil does not bake, pack down hard, and crack. As the make-up and up-keep of the greens are artificial, it is not necessary or desirable to choose grasses that are natural to, or thrive best, in a certain district under natural conditions, but rather to choose those that are best suited for putting greens.

The nature of the soil in many districts is generally responsible for the failures to produce and maintain really good greens. If the soil conditions can be improved and changed, there is no reason at all, with artificial systematic treatment, why good greens cannot be produced and maintained. In some of the Southern States, for instance, on heavy clay soil in North Carolina and Georgia, putting greens are being constructed on more or less the above system and during June, July, and August, it is proposed to cover the greens with cheese cloth (about three to four feet above the ground) as a protection from the hot sun — and play temporary greens. It is the same arrangement as covering tobacco, but the greens should be watered systematically and uncovered occasionaly to benefit from the natural rains and allowed some early morning or late afternoon sun.

The Use of Lime

By R. Vander Beken

GREENKEEPERS are nowadays fully alive to the importance of maintaining a supply of lime in the soil that it may seem unnecessary to write at length on the subject, but as examples are so often cropping up where otherwise good soils are deficient in lime, it seems an opportune time to point out how to determine whether or not the soil contains a sufficiency of lime.

As is well known, one main use of lime is to neutralize the acidity of the soil, set up by the decomposition of organic matter. For a shortage of lime a good indirect indication can be determined by testing the acidity of the soil.

Methods of testing for acidity with litmus paper.

The usual test for acidity or sourness in a soil is blue litmus paper; if this is turned red, it may be concluded that the soil is sour and that it will greatly benefit by liming or an application of marl or ground limestone.

There are several tests, but three of the simplest are:

(1) Take a handful of soil in a somewhat moist condition, place a slip of blue litmus paper in the soil, which is then kneaded gently for a minute or two so as to bring the particles of the soil in close contact with the litmus paper. If the soil is acid the colour of the litmus paper will change in the course of 5 to 10 minutes to red.

(2) Take a little of the surface soil from, say, half a dozen places on the area to be examined and mix well. Take a few ounces of this mixed soil and, putting it in a clean cup or tumbler, pour on a little boiled water and stir until it becomes a thick paste. Into this insert a piece of blue litmus paper by means of a small stick or the back of a knife. After fifteen minutes carefully draw out the paper and if that part of the litmus paper which has been in contact with the "mud" has turned

red, it is to be inferred that the soil is acid.

(3) Place a strip of blue litmus paper in the bottom of a clean tumbler and over it place a round filter paper, or a piece of clean white blotting paper cut to fit the bottom of the glass. On this place a few ounces of the soil to be tested: pour on sufficient boiled water to wet the earth thoroughly throughout its mass, but no more, then set aside for about a half hour. View the litmus paper by turning the tumbler up-side-down. Here again if the paper has turned red we can conclude the soil is sour.

It should be remembered that it is well not to handle the soil, rather taking an implement, such as a trowel, to take up and mix the soil.

The above tests only tell if the soil is sour or not, so if it is desired the direct test for lime may be employed. This may be done by adding to half a teacupful of soil enough spirits of wine (made by adding to the commercial article an equal quantity of water) to thoroughly moisten and just cover the soil. If lime be present in quantities a lively effervescence takes place; on the other hand if the effervescence is only very slight it is to be inferred that lime is deficient in the soil.

Another test is, place two teaspoonfuls of soil in a glass, cover with water, pour on a teaspoonful of spirits of salt (hydrochloric acid). A gentle bubbling and a frothy head will appear if lime is present; if not the soil requires liming.

Lime in whatever form it is applied acts as a corrective of acidity, but further, it is an aid to the absorptive and retentive properties of the soil.

Ways and means of applying lime.

Quicklime is distributed in small heaps at the rate of ½ ton to the acre. Water is added at the rate of one-third the weight of the heap, and the latter is covered with about an inch of soil. When the heap is slaked it may be spread with a shovel. It is important that the slaked lime does not come in direct contact with organic manure. If carbonate of lime is applied it should be in a finely pulverized state and at the rate of 1 to 2 tons per acre. Its action is less rapid than that of slaked lime, and its use on light soils is recommended because lime itself appears to hasten the oxidation of organic matter —a process which goes on fast enough in well aërated light soils. On the other hand; peaty soils benefit more quickly by the use of lime, for it increases the plant food in the soil by directly attacking the complex insoluble compounds and breaking them down. A further important effect of lime, either as the hydrate or the carbonate on clay soils is the well known "opening" which it induces.

Finally lime and its compounds may perform many functions: in correcting acidity, in improving tilth, in promoting nitrification; all the same they are not fertilizers, and cannot be used as substitutes for manures, for drainage or for tillage.

Autumn is probably the best season for application, spreading on the ploughed land and harrowing it in. The tendency for all lime compounds is to sink, to be washed down by the rain, and therefore it should never be ploughed under. Never apply in excessive amounts, better apply too little than too much, as an overdose will cause a too rapid dissipation of its humus—certainly one of its most valuable constituents—the nitrogen.

It is well to substitute charcoal for lime on the greens and pieces of fairway where no clovers are to be encouraged, as the action of lime has a tendency to decompose the insoluble potash compounds, thus the lime compounds may act as indirect potassic fertilizers. The effect is most noticeable on clays and will be more apparent on clovers, which more particularly respond to potassic fertilizers.

In preference, on all soils, always use pulverized limestone rather than caustic or burnt lime, because in using the latter there is considerable loss in the liberation of Nitrogen and in the burning of the Humus in the soil.