lack of phosphates than from a toxic action of the iron and aluminum compounds.

9. Liming raises the reaction of the soil so that less of the iron and aluminum compounds are in solution, and it may also increase the availability of phosphorus in acid clay soils of the type here used.

10. Lime overcomes the toxic effects of high sulphate concentrations in the soil. The action is largely one of neutralizing the acid to form relatively insoluble sulphates. This is of importance in counteracting the harmful effects of sulphate residues accumulated in the soil following the use of sulphate of ammonia as a nitrogen fertilizer.

11. Climatic factors may have an effect upon the response of bent grasses to soil reaction. The acid-tolerance of these grasses appears to be lower during midsummer than at other times of year. It has also been found that liming has a more beneficial action in summer than at other seasons. These responses are in agreement with the injury of turf in summer resulting from cumulative effects of fertilization with sulphate of ammonia at the Arlington turf garden.

12. The results of the experiments which have been described apply chiefly to two types of soil. In general, the results obtained indicate that, if the fertility of the soil is maintained it will not be necessary to establish narrow limits of reaction.

Questions and Answers

Use of sulphate of ammonia, superphosphate, muriate of potash, and bone meal as fertilizers.—Could a mixture of 2 pounds of sulphate of ammonia and 10 pounds of superphosphate be safely applied monthly to 1,000 square feet of putting green surface? Would an application in the spring of 200 pounds of sulphate of ammonia followed by an application of bone meal be satisfactory for fairways? (Pennsylvania)

ANSWER.—It would be quite safe to apply 2 pounds of sulphate of ammonia to 1,000 square feet of putting green surface and to apply also at the same time 10 pounds of superphosphate to the same area. There is seldom any burning with superphosphate, but occasionally muriate of potash burns, and the fact that it may burn should be considered when using it in a fertilizer mixture. Monthly applications of sulphate of ammonia are all right during the growing season, but superphosphate should not be applied monthly, since phosphorus is not used up as quickly as nitrogen, nor is it released from the soil as readily, and an excess of phosphorus in the soil might lead to difficulty from clover and weeds. One application of superphosphate, either in spring or fall, would be ample. On the fairways 200 pounds of sulphate of ammonia could be applied to an acre in the spring without danger of burning, but the bone meal should not be applied until after a good rain so that the sulphate may first be washed into the soil. The sulphate will give the grass a good start in the spring, and also will make the bone meal more readily available, thus producing good results from it as early as spring and the first part of summer. If bone meal is to be used without an application of sulphate of ammonia its fertilizing elements will become only slowly available, and in that case it should be applied early the preceding fall.

Disking or spiking fairways after they have received fertilizer.—We are planning to apply sewage sludge to our fairways. Our course is hilly and the soil clay. Would it be well to give the fairways a light disking or spiking after the sludge is applied in order to prevent its washing off the high places? (Michigan)

ANSWER.—It would be highly desirable to follow the fertilizing with disking or spiking, so that the fertilizer may work into the soil and not be washed away. Light disking can often be done by loading the carriage and by setting the disks straight. The straight-set, weighted disks will slice the sod but will not turn it to any extent. The disk furrows should be left open until the fairways are watered or until rain has fallen, provided the rain comes before the turf dries too much. The watering or rain will wash the fertilizer into the disk furrows. Before the disked turf dries to excess on account of being loosened from the soil, it is well to pass a roller over the area to put the turf back in contact with the soil.

Magnesia in limestone used for topdressing purposes.—We have received several samples of ground limestone. One contains 45 per cent carbonate of magnesia and only 40 per cent carbonate of calcium; another contains 10 per cent carbonate of magnesia and 65 per cent carbonate of calcium. Is not the sample with the higher percentage of lime the better? Is magnesia an impurity in lime? (Pennsylvania)

ANSWER.—Magnesia is not considered an impurity in lime. The value of carbonate of magnesia is equal to the value of carbonate of lime for agricultural purposes. Therefore the sample containing a total of 85 per cent carbonates of magnesia and lime is superior to the sample containinig only 75 per cent of these two carbonates. The same is true of the oxides of lime and magnesia.

Selecting a bent grass for putting greens.—We are contemplating the rebuilding of our putting greens. Have you any suggestions as to the best kind of bent grass to use? (Pennsylvania)

ANSWER.—Greens planted with stolons and those planted with seed both have their advantages, and the matter is principally one of personal choice. The first consideration should be the selection of a grass that does well in your section. The Metropolitan and Washington strains of creeping bent, which must be planted with stolons, make very good greens. The seaside strain of creeping bent is planted with seed, and also makes a desirable turf. Colonial bent, which is not a creeping bent, is planted with seed and has many advantages. Mixtures of velvet bent and colonial bent seed make very fine turf which has found much favor. A wide selection of turf grasses can be examined at the Arlington turf garden, near Washington, D. C.

Creeping bent on football fields.—What strain of creeping bent is recommended for use on football fields? After a stand of creeping bent is established on a football field will it be able to keep out quack grass? Is creeping bent likely to be injured by alkali? (Minnesota)

ANSWER.—Creeping bent is not generally recommended for use on football fields. It has been tried in a number of cases on football fields but the results have usually not been satisfactory. Since with football the playing season comes when the growing season is over for the grass, scars left in the turf do not heal. Moreover, the stolons of creeping bent are apt to be a nuisance when played on with cleated shoes. Creeping bent thrives best on a slightly acid soil and is not

likely to withstand much injury from alkali. There appear to be no records of its being able to keep out quack grass satisfactorily.

Controlling snowmold.—November 25 our putting greens, which are a mixture of redtop, bluegrass, and Chewings fescue, were attacked by a disease resembling snowmold, although we had not had any snow. Almost overnight they developed a mottled appearance, spots appearing 3 to 6 or 8 inches in diameter. The mycelium was bluish and rather heavy. There were as many as 30 or 40 such spots on some of the greens, the grass in these spots presenting a scorched and dried appearance. The weather at that time had been very foggy but there had been little or no rain. We immediately had the greens sprayed with a solution of calomel at the rate of 3 ounces to 1,000 square feet. The mold thereupon seemed to lighten and gradually disappear. Is there any further treatment we should give the greens? (New York)

ANSWER.—From your description it appears that your greens were attacked with snowmold. Snow is not necessary for the development of this disease. We have had reports from various sections of the country of many snowmold attacks as early in the season as yours. The treatment you have given should hold the disease in check for the remainder of the season. You will find further information on snowmold in the August, 1932, Bulletin.

Treatment of turf subject to injury from salt water; late fall seeding.—Two of our greens have been ruined by salt water. Another we are reconstructing. Is it too late to reseed these after the middle of October? What grass would you recommend for putting greens under our conditions? (New Jersey)

ANSWER.—We would advise you not to replant the greens you refer to until likelihood of their further injury from salt water has been eliminated. Usually proper drainage will rid soil of salt. This may be accomplished by raising the elevation of the greens and putting in tile under-drainage if necessary. On account of its solubility salt is ordinarily readily washed out of well-drained soil. Late October is rather late in the season to sow seed, but it is nevertheless preferable to seed at that time rather than to wait until spring, provided the areas on which it is sown are not subject to surface erosion. In your locality the soil is seldom in condition to work until late spring, while seed sown in October may germinate and be growing early the following season. Under your conditions we would suggest that you use either seaside creeping bent seed or German mixed bent seed. In purchasing German mixed bent seed care should be taken to see that it does not contain a large percentage of redtop seed.

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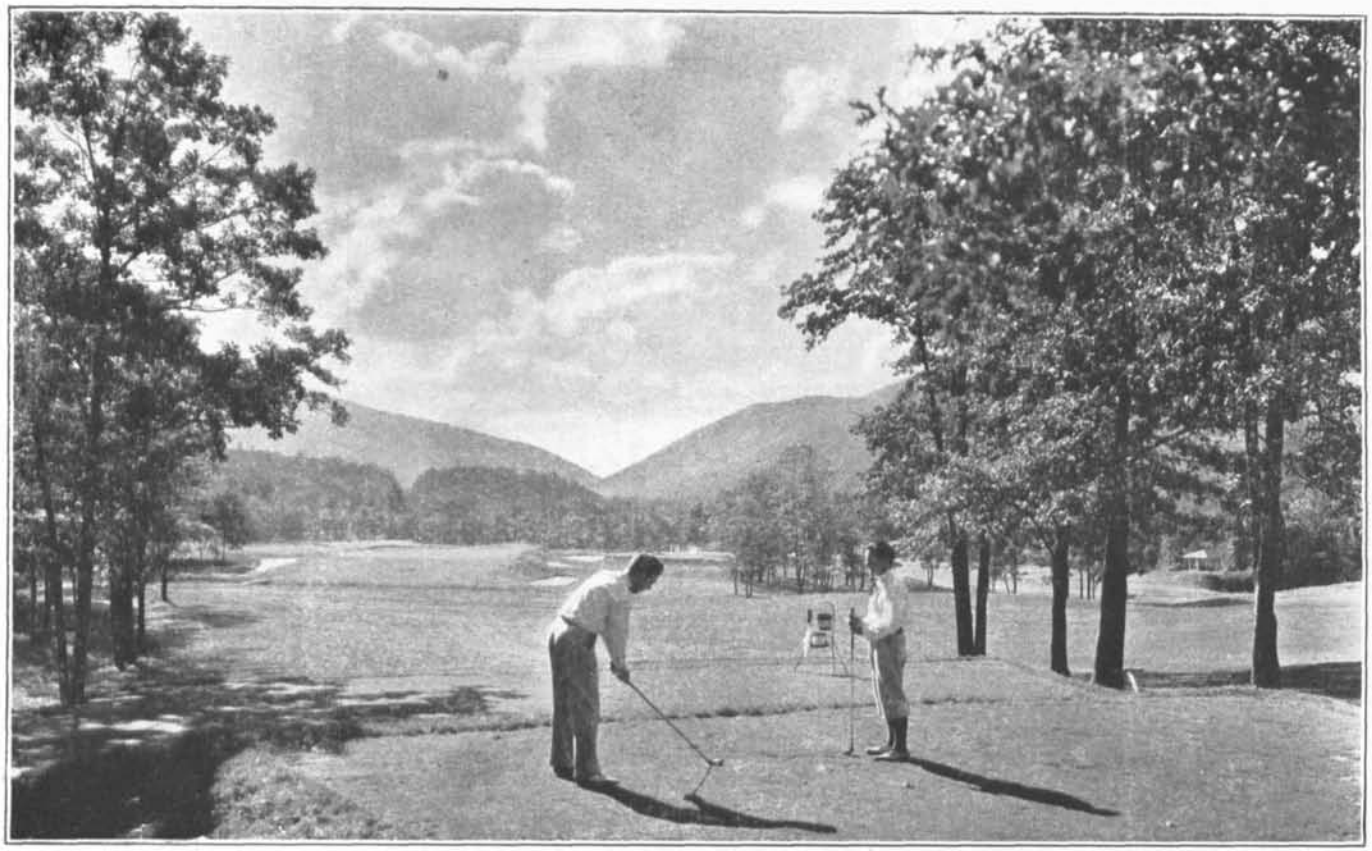

Tenth hole (236 yards), No. 3 course, White Sulphur Springs, W. Va.

Life consists of molting our illusions.

We form creeds today only to throw them away tomorrow.

The eagle molts a feather because he is growing a better one.

Elbert Hubbard