CHAPTER XXII

DRAINAGE

Surplus Water—Local Drainage—Draining Large Areas—Mole Drains—How to Do the Work—Miscellaneous Notes.

Surplus Water

Drainage is an exceedingly difficult subject, and one that should be approached with the utmost caution if the desired result is to be obtained.

Before making any attempt to explain how surplus water can be disposed of, I intend to discuss the matter fully, and to make clear what surplus water is, why it occurs, and why it is undesirable.

Moisture is held in the soil as a thin film surrounding the soil particles and travels upwards by capillary attraction and downwards by gravity. The speed in which it moves is regulated by the texture of the soil, the movements being quick in coarse-grained soils, and slow in fine-grained soils.

Surplus moisture is water held by the soil in excess of the immediate requirements of the crop, which in this case happens to be turf.

It is not only held as a film surrounding the soil particles but it accumulates in the air spaces between them, and if the soil is actually saturated it drives out all the air, to the obvious disadvantage of the grass plants.

As a general rule the fine-grained soils hold the most moisture as they contain the greatest amount of air space and the amount of surface exposed around each grain.

It usually occurs when the soil or subsoil is wholly or partly impervious to the passage of water, consequently it accumulates in the soil instead of being able to sink into the ground and get away.

It may, of course, be caused by Springs and other reasons, all of which should be dealt with on their merits, and in consequence are hardly suitable for general discussion.

Surplus water is undesirable for many reasons. It makes the soil soft and muddy, which is equally bad for the players of Winter games such as Golf, Football, Hockey, etc., who are not at their best floundering about in mud, and the turf, which in order to thrive demands that the soil shall be firm, warm, porous and airy, which conditions are impossible if it is saturated.

It may not be out of place here to point out that backward growth, the presence of moss and a soft tender surface are frequently the direct inheritance of excess moisture.

When rain falls upon ground that is able to absorb and readily pass it through to the subsoil or drains, the heat of the sun is also absorbed by the soil for the benefit of the plants. If, however, the percolation of the water is slow or remains stagnant, the air is driven out of the soil, which becomes sour and mossy, and the heat of the sun is used up wastefully in evaporating the water; consequently, instead of the sun warming the soil, it actually chills it, just in the same way as a sweating man chills if he stands in a draught. The more rapid the evaporation the more the soil is chilled, and it parches and cracks at the same time.

It is therefore plain that an excess of moisture in grounds used for sport is not only a serious discomfort to the players and interferes with the enjoyment of the games, but it is also a serious handicap to the ground staff inasmuch as it is destructive to the turf.

It does not matter what system of drainage is adopted, before it can be successful it is essential that the water can reach the drains.

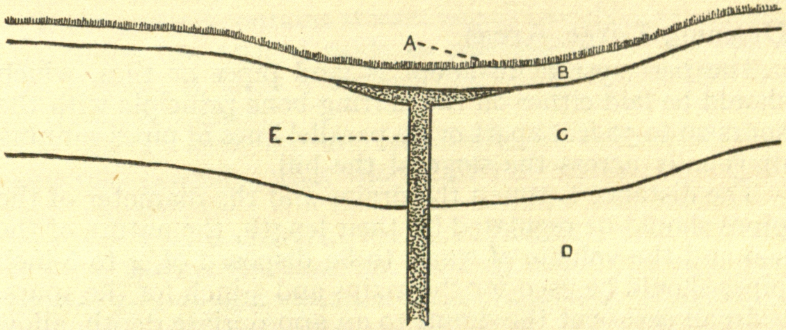
This may seem an extraordinarily stupid remark to make, but is it as stupid as digging trenches in impervious clay, placing the pipes, and carefully covering them with the same impervious clay, as is often done?

I will now try to reduce the question to a common-sense proposition.

Local Drainage

It frequently happens that the valleys in undulating Putting Greens become more or less waterlogged during the Winter. This can be cured by linking up all the depressions and low areas where water is likely to accumulate by means of a piped drain as explained in Chapter III. If, however, it is caused by an impervious stratum of subsoil and there is any possibility of penetrating it and reaching a pervious stratum of earth, sand or gravel, the easiest way to correct the fault is by boring a vertical shaft perhaps 10, 15 or 20 feet deep in the following way.

A circular piece of turf should be removed from the bottom of the depression, say 3 or 4 feet in diameter, then use an earth auger 4 inches in diameter and bore until the porous stratum is reached. There is no difficulty at all in boring to a depth of 20 to 30 feet, but if at this depth a suitable class of earth has not been encountered, it is manifestly time to stop. If, however, a suitable filter bed is reached fill up the bore-hole with graded breeze. Then remove the top spit soil from the area under treatment and place it aside, scoop out the clay starting from nothing at the circumference of the circle, making it 6 inches deep in the centre, replace the clay with sifted breeze, and return the top spit soil and the turf.



A=Turf. B=Top spit soil. C=Clay. D=Porous stratum.
E=Basin and bore-hole.

This will convert what was to all intents and purposes a basin with a choked outlet, into a basin with a free outlet. When ground is generally wet the shaft system will not act, and it will be necessary to revert to earthenware drain pipes or land tiles.

Sketch out a system with a 4-inch main following the natural fall of the ground, and join the same up with an existing drain, or lead it aside where it can discharge without doing any damage. Then put in a herring-bone system of 3-inch spurs 10 to 30 feet apart according to the requirements of the soil. Great care should be taken to see that all the drains have a regular fall and that the spurs meet the main at an angle of not more than 45°. Dig all the trenches to an appropriate depth, place the pipes carefully in position, fill the trenches up to within 4 inches of the top with screened breeze, and return the top spit soil and turf.

Before filling up the trenches it is a wise precaution to pour in a bucket of water at the head of each spur, and see that it travels freely to the outlet of the system, and so avoid any possibility of the water hanging up, or, worse still, running in the wrong direction.

A system like this can only work with high efficiency provided that the water can penetrate the surface soil, and flow through it and along the top of the clay until it reaches the drains.

If it cannot do this, or do it with sufficient speed, the ground should be heavily and repeatedly dressed with clean, coarse breeze, charcoal, or the like, with a view of opening up the soil and allowing the water to travel freely.

Draining Large Areas

The best system to adopt is land pipes or tiles, which should be laid either on the herring-bone principle with the spurs 20 to 50 feet apart or by parallel lines of pipes running diagonally across the slope of the hill.

The distance between the drains and the diameter of the pipes should be regulated by their length, the nature of the soil and the volume of water to be disposed of, 4 to 6-inch pipes should be used for the mains and 3-inch for the spurs.

In all cases cut the drains to an appropriate depth, allow for a good fall and carefully lay the pipes, test them, fill up the trenches to within 2 or 3 inches of the surface with cinders, and finish off with soil and turf.

Dressings of coarse breeze, cinders, etc., which will cut into the soil are a tremendous assistance to any system, as they break up the holding nature of the soil, and so allow the water to travel through it vertically and horizontally.

Mole Drains

This is a very old system of draining which went out of use, apparently because the effect is but temporary and the implements available for the work were so inefficient that it proved to be uneconomical.

Modern tools such as the Wells Mole Drainer drawn by a Cletrac or other tractor or by horses have turned the tables completely ; they have not, of course, converted it into a permanent system, but the work can be done so rapidly and so cheaply that it can now be termed an economical system, in spite of its temporary nature.

Mole drains are simplicity itself inasmuch as they are constructed by drawing a torpedo-shaped tool through the earth, at a determined depth between the limits of 7 and 15 inches, and so forming a pipe-like cavity 2 inches in diameter for the passage of the water.

The durability of the system depends upon the plasticity of the soil; if it is of a holding or clayey nature they will last for two or three years, when it will probably be necessary to clear the drains by running the mole through them again.

The mole does practically no damage to the turf; all that is visible is the incision made by the disc coulter, which can easily be smoothed out by rolling.

If the ground contains stones, one of two things happens: the stones are pushed aside or the mole is forced out of the ground; it takes a big one to do this, and in any case no damage is done.

So far as economy and efficiency are concerned, it is generally conceded that the closer the drains are laid the more efficient they will be. With a mole drainer they can be put in a yard apart, at the rate of about 4 miles an hour, at a trivial cost per acre, but the cost of putting in a piped system at a similar distance would be simply crushing.

Before adopting this system there are two guiding principles which must be taken into consideration. It is imperative that the ground be stiff enough to hold an unsupported drain without it collapsing, and provision must be made to deal with the collected water.

How to Do the Work

Study the ground, its possibilities and the position for the main drain, which must be piped, and remember that the water should be led in the direction it would like to travel, and that is with the general fall of the ground.

If there is a deep ditch in which the moles can end, there is no need to put in a main, but where there is not, one must be provided.

The drains can be made lengthway, crossway, or at any angle at will, the mole drainer being able to follow anywhere the tractor can go.

When the moles are completed, fix the position of the main drain, which should cut across the moles, at about 6 feet from their ends, where they will be down at their full depth.

Make two parallel incisions, 18 inches apart, with the mole drainer and so cut the side of the main to the depth of the moles, remove the soil by hand and then excavate the trench to a depth sufficient to allow the pipes to rest a clear 6 inches below the moles ; this is most important if the pipes are to be safe from the mole plough when it becomes necessary to clear the drains in the future.

See that the outlets of all the moles are clear, fill up with ashes to within 2 or 3 inches of the surface, make good and relay the turf.

This system is well adapted for draining golf courses and other large areas where an intensive system with hand-dug trenches and pipes would be impossible on account of cost.

For prices see Supplement.

Miscellaneous Notes

When faced with a drainage problem study the soil and find out its capabilities.

An easy method of testing the soil is to dig a hole, say, 2 ft. square and 2 ft. deep in a suitable position, putting the spoil around the hole to prevent the entry of surface water, and see if it fills. If it does and the water remains in the hole it is pretty certain that it flows along the top of the clay, but that the clay itself is impervious. If it fills and empties slowly, the clay itself is pervious to water. If no water enters the hole there is no movement of water in the soil.

Dealing with a stiff loam over heavy clay one would expect the water to penetrate the loam and flow along the top of the clay. Bail the hole to see if more water enters and conversely, if necessary, pour water in and see if it can get away.

Should the water assume a more or less constant level, 4 to 8 in. from the surface, it will in all probability mark the start of the impervious stratum.

If the ground cracks during a drought fill the cracks up with ashes, and so improve the surface drainage.

The drainage of a Golf Course or Sports Ground and a farm are not analogous, as the former need only worry about the surface drainage, whereas the farmer has to legislate for deep-rooting crops.

All drains and ditches should be periodically inspected and kept free.

A blocked drain or choked ditch will turn the ground in its immediate vicinity into a marsh. Rushes and similar plants usually denote marshy conditions, which may be brought about by the want of drains, or stopped drains.

Prunella, buttercups and the like point to retentive soils and moisture.

Soil is wet and soft or firm and dry according to the speed that the water can travel through it, and this is regulated by the size of the grains or particles of which the soil is composed. Wet, tenacious soils can be made firmer and dryer by adding large fragments of charcoal, breeze, sand, or, in fact, anything that will act as channels and assist the water to get away.

Soft, wet soils cannot be made firm by rolling: on the contrary, they puddle, and become more impervious to water and consequently wetter.

Many countrymen have a practical knowledge ot draining, but there are many cranks about who should be most carefully avoided. One cannot go far wrong if a system likely to give the desired results is tried on a small scale and proved before embarking on a big scheme.