



# Why Corrugated Turf?

By John Monteith, Jr.

Some of the possible causes of the "washboard" effect common on many courses' fairway turf, are discussed by the author, who also suggests remedies

FOR several years there has been an increasing number of complaints about corrugations in fairway turf. This condition takes the form of a series of wave-like ridges that usually may be somewhere between 8 and 12 inches apart. The distance between the crests of the ridges may vary on the same course and they likewise vary decidedly in depth. In some instances the corrugation is of such a minor extent that it is scarcely discernible. In other cases the corrugation may be so pronounced that balls settle in the depressions and provide a distinctly unfavorable lie.

In the minor cases of corrugations the effect appears to be chiefly on the grass itself; that is, the grass seems to be cut closer in the trough of these waves and cut longer at the crest of the waves. In

the more severe cases there is a ridging of the soil itself and it is in such cases that the playing conditions of the turf are most severely affected. In many instances of the more advanced stage of this corrugated condition the composition of the turf is materially changed. One often finds that the troughs are covered chiefly with white clover whereas the crests of the waves are composed mainly of grass.

The corrugated condition may occur on isolated areas on the course or in some instances it has been found to a greater or lesser extent on practically all of the fairways on the course.

Various theories have been advanced to explain these corrugations. Unfortunately no tests have been made to determine their exact cause. The purpose of this article therefore is merely to call at-

tention to them and to discuss some of the possible causes and apparent remedies.

The general similarity of this corrugation to the "washboard" effect so common on roadways with gravel or crushed rock surfaces immediately suggests the association of this condition with the rhythmic vibrations set up by machines going at a rapid pace over the surface. Naturally one immediately traces it to the various machines drawn over the fairways.

#### Fertilizer Application Not at Fault

It has been suggested that the corrugations may be traced to fertilizer being dropped on the turf unevenly due to certain jarring action as the distributor is drawn over the turf. Such jarring, it has been argued, would tend to drop the fertilizer in ridges crosswise on the fairway and result in a more rapid growth across the strips where most fertilizer had been jarred down. This theory immediately appears to be untenable on several counts but chiefly because it has been observed on fairways that have not been fertilized in many years.

Another explanation is that it is probably due to rolling the course when the soil is too wet. It is pointed out that when the rollers hit a high area they may jump a bit and then as they come down they will tend to make a depression in the soft soil; then will tend to jump out of that and so start a rhythmic jumping effect which will result in irregularities in the soil. This cause seems possible but not probable in most instances

since the rhythmic vibration of this nature in a roller is not apt to continue as far as it is observed to occur on many fairways. Also, such an explanation would not account for the minor irregularities that appear to affect only the grass. Since these minor irregularities appear to have approximately the same spacing as the deeper corrugations that definitely affect the soil, it is logical to assume that they originate in the same way and can hardly be traced to any rolling that may have been done several months earlier.

The explanation that appears to be most generally accepted as the logical one is that the corrugations are in some way caused by the mowing units. It has been observed that they always occur perpendicular to the direction of the usual mowing operations.

#### High Speed Mowing Possible Cause

The development of these corrugations in recent years suggests some connection with the high speed of the modern mowing operations. We all realize that the washboard road was not a phenomena of the horse-and-buggy days but is something we always associate with the high speed days.

In an advanced stage of fairway corrugation the soil is also ridged and the botanical composition of the turf is different in ridge and furrow. Playing conditions are definitely affected. Various possible explanations have been suggested for this irregular cutting, such as slip-page or too tight a setting of one or more of the units. This may be respon-



This photo shows a perfect example of fairway turf that has developed the "washboard" effect, caused, probably, from one of the reasons set forth in this article.

sible for the effect in some instances. However it appears to be likely to be caused by any number of disturbances which would affect the smooth operation of the mowers.

As the mower units are drawn rapidly over the turf it is conceivable that any irregularity in the surface may cause the roller of the unit to snap up and then come down sharply, rebounding several times before regaining equilibrium. Such a condition has been recorded in tests by the Bureau of Public Roads when automobiles have gone over obstructions placed on a smooth highway. A line on a chart rating the vibrations caused in such highway tests takes the form of a series of waves of decreasing depth until they flatten out on the smooth road. Such an effect was naturally more pronounced with solid tires than with pneumatic tires, which are able to absorb much of the shock.

#### Rhythmic Motion Set Up

In the case of the mower unit the roller, like the solid tire, is unable to absorb the shock and a definite rhythmic up-and-down vibration may be set up. On the down stroke the bedknife is slapped down well into the turf and the knives cut close. On the upward swing the bedknife is lifted so the grass remains longer. The original impetus may come from a ridge where moles have been working or from some minor obstruction such as a small stick or a divot. It may even be provided by a piece of dense tufted turf. The first series of undulations are probably not very numerous, but with each mowing they are carried on further along the fairway and finally over the entire length of the fairway the mowers may continue this rhythmic vibration. When the ground is hard these vibrations affect only the turf plants. When, however, the ground is very wet, particularly in the case of clay soils, the blow delivered by the roller on the down stroke may be heavy enough to make a definite depression in the ground. With each subsequent mowing when the ground is wet, this depression may be increased in depth. Naturally the deeper the depression the heavier the blow delivered by the roller. Therefore once this corrugated condition develops in fairways it is likely to become increasingly pronounced unless immediate steps are taken to remedy it.

Corrugations appear likely to develop on fairways regardless of the type or

manufacture of mowers used. Units equipped with either the large or the small type of rollers have produced this condition. Corrugations have been observed on courses where the mowers are drawn with rubber-tired tractors and also on courses where metal wheels are used.

The best remedy for corrugations appears to be to cross-roll-and-mow the affected fairways. It appears to be necessary to cross-mow only occasionally to keep these irregularities in check after they have once been definitely overcome. Where it is inconvenient to mow across the fairway it is possible to check the damage by diagonal mowing occasionally. In the more advanced stages where the soil itself has been corrugated, cross-mowing may not be sufficient. In such cases rolling in early spring or at other seasons when the soil is soft appears to satisfactorily solve the problem, especially if it is combined with cross or diagonal mowing at frequent intervals during the season.

Since the problem of fairway corrugations is one of those problems where "an ounce of prevention is better than a pound of cure" it is well to be constantly on the lookout for its early stages. Whenever such a condition appears to be developing it is advisable to change the direction of the mowing at once. Perhaps two or three mowings in the opposite direction will be sufficient to prevent any objectionable corrugations. Where it appears to be developing only in a limited area it may possibly be corrected merely by change, for a time, in mowing speed.

## Colorado Officials Contemplate Course for Greenkeepers

STATE of Colorado, division of agriculture, is considering the possibility of having a greenkeepers' short course for men in the Rocky Mountain region.

Wide variation in maintenance problems and distances short course students must travel from limits to the center of the Rocky Mountain area, are handicaps. However, outstanding achievements in this section's course maintenance and increasing importance of golf for resident and vacation recreation leads the state's agriculture authorities to believe the proposed short course would have enthusiastic reception and be of substantial value.