

the expense of drainage. The drainage of small potholes in playing areas is highly desirable. It is easier to drain them than to dodge them when wet.

Mistakes have been made in draining potholes only deep enough to permit the surface water to escape. Successful drainage calls for a tile 3 feet below the surface of the ground at the lowest point in the pothole. In small potholes the required covering for the tile may be obtained economically by scraping in earth from the surrounding high land.

Seepage Marshes: At the foot of almost every hill there is a narrow zone kept wet by seepage from the higher land. This is most serious where the hills are high and where there are seams of sand or gravel in the subsoil through which water moves easily until it comes to the surface. Frequently large springs are caused in these places. In other places millions of smaller springs, each doing its share to keep the land wet, take the place of a few larger springs, and zones 80 rods and more in width are kept wet continuously by the seepage from the higher land. Seepage marshes, although relatively high and sloping, are frequently the wettest of lands.

The most economical way to drain the seepage marsh is to cut off the seepage water before it enters. If a line of tile can be laid in the layer of sand or gravel bringing in the seepage water, it may dry the area for 20 rods below it.

Seepage areas can be drained easily because they usually have a liberal fall—sometimes 1 foot in 100 feet. Their drainage is desirable also because they are adjacent to higher playing areas. The drainage of seepage marshes occurring in narrow swales is particularly desirable for the double reason that they increase the playing area and decrease maintenance costs.

(To be continued)

More Attention for Fairways

THE present day golfer demands better fairways. Golf clubs have been too much inclined to put more seed on their thin fairways and to overlook the fact that the grass already there was starving to death. Plants require food just as animals do. Greens are top dressed and fed regularly, but many fairways are allowed to shift for themselves. Much money is wasted in seeding impoverished fairways. Much money can be saved by properly fertilizing them.

At one Chicago district club it was the custom to spend about fifteen hundred dollars a year on seed for the fairways, and nothing on fertilizers. The soil was a worn-out clay hill farm. The turf was thin; bare patches were the rule rather than the exception. A change in policy brought fairway feeding. The first year under the new plan four hundred dollars was spent for seed and about a thousand dollars for fertilizer. The results were most satisfactory. The ground was com-

pletely covered with turf the first year and the grass stayed green much later in the summer. After the first year no seed was used on the fairways except for repair work, but fertilizer was used each year. There has been no winter kill and no bare spots since that time. Many other clubs have had similar experiences.

Unless the soil contains sufficient properly balanced plant food, the individual grass plants will not spread and cover the ground. Weeds will come into such thin spots and rob the grass of what little plant food may be there. The parallel veined plants such as all fairway grasses thrive on neutral or slightly acid soil. An alkaline soil promotes the growth of the broad leaved plants such as clovers and most weeds.

Fertilizing to Eliminate Weeds

All greenkeepers have seen the effect of the consistent use of sulphate of ammonia in eliminating weeds from greens, due to its residue of acid sulphate. A fairway fertilizer should also always be so compounded as to give an acid reaction and residue. The continued systematic use of such a mixture will gradually eliminate most of the objectionable weeds from fairways. Practically all grasses will grow in acid soils; few common weeds such as the dandelion, plantain, etc., are happy under such conditions, and they will eventually die out if such soils become well sulphated.

Fairways are usually not watered. The problem is to produce a grass plant of sufficient health and vigor to grow throughout the playing season, to maintain a thick solid turf that will afford a perfect lie and will quickly replace itself when divots are removed and when otherwise injured. A complete fertilizer containing all the plant foods, ammonia, phosphoric acid and potash is necessary.

A portion of the ammonia should come from nitrate nitrogen so as to be available at once while the soil is cold; the balance should be largely in the form of sulphate of ammonia, which becomes available during the growing season and leaves in the soil the sulphate residue so discouraging to weeds. A well balanced combination has been found to be a fertilizer analyzing 6% ammonia, 8% available phosphoric acid, and 6% potash.

(Contributed by C. H. MacDowell, President Armour Fertilizer Works, Chicago.)

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