acted by the acid. In the two plots receiving neither lime nor acid there was some scald, but by far the worst damage was done in the plots receiving the acid. Two of these plots are illustrated in figure 10.

In other plots where lime was used on turf badly scarred with both brown-patch and scald there was a relatively quick recovery in the limed plots as compared with those where lime was not used. However, where the injury was due to previous use of Bordeaux mixture resulting in an accumulation of copper in the soil, the use of lime failed to bring about recovery of the turf. There are no doubt other poisons to be found in some soils which will not be remedied by lime. In such cases the only remedy so far found to be effective is to remove the poisoned soil and replace with fresh earth.

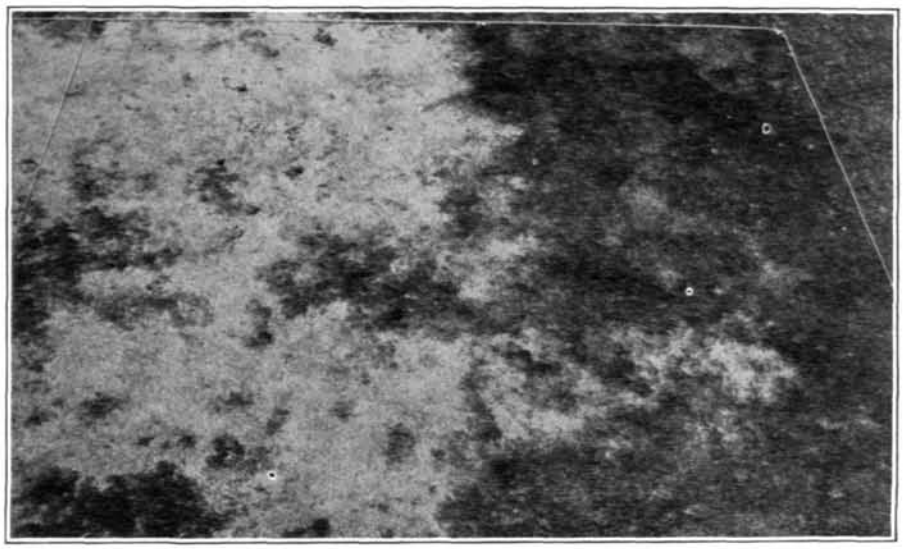

Fig. 11.—Cottonseed meal plot in the fertilizer series on Washington creeping bent. The large irregular blotches of browned turn on the left are the type of injury that was common throughout the East and Middle West during the summer of 1928. The right half of the plot was treated with corrosive sublimate and calomel. This treatment greatly reduced the amount of injury even though it did not completely control it. Photographed August 13, 1928.

Fertilizers Affecting Scald

Another though similar type of scale is that shown in figure 11. This type produces the same irregular patches of dead turf, but the symptoms are somewhat different and the causes are probably not the same. At the present time, however, there is not sufficient knowledge of either type to warrant any distinctive names. In this latter type the injured grass has more the appearance of having been burned by a recent excessive application of some chemical such as sulphate of ammonia or corrosive sublimate. These symptoms are so similar that several cases have been experienced where the greenkeeper or green committee members have been inclined to blame the injury on some malicious individual who was suspected of having thrown chemicals upon the turf when none had been used by the club staff for perhaps three or four weeks. In the fertilizer series at Arlington this injury was most serious in the plots where the more slowly available fertilizers were used. In the spring of 1928 there seemed to be little response to some of these fertilizers even though the turf appeared to need food. Apparently the process of decomposition of the fer-

tilizers was a slow one, due to some unfavorable factor. During the latter part of June and during July decomposition of these fertilizers was rapid and the grass became soft and succulent. Scald soon spread through this tender grass. Similar injury was observed on golf courses, and in many cases the strong odor in the vicinity of the greens testified to the rapid decomposition of the fertilizers which were applied even weeks before that time. Whether this sudden decomposition of the accumulated slowly available fertilizers was sufficient to release nitrogen and other foods too fast for the welfare of the grass is not definitely known. Many cases were observed which certainly might readily be explained in this manner. The checking of the spread of this injury by corrosive sublimate and calomel in some of the plots at Arlington, as is shown in figure 11, indicated that some living organism was responsible for the injury. Whether the actual damage was due to some unknown plant parasite which was able to destroy the grass under these particular conditions, or whether the corrosive sublimate and calomel held in check the microorganisms causing disintegration of these fertilizers, remains for future work to disclose. Attention is called to this injury at this time to warn readers against the indiscriminate repetition of applications of such fertilizers during seasons when it is obvious that the grass is not able to use these plant foods. If the grass does not respond to a normal application of such fertilizers it is probable that decomposition has not been accomplished, and further piling on of such material is not likely to aid the turf but is merely inviting disaster at any time that conditions become suitable for rapid decay. Cottonseed meal, soy bean meal, bone meal, and urea were some of the fertilizers that seemed to favor this particular type of injury.

Some Practical Applications of the Foregoing Observations

It is recognized that observations and experimentation such as are detailed in the foregoing often appear extremely confusing to those who would like to put such findings into practical use. Many readers who have been struggling against small brown-patch will probably emit sighs of relief when they look at figure 1, for instance, only to have new hopes rudely strangled when they see an illustration of the results with this same fertilizer in figure 11. The individual who is looking for some simple cure-all for turf ailments will find little encouragement in this report, and it is probably safe to predict that such expectancy is most likely doomed for similar disappointment for many years to come. However, for those who are willing to admit that turf culture is a complex problem with consequently complex solutions, this report may serve some useful purpose in checking turf losses.

In interpreting these results it must be remembered that the tests were made at Arlington and that results with the same treatments may vary with different soil and climatic conditions. However, these tests are supported by observations on golf courses in widely different sections of the country. In working out a solution for any complex problem it is to be expected that contradictions will be relatively frequent. Time, with added hundreds of observations, will be needed to work out the many details and exceptions. Even if these observations were to serve no other useful purpose they would at least be of service in showing that some of the recent dogmas, like old ones, must be subject to revision if progress is to be made toward ultimate solution. All information must be given out in the light of