LAWNS

AND GREENS:

THEIR FORMATION AND MANAGEMENT.

By T. W. SANDERS, F.L.S.

ILLUSTRATED.

LONDON:
The "Amateur Gardening" Office, 148 & 149, Aldersgate St., E.C.

ONE SHILLING NET.

A WELL-KEPT LAWN. (Photo: H. Canning Wright.)

An excellent type of a thoroughly good level lawn, which could be utilised for tennis or croquet.

LAWNS AND GREENS:
THEIR FORMATION AND MANAGEMENT.

Garden, Tennis and Croquet Lawns, Bowling and Golf Greens, Cricket Grounds, Grass Paths, etc.

BY

T. W. SANDERS, F.L.S., F.R.H.S.,

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FOREWORDS.

THE chief charm of a garden lies in its beautiful lawn. In no other country do we meet with such velvety turf, and of such a delightfully pleasing green tint, as in the gardens of the British Isles. This fact is at once apparent to foreigners, especially those from arid climes, on first visiting these shores.

British gardeners, therefore, naturally feel proud of their unique possession, and spare no pains or care in maintaining it in the highest degree of perfection. If one may judge from the hundreds of queries which have reached us yearly from readers of "Amateur Gardening," seeking for information as to the formation and management of lawns, there must be an immense amount of interest taken in the subject. Anyway, there are very few people indeed in this country who, owning a small garden, do not appreciate the charm of a patch of turf, and certainly no garden of any extent would be considered complete without such a pleasing feature as a lawn.

A knowledge of this fact, and of the need experienced by thousands of owners of gardens for information on the methods of forming a lawn and its subsequent management, has induced us to prepare a handbook dealing fully with all aspects of the subject, including the collateral features of golf greens and cricket grounds, their formation and

management. It is true, publications, excellent in their way, on the subject have been issued by two leading seedsmen, and a good deal of instruction given thereon in books devoted generally to the flower garden; but no book has yet appeared which has attempted, if we may venture with all modesty to say so, to go fully into all the details concerning lawns, bowling and golf greens, and cricket grounds. We have, consequently, at the request of the publishers, undertaken to prepare the present work.

As the reader will observe, on reference to the following pages, we have dealt exhaustively with all branches of lawn formation. Such important subjects as the various soils, drainage, manures, seeds and seed-sowing, laying down turf, weeds, mowing, renovating, and general management, have all been dealt with in separate chapters. Then, tennis and croquet lawns and bowling greens have each had their formation and management fully described. Chapters have also been devoted to a description of the various types of mowing machines, rollers, and other appliances essential for the proper maintenance of lawns and paths.

The interests of lovers of cricket and golf have not been overlooked. Special chapters, contributed by an expert (Mr. J. C. Newsham, F.L.S., Headmaster of the Farm School, Old Basing, Basingstoke, and a keen golfer and cricketer), are included on the formation and management of cricket grounds and golf greens; in fact, every effort has been made to make the Handbook as complete a guide on the various subjects as it is possible to make it.

Lastly, we have to acknowledge our indebtedness to Messrs. George Garner and White for most of the diagrams that appear on the following pages, and which have helped in no small measure to elucidate the various details which appear in the text.

T. W. S.

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Lawns and Greens.

Part I.—FORMATION OF LAWNS.

CHAPTER I.

SOILS AND THEIR TREATMENT.

It is just as important to study the question of soil in regard to the site of a lawn or bowling green as in relation to a fruit or vegetable garden. Grass will not grow properly on a poor or ill-prepared soil, any more than a cabbage or a potato will succeed under similar conditions. Some people—and builders of suburban houses who undertake to lay out the gardens ready for the first tenant are the worst offenders—imagine that grass requires no special soil; they regard it as only necessary to level the mixture of foundation soil, brickbats, and so on, rake over the surface, and then lay turf or sow grass seeds. Never was a greater mistake made. Every year hundreds of readers of "Amateur Gardening" appeal to us for advice how to improve such ill-made lawns. They are an eyesore, and a source of perpetual worry to tenants and owners who possess them. Knowing these facts, we must strongly urge upon readers of this book the absolute necessity of thoroughly preparing the soil before they sow seeds or lay down turf.

Heavy Soils.—Those in which clay preponderates re-

quire the most careful treatment. Besides draining to get rid of superfluous water, they also need trenching deeply—two to three feet—and to have plenty of road grit, decayed refuse, and manure added to help render them porous, assist drainage, and provide a healthy pabulum for the roots of the grasses. Lime, too, should be added to break up the clay, and set free the precious potash it contains for feeding the roots. In very bad cases from three to six inches of good mould should be spread on the surface to give the grass an opportunity of establishing itself. Where grass seeds are to be sown the soil should be turned up roughly in winter, so that frost and air may pulverise and sweeten it by spring. Fine cinders, too, might be forked into the surface. The aim should be, in fact, to provide an open, porous, and gritty soil, so that sun and air may readily gain access to its pores, and surface water rapidly disappear below.

Medium Soils.—Here we refer to those soils which are of a loamy texture, neither too heavy nor too light, and which come in about midway between a clay and a light sandy soil. Within this definition come soils that have been cultivated in the garden or field. They are usually rich in vegetable matter, or humus, fairly porous, and easy to work. Such soils will require to be deeply dug, liberally manured and limed, to put them in good order for the successful growth of grasses. Too much importance cannot be attached to deep culture. It affords the roots a good opportunity of descending deeply in search of moisture in hot, dry seasons, and of food at all times.

Light Soils.—These are by no means ideal ones for the growth of lawn grass. Their porous nature, deficiency of moisture in dry weather, and sterility cause the grass to become stunted in growth and to be scorched in summer. Those who have the misfortune to garden on poor, sandy soils, or on thin soils overlying chalk, are entitled to sympathy. Well, they must make the best of the situation by working in plenty of cow or pig manure, that will help bind the particles together, conserve the moisture, and keep the soil as cool as possible in hot weather. An addition of clay or loam would be an advantage in the case of sandy soils, and a dressing of lime would also be beneficial. On thin soils

LAWN WITH BEDS.

An extensive area of lawn tastefully broken up with irregularly-formed flower beds.

overlying chalk the only thing possible to provide a greater depth of soil is to either excavate the chalk to the depth of a foot or so, and use it for the foundations of paths, and put good loam in its place, or to add soil to the existing surface. In any case cow or pig dung, not horse manure, should be plentifully used, because of its binding, cooling, and great nourishing properties.

Stony Soils.—In some districts lawns have to be made on soils that are of a stony or coarse gravelly nature. Now the question will naturally arise in many minds as to whether it is desirable or not to remove the stones or gravel. So far as the stones are concerned our advice is, remove only those on the surface. Those below will help to keep the soil open and to maintain it in a cool, moist condition. Where gravel abounds it would be advisable to screen the upper six inches, at least, and use the gravel for path-making, and then add fresh soil and manure equivalent to the amount of gravel removed. There is no necessity to sift the soil fine, as so many do. A too-fine soil becomes compact and sour in time, and causes the roots of grasses to die.

Peaty Soils.—These require special preparation to ensure the successful growth of turf. If the site be damp drains must be inserted to carry off the surface water. Where there is only a thin layer of peat overlying a subsoil of sand remove the peat and a few inches of the sand, and place this in a heap; then dig out a foot of the sand, throw in the peat first removed, and fill up the remaining space with a mixture of road scrapings, leaf-mould, and as good loamy soil as can be procured. Tread this down moderately firm and evenly. Where the peat is more than a few inches thick it will be necessary to dig this out entirely to a depth of a foot, put in six inches of road grit or scrapings and fork it into the subsoil, then fill up with good loamy soil and manure. Before doing this the site must, of course, be properly drained. This may seem a troublesome and expensive business, but it must be undertaken if a good lawn be desired, as grasses will not thrive satisfactorily on a peaty soil.

A reference has been made in several cases in the preceding paragraphs to manures. For a fuller account about these see p. 55.

CHAPTER II.

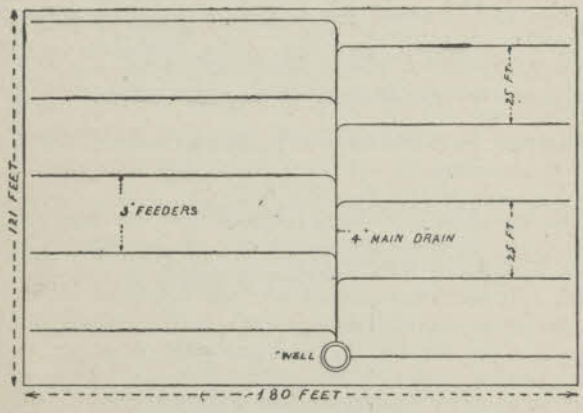
DRAINAGE.

A POINT of primary importance in the formation of a successful lawn, bowling-green, or tennis court is good drainage. Turf overlying a waterlogged subsoil is not only uncomfortable to walk upon, but also very liable to be badly infested with moss and crowfoot, and to have a generally unsatisfactory growth of grass. Too much care, therefore, cannot be taken, when about to form a new lawn, to see that the subsoil is free from the presence of stagnant water.

Testing for Water.—The initial step in forming a new, or renovating an old, lawn inclined to dampness should be to dig test holes at intervals of several yards, to ascertain if water be present. These holes should be dug about a foot square and three feet in depth. Leave them open for a week or so, and then measure the depth of water present in each. If no water be present, this will be a safe indication that no artificial drainage is required. If only an inch or so of water be found, then moderate drainage will be needed; and if several inches accumulate a thorough system of drainage must be regarded as indispensable. This system of ascertaining if drainage is required is an excellent one, and will save much future trouble, expense, and worry. Of course, on gravelly soils, or those of a sandy nature, unless on a level with a neighbouring pond, river, or brook, where water can easily percolate through the porous soil, artificial drainage is not needed. It often happens, however, that even gravelly soils may rest on a basin of clay, in which case water may accumulate and form a stagnant subterranean pool injurious to the turf above. Testing in the manner indicated is, after all, the surest way of determining if drainage be needed or not.

A Simple Mode of Drainage.—In the case of very small lawns, where it is difficult to insert drains and ensure an outlet for the escape of water, the best method is to trench the site three feet deep, and work in plenty of broken

clinkers, bricks, or cinders among the lower two feet of soil. The deep trenching will drain the upper foot of soil, and keep the turf comparatively dry. Generally speaking, we have found that if the neighbouring paths are properly made the water from the lawn will gradually drain into the substratum of the paths and leave the lawn free from excessive dampness. In this case the foundation of the paths should be dug out 18in. deep, and at least a foot of brickbats be



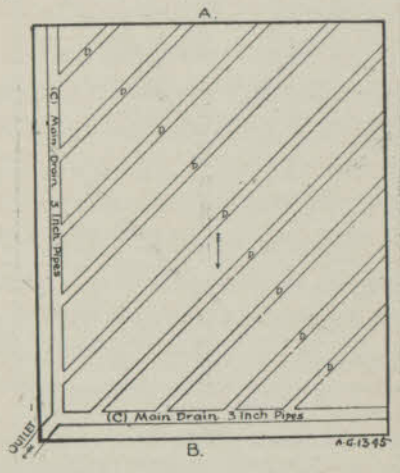
TRANSVERSE METHOD OF DRAINING LARGE LAWNS.

This method is suitable for level tracts of land, or where there is only a slight fall.

placed in the bottom, these forming a splendid permanent drain.

Pipe Drains.—This form of drainage is applicable to large lawns, tennis courts, or bowling greens, and consists of circular pipes of burnt clay, 1ft. in length, and 2in., 3in., 4in., or 6in. in diameter, buried in trenches two to three feet below the surface. There are several ways of laying such drains. For instance, there is the "transverse system," which consists of a main drain in the centre, with branch drains at right angles running into it. This system is suitable for large areas of an acre upwards, and where the

site is level, or nearly so. Another method is the oblique, which consists of a main three or four-inch drain running down one side and across one end of the plot, and branch drains running obliquely into these. Such a method is a very suitable one to adopt in the case of a tennis lawn or bowling green, or where the soil is very damp. A third method is the "herring-bone" drain. In this case the main drain runs down the centre, and empties itself into a well, ditch, or large main drain, and the branch drains are



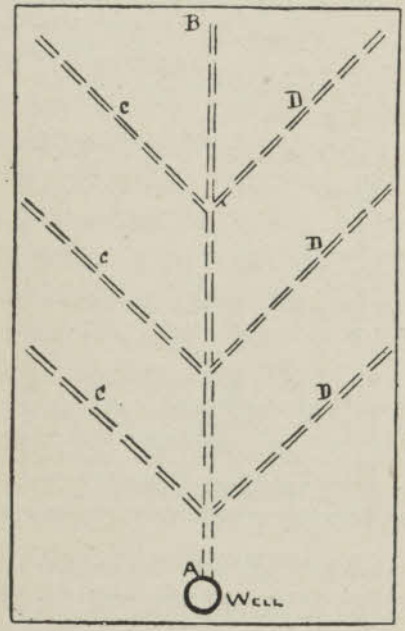
OBLIQUE METHOD OF DRAINAGE.

This plan is suitable for level or sloping sites. A main 3 in. drain runs down one side and end, and 2 in. drains are run obliquely into these.

arranged obliquely on each side at an angle of about 45 deg. This method is also suitable for lawns, tennis courts, or bowling greens. A fourth method is to insert the main drain in an adjoining path, and the branch drains at right angles. The various plans on this and adjoining pages show clearly the types of drains just described.

Distance Apart of Drains.—The distances apart for the branch drains vary according to the character of

the soil and the amount of water likely to be present and required to be removed. As a general rule, they should not be more than 21ft. on heavy, damp soils, 15ft. being the better distance to ensure efficient drainage. On those of a medium character, as light sandy or gravelly loams, the usual distances are 27ft. to 40ft. In the first-named case



HERRING-BONE METHOD OF DRAINAGE.

A is a well for receiving the water from B, the main, and C D, the branch drains. Adapted for small lawns.

the drains must be fairly close together to enable them to act effectively. When, however, the soil is more or less porous, the water will readily travel to the branch drains.

Depth of Drains.—Then, as regards depths of the drains, these should range from 2ft. 6in. to 3ft. on heavy

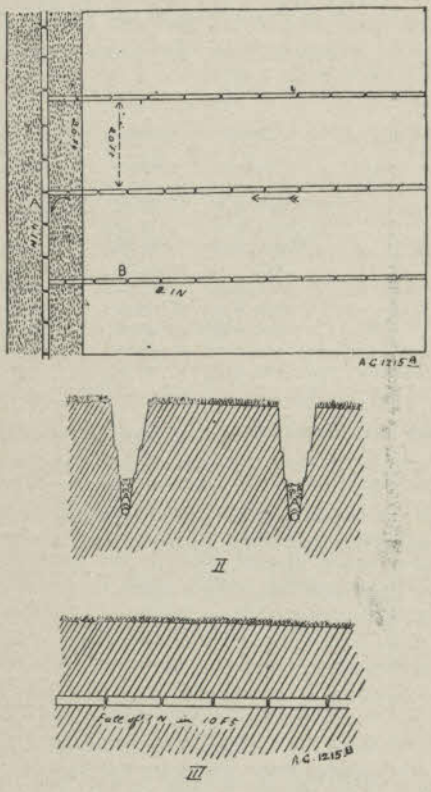
soils; 3ft. 6in. to 3ft. 9in. on loamy soils; and 4ft. to 4ft. 6in. on gravelly or sandy soils. The more adhesive or heavy the clay the nearer should the drains be laid to the surface, and the more porous the soil the deeper they should be placed. The following table shows the depths, distances, etc., of drains on various soils:

Soil.	Depth of Drain.	Distance apart of Drains.	Number of Drain Pipes per acre.	Total Cost per acre.
Clay, stiff	2ft. 6in.	15 ft.	2,905	£8 0 6
,, friable	2ft. 6in.	18 ft.	2,420	6 7 8
,, soft	2ft. 9in.	21 ft.	2,076	5 4 3
,, loamy	3ft.	21 ft.	1,980	5 9 5
Loam and Gravel ...	3ft. 3in.	27 ft.	1,613	5 5 6½
,, light	3ft. 6in.	33 ft.	1,320	4 16 3
,, sandy	3ft. 9in.	40 ft.	1,117	3 3 2
Sand and Gravel ...	4ft.	50 ft.	880	3 12 10
,, coarse gravelly ...	4ft. 6in.	60 ft.	726	3 5 9

Position of Drains.—The first point to consider is the position of the drains. As far as possible the main drain should be laid to follow the natural slope of the land, and to terminate in a ditch, pond, or brook, so that the water can easily get away. Where no such natural facility exists, then the main drain should lead to the lowest part of the garden, and be connected with a tank to receive the water. In the event of the site being a level one, let the main drain run to the most convenient spot for forming a tank, or well, for the reception of the water. It would, of course, be useless to lay down a drain where no provision is made for the discharge of the water. The water collected in tanks or wells would come in useful for watering purposes in summer if an iron pump were fitted to the tank. The "fall," or slope, of a main drain should be at the rate of 1ft. in every 100ft., and 1ft. in every 75ft. for branch drains. Where the land has a natural slope of not less than the figures quoted, then let the drains follow the natural inclination of the surface.

Size of Pipes.—On a very wet soil, where the area is large, and a large quantity of water has to be got rid

of, the main drain-pipes should be 4in. to 6in., and the branches 3in. to 4in. in diameter. For all ordinary pur-



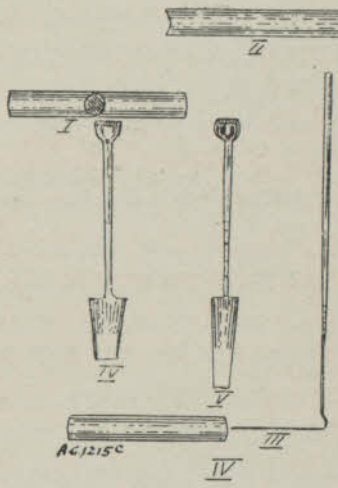
DRAINAGE SYSTEM FOR LAWN.

Fig. 1 shows method of draining a small lawn, A being main pipe laid down centre of adjoining path, and B branch drains running at right angles into main drain (A). Fig. 2 shows section of the trenches with drains at bottom and stones on top. Fig. 3 section showing "fall" of drains.

poses, however, a 3in. main and a 2½in. branch drain-pipe will suffice. Smaller sizes are useless. These pipes are

made of burnt clay, are cylindrical in shape, and a foot in length. Another type of drain is the tile. This is of oval or horseshoe shape, 14in. to 3ft. long, and has to be laid on flat tiles. This style of pipe is suitable for sandy or light soils, as it is not so liable to be choked with silt. Both kinds are made in most rural brickyards, and their prices average about 25s. for 2½in.; 30s. for 3in.; 60s. for 4in.; and 120s. for 6in. sizes per 1,000.

Laying the Drains.—Having marked out the position of the drains, the next thing is to dig out the trenches. These should be dug out by means of a proper draining tool with a semi-circular blade, 14in. to 18in. wide at top, narrowing to 3in. or 6in. at base, according to the size of the pipe. The



Draining Tools, Etc.

Fig. 1, drain-pipe with hole cut in to receive branch drain-pipe (Fig. 2); 3, tool for laying pipes; 4 and 5, curved spades for digging out drain and trenches.

cost of excavating, laying the pipes, and refilling averages from 5d. to 1s. per lineal rod, according to the nature of the soil and depth of the trench. Care must, of course, be

taken to dig out the trenches so as to ensure an even fall, otherwise, if the pipes should be lower in one place than another, mud would accumulate and choke the drain. The trenches being ready, the next thing is to lay the pipes or tiles. First put in the main drain and then the branches. At the junction of the two chip out the sides of the two main pipes to allow the branch pipes to fit in fairly close; then pack some stones firmly around the junction, and cover this with clay firmly pressed down. The joints of all pipes should be neatly and closely pressed together; and, where possible, it is advisable to cover these with pieces of common roofing tiles. Indeed, where stones or flints are plentiful it is a good plan to cover the pipes with a layer of these before filling in the soil. Six-inch pipes are often made with flanges, so that one may fit into the other; and this is a good plan where the soil is of a sandy nature. On very wet soils we have found it an advantage to lay brushwood over the pipes before filling in the soil. Throw the soil in carefully, and tread or ram the lower foot or so very firmly. The upper layer may be put in less firmly, so as to coincide with the firmness of the surface.

Points to Remember.—Drains should, as far as possible, not be laid too close to the roots of trees or Virginian creepers. We have seen specimens of roots of the latter that have grown 20ft. and more in a drain, and entirely choked it.

Efficient drainage means a sweeter, richer, and warmer soil, and ideal conditions for the successful growth of grasses.

Furthermore, it enables the turf to be used with less personal discomfort, and in other ways produces a more beautiful sward than if undrained.

Lastly, although it may appear a costly matter to drain a site as described, yet in the end its advantages will strongly outweigh the expense, and be economical.

CHAPTER III.

PREPARING AND LEVELLING SITES.

Sites vary considerably in their surface conformations. Some are more or less level, and others are of a sloping nature. Those of a level character only require to have their surface made uniform, unless there is some special reason for determining otherwise. As a rule, in gardens up to half an acre in extent the surface is made level; but in those of an acre and upwards there may be good reasons for grading or undulating some part of the area to form ponds, ferny dells, or sunk rockeries, or gently-rising mounds on which to plant shrubs and trees. Then, in the case of sites of a sloping nature, it may be necessary to so arrange the levels of these as to form terraces, tennis courts, etc., in order to make the most effective use of the ground. Each type of surface, therefore, must be accorded special treatment.

Small Dead-level Lawns.—Sites that are more or less naturally level are easily dealt with. The chief point in

Appliances for Levelling.

These consist of a garden line, pegs, a straight-edge resting on the pegs, and a spirit-level on top.

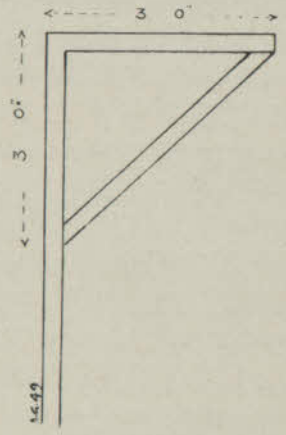
their case is to make the surface uniformly level before sowing the seed or laying the turf. For this purpose some 2in. square deal wood, cut into 18in. or 2ft. lengths and with one end pointed, is required to form pegs for driving into the ground. The essential requirements are a straight-edge board, 6ft. long and 1¼in. thick, planed perfectly true, a spirit level, and a garden line. Stretch the line down the centre of the site, then drive in a peg at the highest, if any, end of the plot, to within an inch or so of the soil, and

another 6ft. from this, close to the line. Put the straight edge on the pegs, the spirit level on this, and adjust the second peg by driving it further in until a true level is obtained. Proceed in the same way down the plot, and you will then have the exact level of the centre of the ground. Next stretch the line across the plot, and insert pegs at intervals of 6ft., and level as before from the centre pegs. If the levels are accurately taken thus, these will show you the natural inequalities of the surface, and the soil must be levelled accordingly to coincide with the tops of the pegs. By running the straight-edge board, or stretching a garden line tightly, over the pegs any inequalities of surface may be easily detected.

Large Dead-level Lawns.—The business of levelling a large area of ground by the means just described would be a slow and tedious one. In such a case it would be wiser and cheaper in the end to employ a surveyor to take accurate levels by means of a theodolite and staff. By the use of a straight-edge or taut garden line the site could then easily be levelled coincident with the pegs inserted by the surveyor. Practical landscape gardeners also use a simple appliance known as a "borning rod" for ascertaining levels. This consists of a straight piece of wood about four feet long, and with a short piece of wood fixed at right angles at the top, like the letter **T** Three of them are necessary, and each should be painted of a distinctive colour. Three persons are required to use the rods. One holds his rod at one end of the plot, and another his at the opposite end; then the third one holds his about midway between the two. No. 1 then puts his eye to the top of the cross-piece and looks to the third one, and if the middle one is too high the soil is lowered accordingly; or if too low more soil is added, until the eye can see all three rods exactly in a line. Pegs have then to be driven in to the requisite levels. A good deal of practice is required to level soils in this way.

Sloping Lawns.—To get sites of a uniform slope the ground must be levelled across by driving in pegs 6ft. apart, and using the straight-edge and spirit level. This done, stretch a garden line straight down the rows of pegs,

and make the soil up level with the lines. The intervening spaces can then be levelled accordingly. Where a slope is very steep, and a terrace or tennis lawn is required, the width of the terrace should be first determined. This, of course, must be decided by the size and character of the house. A too narrow terrace never looks well; it has a puny appearance. It should certainly not be less than 12ft. in width. The next question is the angle of the slope. The general idea is a slope of one foot in every foot of depth.



TEMPLATE OR GAUGE.

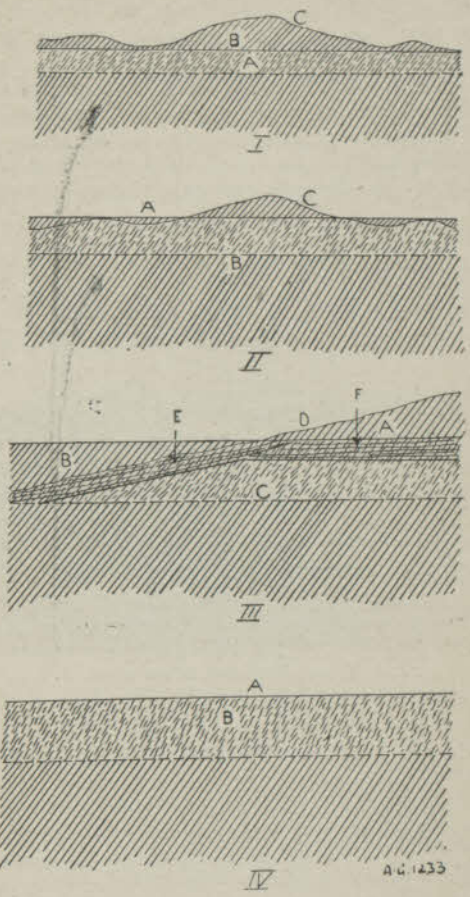
An appliance for gauging the correct slope of a terrace during its formation.

or an angle of 45 deg. Some, however, make the slope two feet in one foot, but we prefer the former. Supposing the terrace is required to be 12ft. wide, drive in a stout post at 12ft. from the house wall, and another midway. Get someone to hold the straight-edge in position against the side of the middle post, while another places the spirit level on the top. The person holding the straight edge then raises or lowers it accordingly till the level is obtained. Mark the post on the under side of the straight-edge, and then nail on a piece of wood crosswise, level with the mark.

Next place the straight-edge on this crosspiece, and hold the other end against the outer post; adjust by means of the spirit level, mark as before, and fix a crosspiece to the post as in the previous case. Now level along the side of the house wall, and fix in pegs till you get to the end of the proposed terrace, and then level across as in the first instance. Further cross levels may be taken at intervals of 12ft., and the correct height and width of the terrace will be obtained. The base of a terrace 3ft. deep would thus be 15ft. from the house wall. Pegs may be driven in to indicate the base, and a strip of wood nailed on these in a sloping direction to the crosspieces on the outside long posts, these indicating the slope or grade of the terrace. In forming a terrace great care must be taken to well ram down the soil as the building proceeds; otherwise, later on, the soil may sink in places and cause trouble. If a tennis lawn be required below the terrace, the same course of procedure as regards levelling must be followed. First measure off the required width, and then take the levels along and across by means of stakes and spirit level.

Undulating Surfaces.—In gardens of large extent it is sometimes advisable, in the case of those with sites of a more or less level nature, to break up or grade the surface into a series of undulations, to create a more artistic and picturesque effect. This, however, can only be rightly done in the more distant part of the lawn. The primary object of introducing this feature is to provide ponds for water-lilies, dells for ferns, or sunk rockeries. In such a case, the soil excavated is thrown into irregular mounds, to be planted with trees and shrubs intended to screen unsightly objects from view, and to impart a more diversified appearance to the landscape. The spaces between such mounds then take the form of gentle undulations, the depressions forming basins or bays a foot or so deeper in the centre than the surrounding mounds. The turf thus gradually slopes upwards to the edge of the beds on the mounds, and has a natural and pleasing appearance. The levelling or contour of these undulations must, of course, be done by the eye alone.

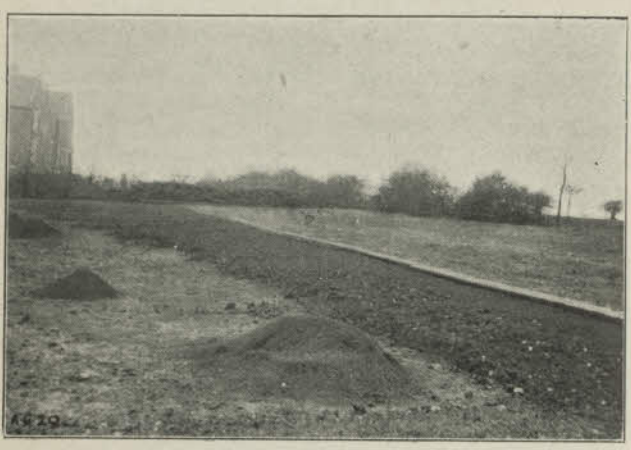
General Remarks.—As regards the preparation of the soil, this must be done in the manner advised in the



LEVELLING GROUND FOR LAWNS.

Fig. 1: C, uneven surface; B, level required; A, soil dug 1ft. deep. Fig. 2: A, level required; B, base of levelled and dug soil; C, soil to be spread into hollows to secure desired level. Fig. 3: Levelling sloping ground; A, soil to be removed to B; C, subsoil; E, good soil to be removed before placing A on B, and afterward replaced on top. Fig. 4: Result of levelling surface.

chapters on "Soils" and "Manures," so far as digging and manuring are concerned. Where the surface is very uneven it is advisable to level the site first, and dig and manure afterwards, so as to save time and labour in readjusting the soil. When the digging is in progress it is not a difficult matter to make the surface fairly level. The final levelling must be done last of all by forking and raking over the surface. The digging and partial levelling ought to be



PREPARING SITE FOR A NEW LAWN.

Showing progress of work of levelling the site ready to sow seeds or lay turf.

done fully three months before the turf is laid or seeds sown. The reason for this is, dug soils vary so in texture that they are liable to settle down unequally, and to form an uneven surface if turfed or sown at once. Given three months to settle down—say, if dug in autumn and left until spring—then finally levelled, a permanent, even surface may be regarded as certain. See also remarks in chapters on "Turf Laying" and "Sowing Seeds."

CHAPTER IV.

TURF VERSUS SEEDS.

THERE are two ways of ensuring a lawn, namely, by laying down turf, or sowing seeds, and the problem which often exercises the minds of those who have had but little experience in the matter is, which of the two methods is the better? Well, both have their good points, as the following facts will show.

1. **As to Turf.**—Turf has a distinct advantage over seeds in forming a good sward at once. There is no waiting for months before it can be used for games; it is practically ready for use directly it is laid. We are referring, of course, to good turf, free from weeds. If turf contains a lot of daisy, plantain, and other weeds, its value is greatly minimised, and it is decidedly inferior to seeds. It is a more costly means of forming a lawn than by seeds. For example, note the comparative cost of forming a tennis court of full dimensions (50 yards by 25 yards) by seeds or turf:

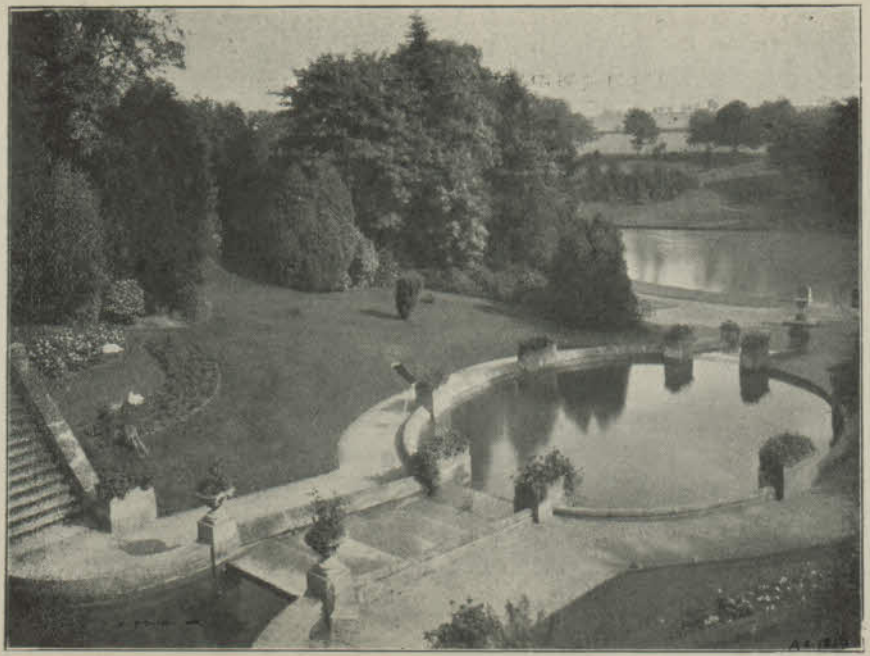
By Seeds.	£	s.	d.	By Turf.	£	s.	d.
Seeds	1	10	0	Turf	24	0	0
Labour	15	0	0	Labour	19	7	6
Extras	2	0	0	Extras	2	0	0
Total	18	10	0	Total	45	7	6

Turves are usually cut in lengths of 3ft., widths of 1ft., and with a thickness of 1½in. to 2in. Three turves, therefore, go to a square yard, and eighteen square yards constitute a load. The average price of good turves is about 1½d. each, and the cost of a load (54 turves) about 6s. 9d. To this sum has to be added the cost of cartage, this averaging 1s. 3d. to 2s. per mile. Roughly speaking, the cost per square rod for turf, labour, etc., works out at about 18s. to 20s. In choosing turf for a lawn, tennis court, or bowling green, it is advisable to obtain it from a common or down, where the herbage has been kept short by sheep or cattle grazing thereon, and

where the grasses are fine and free from weeds. Failing this source, procure it from an old pasture, taking particular care to obtain it free from daisies, crowfoot, plantain, dandelion, and self-heal. On no account obtain turf from a coarse pasture, even if it can be procured as a gift. Good turf, apart from the previous essentials, should be tough and wiry, and not easily broken when handled. Rotten, easily-broken turves are to be avoided.

2. **As to Seeds.**—Unquestionably the cheapest and best of all methods of obtaining a good lawn, tennis court, or bowling green is by seeds. Given a thoroughly-prepared and good soil, and a mixture of seeds to suit a light, heavy, or medium soil, and a sunny or shady position; and these, sown in accordance with the advice given in another chapter, a far better turf will eventually be obtained than by laying turves. As shown in the previous paragraph, seeds cost much less than turves. A pound of seed will suffice for a square rod (30¼ square yards), at a cost of 1s. to 1s. 6d.; a bushel for a full-sized tennis lawn, costing 30s.; four to six bushels for an acre, at a cost of £4 to £6; and two bushels for a bowling green (40 yards square), costing £3. If we compare the cost of forming a bowling green with seed as against that of turf, we shall find that while the seed will only cost £3, the cost of 4,920 turves, at 1½d. each, to cover the same area would be no less than £30 11s. 6d. For the advantage of using a green laid down with turf the same season you have to pay the sum of £27 11s. 6d., while if you sow seeds and wait a year for a good sward to form, you save that amount.

Some Conclusions.—It will at once be apparent that it is more economical to sow seeds than lay turf. Besides, there is the further advantage of getting the right kind of grass to suit the soil, a matter of supreme importance. When the great saving in cost is taken into consideration, it is surely worth while exercising a little patience by waiting a year to give the grasses a good chance to grow, tiller out, and form a dense turf. On the whole, we are strongly in favour of sowing seeds, unless, as aforesaid, really good turf can be obtained, expense is of secondary consideration, and the green, court, or lawn is required for immediate use.



AN UNDULATING LAWN. (Photo : E. E. White.)

An extensive lawn, skilfully graded into pleasing undulations and broken up with ornamental ponds.

CHAPTER V.

SEEDS FOR LAWNS, GREENS, &c.

We now come to the all-important question of seeds of the best grasses and other plants for forming a good turf on various soils. Be it understood at once that no one general mixture of seeds will suit every kind of soil. Some kinds of grasses, etc., do best on light and dry soils, others on loamy and moist ones, and so on. Those about to sow a lawn with seeds should, therefore, make it their business to ascertain the nature of the soil, and then select the kinds that naturally suit it. All leading seedsmen make a point of preparing mixtures to suit the various types of soil; consequently, when ordering the seeds, mention should be made of the class of soil.

We will now describe the grasses and other plants that are generally used for forming the ideal turf of lawns, bowling and golf greens, and cricket grounds.

Achillea millefolium (Yarrow or Milfoil).—Many devoted admirers of lawns regard the presence of this plant on a lawn as most undesirable. As a matter of fact, they are justified in their antipathy to it where grasses usually do well. But there are soils of a poor, hungry nature, as in the case of public parks, where there is much foot traffic, on which it forms an admirable component of the turf. It has a close habit of growth, grows very densely, and forms a thick, velvety pile of herbage over the surface in the hottest and driest seasons, succeeding where grass often becomes burnt up. In such a case it is manifest that the Yarrow is a lawn plant worth growing where it is difficult to get grass to grow freely. Those, therefore, who have perforce to form lawns on a gravelly or a thin soil overlying chalk, would be well advised not to despise the presence of this common weed on their lawns.

Cynosurus cristatus (Crested Dog's Tail).—A dwarf, tufted perennial grass, which possesses the valued faculty of forming a close, fine sward on dry loamy soils or

on thin soils overlying chalk or limestone. It grows naturally on dry, hilly pastures and downs, and hence admirably adapts itself to the classes of soils before-mentioned. It is, indeed, an ideal grass for tennis lawns, bowling greens, etc., where a fine, even surface is required.

Festuca duriuscula (Hard Fescue Grass).—This is said by some botanists to be a variety of F. ovina. Anyway, it is of a tufted habit of growth, very hardy, and a splendid grass for light, sandy soils, or for thin soils overlying chalk or limestone. Often does well on a clay soil. Not suited for soils of a heavy, damp nature. Makes a fine, even sward.

Festuca ovina tenuifolia (Sheep's Fescue).—A fine-leaved form of the Common Sheep's Fescue Grass (F. ovina), of tufted habit, and furnished with roots that descend deeply into the soil. A good grass for ordinary garden or sandy soils. Requires to be sown in conjunction with other grasses to make a really good turf.

Festuca rubra (Red Fescue).—An excellent, dense-growing grass, thriving on ordinary loamy or sandy soils. Succeeds well, too, on dry soils. A very suitable kind to sow in mixture of other kinds.

Lolium perenne (Perennial Rye Grass).—The ordinary type is not to be recommended for lawns, on account of its somewhat coarse habit. The dwarf variety of it, named Suttoni, introduced by Messrs. Sutton and Sons, Reading, is, however, an excellent grass, forming a dense, even sward in a short time. It is suitable for all classes of soils.

Poa pratensis (Meadow Grass).—Here we have a good grass for ordinary, heavy, or sandy soils. It has a creeping root stock, and soon forms a good, dense turf. Withstands a dry season fairly well.

Poa nemoralis sempervirens (Evergreen Meadow Grass).—This grass does well under the shade of trees, forming a beautiful, dense sward, and retaining a bright green

colour all the year round. Good also for ordinary soils. A splendid lawn grass.

Poa trivialis (Rough-Stalked Meadow Grass).—Another good grass for lawns shaded by trees, and heavy, moist soils. Wherever there is a difficulty in getting grass to grow under the shade of trees, this variety should certainly be given a trial.

Trifolium repens perenne (Perennial White Clover).—Opinions differ as to the value of clovers as a component of lawn herbage. On poor, thin soils, where grasses do not thrive well, the presence of clover is beneficial. On tennis lawns, bowling and putting greens it is not so desirable, owing to its holding the moisture, and to its failing to withstand the hard wear and tear incidental to such swards. It is wise, therefore, to avoid clover seed in grass mixtures intended for tennis lawns, bowling and golf greens, and cricket grounds. On ordinary lawns, where grasses fail to succeed, by all means include this clover.

Trifolium minus (Yellow Suckling).—An annual clover with very fine foliage, and a compact, dense habit of growth. Suitable for poor and thin soils. Not so strong-growing as the preceding species. Readily perpetuates itself by seed every year.

Selections for Various Soils.—Having briefly described the grasses, clovers, etc., usually used in the formation of a successful sward, the next business is to classify them according to their special adaptability for various soils. It does not follow, however, that because certain kinds are specially advised for certain soils they will not succeed in others. The whole of the grasses and clovers described may, and are, frequently sown in mixture on any kind of soil. In this case, it is merely a question of the survival of the fittest when growth eventually takes place. However, the cautious man will be well advised to sow those recommended for the particular kinds of soils.

Clay or Heavy Loam.—Festuca duriuscula, Lolium perenne Suttoni, Poa pratensis, and Poa trivialis.

A Waterside Lawn. (Photo: H. N. King.)

Gravelly and Poor, Thin Soils.—Achillea millefolium, Cynosurus cristata, Festuca rubra, and Trifolium repens perenne and minus.

Chalky or Limestone Soils.—Cynosurus cristata, Festuca duriuscula, Festuca ovina tenuifolia and rubra, Trifolium repens perenne and minus, and Achillea millefolium.

Sandy Soils.—Festuca duriuscula, Festuca rubra, Poa pratensis, Trifolium repens perenne and minus, and Lolium perenne Suttoni.

Shady Positions under Trees.—Poa nemoralis sempervirens and Poa trivialis.

Good Ordinary or Old Garden Soils.—Here a general mixture may be used, such as Cynosurus cristata, Festuca ovina tenuifolia, duriuscula and rubra, Lolium perenne Suttoni, Poa pratensis and nemoralis sempervirens, Trifolium repens perenne and minus. If clovers are objected to, leave them out.

CHAPTER VI.

SEED SOWING.

As explained elsewhere, the simplest and cheapest method of obtaining a first-rate turf for a lawn, tennis court, or bowling green is by sowing seeds, and it will now be our business to describe how the operation should be carried out so that ultimate success may be assured.

When to Sow.—The best periods of the year for sowing grass seeds are March and September. Observation and experience have shown us that the latter half of the first and the first half of the last-named months are the ideal periods, as then the soil and climatic conditions are usually in the best possible state for successful germination of the

seed and the after-growth of the seedlings. It is certainly not wise to sow between April and September, unless the season be cool and moist, as there is a great risk of the seedlings being scorched by the sun or shrivelled by the drought. Nor is it wise to sow between September and March, on account of cold weather crippling the growth of the tender grasses.

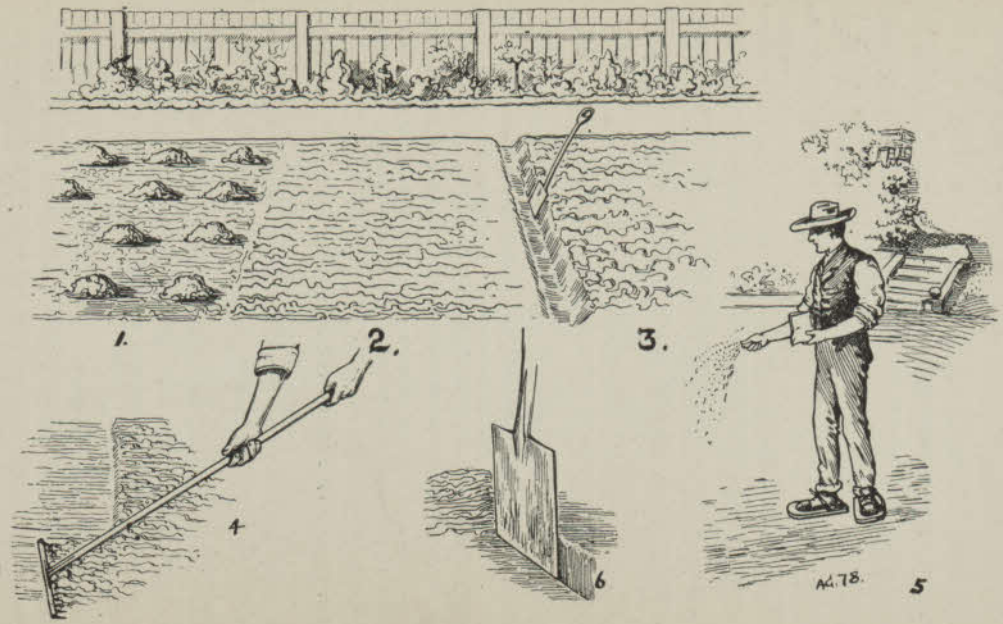
The Seed Bed.—In addition to the draining, trenching, manuring, and levelling already fully described elsewhere, it is of the utmost importance to have a fine tilth on the surface, to ensure a satisfactory seed-bed. In the case of a heavy soil, for instance, advantage should be taken of fine, dry weather in February and early in March, to repeatedly fork the surface over to get the soil as fine as possible. Run the roller over the surface when quite dry to help crush the lumps of soil before forking, each time the latter is about to be done. Finally, when the time has arrived for sowing, give the surface a top-dressing of a thin layer of finely-sifted, good soil, run the roller over it, and then very lightly rake the surface, so that the seeds can fall into the shallow interstices of the soil. We would add a note of warning to the inexperienced that on no account should the roller be used on a heavy soil whilst the latter is wet. Such a practice would cause the clay to combine into a compact mass, and prevent the seedlings easily rooting into the soil. We repeat again, therefore, that the final preparation of the seed-bed, as above advised, should only be done in dry weather.

On medium or light soils the roller should be used more frequently, to ensure a firm seed-bed. In the case of a light soil it is essential to give a double rolling, once across and once up the plot, and to use a garden rake instead of the fork for loosening the surface. Especial care should be taken to see that the effect of the rolling does not produce depressions in the surface. If so, then add a little soil to fill these up, so that the surface is uniformly level throughout. Where the intended lawns are small, and a roller is not available, the surface may be made firm by uniformly treading it with the feet. First tread steadily and with an even pressure across and then up or down the plot. It will

not be necessary in the case of medium or light soils to add a top-dressing of fine soil, as advised for the heavy soils. Nor, again, must a layer of fine coal ashes or gas-lime, as recommended for turf, be applied, as both substances would prevent the germination of the seeds. For grass seeds the soil must be well drained, deeply dug, and otherwise well prepared beforehand. Lastly, bear in mind that you cannot make the surface too firm, too even, and too fine, for the growth of grass from seeds.

Sowing the Seeds.—A perfectly calm and fine day should be chosen for sowing the seeds. If the weather be windy, grass seeds, owing to their extreme lightness, cannot be evenly distributed over the surface. In sowing, walk down the plot at a steady, even pace, and sow with a swinging motion by means of the right hand. Take care that the seeds are not dropped in quantity in one spot and thinly in another. It is a good plan to mark off strips four feet wide with a garden line, to serve as a guide, and to walk down the centre of each strip. When the first strip is sown put down a second line and walk up midway between the two. At the end of the second strip shift the first line onward, and proceed in this fashion until the whole plot is sown. It is usual, and in our opinion quite necessary, to make a second sowing in a similar manner to the first, across the plot. This method ensures a more perfect distribution of the seeds. When sowing on very light soils there is a risk of the feet making depressions in the surface, and to guard against this it is wise to adopt the old-fashioned plan of having two fairly stout boards, 1ft. long and 6in. or 8in. wide, fastened by leather straps to the feet. The front corners should be slightly rounded off. The boards prevent holes, such as would be caused by the heels of the boots forcing and burying the seeds too deeply.

Covering the Seeds.—The next step is to cover the seeds. This is done by lightly raking over the surface, wearing boards on the feet as before. Give two rakings, one across and one down the plot, and then run the roller over, down and across, to ensure the seeds being uniformly buried and the surface level and firm. It must be remembered that



MAKING A LAWN FROM SEED.

Fig. 1, manure for enriching the soil; 2, same spread over the surface; 3, ditto, dug in; 4, making the surface fine 5, sowing the seeds; 6, trimming off edges of lawn.

only those seeds which are covered by soil will germinate satisfactorily; hence the necessity of carefully raking and rolling after sowing.

Protecting the Seeds.—Having expended a good deal of care and labour on the preparation of the site and the sowing of the seed, it frequently happens that the expectations of a good crop of grass are thwarted by birds having eaten a large proportion of the seeds, and thus produced a patchy, instead of an even, growth of grassy verdure. Sparrows and finches are the worst culprits in this respect, and the starling, blackbird, and thrush also do much injury when in search of worms and soil grubs. The most practical remedy is to insert small stakes a few feet apart over the site, and wind strands of black cotton around the stakes backwards and forwards about two or three inches from the ground. When the birds attempt to alight on the soil their bodies come in contact with the, to them, invisible cotton, and this promptly puts them to flight. Where feathery pea sticks are plentiful, cover the plot with these; they will help to keep birds away, and act as a protection to the seedling grasses. Remove them as soon as the grasses are well up through the surface. Bits of tin, glass, or red rags suspended by twine to sticks fixed in the soil at an angle of 45 deg. will also prove efficient bird-scarers; and so, indeed, will the imitation cats, hawks, etc., sold for the purpose of bird-scaring.

General Treatment.—If worm casts should be numerous soon after sowing, run the roller over the surface on a fine, dry day, to consolidate the casts. The latter, owing to their slimy nature, may adhere to the roller and cause it to pick up patches of soil and seeds. To guard against this, well clean the roller by means of a broom after each journey. Once the grasses have begun to grow it is not advisable to use the roller, on account of the risk of injuring the tender growths.

Mowing New Grass.—When the growth is 3in. high it should be lightly tipped with a scythe, not a machine. A few days afterwards run a light roller over the plot. September-sown grass will not require cutting more than twice

or three times, and then always with a scythe, before the following March. March-sown grass will require cutting about every week or ten days with the scythe until June, when the machine may be used in the usual way. The reason a scythe is advised for the first cuttings is because a machine, unless in proper working order, is apt to bruise or pull up the young grasses. A scythe makes a clean cut, and does not disturb the roots. A light rolling may follow every other cutting, choosing a time immediately after a shower for doing it.

When the Lawn is Ready for Use.—Lawns, etc., sown in September may be used the following June, while those sown in March are usually fit to use about August. There is no doubt, however, that it is by far the wisest plan not to use a lawn for tennis, or croquet, or bowls until a year after sowing. A heavy traffic bruises the tender growth of the grasses, and seriously cripples their future growth.

Edgings and Terrace Slopes.—It is a very good practice where there are many walks or beds intersecting a new lawn to lay down a marginal strip of turf one foot wide around the boundaries adjacent to paths. This at once forms a firmer edging than soil sown with grass seeds. The latter system is not satisfactory, as rains wash the soil and seeds on to the path, and a good firm edging is difficult to obtain. Good turf must, of course, be obtained for this purpose, and it must be laid so that its upper surface coincides with that of the soil intended to be sown with seeds. Similar margins of turf should also be laid around beds or borders on intended lawns. In the case of terrace slopes, it is exceedingly difficult to get seeds to germinate and make a satisfactory turf thereon. In such a case turf only should be employed for the slopes, and grass seeds for the top or level surface.

CHAPTER VII.

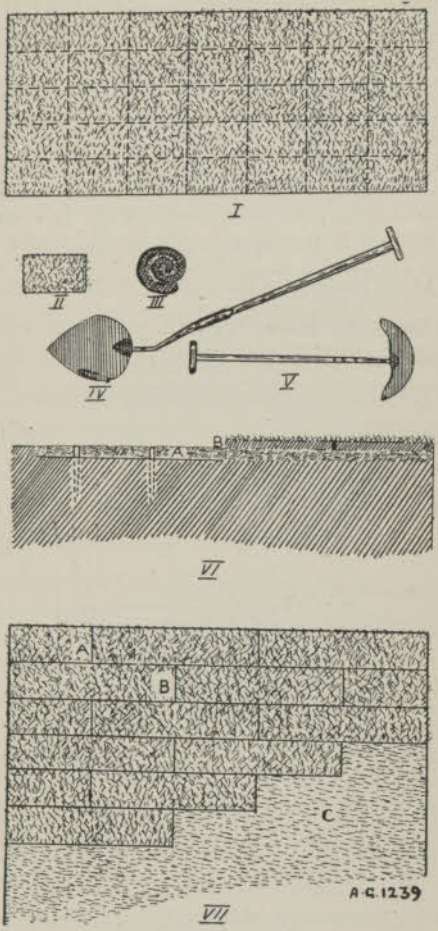
TURF LAYING.

HAVING dealt elsewhere with the necessity for the thorough preparing, draining, and levelling of the site of a proposed new lawn, etc., and the comparative merits of turf versus seeds, and assuming that turf is preferred, we will now give the *modus operandi* of laying it.

Firm Soil Essential.—It is imperative that the soil should be moderately and evenly firm. After the levelling is done, either tread or roll the surface lightly to make sure that the soil will not shrink in places and form hollows afterwards. If there should be an unevenness of surface, fill these spaces up with additional soil, and then rake over the surface, so that the roots of the turf may find no difficulty in penetrating the soil. On soils naturally inclined to be damp, or where worms are abundant, mix together one part of gas-lime to two parts of fine coal ashes, and pass this through a fine screen; then spread a half-inch layer of it on the soil before laying the turf.

Laying the Turves.—These, as mentioned elsewhere, are usually cut in 3ft. lengths and widths of 1ft. Lay them down so that their joints join lightly together, beating each one firmly with a wooden beater as the work proceeds. Unless the turves fit very accurately open joints will occur, and an uneven appearance will be given to the surface. Proceed with the laying until the whole area is covered; then give a further beating to ensure a uniformly even surface and the perfect closing of the joints. When this is finished give the turf a good rolling, first across and then down the plot.

Management of Newly-laid Turf.—After the first rolling let the turf have a rest for a month or so to give the grasses an opportunity of rooting into the new soil. Go carefully over the lawn, and, if any open joints are found, fill these in with fine soil. Give a rolling about once a

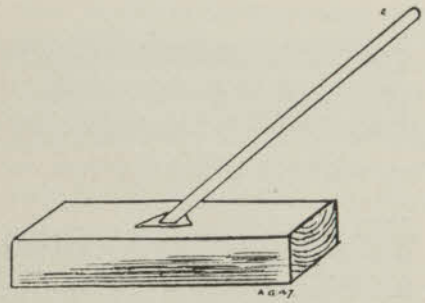


METHOD OF TURFING LAWNS.

Fig. 1 shows the turf cut into widths of 1 ft. and lengths of 3 ft., ready for lifting 2, a turf; 3, the same rolled up; 4, turfing spade for cutting the turves; 5, turfing iron for dividing the turves; 6, section of lawn where turf is to be laid, A being the soil levelled to receive turf, and B turf laid; 7, method of laying the turves, the piece of turf A having its end midway between turf B; C, soil for receiving the turves.

month the first year, and this always after rain. No manures or top-dressings will be needed the first season, the grasses being able to get ample food from the new soil below. It is not advisable to cut the grass too closely the first year. We recommend a scythe to be used for the spring mowings, this cutting off the coarse grass, if any, and ensuring a finer growth. Nor is it advisable to have the machine set too low the first season, as plenty of leafage is essential to encourage vigorous root action, without which the turf cannot be expected to do well in future years. See also chapter on "General Management of Lawns."

When to Lay New Turf.—Any time between September and March is a suitable time. If laid between

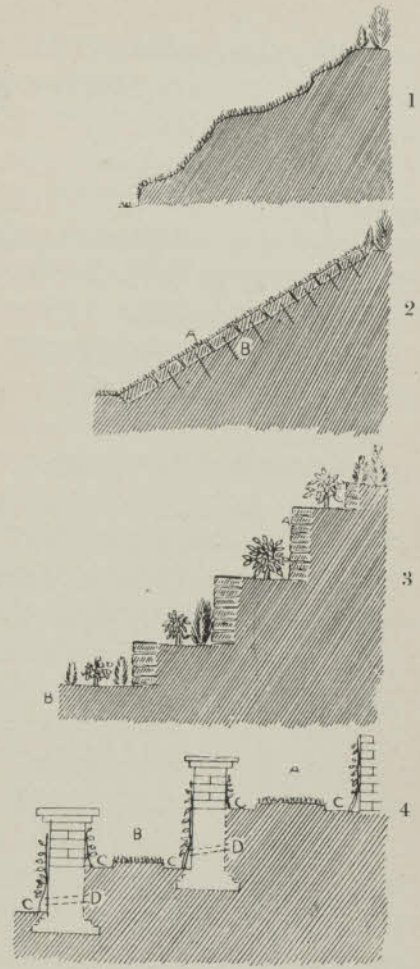


A Turf Beater.

An appliance made of a piece of heavy wood and fitted with a handle. Required for beating down newly-laid turf.

March and September the turf has not so good an opportunity of rooting freely and establishing itself as during the cooler period of the year.

Turfing Terrace Slopes.—Considerable care has to be exercised in laying turf on a terrace slope. The turves should be cut into squares of a foot, and each secured firmly in position by means of pegs driven through them into the soil. This precaution is necessary to prevent the turves slipping down. Where the slope is not very steep whole turves



SLOPES AND TERRACES.

Fig. 1, a natural slope; 2, an artificial slope, A showing turves laid, and B pegs used to fix latter in position; 3, a steep slope, arranged in terraces, with turf walls (A); 4, terraces divided by walls.

(3ft. long) may be used. These should be laid down, not across the slope. Lay the turves closely together, and beat them down firmly. It is a good plan to lay each turf of the bottom layer so that about a foot of its lower end projects on to the level ground at the base, and the turf laid at the upper end of the slope should also project over the top of the slope about the same distance. When well beaten down, turves so laid are not liable to slip or move. There must be no attempt at walking up the slope for months, otherwise the turves will slide down.

Part II.—MANAGEMENT OF LAWNS.

CHAPTER I.

MOWING LAWNS.

The subject of mowing lawns has been briefly referred to in the chapters dealing with turf-laying and seed-sowing, but it is necessary that it should be further enlarged upon here. To mow a lawn may appear a very simple, although a laborious, operation, not requiring much to be said about it. But, simple as it may appear, there are, nevertheless, many important points that should have the weighty consideration of all who desire to command a really good lawn, the pride of every English garden, and the envy of those who live in less favourable climes than our own for grass culture.

The Scythe versus the Mowing Machine.—Since the introduction of the mowing machine, that good and valuable old implement, the scythe, has, unfortunately, fallen very much into disuse. Few of the younger generation of professional gardeners have any real practical knowledge of its use. In their hands it would be a dangerous tool to use, both for cutting the grass and sharpening its well-tempered steel blade. Older men who have been trained to use it, however, know its worth as an indispensable tool for cutting seedling grasses during the first three months of their growth; cutting established grass in the early spring;

removing bent grasses and daisy flowers in summer; and mowing grass that has been neglected and allowed to make coarse growth. In all these instances the scythe is a hundredfold more useful than the mowing machine. The latter will not remove bent or coarse grass successfully, and in that case a scythe is indispensable in every large garden. Once, however, a lawn is in proper condition, then a mowing machine in correct working order is preferable to a scythe, because it will cut fine grass more evenly than the latter.

When to Mow.—The best period of the day to use the scythe is early in the morning, whilst the dew is on the grass, or on a wet day. The blades of the grass are then more firm and succulent, and the scythe will cut more easily and with less physical effort on the part of the user than later on in the day. The opposite is the case with a mowing machine. If used early in the morning or in wet weather the moist grass clings to and clogs the cutting blades and working gear, also bruises the grass, and renders the work exceedingly laborious. A machine should, therefore, always be used when the grass is free from dew or rain. The work is then performed with greater ease and speed, and the result is more satisfactory to the lawn.

How to Mow.—As a general rule it is advisable to cut the grass for the first time in each year with a scythe. The winter growth is always tough and wiry, and the scythe will remove this better than the machine. The first cutting should take place early in March and the last late in October. After the first cutting with the scythe the machine may be used, setting the knives moderately low. During March and April cut once a fortnight; in May once in ten days; from then to September once a week; and from September to November once in ten days. In regard to tennis lawns and bowling greens, it may in moist seasons be needful to cut the grass twice a week, to ensure a nice, even surface. In hot, dry weather it is not advisable to use the collecting box, but to let the knives distribute the cut grass over the lawn, to serve as a mulch and protect the roots of the grass from the hot sun. There is, however, one disadvantage about this; if the turf should be very weedy it is

possible that some of the flower heads may contain fully-developed seeds, which will germinate and give trouble in due course. At the same time, too, it is not desirable to set the knives too low. We firmly believe in the practice, at every alternate mowing, of cutting the grass the opposite

Photo: H. A. Smith.

A TUFT OF "BENTS."

Some of the lawn grasses produce wiry, tough flower stems, which can only be cut off by means of a scythe, or a "Bent Mowing Machine."

way. Thus, if cut down the lawn one time, it should be cut across the next. This method ensures the grass being cut evenly all ways.

General Hints.—It is of the utmost importance that the cylinder of knives of the machine should be in good order

and these properly and accurately adjusted to the blade below. Each time the machine is about to be used test the blades by inserting a piece of paper between the knives and the blade, revolve the knives, and ascertain if they cut the paper clean through at the ends and in the centre. If they do not do so, adjust the screws until the cutting is equally true. The jarring of the mechanism when in frequent use is liable to alter the adjustment of front roller and the cylinder; hence this needful precautionary inspection. When a scythe alone is used it is needful to sweep off the cut grass by means of a good birch broom. In the case of a heavy crop a preliminary raking may also be necessary before using the broom. The sweeping is beneficial in another way—it helps to distribute the valuable worm casts, and, if a good rolling be given directly afterwards, so much the better. We have already pointed out that a machine invariably refuses to cut the wiry bent grasses, as well as the majority of daisy and dandelion flower heads. If these are numerous, skim the surface over with a scythe, or use the special bent cutting machine described on p. 124. This precaution is specially needful on a tennis lawn or bowling green.

CHAPTER II.

ROLLING LAWNS, Etc.

ALTHOUGH references to this subject have been made in various parts of this book, it will, perhaps, be useful if we present the few facts there are to impart thereon in a more concrete form.

Briefly, rolling should never be practised in frosty weather. The best time to do it is during showery weather or directly afterwards. Lawns on light soils require more frequent rolling than those on heavy ones. In the latter case it compresses the plastic clay into a dense mass, and prevents the roots of grasses or air and rains descending into the soil.

Once a fortnight, or even once a month, is often enough to roll a lawn overlying a heavy soil. On the lighter soils it may be beneficially done once a week, except at the periods previously named.

Then again, it is better to use a lighter type of roller for a heavy soil, this not unduly compressing the soil into too compact and solid a mass. Where a water-ballast roller is used, use it empty in wet weather and full in dry weather.

Before rolling always sweep the surface of the lawn over with a birch broom to distribute worm casts.

Rolling is of immense benefit to lawns, tennis courts, or bowling greens that have been properly made and properly drained. It conduces to the formation of a firm, solid turf, prevents worms rising too freely to the surface, and promotes an even growth of fine grass.

Lastly, it affords a splendid and healthy form of exercise to the amateur gardener in the early mornings.

CHAPTER III.

WATERING LAWNS.

Lawns, tennis courts, and bowling greens formed on light and very dry soils are apt in hot seasons to suffer considerably from drought. Watering then becomes an absolute necessity. Grass will not maintain its typical green verdure or grow satisfactorily if it fails to get sufficient moisture at the roots. But water must not be indiscriminately applied, or more harm than good will be done.

How Not to Water Turf.—A note of warning under this heading is most desirable. One of the greatest mistakes ever made is to apply mere sprinklings to the surface every evening or during the day. This slight amount of water merely remains on the surface, to be dissipated by the early

morning sun. It is akin to a man washing his face and hands to try to refresh his weary body, without taking any liquids or solids as food. The roots of grasses are not on the surface, but several inches below; and the result is they derive no benefit from the surface sprinklings. Even suppose that young roots were induced to form near the surface, the hot sun would heat the thin film of moisture and kill them. Light sprinklings are, therefore, not only a waste of labour and precious water, but a source of positive injury to the grasses. It is equally a mistake to water lawns during hot, sunny days. The sun heats the surface and scalds the grass.

Sensible Way to Water Turf.—In the case of newly-sown seeds it is not advisable to apply water unless absolutely necessary. If, however, very dry weather follows after seed-sowing, give a good watering late in the evening. Usually one application suffices till the seedlings appear. If dry weather continues, give one more application, in each case a thorough one, when the seedlings are coming up freely, and then rely afterwards upon the mulching of cut grass produced by the first mowing to keep the soil sufficiently moist. Established turf should be watered in no half-hearted way. Instead of the slight sprinklings previously condemned, divide the lawn into sections, and give each a thorough soaking in turn on subsequent evenings until the whole has been done. Where the soil is at all hard, drive the tines of a steel fork down here and there to provide inlets for the water to reach the lower soil, the region of the roots. Always water in the evening. If a sprinkler be used, let this operate on each section for an hour at least. When water has to be applied by hand, apply a gallon at least to each square foot of surface. After the thorough watering has been given, run the machine over the lawn without the collecting-box, so that the cut grass can fall on the turf and protect the surface from the hot sun.

A Sloping Lawn. (Photo: H. N. King.)

In this instance the lawn has had its surface evenly graded to a gentle slope.

CHAPTER IV.

RENOVATING LAWNS.

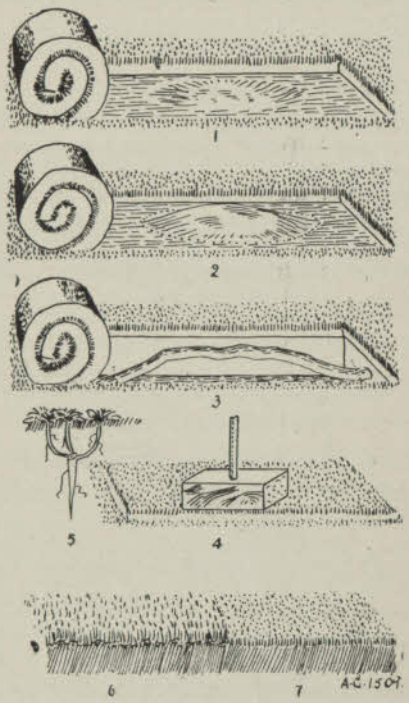
Lawns that have been made a long time and become impoverished through want of food, or those of more recent date, the grass on which does not grow satisfactorily, may be vastly improved by a generous top-dressing of compost or manure, details of which are given in the next chapter. There are also other ways of achieving the successful renovation of unsatisfactory lawns, which we shall at once proceed to describe.

Thin and Patchy Turf.—This condition usually indicates a poor soil, imperfect drainage, or too much hard wear and tear in use. In the first case, the surface should be vigorously scarified by means of an iron-toothed rake, to loosen the soil. Do not be afraid to use the rake; it may apparently be ruining the existing turf, but no real harm will accrue therefrom. Do this in autumn; then apply the special compost and manures advised in Chapter V., and afterwards roll. In the March following procure a Renovating Grass Seed Mixture from a reliable source, again well rake the surface, sow the seeds down and across the lawn, rake well once more to cover the seeds, and finally roll. The autumn top-dressing, the re-raking, sowing seeds, and re-rolling, will work wonders in due course, and yield a good turf. Choose fine, dry weather for the sowing. It will pay to renew the top-dressing annually for a few years until a good, sound turf is obtained.

Mossy Lawns.—See the chapter on "Weeds" (page 66) for treatment of these.

Hide-bound Turf.—Old lawns, tennis courts, and bowling greens often become very hard, or hide-bound, in consequence of the continual traffic upon them, and hence the roots are unable to freely penetrate the soil in search of food, with the inevitable result of a stunted, impoverished growth. In this case a good plan of renovating the turf

and imparting to it a fresh lease of life, is to mark off the turf into strips a yard wide, and then, at intervals of a foot in each strip, to drive the tines of a good steel fork into



METHOD OF REPAIRING LAWNS.

Fig. 1 shows the mode of repairing low spaces in a lawn, the turf being lifted, soil added, and turf replaced. Fig. 2 shows method of reducing lumps or raised parts of a lawn. Fig. 3 shows the large root of a tree and method of getting rid of it. Fig. 4, turf replaced, with rammer for beating it down firmly. Fig. 5, deep-rooting weeds. Fig. 6, a specimen of poor turf. Fig. 7, good turf.

the turf, and press the handle gently backward to slightly move the turf. The disturbance of the turf is scarcely visible on the surface, but yet is sufficient to loosen the soil below, allow air and rains to enter through the crevices, and

provide a means whereby the roots can obtain more sustenance. Such a mode of treatment is very essential in the case of old tennis lawns and bowling greens. It is practised annually at the close of every season on the Northern bowling greens. After the forking is completed apply the top-dressings and manure advised in Chapter V.

Uneven Lawns.—Old lawns that are very uneven in surface and are required to be made more or less level can only be properly renovated by lifting the whole of the turf in autumn (October or November), levelling, digging, and manuring the soil, and then relaying the turf thereon. Where only a few hollows occur, lift the turf of these portions only, add the requisite amount of soil, and then re-lay the turf, beating and rolling it down firmly. It is a fairly common mistake on the part of many people to suppose that hollow spots in lawns may be remedied by adding soil on the existing turf, under the supposition that the grass will grow through it. As a matter of fact, the soil will kill the turf buried below, and leave a bare patch. In newly-sown lawns containing depressions soil may be added and more seeds sown.

Weedy Lawns.—See remarks in connection with each kind of weed in Chapter VII., p. 66.

Rotten Turf.—Turf under the shade of trees or in damp spots often becomes rotten and sparsely covered with grass. In the first case the best course to pursue is to dig in the rotten turf, together with some rotten manure, a little bone-meal, and some ground-lime, and then to sow the mixture of grass seeds advised elsewhere for growing under trees. In the second case, the old turf may be removed, the soil dug deeply and manured, and new turf laid; or seeds may be sown in September or March.

Lawn Edgings.—After a time the constant treading on the margins of a lawn causes the edgings of the turf to be more or less irregular in outline, and to have a ragged, untidy appearance. To remedy this defect, stretch a garden line down the margin of the path. If the walk be a straight one, draw the line tight, and take care that each end is at

a point representing the required width of path. Insert a peg here and there alternately on each side of the line to keep it in position. If the edging be a curved one, arrange the line to follow the curve, and then, judging by the eye, insert short stakes alternately a foot or so apart on each side of the line, and gradually adjust these so that the latter, when pulled taut, produces an even curve. The next step is, by means of an edging iron, to carefully trim the edge of the turf so that it has an even, smooth face. The trimmings may be collected and stored to make potting mould. The edgings of beds should be carefully adjusted and trimmed in a similar fashion whenever they become uneven. Early spring is the best time to do it; then they will look nice and fresh during the summer.

CHAPTER V.

MANURES FOR LAWNS.

As previously explained in the chapter on "Soils," manure is essential for enriching the soil before laying the turf or sowing seeds. It is also indispensable later on for top-dressing the surface of lawns, etc., to keep the roots of grasses constantly supplied with food. We wonder how many have realised the fact that lawn grass has no opportunity of enriching itself yearly as other crops have. Every time the grass is cut by the mowing machine a large proportion of the food stored in the leaf blades is removed and practically lost. Very little of the cut grass falls on the surface to decay and become reconverted into food for supporting the plants whence it was removed. This goes on year after year, and it therefore naturally follows that the soil must be gradually depleted of its store of food. In process of time, therefore, the turf becomes poor and stunted in growth, and the result is an indifferent sward. In the ante-machine period, when the scythe alone was used, a good proportion of grass

blades settled down among the grass plants, decayed, and eventually formed a constant rich mulch or top-dressing for the roots. This really is the secret of the grand old lawns we see to-day. Of course, if the excellent practice be adopted of not using the collecting box in hot weather, when growth is less vigorous, the cut portions distributed by the machine then form the desirable mulch so much needed by the turf. Still, manures are needed to replenish the food supply in the soil, and to encourage an even, healthy growth. The question consequently arises as to what manures are suitable, and their mode and time of application. This information we will now supply.

Manures for Heavy Soils.—As mentioned in connection with this type of soil on page 9, the best form of stable manure to use for mixing with the soil when preparing it for turf-laying or seed-sowing is horse dung. Its light and porous nature is just the thing needed to lighten a heavy soil. That fresh from the stable is preferable to decayed material, because the strawy particles assist to keep the soil open. Peat-moss litter manure is not suitable because of its moisture-holding properties, and manure containing shavings should certainly be avoided, owing to the latter encouraging the growth of fungi.

Among artificial manures bone-meal and basic slag are excellent for supplying the soil with phosphates. Both may be applied at the time of preparing the soil, at the rate of 4oz. per square yard, or 8lb. to the square rod (30¼ square yards); also at a similar rate to established turf in autumn. As a general rule, potash is not required on heavy soils; they usually contain sufficient to meet the requirements of growth.

Lime, particularly ground agricultural lime, is specially beneficial to heavy soils, and should certainly be applied at the time of preparation of the soil for new lawns, at the rate of 1cwt. to each twelve yards square. Ground lime is preferable to ordinary lime because of its being reduced to a very fine powder, which renders it capable of being more evenly distributed, and of its acting more thoroughly upon the soil. Lime helps to break up the clay into finer particles, sweetens it, and sets free potash, as well as promotes

GRASS TERRACE AND LAWN.

A good example of a skilfully planned and well-managed terrace and lawn.

the formation of nitrates in the soil. Ordinary "quick" lime possesses similar virtues, but is not so even or thorough in its action. Before using, it should be slaked by throwing water over it. Lime, too, may be used as a component part of a top-dressing compost, which see.

Guano is a good fertiliser to apply to lawns about to be sown with seed. Use at the rate of 2oz. per square yard, or 4lb. per square rod, lightly raking it in. It will encourage the speedy germination of the seeds. When the grass is established apply 1oz. of sulphate of ammonia per square yard, or 1½lb. per square rod, in April.

Manures for Medium Soils.—So far as stable manures are concerned, those advised in the preceding paragraph are applicable to medium soils. Bone-meal, too, may be used as a phosphatic manure, and superphosphate instead of basic slag, the last-named being suitable only for damp soils. Of the superphosphate use 1oz. per square yard, or 2lb. per square rod. This may be used when preparing the soil, and also as a top-dressing to established turf in autumn. Kainit, too, as a source of potash, may be beneficially applied when digging, at the rate of 1oz. per square yard, or 1½lb. per square rod, and a top-dressing of half above quantities in spring. Guano may also be used, as advised in the previous paragraph. Nitrate of soda, at the rate of 1oz. per square yard, or 1½lb. per square rod, is a suitable nitrogenous manure for a spring top-dressing. Soot at the rate of one peck per square rod in spring is also helpful to the growth of established turf.

Manures for a Light Soil.—Here materials of a cool, moisture-conserving, and binding nature are essential, and the best kinds to use are cow, pig, or peat-moss litter manures. These will supply the soil with the much-needed humus, especially in the case of a sandy soil. They should be dug freely into the soil before turfing or sowing. Then in the way of artificials, superphosphate is the best of the phosphatic class, and this should be used at the rate of 1oz. per square yard, or 2lb. per square rod, when preparing the soil; also as a top-dressing in spring. Kainit is very necessary on a light soil. Apply at the rate of 1oz. per square

yard, or 1½lb. per square rod, as advised for superphosphate. Wood-ashes contain a good deal of potash, and may be freely used as a spring top-dressing. For spring use, for encouraging the growth of the grasses and reducing the spread of clovers, apply 1oz. of nitrate of soda per square yard.

Top-dressings.—In addition to the artificials mentioned in the preceding notes, it is advisable to give lawns, tennis courts, and bowling greens an occasional, if not an annual, top-dressing with a good mixed compost. This should consist primarily of good loamy soil, such as has not been taken from a weedy spot. In connection with the latter fact, it should clearly be understood that very great care must be selected in the choice of soil, as there is a great risk of daisy, dandelion, and other weed seeds being introduced through its agency to the turf. Another important ingredient is well-decayed manure, such as has been used for a hot-bed or a mushroom-bed. Mix two parts of soil with one of the manure, and pass the whole through a half-inch screen or sieve; in fact, it would answer still better if a quarter-inch mesh were used. To each cubic yard or cartload of this mixture add one hundredweight of lime (ground lime, if possible). Mix thoroughly, and then apply at the rate of a good barrow-load to every six or eight square yards. November is the best time to apply it. Spread evenly over the surface, and then sweep with a birch broom. This is a simple, plain top-dressing for an average lawn.

Where the grass is thin and poor, or is much used and worn, as in the case of a bowling green or a tennis court, then a much richer compost should be applied. For example, in addition to the ingredients just mentioned, there should be added to each cartload about 3cwt. of wood-ashes, 1cwt. of fine charcoal, and ½cwt. of bone-meal. Mix all thoroughly together, and apply at the rate of one barrow-load to eight or ten square yards, in November. The addition of charcoal is most beneficial. It encourages a sturdy, green growth, and helps to keep the surface soil sweet. The surface roots, moreover, like it, and cluster around each particle in search of the food stored within its pores. The above compost is a capital top-dressing for moss-infested lawns.

For a spring top-dressing we have found 4lb. of dissolved

bones and one peck of fine charcoal per square rod a splendid mixture for improving the turf of bowling greens and tennis courts. This can be tried in place of the mixed composts previously mentioned.

General Remarks.—It should be clearly understood that the manures and top-dressings will only produce an adequate effect where the soil is properly drained. Grasses cannot thrive properly on a water-logged soil, and manures will only intensify the evil by increasing the sourness incidental to such soils. Manures will, however, speedily and beneficially act upon poor soils where they are naturally or artificially drained.

Poultry Dung.—The question is often put to us by readers of "Amateur Gardening" as to whether poultry, pigeon, rabbit, and goat dung is of any value for application to lawns. Poultry and pigeon dung, if mixed with soil to form a compost, and then sifted finely, may be applied to lawns in autumn with good results. Use a bushel to every ten square yards. Goat and rabbit manures possess no special value for this purpose.

Acetylene gas refuse has been found a beneficial substance to apply to lawns. It imparts a dark green hue to the grass, encourages it to grow freely, and is distasteful to worms, bringing them quickly to the surface. This material is the refuse obtained from calcium carbide, used for making acetylene gas, and is practically equivalent to slaked lime.

Liquid Manures from the farmyard or stables are also beneficial if applied in a diluted form during or immediately following wet weather. Use sparingly, and never in dry weather.

Prepared Fertilizers.—Clay's Fertilizer is one of the best of the prepared manures for top-dressing lawns in spring. Use at the rate of one ounce per square yard.

CHAPTER VI.

LAWN PESTS.

THERE are practically few insect or animal pests that do any serious harm to lawns, the only ones worthy of note being Leather Jacket grubs, earthworms, ants, and moles.

Ants.—On light soils and in warm seasons ants prove troublesome in undermining the roots of the grass and throwing up their unsightly "hills" of fine soil. Besides, their presence in large numbers prevents the comfortable enjoyment of the lawn in summer time. It is well, therefore, not to tolerate their presence if it can be easily avoided.

REMEDIES.—There are many. One is to find out the nest of the ants, carefully lift the turf over it, and then saturate the soil below with boiling water in which camphor has previously been dissolved; then replace the turf an hour or so afterwards.

Another remedy is to make a hole 1ft. deep and 2in. wide, pour in a tablespoonful of bisulphide of carbon, and instantly ram the soil tightly into the hole. The fumes will then permeate the soil over a good area, and asphyxiate the ants. This substance is highly inflammable, so must not be used in the presence of a cigarette, cigar, or pipe, or light of any kind, or it will instantly ignite and do harm to the person using it.

Sprinkling guano on the grass will also drive the creatures away, but not kill them.

Earthworms.—That these make the surface of a lawn unsightly by throwing up their "casts" there is not the shadow of a doubt, and on that account they are heartily detested by all who pride themselves on a well-kept lawn. Apart from this fact, the worm is a good friend rather than an enemy, and, if people only knew what excellent qualities it possesses, they would never want to destroy it. So far from doing harm to our gardens and crops, it really does an immense amount of good. Its good qualities consist, first of all, of draining the soil; and, secondly, of helping to mate-

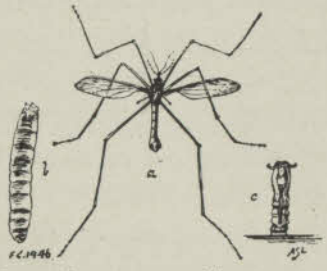
rially increase its fertility. Thus, in the first case, its indefatigable method of tunnelling the soil provides channels through which the air and moisture can pass downwards from the surface. The air which passes downwards acts beneficially upon the stored-up elements in the soil, oxidising and liberating substances for the sustenance of plant growth, which would otherwise be unavailable. The rains, moreover, which are enabled to pass through the tunnels are charged with nitric acid, which, on coming in contact with the soil, becomes converted into nitrogen, another valuable plant food. Furthermore, the air and moisture helps to provide congenial conditions for the development and activity of those wonderful and minute organisms, the nitrifying bacteria. Without air the latter could not exist, and without their presence in the soil plants could not thrive. Nor is this all. By tunnelling and draining the surface, water which would otherwise remain stagnant, seal up the capillary tubes, and keep the temperature low, is allowed to pass into the subsoil, leaving the surface drier and warmer.

Then, worms enrich the soil by ejecting to the surface excrement consisting of desiccated vegetable matter and soil. The excrement is popularly known as "worm casts," and, being composed largely of vegetable matter, they are rich in plant food. Professor Darwin, in his most interesting work, "Vegetable Mould and Earthworms," says, as a result of his experiments and researches on the subject, that each large worm ejects about 20oz. of excrement or castings per annum. He further states that each acre of pasture land contains on an average about 26,886 worms, the castings from which amount to 15 tons annually. In ten years, at this rate of deposit, a layer of an inch of mould would be added to the original surface. Worms are more numerous in garden soils than in pastures. Darwin records a statement made by another scientist, that there are 53,767 worms to the acre.

It will thus be seen that there is a good deal to be said in favour of the lowly earthworm. Personally, we do not bother ourselves about the presence of worms in a lawn. Knowing the good they do in draining and enriching the soil, we prefer to undertake the trouble of systematically sweeping the lawn with a birch broom to distribute their rich excrement, followed by a good rolling. We have the satis-

faction of knowing, then, that we are enriching the surface of the lawn, and keeping the turf well supplied with the means of access of air and rains to the roots. Still, others will not share this view, and so we give the usual remedies for reducing the number of worms on lawns and bowling greens.

Remedies.—The latest and most efficacious of these is a preparation in powder form, which has to be applied at the rate of ½lb. or so per square yard, in mild weather, then be well watered in. In a very short space of time the solution will bring every worm with which it comes in contact



Daddy Longlegs or Crane-fly.

References: *a*, Perfect insect (Tipula oleracea); *b*, Larva or leather-jacket; *c*, Pupa case.

to the surface, and then follows the by no means pleasant occupation of sweeping up, collecting, and disposing of them elsewhere. The solution does no harm to the grass. Two such preparations are in commerce—Carter's Worm Killer and Sutton's Worm Destroyer—and full directions for use are supplied with each.

Another simple remedy is to place a peck of fresh lime in forty gallons of water, stir it well, then let the solution clear itself, and afterwards apply it to the turf. This, too, will speedily bring worms to the surface, when they must be swept off, collected, and destroyed.

We understand, too, that acetylene gas refuse, which is really lime, is just as efficacious. Neither will injure the grass.

Leather Jacket Grubs.—These are the larvæ of the Daddy-Longlegs, or Crane Fly. The flies lay their eggs late in summer at the base of the grasses, these hatch in due course into darkish legless grubs, having a blunt tail and a tough, leathery skin. During the day they remain beneath the surface of the soil, and at night come to the surface and feed on the base or root stock of the grasses, causing the latter to wither, turn yellow, and die in patches. They are more prevalent in some seasons than others.

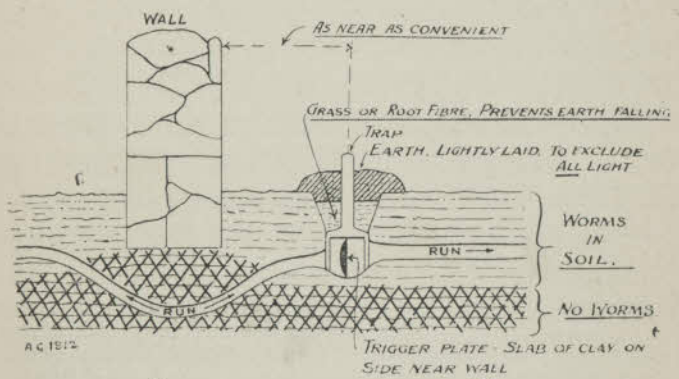
Remedies.—To ascertain if they are present, when the grass turns yellow in patches lay roofing slates, tiles, or boards over the latter early in the evening. These will lure the grubs into the belief that they are quite safe, and they will not descend into the turf when daylight arrives. Lift the boards in the morning, and scores, or even hundreds, may possibly be found quietly lying on the surface. It is useless sprinkling anything over them, as their tough skins render them immune from injury. The best plan is to pick up every grub, and either give them to poultry or cast them on to a fire. There is no other way of coping with this pest.

Moles.—These velvet-coated rodents sometimes find their way into the soil of a lawn, tennis court, or bowling or golf green, and, by means of their habit of burrowing beneath the surface and throwing up "hills" of soil, do great damage to the turf.

Remedies.—Their presence must not be tolerated an hour longer than it is discovered. Trapping is the usual method, but it requires skill and experience to properly carry this out. Wherever possible, a professional mole-catcher should be employed to do the trapping. Where this course cannot be adopted procure steel traps from an ironmonger, set these with gloved hands, and rub the parts touched with soil; then, by means of a trowel, open an entrance to the run, fix the trap exactly across the run, and fill up with soil. On no account touch the soil with the hands. Set a number of traps in various parts of the run.

If this method fails, collect some earthworms, put them in a jar, and get a chemist to add a few grains of strychnine or a little arsenic to them; then, by means of a pair of tongs,

push two or three worms here and there into the runs. Worms are the special food of the mole, and he will soon find them out, and then, having partaken of them, his life's work will be finished.



DETAILS SHOWING HOW TO TRAP MOLES.

Follow up the runs until they disappear under wall, hard path, or hedge. Carefully take out the soil until the bottom of the run is reached, using gloves well earth-stained, and a trowel. Place the trap in the run and fill in the space around it first with a good handful of grass or root fibres, to prevent the trap jamming with earth falling in, and finally with sufficient soil sprinkled on to exclude all light.

Sometimes a strong solution of soap-suds and paraffin oil poured here and there in the runs will prove effectual, as, should the mole venture through this, he will be suffocated. Trapping, however, is the most merciful way of exterminating these creatures.

Birds.—A word in favour of the starling, thrush, and blackbird. All three are partial to worms and Leather Jacket grubs, and hence should be encouraged to visit lawns and greens. Let anyone take the trouble to watch a group of starlings on a lawn early in the morning, and note the immense number of worms devoured in a short time.

CHAPTER VII.

LAWN WEEDS.

One of the greatest difficulties that the gardener has to contend with in the management of lawns, bowling greens, and golf links is the continual warfare he has to carry on with regard to the eradication of weeds. In spite of every care and precaution, weeds will make their appearance, since the seeds are constantly being conveyed by the agency of wind, birds, and insects, and distributed over the turf. There they find beneath the shelter of the grass congenial conditions for germination, and eventually develop into sturdy seedlings, which cannot easily be detected until they protrude themselves above the grass. It is then that the wise gardener adopts prompt measures for their eradication. Woe betide the laggard who permits them to grow unchecked. In a few years he will find his turf completely overrun with the proliferous daisy, plantain, and crowfoot, and, to his sorrow, will discover it to be no easy matter to get rid of the pests.

Here we would anticipate a question often asked by those who have had very little experience in the management of lawns, viz.: is there any means of preventing weeds growing in lawns? Our answer is "None," for the simple reason that any substance which would prevent the growth of weeds distributed by the agencies before-mentioned would at the same time prevent growth of the grass. The only way, indeed, of coping with weeds in lawns is to keep a constant watch for their appearance, and to either spud them out or dress the turf with lawn-sand in early spring.

So much by way of introduction. Now we will proceed to give a description of the principal weeds, describing their respective characteristics of growth, and the best remedies for their eradication.

Daisy (Bellis perennis).—This is unquestionably one of the most troublesome of lawn weeds. So common is the plant that everyone knows its habit of growth, hence we need

not give a detailed description thereof here. Suffice it to say, the plant is a perennial, capable of producing a number of crowns which gradually spread and in time develop into large patches. The plants flower and bear seeds very freely, and hence, where the blossoms are permitted to develop, hundreds of seedlings will inevitably make their appearance in due course. The mature flower-stems are very tough and wiry, consequently the mowing machine fre-

(Photo : H. A. Smith.)

DAISY (BELLIS PERENNIS).
The commonest of all lawn weeds.

quently fails to cut off the heads, and the roller behind presses them into the grass, with the result that seed ripens and germinates, producing colonies of young plants. If the scythe be used occasionally few daisy flowers will escape destruction. Another plan of getting rid of daisy flowers is to run a useful tool called a daisy rake over the lawn once a week. This tool is provided with sharp teeth, which easily cut the daisy flowers off when drawn along the turf.

As regards getting rid of daisy plants, one method is to spud them out by means of an old steel fork, or one of the weed extractors sold by all sundriesmen. Care should be taken to lift the entire root. On no account should the plants be cut off, as so often done, as the root stock left in the soil would in all probability sprout out again. Other methods of exterminating daisies are to put a pinch of salt on the crown of each plant, or to sprinkle "Watson's Lawn Sand" over the infested parts. This latter is best applied in March or April, when the growth is tender and succulent. Use it at the rate of 4oz. per square yard. The sand, while killing all weeds, will not injure the grass, but, on the contrary, cause it to grow more freely, imparting quite a healthy tone to it. Where daisies are very numerous the destruction of so many will leave bare patches, which will have an unsightly appearance. To remedy this defect, well loosen the surface with an iron-toothed rake, sow grass seeds thereon, and then cover with a little fine compost and well roll.

Dandelion (Taraxacum Dens-leonis).—Another very common and vexatious weed, which sorely taxes the patience of those responsible for the care and management of lawns. It is of perennial duration, and has a thick, fleshy root which descends deeply into the soil. It is very tenacious of life. Those who simply cut off the crown of the plant, under the impression that the stump left in the earth will decay, will find that in a short time the latter will sprout and produce several new crowns, and be as troublesome as before. Dandelions are also readily propagated by seed. The seeds, or achenes, are furnished with a tuft of silky hairs, and when the former are ripe they are easily wafted by the wind for long distances; and hence there is always a risk of their being deposited in large numbers on lawns, bowling and putting greens. Once they alight on the turf the seeds gradually work down to the soil, and soon germinate.

To exterminate dandelions a weed extractor, consisting of a hollow steel cylinder, should be used. Place the cylinder over the crown and force it down deeply into the soil, then withdraw, and the entire root with a little soil will be re-

moved. Put a pinch of salt in each hole, and fill up with good soil.

Another method is to use an iron skewer, dip this into a bottle of sulphuric acid, and then force the skewer well into the centre of the root. Gloves must be worn when using the acid, to protect the flesh of the hands from being burnt by the latter. Yet another plan is to fill an ordinary oil-can, fitted with a long spout, with carbolic acid, and to

(Photo: H. A. Smith.)

THE DANDELION (TARAXACUM DENS-LEONIS).
A very common perennial lawn weed.

drop small portions of the acid on the crown of each plant. A special instrument for killing weeds by means of weed-killers, etc., is described in the chapter on "Tools," elsewhere.

A pinch of salt may be used, but, as a rule, one application will not suffice to kill the root; hence the dose must be repeated several times. "Lawn sand" may be used in a similar way.

Plantains (Plantago major and lanceolata).—The plan-

tains have broad, ovate, or narrow lanceolate ribbed leaves, and thick, woody root stocks. Both, but the broad-leaved kind (P. major) especially, are very common weeds on lawns. The leaves spread out in rosette form, and quite kill the grass covered by them. They are readily increased by seeds. Birds are very partial to the latter, and it is assumed that the seeds voided with their excrement do not lose their germinating power; consequently, it is possible that seeds are deposited by birds on the lawn. As plantains bear seed very freely they should not be permitted to flower on, or in the vicinity of, lawns, bowling or putting greens.

The remedies are precisely as advised in the last case. Their foliage, however, being tougher than that of the dandelion, it may be necessary to give two or three applications of "lawn sand" to kill the growth. It is useless cutting off the crowns of the plants and leaving the roots in the soil, as the latter will assuredly sprout later on and produce a fresh crop of crowns. If the tops are cut off, place a pinch of salt on the root stumps to kill them.

Crowfoot (Ranunculus).—Several species of crowfoot infest lawns. One of the most troublesome species is the Lesser Celandine (R. Ficaria). This has small roundish or kidney-shaped shining leaves, and small oblong, tuberous roots. It flourishes in turf growing under the shade of trees. The flowers are yellow, and borne in spring, and the plant is of perennial duration. The Meadow Crowfoot, or Buttercup (R. acris) is another troublesome weed. It has palmate, finely-divided leaves, and spreads itself out into a fairly large patch. Of perennial duration. Being a common pasture weed, and seeding freely, seeds are very liable to be distributed by birds, and to find their way thus to lawns. The roots are tough and wiry. The Creeping Crowfoot (R. repens) is a still greater nuisance when it gains a footing on lawns. It has very similar foliage to the latter species, with the additional characteristic of throwing out runners, which root at every joint. It will thus be readily understood that a single plant of this species will soon spread over a large area, and choke the grass.

The Lesser Celandine, owing to its tuberous roots, is not easily got rid of. Repeated dressings of "lawn sand" in

spring will, however, in a year or so, so weaken the growth as to ultimately kill the tubers. In case of a bad infestation the best remedy is to remove the turf to a depth of three inches, and replace with new, burning the old so as to destroy the tubers. The Meadow Crowfoot must be either spudded out with a weed extractor or killed by employing the acid and salt remedies advised for plantains. The Creep-

(Photo: H. A. Smith.)

GREATER PLANTAIN (PLUMBAGO MAJOR).

A weed with broad, ribbed leaves, which commonly infests lawns.

ing Crowfoot is difficult to exterminate, owing to the rooted runners fixing themselves so firmly in the soil. The best plan, in our opinion, is to lift the infested turf and replace with new, or sow grass seeds.

Docks (Rumex).—Several species of perennial docks occasionally infest lawns. The most commonly met with are

the Red-veined Dock (R. sanguineus), with reddish leaf-stalks and flower-stems; and the Curled Dock (R. crispus), with crisped-edged leaves. Both have rather broadish and long leaves, and thick root stocks, which descend deeply into the soil. They are common roadside and pasture weeds, and bear seeds freely, which are liable to be conveyed by the agency of birds to lawns.

Being tap-rooted, they are best eradicated by means of a weed extractor, in the manner advised for dandelions. Other methods are dropping salt or a little carbolic acid on the crowns, or using the iron skewer and sulphuric acid remedy recommended in the case of the dandelion.

Self-heal (Prunella vulgaris).—This weed is very common in moist positions. It is of perennial duration, has ovate leaves, and procumbent or creeping stems, which root freely at every joint. If it once becomes established in a lawn it will be no easy task to get rid of it, owing to its creeping and free-rooting habit. Moreover, it has a tough, wiry habit of growth. The creeping stems increase very rapidly, and soon kill the grass it infests.

Small quantities may be spudded out by means of an old steel table fork. Larger patches should be sprinkled with "lawn sand" at two or three successive intervals. Where very numerous, it is better to lift the infested turf and replace with new. Its presence in a lawn indicates want of proper drainage, hence draining the lawn is an imperative necessity if this weed is to be abolished.

Sorrel (Rumex Acetosa).—This weed is really a species of Dock, and is familiar to most people on account of the pleasing acidity of its foliage. It has bright green, arrow-shaped leaves, a fibrous-rooted root stock, and a tufted habit of growth. Grows chiefly in damp soils.

Spud the tufts out with an old steel table fork.

Mouse-ear Chickweed (Cerastium vulgatum).—An annual weed with small viscid leaves and branching stems, which creep among the grass and form a dense mass of foliage. The flowers are small and numerous, and the plant seeds very freely. It grows in dry or wet positions,

and in some seasons spreads very rapidly, quite choking the grass.

As the plant seeds very freely it is obvious that if it be allowed to develop to any great extent the lawn would soon be overrun with it. Sprinkling "lawn sand" occasionally

(Photo: H. A. Smith.)

MOUSE-EAR CHICKWEED (CERASTIUM VULGATUM).

An annual weed, which often grows freely among the grass on lawns, etc.

over the infested areas is the best remedy for checking its growth.

Bird's Foot Trefoil (Lotus corniculatus).—A rather attractive weed, belonging to the Pea order, and bearing yellow and red-tinted flowers. It has small pinnate leaves

and a long, tap-like root. Grows chiefly in rather dry and poor soils.

Best eradicated by cutting off the plant just beneath the surface of the soil, and dropping a pinch of salt or a few drops of acid on the root stump.

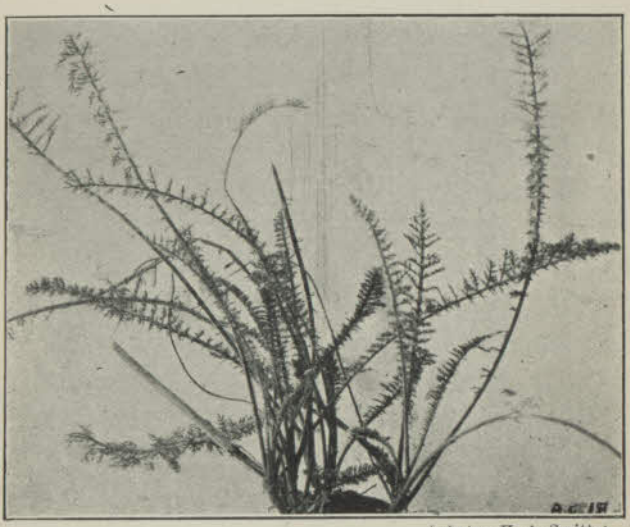
Clover (Trifolium).—Opinions differ as to whether the presence of clover in a lawn or bowling green is harmful or not. On dry and thin soils, where grass naturally does not do well, clover is then undoubtedly valuable, as, owing to its compact foliage, it furnishes a dense green carpeting of verdure. In cases, however, where grass naturally succeeds well the presence of clover is not so desirable, as it overcrowds and weakens the growth of the former. Personally, we have no objection to a moderate amount of clover in a lawn, because it adds to the density of the turf, and to its freshness. The species that are most commonly found growing in lawns are the White Dutch Clover (Trifolium repens), a perennial kind with fairly large leaflets marked with a dark horseshoe-shaped tint in the centre, and furnished with creeping stems, which root at every joint. Owing to the latter characteristic, and to its rather vigorous growth, it soon spreads and smothers the grass. Another species fairly common is the Lesser Clover (T. minus). This has small leaves and slender shoots, which creep along very close to the ground. It seeds very freely, and quickly spreads over a large area.

If clovers are not desired in a lawn the best plan is to give liberal dressings of finely-sifted, decayed manure in autumn, and sulphate of ammonia or nitrate of soda in spring, at the rate of half-an-ounce per square yard. These manures will encourage free growth of the grasses, and diminish that of the clovers.

Yarrow, or Milfoil (Achillea millefolium).—Here, again, we have a plant which it is desirable to encourage to grow on poor soils, where grasses are liable to die in hot summers. Its dense creeping habit of growth, and its ability to maintain a fresh green appearance throughout the summer, entitle it to consideration in the case of the soils referred to. Where, however, grass thrives really well it is not desirable to encourage its growth. The leaves are very

finely divided and fern-like, and the foliage forms a dense carpeting on the surface. It is perennial in habit.

Where not desired as lawn herbage, the plants must be spudded out, or frequently sprinkled with "lawn sand." It should be noted, however, that the roots and stems are very tough and wiry, and by no means easy to eradicate.



(Photo: H. A. Smith.)

YARROW OR MILFOIL (ACHILLEA MILLEFOLIUM).

A perennial, occasionally as a substitute for grass on poor soils, but otherwise a troublesome weed on lawns.

Fairy Ring Fungus (Marasimus oreades).—Occasionally fungi may be seen growing in rings on a lawn. The particular fungus which forms the ring is the Fairy-ring Champignon (Marasimus oreades). It is a drab-coloured fungus, which French epicures gather dry and store for culinary purposes. The fungus lives on the roots of grasses, and increases itself by means of mycelium or thread-like bodies, which creep along just beneath the surface of the soil. The fungus practically kills the ring of grass upon which it has subsisted, thus forming a brown ring in autumn.

The mycelium then creeps further outwards, and produces another ring of fungi the next season. The ring of dead grass and fungi in due course decomposes and enriches the soil, whereupon the adjoining grass spreads over the brown ring the following season and produces a crop of luxuriant dark-hued grass, which forms a distinctive ring of rich verdure.

To get rid of the fungi dissolve 1lb. of sulphate of iron in two gallons of water, and well moisten the turf to a width of 2ft. to 3ft. from the dark ring of grass. This will destroy the mycelium and do no harm to the grass.

Thistle (Carduus).—Thistles sometimes make their appearance in lawns, the most common species being the Creeping Thistle (C. arvensis), a perennial with a creeping root stock; and the Dwarf Thistle (C. acaulis), also a perennial, of very dwarf stature and without a flower stem. The latter is met with chiefly in the South of England.

Thistles are easily spudded out with a weed extractor, or may be eradicated by similar methods to those advised for the dandelion.

Pearlwort (Spergula or Sagina filifera).—A dwarf evergreen weed with fine, narrow leaves and creeping stems, belonging to the Pink family. Grows chiefly on poor, light soils. Formerly used as a substitute for grass on dryish soils.

May be eradicated by annually top-dressing the turf, so as to encourage free growth of the grass, and thus choking the weeds.

Common Pearlwort (Sagina procumbens).—A very dwarf annual weed, with small leaves, growing in a dense carpet, mainly on poor sandy soils.

Where the turf is properly manured and top-dressed this weed will not thrive to do any harm.

Shepherd's Purse (Capsella Bursa-pastoris).—An annual weed, with a long, tapering root and pinnate leaves. Rarely troublesome except in the case of newly-sown lawns, when pulling out the plants by hand is the best remedy.

Hawkweed (Hieracium Pilosella).—A perennial weed with a stout root stock, oblong, having leaves and creeping shoots. Infests lawns on poor and dry soils chiefly.

Spudding out the main root stock, and sprinkling with "lawn sand" are the best remedies.

Knot-grass (Polygonum aviculare).—An annual weed with wiry, prostrate shoots. It spreads very rapidly and chokes the grass, especially newly-sown grass.

Pulling or spudding out the weeds by hand is the best way of getting rid of them.

(Photo: H. A. Smith.)

PEARLWORT (SPERGULA OR SAGINA FILIFERA).

A weed often found in turf on sandy, dryish soils. Formerly grown as a substitute for grass on dry soils.

Moss.—This grows chiefly on very dry and poor or very moist soils. In either case it does an immense amount of harm to the grasses, starving or choking them, and rendering the turf poor and barren-looking.

The remedy in the first case is to enrich the soil, and in the second to provide efficient drainage. In both cases, however, the moss should be eradicated by well scarifying the surface with an iron-toothed rake to detach the moss,

after which it should be raked off. The lawn should then be top-dressed with a rich compost of good soil, decayed manure, and wood ashes. Use two parts of soil and one part each of the other ingredients; then pass these through a fine screen, and apply at the rate of one cartload to every forty square rods. If the soil be of a dry nature add 7lb. of bone-meal to each square rod. If moist, use a similar amount of basic slag. Well rake this, then give a good rolling. In spring apply ½lb. of nitrate of soda to each square rod in the case of dry soils, and a similar quantity of sulphate of ammonia in that of a moist one. Repeat these dressings every three years. Where the grass is very thin sow a mixture of grass and clover seeds in March. October or November are suitable months to apply the top-dressings.

Part III.—GREENS, Etc.

CHAPTER I.

TENNIS AND CROQUET LAWNS.

These require to be formed with the same care and preparation as an ordinary good lawn; indeed, on level lawns, where a clear space of a trifle over 78ft. by 36ft. obtains, tennis may be played just as easily as on a specially-prepared site. But there are occasions when it is necessary to form a court elsewhere, in a field or on an uneven lawn, and here, therefore, it becomes needful to properly prepare the site.

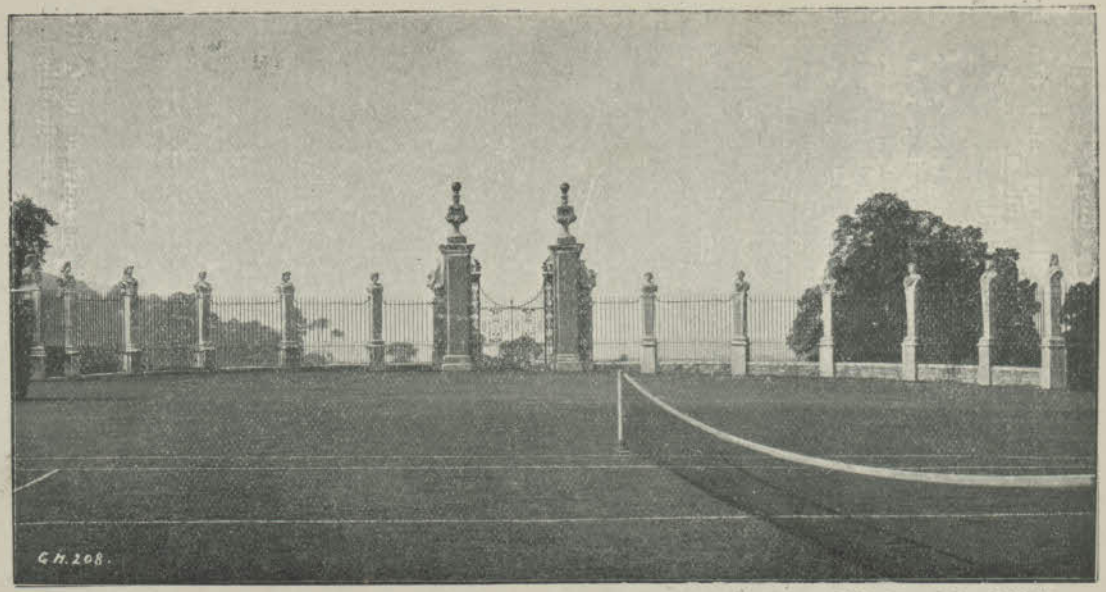
Size of a Tennis Court.—The regulation dimensions of a full-sized lawn tennis court are 78ft. by 36ft. Experts, however, recommend that additional space should be provided at the ends and sides, to allow ample room for moving about. Thus it is suggested the total area should be 120ft. to 135ft. in length, and 60ft. to 75ft. in width. Where space is limited, 120ft. by 36ft. will suffice.

Drainage.—The site must, of course, be well drained either naturally or artificially, as advised in the chapter on "Drainage." A water-logged or damp soil is not only uncomfortable to play upon, but also prevents the development of a good, sound, fibry turf. Low-lying, damp situations should, therefore, be avoided. So, too, should those

overhung or much shaded by trees, as grass fit to stand hard wear and tear will not thrive healthily for long in such positions. In positions where it is difficult to drain the site with pipes, and the subsoil is very wet, the upper foot of soil should be taken off and placed on one side. Another foot of subsoil should then be taken out and this carted right away. In its place a foot of stones, brickbats, or clinkers should be placed, and on this be put the foot of surface soil, treading or rolling it down firmly. By adopting this method a dry, firm foundation for turf or seeds will be obtained. Of course, this is an expensive plan, but it is the only satisfactory one where a site is very damp, and it cannot be properly drained by means of pipes.

Forming the Court.—If the court has to be formed on sloping or uneven ground, levels should be taken as advised in the chapter on "Levelling." This done, the next step is to remove the top spit of soil and place this on one side. The subsoil should be excavated to the necessary level, that removed from the highest part being placed in the lowest and well rammed down to make a firm foundation. The subsoil not made up should then be broken up, at least a foot in depth, to render it porous, and the top soil previously removed be replaced on the foundation, adding some well-rotted manure and mixing this well with the former. The levels should again be carefully taken, and the surface adjusted accordingly. If the soil be not particularly good add an inch or so of fine, good soil on top. Now roll the surface down and across to make it evenly firm; rake over, and again test the levels. When the surface is made quite firm and as level as a billiard table it will be ready for turfing or sowing, as advised in the chapters dealing with those subjects.

Some people have a fancy for forming a tennis lawn in a sunk panel. In this case the mode of procedure is the same as advised for a bowling green if the site be a damp one; if dry and well drained, then no drainage or outside channel is required. The top spit has first to be removed, then the second spit of subsoil carted away, and the top soil replaced. We particularly caution readers about to form tennis courts on slopes or in sunk panels against cart-



(Photo: Lindon Hat & Son, Bristol.)

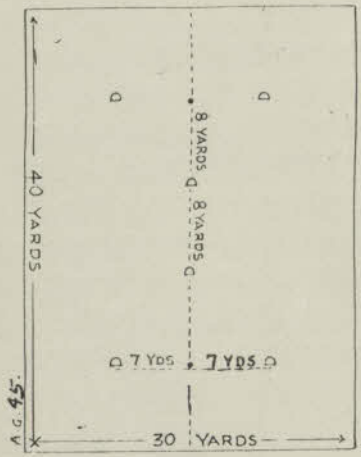
A Tennis Lawn.

A full-sized tennis lawn, allowing ample room for play.

ing the top and naturally good soil away, and then laying turf or sowing seeds on the bare subsoil. A good turf can never be ensured under such conditions.

General Management.—The advice given elsewhere as to manuring, top-dressing, mowing, rolling, renovating, and watering a lawn applies with equal force to a tennis lawn. The dressings recommended for a bowling green at the close of the season might, indeed, be applied with beneficial effects to a tennis lawn. In a word, the proper treatment for a good lawn is applicable in every way to the present case.

Croquet Lawns.—Croquet may be played on any level piece of lawn that will afford a space of 35 yards in length and 28 yards in width. If a special site be desired,

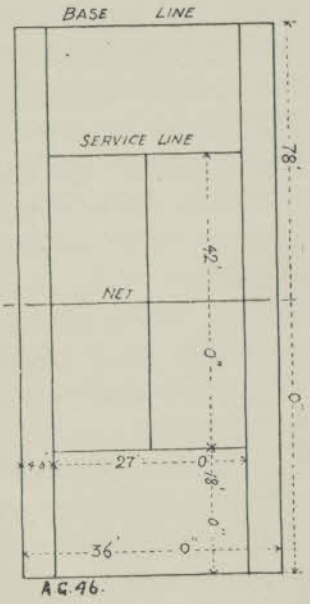


PLAN OF CROQUET GROUND.

sunk or otherwise, then prepare it as advised for a tennis court, and treat its after-management as described for lawns generally.

Special Points.—In making and maintaining a tennis or croquet lawn the following important points should be carefully observed.

1. The surface must be uniformly level, firm, and dry.
2. Lawns laid down with turf in September should not be played upon until well into June; and those laid down



PLAN OF TENNIS COURT.

in March not till August, or, better still, the following year. It is better to give the turf a good opportunity of becoming thoroughly "knitted," or united to the soil, before treading much upon it.

3. Lawns formed by sowing seed should certainly not be used for playing upon the first year after sowing. The traffic bruises the tender grasses, and causes them to die in winter,

leaving the surface patchy. Far better wait a year to enable a strong turf to form; then the latter will wear satisfactorily and gradually improve as years go on.

4. Do not overlook the importance of watering in dry weather, and doing this in accordance with the advice given in Chapter III., p. 49.

5. No weeds must be permitted to grow.

6. See that the surface is top-dressed every autumn, as advised in Chapter V., p. 55. This point is an essential one to ensure good, healthy turf.

7. On no account lay down turf of a weedy or coarse nature. Grass seeds, as the Crested Dog's-Tail, Sheep's Fescue, and the Wood Meadow Grass, will produce a much better, finer, and firmer turf in a year or so than can be obtained from bad turf.

8. Roll frequently in moist weather, first sweeping over the surface with a birch broom to distribute worm casts.

9. Never permit a horse or pony to draw a mowing machine on a tennis court, unless its feet are shod with special leather boots; nor men using a machine to dig the toes of their boots into the turf. If sufficient strength be put to draw a machine there is no necessity for the latter to be done.

10. Two bushels of seeds will sow a full-sized court, 120ft. by 60ft.; and one bushel an ordinary-sized court of 78ft. by 36ft. The cost for seeds in the first case would be £3, and in the second 30s.

11. A tennis court should always be made to run due north and south, not east and west. The reason is obvious: the setting sun would, in the latter case, be shining direct in the face of the players facing the west.

CHAPTER II.

BOWLING GREENS.

Although a good deal of the information given in regard to lawns generally applies equally to bowling greens, there are, notwithstanding, many points on which more detailed and precise facts are required.

Forms of Bowling Greens.—There are two distinct styles of greens in use in this country. In the Northern and Midland parts of the kingdom the "Crown Green" is the favourite type. This consists of an area of turf with an even, all-round fall or slope of 18in. from the centre. In other words, the centre or crown is about 18in. higher than the extreme edges of the green, the exact height being governed by the area of the green. The style of green in favour in the South—and, indeed, everywhere where the ancient game is pursued as a popular pastime rather than as an object of sport—is the "Flat Green," and this is the only kind we shall concern ourselves about in this work. The green in this case should be a perfectly level one—a dead level one, in fact.

Size of Bowling Green.—The regulation size for a full-sized bowling green is 40 yards square. Greens of smaller or larger sizes, however, are often used; in fact, any level piece of lawn, or a well-rolled and closely-mown plot in a meadow, may be turned to account for playing a game of bowls. Still, a properly-made green is the ideal spot on which to play bowls.

Site for a Bowling Green.—The ideal site is one naturally well drained, and in a sheltered position free from draughts or cold winds. When it is understood that to play the game well the player must discard his coat, it will be seen that he might run the risk of contracting a chill whilst awaiting his turn to play. An ideal green should, therefore, be surrounded by a holly, hornbeam, beech, or yew hedge, or by walls to act as a shelter from cold winds.

Preliminary Steps.—When a bowling green is to be formed on naturally well-drained soil the details of formation are precisely similar to those described elsewhere for a lawn. But in positions at all inclined to be damp, a special method of formation must be adopted. In this case it is usual to form the green as follows: Mark out the area of the proposed green, dig out the top spit of surface soil and wheel this away to a heap outside the boundary. Next mark off a further 2ft. of soil beyond the boundary of the green proper, and take off this portion of soil in such a manner that the sides slope to 1ft. at the bottom of the bed of the green. Next remove 1ft. of the subsoil from the bed of the green, and discard this altogether.

Drainage.—If the subsoil be not damp, nor any springs of water be present in the neighbourhood, this will only need to be broken up to the depth of a foot, by means of a fork, to render it porous. If, however, it be very damp it will be advisable to put in drains diagonally across the bed, as shown in diagram, Fig. , Chapter II., Part I., arranging these 10ft. apart, and leading them into a side and end main drain having a gentle fall to an outlet drain. Place the diagonal drains a foot below the excavated bed. The diagonal drains should consist of 2½in., the main side and end drains of 3in., and the outlet drain of 6in. pipes. Allow a fall of 6in. from the top to the outlet drain. For the side and end main drains dig out a trench 1ft. wide and deep; in fact, such a trench should be dug out all the way round. This trench should be left open, and have sufficient large stones or brickbats filled in to within a few inches of the finished surface of the green. This plan ensures an efficient drainage. In any case, if drains be not laid down there should be a trench 1ft. wide and deep all round the boundary of the green, and a 3in. tile drain laid on the bottom to carry away water from the green. Cover the drain with stones or brickbats, and finish off at top with a neat iron grating if the appearance of the stones be objected to.

Another method of draining a bowling green is as follows: Remove the upper foot of good soil, and place this on one side. Next take out another foot of soil and dis-

BOWLING GREEN AT TORQUAY.

The green in this case was formed out of a portion of a meadow, and is of full size.

pense with this. In place of the latter put a foot of clinkers, stones, or brickbats, and finish off the surface with a layer of finer material. If around this foundation there be also the trench previously described, the water will drain into it, and leave the green fairly dry on the surface. If the green is to be a sunk one, put in 6in. of stones only, and 6in. of soil on top; if to be level with the ordinary surface then add a foot of stones as above advised, and a foot of soil on this. Some authorities lay pipe drains on the foundation, and put the stones, etc., on top.

The Bed or Foundation.—The next step is to replace the top soil first removed on the forked up or drained bed. Of course, if this top soil be clay or sand it would be useless to replace it; but if good, rich loam or fairly good soil, then use it, mixing a fair proportion of rotten manure with it as the work proceeds. We ought to have said that accurate levels should be taken before replacing the top soil, and the subsoil made level, so that the upper foot of good soil is of even thickness. Spread the new soil on in thin, even layers, and tread firmly and evenly as the work proceeds. When the foot of soil has been replaced, again test the levels and see that the surface agrees accurately with the ascertained levels. The surface should be well raked over, and made as fine and as even as a billiard table. Too much care cannot be exercised in seeing that the soil is uniformly firm, so as to avoid the possibility of depressions occurring. If a roller can be used, so much the better.

Turfing and Seeding.—If really good turf can be procured, by all means use it, and lay it as advised in Chapter III., Part I. If not, then have recourse to seeds, sowing these as advised in Chapter VI., Part I. In the latter case the green should not be used the first year. Far better to wait a year and then have a really good, sound turf which will bear traffic, than cripple the growth of the grasses the first season. Seeds will yield a far more satisfactory turf in the end than old turves.

Top-dressing.—An annual top-dressing of fine charcoal at the rate of 3cwt.; bone-meal, 1cwt.; or basic slag, 1cwt., if the soil be moist; with two cartloads of weathered

sea sand, per 40 yards square, will maintain a bowling green in splendid condition. This dressing will impart a robust, healthy tone to the grass if applied at the close of each season. A very slight sprinkling of bone-meal once or twice during the summer on showery days will also be of immense benefit. See also the chapters on "Manures" and "Renovating Lawns," especially the reference to "Hide-bound Turf."

A Remedy for Worms.—Besides the remedies de-

(Photo: H. A Smith.)

BROAD-LEAVED DOCK (RUNNEX OBTUSIFOLIUS).
A perennial weed, occasionally infesting lawns, greens, etc.

scribed elsewhere, it is also the practice to guard against the intrusion of these creatures in a bowling green by mixing one-third of gas-lime with two-thirds of sifted coal ashes, and placing a 6in. layer of this material immediately under the turf. Worms will not venture through this. Greens so treated, however, require a good deal of artificial feeding, as the roots of the grasses cannot obtain so much

support from the soil below. Besides, we doubt if the plan would answer in dry districts.

Cost of Forming a Green.—The cost of forming a bowling green varies considerably, according to the methods adopted. To turf a green of 40 yards square, about 4,920 turves would be required. If these could be purchased at 10s. per 100 the cost would be, roughly, nearly £25. Add to this another £5 for laying and £50 for preparing the site, the total works out at £80. Where special drainage has to be provided, much soil excavated, and new soil obtained, the cost of these features alone may be fully £100 or £130 in all. Some greens, indeed, have been known to cost upwards of £250. If seed be used in place of turf, a considerable saving may be effected, as the cost for four bushels of seeds would only be £6, and the labour for sowing another 10s., or £6 10s. in all, as compared with £30 for turf. Unless exceptionally good turf could be obtained we should certainly advise grass seeds to be sown early in September, to provide turf to be occasionally played on the following summer; or in March, to be played on the following year.

Management.—The management of a bowling green as regards mowing, weeding, feeding, watering, and rolling is practically identical with that described in various chapters on those subjects in Part I., and it would be mere repetition to again reiterate them here. Suffice it to say that too much stress cannot be laid upon the importance of the advice given therein in the case of a bowling green. Especially must a green which has had much usage during the summer be enriched every autumn, as well as kept quite free from weeds. Once allow weeds to get the upper hand, and the evenness of the turf will be spoiled.

CHAPTER III.

CRICKET GROUNDS.

While all athletes and lovers of games acknowledge that there is nothing to equal cricket, it must be admitted that much of the present-day lack of enthusiasm for this game is not due to a depreciation of the game itself, but is rather to be attributed to the great difficulty to be experienced in securing ground whereon the batsman or bowler may reap the full advantage of his skill. No other game offers less margin for mistakes; many a good wicket is lost or secured, as the case may be, through some slight undulation of the ground, which has been the means of diverting the ball from its original course, thereby causing it to twist or break on to the wicket at a most unaccountable angle, much to the surprise of both bowler and batsman. Not only is a slight knot or undulation in the ground capable of performing these great feats, but a ball pitching on to a well-expanding plantain is equally uncertain of results.

While there are many enthusiasts who do not excel at either batting or bowling, they nevertheless enjoy the exercise afforded by fielding; but here, again, their power to field a ball correctly is frustrated by the bad condition of the ground; thus it is evident that, if good cricket is to be encouraged, it can only be done by giving better attention to the laying down of pitches, and the proper manipulation of the surrounding ground.

In the case of County Councils, the laying down of turf and its proper management can only be compared with the keeping of a well-appointed tennis lawn, except that the former is carried out on a much larger scale. Although the average cricket club cannot hope to aspire to the ownership of a county ground, there are, nevertheless, many fairly wealthy clubs that can do much to improve their present conditions, or where new ground is acquired, to lay it down on the most approved and up-to-date principles.

Site and Drainage.—In the majority of cases

cricket pitches are situated on permanent pastures, and where such pastures are of a wet and retentive character it will be essential to pay attention to the question of drainage, as in wet summers many excellent pitches or grounds are rendered useless, owing to their waterlogged condition. In selecting a field for cricket, preference is naturally given to one devoid of furrows, and consequently fairly level. This absence of furrows, such as usually exist before and after the field is laid down to grass, provides a natural means of surface drainage. Failing this, some underground system of drainage may become necessary, and if so the lowest side of the field must be ascertained for the purpose of opening a main drain with as natural a fall as possible. Into this primary drain secondary drains should be connected at distances of 10ft. to 15ft. apart, and running parallel to each other from the highest side of the field to the lowest. The number of outlets necessary will depend on the area of the field; also on the configuration of the land. If the field be of moderate size, as in the case of many cricket grounds, one outlet will probably suffice, and if sloping in one direction, as above represented, the outlet may suffice for an area of from twelve to fifteen acres; whether there be one or more drains is a matter to be decided by local conditions, especially as regards rainfall. The sectional strata of the district should also be taken into account, as well as the contour of the surface; also its texture and that of the subsoil.

The conditions affecting the depth and distance of drains are both numerous and varied. Deep drains are longer in commencing to flow, but if placed in porous soils they will carry off surface water even quicker than shallow drains. It can usually be reckoned that the distance between drains on strong clays may equal from four to six times the depth, on heavy loams six to eight times the depth, and on light soils eight to ten times the depth. As to the cost, this is chiefly dependent upon the labour of cutting and filling, cost of material composing the drain, and construction of outlets for discharging the water.

It is outside the purpose of this chapter to go into detail as to the formation and cost of draining, as this subject has already been fully dealt with elsewhere. Deep drains in hard soils cost more in cutting; but in light working soils

(Photo: Valentine and Sons, Ltd.)

CRICKET PITCH AT HARROW SCHOOL.

One of the many examples of a good cricket ground in this country.

3ft. drains will cost considerably less. The fact of drainage lessening the amount of water in the soil will, in consequence, increase the soil temperature to the deterioration of the grosser weeds, such as thistle, crowfoot, docks, and many of the coarser grasses, as cock's-foot and many varieties of Carex.

Grasses and Clovers.—To many who are unfamiliar with country life, all grasses appear more or less alike, but the skilled cultivator knows only too well that, if his pastures are properly cared for as regards the administration of manurial stimulants, the finer grasses and clovers will be encouraged at the expense of the coarser varieties, and this should be the aim of all who are in charge of fields set apart for cricket. In many heavy land pastures a barrenness of grass is often observable after the frosts of winter have cut down the luxuriant herbage of late autumn, and when this is the case the ground can very substantially be improved by sowing a mixture largely composed of Yellow Suckling and Perennial White Clover, together with Crested Dog's-tail, Perennial Rye Grass, Smooth-stalked Meadow Grass, and Festucas ovina tenuifolia, F. duriuscula, and F. rubra. It can generally be assumed that the presence of moss on a pasture indicates poverty, excess of moisture, and insufficient air and sunshine; and, if land containing an abundance of moss can be fed to well-fed stock, this will be preferable to mowing, as the close feeding by stock is considerably injurious to the welfare of weeds, while it is in no way detrimental to the vitality of the various grasses. A cricket pitch containing much moss is consequently slow of play, and the bowler's skill is considerably hampered as compared with a fast wicket, where the pitch is composed of a short-clipped sward resting on a firm and moist soil.

Levelling the Ground.—While it is by no means essential that a cricket field should be entirely level, the pitch or bowling area should be as nearly level as is possible, and, whatever its area, it must gradually divert into the same plane as the surrounding ground. The majority of clubs, although not financially strong enough to level a large area, should attempt as much in this direction as their

means will allow. If the area or plot selected for the formation of the pitch be possessed of turf of good quality, this should be stripped off to a uniform size and thickness, usually 1 yard long by 1ft., and 1½in. thick; if cut at random and of varying lengths and depths it can no longer be employed for relaying. Should the original turf contain a large percentage of daisies, dandelions, plantains, crowfoot, and other coarse weeds it will be useless for the formation of a good cricket pitch, but there should be little difficulty in procuring good turf at a reasonable cost from a distance. Having

(Photo: H. A. Smith.)

SPEAR THISTLE (CARDUUS LANCEOLATUS).

This and other species of thistles sometimes infest the turf of lawns and greens.

stripped the turf, and placed it in orderly piles around the edge of the allotted area, the work of levelling can proceed, either by the aid of a dumpy level, or, if such an instrument is not at hand, an ordinary spirit level with a long straight edge answers equally well.

Turfing the Pitch.—In the event of the ground being undrained and low-lying, the pitch should be raised as well

as circumstances admit, and, after the final work of levelling is completed, a liberal coating of ashes or chalk will tend to keep the pitch dry, and check the more luxuriant grasses and plants; it will also prevent the subsoil cracking during sudden droughts, although on a well-managed ground no such contraction of soil will take place, as it can be arrested by systematic waterings. Turves from chalk downs are the best to procure for all purposes of lawn formation, as, containing an abundance of fibrous roots, they readily establish a firm hold on new ground; whereas turves from heavy, retentive soils frequently sicken after removal, or, if the under-soil is of a fertile nature, the grasses are forced into top-growth, thus leaving a naked sward similar in every way to the one whereon it was advised to seed with a mixture of grasses and clover. Another point in favour of down turf is that it can be handled without fear of breaking, and does not suffer decay so readily from being rolled up.

Rolling.—When laid, the next operation is to brush the turves over with finely-sifted soil in order to fill up all the interstices; after which use the turf-beater as a means of knitting the whole surface together, and reducing any projections to a uniform level. The sooner all such ground work is performed before winter the better, as root action is immediately active while the ground is yet warm, and before the arrival of the winter rains the whole surface will have become well rooted. No rolling should be given until spring, when at intervals a heavy roller can be carefully drawn over the pitch, avoiding such practices when the ground is heavily charged with moisture, the degree and extent of consolidation largely depending on these conditions. Should the work of laying a pitch be prolonged until the end of March, it will not be advisable to play on it for that season, as the turf will not have grown sufficiently well together, and will, therefore, be apt to lift. The same treatment as to rolling must, however, be given, and when the grass has reached a height of from 3in. to 4in. it should be carefully mown with a scythe; after which a machine may be used to keep it at the required length, which should not be that of a closely-cropped playing pitch. If grass of a newly-laid pitch is too severely cropped for the first season

much damage results from scorching, which evil effect is increased by the roots not yet having penetrated sufficiently deep into the subsoil.

Watering the Turf.—A good water supply is an essential adjunct to all cricket grounds, and without its aid no pitch can ever be expected to attain a fit and safe condition for play throughout the drier months of the year. There is no need for continuous watering, as one good soaking twenty-four hours before a match is ample to secure the desired result, followed just previous to the match by judicious rolling, the nature and extent of which experience alone can teach.

Manures.—The manuring of cricket grounds is a subject upon which many club managers and groundsmen are ignorant. This cannot be attributed, however, to their having ignored the importance of manuring, but is rather because they have gone astray by adopting the several systems of applying artificial manures to cricket grounds as if they were cultivating the grasses and other herbs from a purely agricultural standpoint; whereas, in reality, this is furthest from their wishes. Not only are manures containing nitrogen expensive to purchase, but their use on recreation grounds is fraught with injury to the grasses it is desired to retain. Phosphatic manures, while being highly beneficial, are rarely required to the extent that their use would demand were the ground grazed to cattle; they should only be used in moderation, while for correcting coarseness and luxuriousness of herbage in general much useful results will follow the judicious application of potash salts in the form of kainit.

In conclusion, it may be remarked that during winter no fast game like hockey or football must be allowed on properly-maintained cricket grounds or pitches, as, if so, considerable expense and trouble will be encountered before the surface can be restored to its former condition.

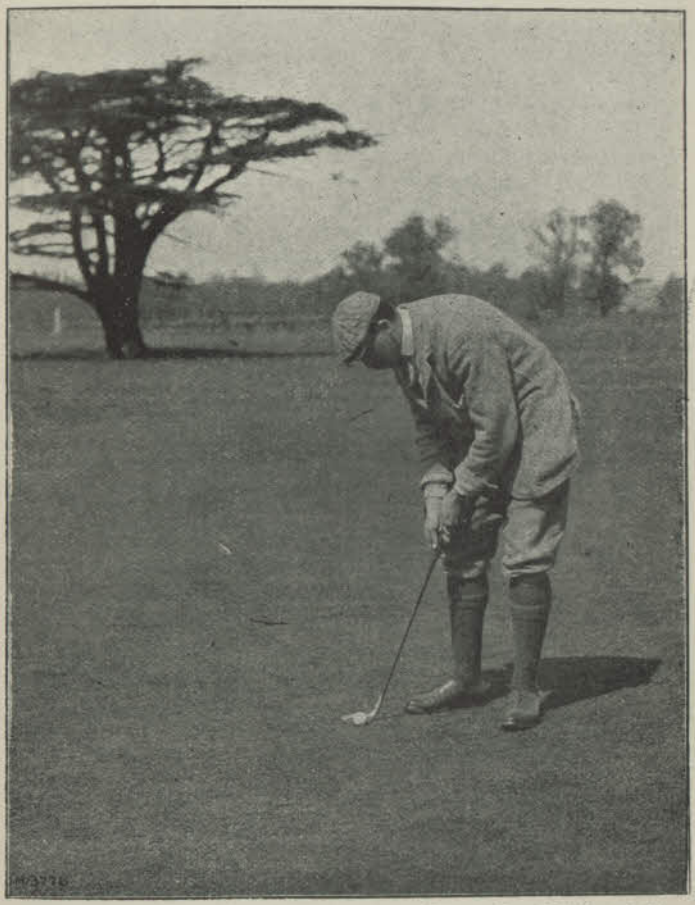
CHAPTER IV.

GOLF GREENS.

The universal popularity of golf has brought into existence numerous courses or links wherever a sufficient number of enthusiasts can be mustered who are prepared to defray the necessary expenses of renting and laying out the ground in an approved and up-to-date manner. While many sites are naturally adapted for the formation of golf courses, such as downs, commons, or moorlands, and the sandhills to be encountered along our sea coasts, there are other districts in which the selection is confined to ordinary grazing land, which in many cases is entirely free from undulations.

Principal Features of a Golf Course.—While there are recognised theories or laws in the planning of a course, much is left to the designer, who, like the landscape gardener, must make the most of the materials at his disposal. The principal features of a well-arranged course include eighteen holes, whilst the intervening ground varies as much as possible in general character, thereby influencing the conditions under which the various shots are made. To still further increase these natural difficulties, artificially-constructed obstacles are to be encountered, in the form of bunkers, etc.; further, the putting greens must be guarded, and their area modified in accordance with the distance from the teeing green to the hole. When circumstances admit of a long shot being played on to the green, the latter must then be of liberal dimensions, in order to compensate the player for his skill.

Obstacles, or Bunkers.—The placing of obstacles or bunkers demands careful consideration, the object being to make it compulsory for the player to drive his ball to a set distance from the tee; should he fail to accomplish this feat, the second shot is, in consequence, rendered more difficult than if the obstacle had been cleared by the first shot. On well-designed courses the player has the choice of two



(Photo : Campbell-Gray, Ltd.)

GOLF : THE PUTTING GREEN.

An excellent piece of turf, well laid and properly managed.

methods of reaching the hole—namely, an easy and a difficult one. Should he select the latter, and successfully accomplish his task, he is then rewarded by an extra point.

Teeing Grounds.—Where space admits provision is made for alternative tees on many courses, thus affording a means of adaptation to varying winds and suitability of weather; also as regards the wet or dry condition of the ground. If the area of ground at disposal does not admit of these advantages it then remains to make the most of existing conditions; and, consequently, the planning must be done to suit the prevailing winds of the district, this being particularly essential on laying out courses situated in close proximity to the sea.

Holes.—In determining the first hole, it should be as open as possible from the tee, with, perhaps, the exception of a small bunker towards one side and a pot bunker on the opposite side fairly close to the green. The beginner, when making his shot towards the first hole, is frequently subjected to close observation from others who are either waiting their turn to play or who are merely spectators; thus a beginner of a nervous temperament cannot possibly put in his best work; consequently his stroke is faulty, the result being that a greater length of time is occupied in getting clear away. This difficulty of ensuring a fair start can be still further minimised by having several alternative tees, and on all courses it is noticed that the first tee is considerably more worn than the rest. Three hundred and fifty yards may be allowed for the first hole, the second being increased to 380 yards, thus demanding two good shots. The third green should be well guarded, the hole being of similar length to the second, and, as in the two previous holes, alternative tees should be provided to allow for variation in wind; these must not, however, be placed one in advance of the other. The fourth can be placed at 200 yards, or of a sufficient length to test a good, full drive. If 320 yards are allowed for the fifth hole, good iron-play will be demanded, and a skilful approach on to the green, whereas 480 to 500 yards for the sixth hole will prove an equally good test for wooden clubs; a short seventh hole of 120 yards will

call for accuracy and delicacy of play, and for preference this green should be pear-shaped, with a width of 24 yards, gradually narrowing towards the entrance; no bunker need be placed as a means of obstruction, but the fairway should be rough to within twelve yards or so from the green, in order to prevent a fluky shot running towards the hole. A number of pot-bunkers might also be placed in close proximity to the green towards either side, leaving an entrance to the green of not more than about 12 yards in width. The eighth and ninth holes may each vary from 400 to 430 yards, thus affording first-class wooden club play of two shots each; whereas, if the tenth hole is 530 yards, it will be within two shots, and will prove a difficult hole to negotiate

(Photo: H. A. Smith.)

CREEPING CROWFOOT (RANUNCULUS REPENS).
A very troublesome lawn weed.

with the second shot. For the eleventh hole a length of 410 yards will prove another good two-shot test; while at the twelfth hole another short range of 130 yards may be introduced, thereby proving a difficult "mashie," or iron, shot; the entrance to this hole could be constructed on similar lines to the seventh hole, or, by way of variation, a cross-sunk

bunker might occupy a position at 15 yards in front of the green. The thirteenth hole may be equal in length to the first, but should contain more bunkers, thus minimising the possibility of getting on to the green in two clear shots. The fourteenth may be reckoned as the long hole in, and would therefore need to equal the sixth hole in length, bunkers being placed near to the green. A short hole of 180 yards, demanding a good, straight "cleek" shot, could be introduced as the fifteenth, while the sixteenth might be given the same length as the third, but with considerably more difficulties to encounter. At the seventeenth another two-shot test could be introduced, and at the last, or eighteenth, hole an equally difficult finish of, say, 400 yards might suffice.

Formation of Teeing Ground.—While any recognised patch of ground may suffice for the formation of teeing grounds, the question of proper construction is just as important as in the case of putting greens. Large teeing grounds should be encouraged on heavy land, and when three in number they should assume the form of a triangle, with the base at right angles to the hole. The position and number of the respective tees will be regulated according to the length of drive necessary to clear the first bunker. In the longest of the short holes an additional tee placed in advance of another is useful, as, if restricted to one tee with an adverse wind to encounter, the player would doubtless find great difficulty in playing a stroke long enough to reach the green; whereas, if he drives from an advanced tee, this difficulty is greatly minimised. Where the teeing ground does not admit of a firm foothold it is quite impossible to make a good drive; therefore, anything in the nature of a greasy or clayey turf must be avoided, and, as a remedy, artificially-constructed tees may become necessary. Should the soil be naturally heavy and retentive to moisture, the ground must be raised above the ordinary level, thus affording drainage, and thereby favouring the growth of the finer grasses; chalk or even ashes laid under loamy turf produce a somewhat similar effect. While strong-growing grasses, such as cock's-foot, stand a considerable amount of wear, they are never so even to the tread and do not last so long as the more wiry grasses, such as the fescues, of which the

various mixtures recommended for putting greens and teeing grounds are composed.

A teeing ground need not necessarily be level; the lie or slope should, however, correspond to the surrounding ground, particularly in the direction of the hole, and if a portion of the tee has an upward slant it may still better meet with the approval of some players who desire that particular "stance."

Formation of Putting Greens.—It is obvious that the successful planning of a golf course is largely dependent on well-constructed putting greens, the proper placement of the bunkers and other obstacles to be encountered by the player. Putting greens are of various forms and sizes, and contain different degrees of undulation. When a green is expected to be reached by a long drive it must be fairly large, but the size must be considerably smaller when an iron shot is required to pitch the ball on to the green; similarly, when the entrance to a green is guarded by a long bunker it should be fairly large, and longitudinal in shape and line of play, so that the ball may remain on the green even when urged onwards by a strong wind. While a green may be undulating, its surface is not necessarily rough; needless to say, anything in the nature of worm casts, prominent weeds, and other obstructions likely to divert the ball from its course, must be kept under control. Where the natural turf of a meadow has been badly grazed, and inattention has been paid to the manuring of its grasses, much trouble will be experienced for a number of years as regards the good qualities of a putting green; and where the original turf contains an excessive amount of daisies, dandelions, plantains, or even moss, it may become advisable to strip the surface and returf with good down turf or turf of a superior quality, according to local facilities. In the ordinary construction of golf courses the sowing of grass seeds cannot very well be recommended, as birds, moles, and many other destructive agencies render the work unsuccessful; and, if the ground is subjected to much wear before the seedling grasses have become well established, they are soon completely destroyed.

It is by no means essential that all putting greens should

be flat, as this would entail a lack of variety, no great judgment being required in putting except in the case of an occasional long shot. It is for the latter test that several fairly large flat greens are recommended as terminations to very long holes, this being regarded as a consideration for the difficulties the player has previously experienced. Also, if mistakes have been made, he is enabled to recover himself by a successful long putt; on the other hand, if the ball has been placed on the green by successive good drives, he may still further excel in holing-out with one long putt. For similar reasons, saucer-shaped greens are to be recommended in connection with long holes, the ball being thereby drawn towards the hole, thus giving the player the advantage of a long, well-directed shot into the green.

It cannot be denied that on greens containing many undulations, or waves, a large element of luck attaches to putting; yet their inclusion gives variety of play. Another useful form of green is that containing a crown on one side, but not situated too near to the hole; the player can then loft his ball so that it pitches between the crown and the hole. Should he be unfortunate enough to lie on the upper side, with the crown between the ball and the hole, he is left no easy task to contend with. A different variety of green is that which takes the form of a plateau, and is difficult to approach; it should be large, and admit of a running-up shot.

Formation of Bunkers.—The object of bunkers is to catch weak or otherwise defective shots, and, where possible, the surrounding ground should slope gradually towards their cavity, in order to draw a running ball that might otherwise become stationary near to the margin, thereby affording the player an average lie, instead of his being penalised by the loss of a stroke. A good position for the bunker is to the left of the fairway, so as to catch a pulled ball, and when so placed it should not be at right angles to the line of play, but at right angles to what is considered the course taken by a ball badly pulled; consequently, the right-hand corner of the bunker is nearest the fairway, and it is evident that the ball cannot readily escape

being trapped when the bunker is so placed; further, the bunker should be double crescent-shaped.

Bunkers of similar form and construction, but assuming opposite directions, may be placed on the other side of the fairway, as a means of trapping sliced balls; while pot bunkers are placed nearer the centre of the fairway in order that the player should use judgment in placing his shots. A bunker must not be constructed with the object of making it next to impossible to play the ball out into the open again,

(Photo: H. A. Smith.)

A Sample of Moss-infested Turf.

The grass in this instance has been practically killed by the dense growth of moss.

the penalty of losing one stroke being sufficient punishment for the player. The form of construction must be simple, and the raised bank must not be too high, nor yet assume a too perpendicular rise, otherwise a ball lodged close to the base of the bank cannot be played. A similar difficulty would occur were the entrance to the bunker merely dug out at right angles to the surface, as a slowly-running ball would drop over the edge instead of rolling, and would thereby occupy an impossible position to play from.

When introducing pot bunkers, they should be placed so as to trap both pulled and sliced shots, and, where a good drive has been made from the tee, similar traps must be set for pulled or sliced second shots. It will be observed that a pulled ball usually covers more ground than a sliced shot; therefore the bunkers placed to trap the former shot should be situated some distance in advance of the latter. The placing of long cross-bunkers is regulated by the length of the carry; and, while an average player with a fair stroke may only reach the bunker, a good player will endeavour to clear it. There are others who will be tempted to play round the ends of the bunker, but this practice entails the risk of getting into the rough, and, to make this a more or less certainty, the ground round about the ends should draw towards the bunkers. If need be, the bunkers could be extended in length across the fairway; this is not, however, advisable, as they look unsightly, more especially if steps are arranged over the bank instead of a narrow passage cut through the centre of the bunker.

In passing, it should be remembered that this passage should assume the form of a letter S, in order to prevent the ball passing completely through the opening. As an alternative, the opening may be guarded by a central bunker somewhat broader than the passage, and placed several yards in advance of it. For like reasons, a sunk border should be shaped like the figure S, thereby doing away with the use of a plank or straight path. Other useful forms of bunkers are those known as the diagonal and double-diagonal, and, as the name indicates, they are placed diagonally across the ground, whether it be raised, sunken, or merely composed of a line of pots or series of dog-leg holes. The end nearest to the tee should extend fairly close to the edge of the fairway, while the other should reach but a little way beyond the centre of the course; thus it is evident that the player who has confidence in himself goes for the long carry, while the less expert player will try to get over the right-hand side or keep the left of the course. If he takes the former he will probably get into the rough, but should he just escape he will find himself confronted with a bunker in his second shot for the green; or, on the other hand, if the extreme left of the diagonally-placed bunker is taken, his ball will

(By Permission of George Newnes, Ltd.)

A Croquet Lawn.

An ordinary level lawn, with sufficient open space for croquet being played.

probably find a pot, such a trap being essential in this position, as the further extension of the bunker to the left could fill no further useful purpose. A double diagonal is merely the repetition of the single, so as to form an inverted letter V, thus giving the short driver the option of taking a course to the left or to the right. The great advantage of bunkers so placed is to encourage the player to take a central course, when, should be carry the bunkers, his difficulties are minimised to a greater extent than if he plays to either side.

For medium holes bunkers should be placed to trap pulled and sliced balls, the former at 160 yards and the latter at 140 yards; thus estimating a fair drive to average 180 yards, the green should not be so well guarded as in the case of short holes.

In bunkering a long hole of, say, 500 yards, the best plan is to allow an open drive from the tee, with nothing to carry; while with the second shot there should be a carry of 160 yards in order to clear the bunker. It is optional whether a trap should be laid for a pulled shot, but the player should be penalised for slicing by the insertion of a bunker cut a little to the right of the fairway, but falling short of the central bunker; thus we have, as it were, a central bunker cut in halves. A bunker should then be placed at the other side of the lower end of the diagonal, in order to trap a sliced ball that may only have cleared the first bunker. Finally, if two bunkers are placed on either side of the green, these will hamper the players who have failed to make straight shots.

General Remarks.—There is no limit respecting the variety and planning of courses, and it only suffices to say that the designer must think out his plans carefully as to the placing of the bunkers, first making a rough plan of the ground, with the position of naturally-formed hazards, then, by using a convenient scale, he can work out his ideas on paper, carefully noting the respective positions of tees, hazards, putting greens, fairways, rough grass, and all other points of importance.

When it is desired to use a course that is in the process of construction, hurdles can be substituted for earthworks until the latter are completed. While ground work may

proceed at any time of the year, there is no better time for turfing than late autumn, as newly-laid turves readily establish themselves while the soil is still warm, although throughout winter little anxiety need be experienced in this respect. The laying of turves should be avoided in late spring as far as is possible, as March winds are conducive to drought, thus preventing speedy root action. Bunkers formed by the building up of deeply-dug turves are to be placed in a different category, however; and, except on parched, dry ground, such work may proceed at any season, more especially when the subsoil is of a loamy, retentive character. Rolling and mowing of grass are the most expensive items in the upkeep of a good golf course, and each operation must be performed systematically, and not neglected until the work entails considerable difficulty, particularly as regards machine-mowing.

Grass land resting on a clay subsoil is usually too luxurious for ideal golfing during spring and summer, and can never compare with the short, close sward of the upland pastures. Where courses are situated in woodland or low-lying districts, this luxuriance of herbage must be kept eaten down by sheep, and its coarseness would be checked to a great extent by frequent dressings with potash salts, such as kainit, which should be applied in winter or early spring. The building of a suitable club house, and convenient roads leading thereto, practically complete the requirements of the average course.

CHAPTER V.

GRASS PATHS AND STEPS.

A WORD or two must be said in this book about the subject of grass paths, because they have a very intimate association with the lawn. In the days of Queen Anne they were very popular, and some very good examples of this dignified and reposeful feature are still to be met with in gardens formed at that period. In those days—the early part of the eighteenth century—it was the fashion to plant avenues of limes, elms, etc., with a spacious grassy path between. In the last century, however, when the geometrical and more formal style of gardening came into vogue, the grassy path and avenue were superseded by the more showy gravel one, and it was not until the reaction set in a few years ago in favour of the more natural style of gardening that they again came into favour.

Their Appropriate Position.—It is generally admitted that grass paths are seen to the best advantage and are also the most appropriate when formed in a straight line, and flanked on each side by a bold herbaceous border or a fringe of trees and shrubs. Curved grassy paths never look well. There is no finer or more beautiful feature in a garden than a strip of green turf margined by borders of hardy flowers. The green tone of the grass seems to accentuate the beauty and charm of the flowers, and to add dignity and repose to the whole. Then again, grass paths are specially appropriate in rose gardens, where the beds are formed in rectangular rather than curved shape. We have also seen them used to good effect in positions allocated to the culture of fruit and vegetables. In the two latter cases the question of much traffic in attending to cultural details has, of course, to be considered, as much treading or wheeling thereon would naturally soon injure the turf. Such injury may, however, be avoided by laying down planks when much wheeling has to be done. A fruit or a vegetable garden separated by grassy paths has such an infinitely more

A Grass Path.

A grass path, as in above instance, in a very appropriate feature when fringed on each side with borders of hardy flowers.

pleasing look about it than when gravel paths are used that we can certainly strongly recommend the feature to be adopted in the smaller type of gardens, subject, of course, to the precaution of using planks for wheeling thereon.

Width of Paths.—A grass path between flower borders may vary in width from 3ft. to 6ft. or 8ft. Short paths, with narrow borders on each side, should not be wider than 4ft.; indeed, the rule to observe is: the longer the walk and the wider the borders, the fuller should the width of the path be. Long, narrow grass paths have a puny look. Avenues should not be less than 24ft. in width. Paths used for dividing fruit or vegetable plots should be 3ft. to 4ft. wide, and for rose beds 18in. to 2ft.

Formation of Grass Paths.—The details are practically similar to those described for the formation of lawns. One special point, however, must be mentioned here, and that is in reference to the drainage. A grass path must of necessity be fairly dry to enable it to be used with comfort. If, therefore, the site be at all damp it must be drained. This may be done in two ways. One is to open a trench 3ft. deep along the centre of the proposed path, lay 3in. drainpipes in the bottom, and cover these with about 6in. or so of stone, burrs, or brickbats; then replace the soil on top. Another plan would be, if the subsoil is very clayey, to move the upper foot of surface soil to one side, then take out a foot of the clay subsoil and cart this away, putting in its place a foot of broken stone, brickbats, slag, or coarse cinders, and replacing the surface soil on this. The latter plan would make a nice dry path, and a good, firm turfy surface.

Turf v. Seeds.—For grass paths turf is undoubtedly the best. Its advantage over seeds would be its readiness for almost immediate use. If seeds were employed, the surface could not safely be used the first season without jeopardising the growth of the grasses. In any case a narrow strip of turf 1ft. wide should certainly be laid down along the edges of the path to form a firm edging, the central portion then being sown with seeds. For the laying of turf and the sowing of seeds see Part I.

Management of Grass Paths.—The remarks given in the various chapters in Part II. apply equally to grass paths. As they would naturally be used more frequently than the lawn, special attention should be paid to top-dressing every autumn to keep the turf in good heart.

Grass Steps.—Where there is not much traffic grass steps form a pretty feature in the garden. These may occur on the slope of a terrace, leading down to a sunk-panel tennis-court, or where a grass path is continued on higher ground. The foundation for the steps must be firmly made, and the turf be very carefully laid. In such a case sowing seeds is quite out of the question, therefore turves must be used. The best way to lay them is from top to bottom, beating down firmly to fit the angles of the steps. Pegs, too, must be freely used to keep them in a rigid position until they unite to the soil. There should be no traffic on the steps for the first six months at least. The grass will, of course, require to be cut by means of shears.

Part IV.—APPLIANCES.

CHAPTER I.

LAWN MOWERS.

For upwards of seventy years, at least, the mowing machine has played an important part in the maintenance and success of the lawn, the lovely, velvety turf of which has long been one of the chief charms of a well-ordered British garden. Prior to its introduction, our forebears had to rely upon that useful, but nevertheless by no means easy, tool to handle—the scythe. In those days to be able to use and sharpen a scythe successfully was regarded as no mean accomplishment. Moreover, its use meant early rising, in order to cut the grass whilst its blades were succulent and covered with dew, the only period in the day when it was possible to mow evenly and quickly. Mowing by scythe was therefore a laborious and costly business, and only those of ample means could indulge in the luxury of a lawn. When the mowing machine superseded the scythe, and rival manufacturers had succeeded in improving its mechanism and reducing its cost, then the desire for adding the charming feature of a lawn to the garden became more general, with the result that to-day even the smallest garden is not considered perfect without its patch of turf. The mowing machine may, indeed, claim to have accomplished more for the beauty and charm of a garden than any other appliance in existence.

GRASS STEPS. (Photo: H. N. King.)

An exceptionally good example of steps formed of turf.

There is no lack of diversity in form, in size, and in cost among modern mowing machines. They can be obtained to suit the strength of a youth or a lady, the more powerful muscles of a man or two men, or a donkey, pony, or horse, or the superior force of a motor engine; and the range of prices is equally variable, the cheapest being available at a guinea, and the most expensive—the motor type—costing upwards of £150. The cheapest type is mostly of American manufacture, and not so durable or easily repairable as those of British make at a slightly enhanced cost.

Main Features.—The chief features are common to all types of machines; they differ only in slight detail. For example, the most important part of a machine is its cutting apparatus. This consists of a cylinder or barrel of iron, with numerous spirally-arranged steel cutting blades fixed to it. The number of blades varies in various types of machines. The cylinder is thrown into action either by means of an iron roller behind or by side wheels connected by cog-wheels, or by cog-wheels and a flat chain. The other part of the cutting apparatus is the ledger blade, a flat piece of steel with an under bevelled edge, which is fixed to the base of the machine, and in such a position that its edge comes in contact with the cutting blades of the cylinder. When the latter is in action it revolves its cutting blades to meet the ledger blade, and thus cuts off the grass and carries the latter round with it, and throws it forward into the collecting-box in front. Not all machines, however, are provided with a collecting-box, especially those of the very light-running American type. In their case the cut grass is distributed over the turf. Then most of the latter type of machines are provided with one central handle, with a crutch at the end, the object being to make the machines as light and easy to use as possible. The stronger and heavier machines are provided with two iron handles cased with wood at the ends. Those that require two men, a horse, or a motor to run them are also provided with a disconnecting gear to enable the cylinders to be thrown out of action when turning the corners or travelling to or from the actual scene of work. Then, again, the majority of the machines are provided with wooden rollers in front, their

object being to keep the ledger blade at an even distance from the turf, and to facilitate the easy running of the machine. The iron rollers, previously referred to, are single cylinders in the case of smaller, and double in that of larger machines. The object of a double cylinder is to enable the machine to be more easily turned round without damaging the turf. The advantage of an iron roller over side wheels is that it rolls the turf after cutting, besides supplying the power required to revolve the cutting cylinder. Such are the main features of mowing machines in general. We will now proceed to give a brief description of the leading types of machines in the market.

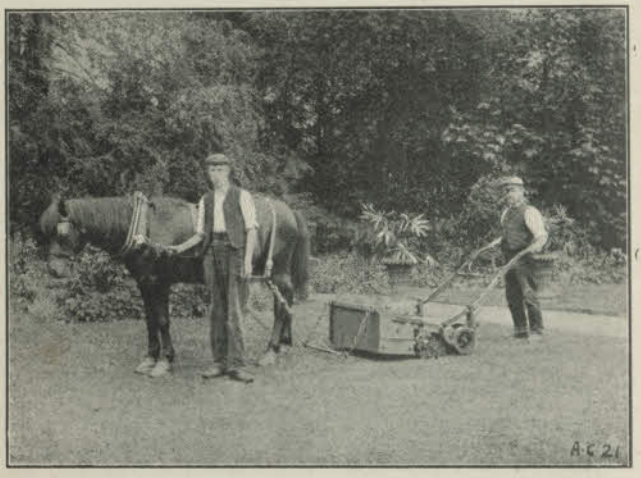
Light Machines.—These are such types of lawn mowers as may be easily worked by a youth, a lady, or a man, varying in width from 6in. to 20in. Such machines are manufactured upon the side-wheel principle, with or without cylinders, and are used for cutting long or short grass. Some are prepared without cylindrical rollers, but have a small wooden roller at the back of the machine. A wooden handle with a crutch at the end is supplied for propelling the mower.

Medium Machines.—Several excellent medium machines are on the market. Some are worked with wheel gear; the gearing of others is controlled by a chain. Being of more substantial make than the lighter type, they are provided with a strong iron roller placed at the back of the cutter; wooden rollers operate in front, working automatically and in harmony with the cutting cylinders. Such machines, although of heavier build, should be light running, practically noiseless in action, and as such would be well suited for service upon tennis and croquet lawns and bowling greens, where the grass is short and a fine surface required.

Heavy Machines.—Under this heading may be classed mowers with a cut of from 14in. to 18in., for the working of which the efforts of a man and a boy suffice; or from 18in. to 24in. requiring two men or a donkey or pony for their efficient working. Strong, active ponies can be employed for mowers up to 30in.; beyond that the services

of a horse need to be requisitioned, and, with a good strong animal and a suitable machine, an effective cut of a clear 4ft. in width is possible.

Motor Mowers.—The comparatively recent advent of the dynamo has resulted in the employment of motor traction to secure quick results and powerful operation. It is, of course, suitable only for use where large areas of grass, as large lawns, pleasure grounds, and golf courses, have to be dealt with. The motor mower in such cases not only does



(Photo: H. A. Smith)

A Pony Mowing Machine.

Note the animal has its feet shod with leather boots to prevent injury to the turf.

the work more rapidly than is possible with a horse machine, but also dispenses with the necessity of frequent rolling, its heavy weight rendering it equivalent to a roller. Then, again, there is no risk of damage to the turf as when a horse or pony is used, and one person only is required to manage the machine.

Such mowers at $2\frac{3}{4}$ B.H.P., weighing between 4cwt. and 5cwt., will rapidly work a 24in. switch. With such a

machine in use the operator walks behind, guiding it by two handles. It is exceedingly useful for gardens from one to three acres, or for mowing cricket pitches. Such a size is very compact and easily managed. A 4 B.H.P. petrol motor, weighing about 9cwt., will do a 30in. cut; for a 42in. cutting cylinder a 6 B.H.P. petrol motor suffices. Such an appliance as the last would weigh rather under a ton, but it is fitted with two rollers, one of which is adapted for steering purposes, so that its movements are effectively under control. In this case the driver is provided with a seat, and has the steering in front.

It is a matter of interest to point out that Messrs. Ransomes, Sims, and Jefferies, Lim., of Ipswich, have a range of mowers corresponding to the requirements suggested in the above descriptions. Their light machines include the "Empire," provided with six crucible steel cutters, working up to 16in.; the "Empire Major," a more powerful machine, with capacities to 21in. The "Lion," a small machine, ranges from a 9in. to a 15in. cut. Their well-known "Automaton" type is in general use. Two classes of this are manufactured having respectively chain and chain-and-gear attachments. The cut of these machines is from 8in. to 14in. A lighter type is the "Automaton Minor," for small gardens and cutting verges. Messrs. Ransomes manufacture quite a number of large machines for pony and horse traction, adaptable for water or sand ballast, and their petrol motor mowers are effective upon the widest areas.

The "Godiva" mower is a well-made appliance, a good type of machine in various makes, from 8in. to 16in. cut, according to the strength of the operator. It is one of the useful machines for the satisfactory upkeep of lawn and garden manufactured by Messrs. Barford and Perkins, Peterborough. It is fitted with iron rollers behind, wooden ones in front, and is driven by chain gear. Its cutting blades are made with bevelled edges, and set at a sharp angle to cut, so as to reduce friction. The front rollers are raised or lowered by "Wansborough's Patent Height Regulator," controlled at the handles, which adjusts the cut. The "Godiva" pattern is also applied to heavier mowers. A man and a boy can work an 18in., two men a 21in.; a pony

or donkey will suffice for a 24in.; for a 30in. to 42in. machine a horse is required.

Care of Mowing Machines.—Many and many a good machine has been damaged through neglect of its working parts or carelessness in its use. To keep a mowing machine in perfect working order, it must not only be kept clean and well lubricated, but also have its cylinders properly adjusted from time to time. Machines that are stored away after use with particles of grass in the cylinders, and with dust and greases accumulated on the bearings, soon get out of order, do not do their work efficiently, and require much more labour to use than those which are kept in good order. A strict rule should be made, every time the machine is used, to thoroughly clean every part of it, and to rub the cylinder knives and ledger plate with an oily rag to prevent rust forming thereon. The sides of the bearings, too, should be well brushed to remove accumulated dirt. This precaution is especially necessary in the case of machines about to be stored away for the winter. Motor machines, too, require very great care at all times, otherwise they will soon get out of order. During the winter, on wet days, it is a good plan to take the machine to pieces and thoroughly clean every part, and then give the frame a coating of paint. If these precautions were carefully observed, a machine would not only last longer, but also work more efficiently. It is also very important to keep the bearings well oiled when the machine is in use.

Adjusting the Cutting Blades.—As regards the adjustment of the cutting blades of the cylinder, this should have very careful attention. If the cylinder be not evenly adjusted to the ledger blade the grass cannot be cut evenly, and nothing looks worse than an unevenly-cut surface. If, therefore, it be observed that the grass is not being cut evenly, the cutting blades should be tested by introducing a thin piece of paper between each end of the cylinder and the ledger plate. Slightly turn the cylinder round, and if the knives fail to cut the paper in two, adjust the screws gradually until the cutting is accomplished at both ends. The adjustment, in fact, of the cylinder to the ledger plate should be so even that a piece of tissue paper placed along

A Natural Grassy Slope. (Photo: E. E. White.)

Th slope has not had its surface graded. Slopes of this type should not be permitted near the house, but away in the grounds.

any portion of the ledger plate is cut sharply in two by revolving the cylinder. Unless the adjustment of the two parts be true the knives of the cylinder or the edge of the ledger plate will become more worn at one place than another, and the machine in that case cannot again be got to cut evenly. The only remedy then is to have a new cylinder and a new ledger plate, or buy a new machine. The cutting blades are often damaged by small pebbles or stones coming in contact with them, and when this is of a serious nature the machine must be sent to the makers to be re-

(Photo: H. A. Smith.)

SELF-HEAL (PRUNELLA VULGARIS).

A perennial weed, which grows in badly drained or moist lawns.

paired. When a proper adjustment is maintained the cutting parts become self-sharpening, as all the parts work true. Again, failing a proper adjustment of the cutting parts, the knives fail to cut the tougher blades of grass, but tear them off, and these soon choke up the cylinder or get fixed between the cutting blades and the ledger plate, causing the cylinder to cease revolving. The machine, moreover, is harder to work under such conditions.

General Remarks.—Given a clean machine, well oiled bearings, and properly-adjusted cutting blades, the only other points that need consideration are the best times for mowing and the heights for cutting the grass. As to the first point, the best time is when the morning dew has dispersed. If grass be cut whilst wet, there is always the risk of its clogging the cylinder and driving gear, and rendering the work more laborious. If done when dry, no such difficulty arises if the machine be in good order. The next point is the height to which the grass should be cut. On tennis and croquet lawns and bowling greens it is required to be cut as close as possible, and in this case the front rollers should be adjusted so that the ledger blade practically touches the turf. In the case of ordinary lawns it is not necessary to cut so closely, and here, then, the front rollers should be adjusted to raise the ledger plate as high from the turf as necessity requires.

Minor Special Machines.—For cutting grass of a coarse nature and on uneven ground Ransomes' "World Mower," a wheel-geared machine with iron back rollers, side wheels in front, and a cylinder of three knives, is a specially good machine. This machine is made in widths ranging from 6in. to 24in. Another useful machine made by the same firm is "Short's Patent Side Cutter." This is provided with a cutting cylinder 6in. on the side of the machine, which enables the grass on the margins of beds to be cut without injury to the flowers. Another useful machine is Ransomes' "New Bent Cutter," a machine with a large, open cylinder fitted with four blades, which enables bents to be easily cut off, thus dispensing with a scythe.

CHAPTER II.

GARDEN ROLLERS.

A ROLLER is almost as indispensable an appliance in a well-ordered garden as a mowing machine. Indeed, we might truly say that a roller cannot be dispensed with where there are a lawn and gravel paths to be maintained in good condition. The more frequently a gravel path is rolled the better, firmer, and more pleasant it is to walk upon, and the neater its appearance to the eye. And in the case of a lawn a roller is most essential for compressing the turf, consolidating worm casts, and ensuring an even surface. As for tennis lawns, bowling greens, golf links, and cricket grounds, frequent rolling is absolutely necessary.

Having shown the necessity for the possession of a roller, the next question is to discuss the various types of rollers in the market, and their respective advantages for different purposes. As in the case of lawn mowers, so in rollers, there are various types, some to be used by one person, others by two or more men, donkeys, ponies, horses, and motor power.

Hand-power Rollers.—Of these there are several types—open-ended, closed ends, water-ballasted, and single and double-cylindered. The open-ended type is the cheapest form of roller. These are made with single and double cylinders. For rollers beyond 2ft. in width a double cylinder is preferable, because there is less risk of cutting up the turf when turning round. The former, however, can be obtained in widths of 14in. by 14in. to 36in. by 36in. As to the double-cylindered rollers with open ends, the best types are those with solid-rimmed ends, small openings, and rounded edges. They cost a trifle more than the plain-edged ones, but have the compensating advantage of not cutting into the turf. The smallest size is about 18in. by 16in., and the largest 38in. by 36in., and the weights range from about 1cwt. up to 10cwt.

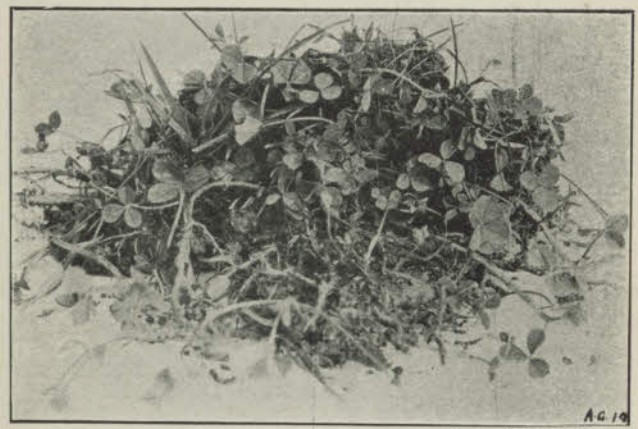
Pony or Horse-power Rollers.—These are useful for rolling drives, cricket grounds, and large areas of lawn. They are made with double or single cylinders, and, of course, fitted with shafts. There are also types with open ends, closed ends, and with provision for ballasting with water.

There are many makes of the simpler form of roller, but, after all, it is as well to obtain one for use that has the guarantee of a well-established firm of reputation behind it. Such appliances as the "New Automaton," of Messrs. Ransomes, Sims, and Jefferies, Lim., of Ipswich, having rounded edges and balance handles, and sold in various sizes ranging from 16in. by 16in. to 24in. by 24in., are reliable and durable. Suitable for all classes of work are the sand and water ballast rollers made by the Ipswich firm. Such serve for medium and more extensive areas. Supposing it is required to roll the tennis lawn or bowling green in damp weather, the roller can be used empty; if the weather be dry it can be ballasted, and better results are obtainable. Larger machines for pony or horse traction are also produced at Ipswich, and motor rollers are naturally amongst the productions of the engineering firm at their extensive works upon the Orwell. For rolling golf greens Messrs. Ransomes, Sims, and Jeffries, Lim., make a light wooden roller, fitted with a scraper and trough to take up worm casts.

Before leaving the subject of rollers, it may be added that medium and large-sized appliances are also manufactured by Messrs. Barford and Perkins, the old-established Peterborough firm, who make the sizes suitable for manual use, and also produce the New Patent Universal series of machines, with single and double cylinders, which range up to dimensions sufficient for draught by pony, cob, and pair horse.

General Hints.—The most useful size for a youth to use would be one weighing about 1cwt.; for a man to draw comfortably, 2cwt. to 4cwt.; for two men, 6cwt. to 8cwt. These weights apply to level ground. On sloping lawns or paths 1cwt. would be an approximate weight for a man to use; 2cwt. to 3cwt. for two men; and 4cwt. to 6cwt. for three men. The best time to roll lawns or paths is soon after a shower. Most rollers are provided with a scraper to

remove accumulated worm casts or gravel picked up by the cylinders. If not, the cylinders should be swept at the end of each journey by means of a birch broom. When worm casts or gravel are picked up freely by the cylinders it is advisable for a youth or man to walk behind the roller and sweep the face of the cylinders as the roller moves onwards.



(Photo: H. A. Smith.)

THE LESSER CLOVER (TRIFOLIUM MINUS).

A small-leaved clover, which sometimes spreads rapidly and starves the grass of the turf.

To keep rollers in good working order they should be well cleaned after use, oiled frequently, stored in a shed, not left outdoors, and have the ends and handles painted periodically.

CHAPTER III.

TOOLS AND APPLIANCES.

In addition to rollers and machines, several important tools and appliances are necessary in connection with the formation or management of a lawn. These we will briefly describe.

Daisy Rake.—This consists of a curved iron shield, fitted with V-shaped teeth, attached to a handle like an ordinary rake. It is used for the removal of daisy flowers on a lawn. By drawing it across the turf the daisy flowers are caught between the teeth and cut off, thus preventing them maturing seed.

Edging Iron, or Verge Cutter.—A tool with a crescent-shaped steel blade, fitted to a wooden handle. By means of its sharp edge turf is cut into the convenient lengths and widths for lifting, and the edges of turf near walks trimmed into shape. An improved form of this tool is now made with a wheel attachment, which enables the operator to cut rapidly as he pushes the tool along.

Turfing Spade.—A tool made with a crescent or heart-shaped blade, a bent iron crank, and wooden handle, the latter adjusted so that the blade can be forced underneath the turf to separate it of the required thickness for lifting.

Turf Beater.—A piece of tough wood, a foot or so square or oblong, and fitted with a wooden handle at a convenient angle. Used for beating down newly-laid turf.

Shears.—Two kinds of shears are used, one a short pair with cranked iron shanks and wooden handles, used for clipping grass in positions where the machine or scythe fails to reach; and the other, known as edging shears, having two blades attached to a pair of long wooden handles fixed at almost right angles, and used for cutting grass on the margins of turf.

Scythe.—A useful tool for cutting long grass prior to using the machine, and for removing long bents on machine-mown lawns. It consists of a curved wooden handle, or "snead," furnished with two short handles fixed at right angles to the long one, and a steel curved blade, 3ft. or so long, and possessing a keen edge. The blade has a short crank at the broad end, which is fixed into the end of the long handle, or a special adjustable crank is used to connect the two. The advantage of the latter is that it enables the blade to be easily adjusted to suit the requirements of the user; and the blade, when not in use, can be folded up close to the handle.

Hose.—A good hose is indispensable wherever there is a sufficient pressure of water to enable it to be used. The cheapest form of hose is made of grey or red rubber, in lengths of 60ft. and diameters of ½in., ¾in., and 1in. It is also made in three qualities, one, two, and three-ply strengths, the last two being the strongest. The most durable form is made of vulcanised indiarubber in 60ft. lengths, two and three-ply strengths, and ½in. to 3in. in diameter. Each length is supplied with union connections to enable several lengths to be made, tap union, and nozzles, taps, and spreader. For connecting a hose to a water-tap Royle's Tap Union is superior to the ordinary screw nozzle. For use on gravelled walks or drives armoured hose, tubing protected by a coil of wire, is the most durable. A "lawn sprinkler" is an appliance consisting of a portable stand with a movable nozzle on top, which turns round by the pressure of the water, and distributes it with a rain-like action over a wide area. A galvanised hose-reel, fitted with wheels, is also essential for winding the hose on when not in use.

Weed Extractors.—Tools with bifurcated steel points and wooden handles. The two fork-like points are inserted under the crown of the weed, and, by means of an iron fulcrum and pressing the handle downwards, the weed is lifted out. Used for removing daisies, etc.

Weed Eradicator.—An instrument like a syringe in shape, and furnished with a steel point. The cylinder is charged with a liquid weed-killer, and on forcing the steel

point into the crown of a dandelion or other weed, the pressure liberates a sufficient quantity of poison to kill the weed. The instrument is known as the "Wykeham Weed Eradicator."

Birch Brooms.—These are most essential for distributing worm casts and grass off lawns; also for removing fallen leaves in autumn. They may be purchased with or without handles, and the most economical way to buy them is by the dozen.

Lawn-sweeping Machines.—There are one or two

(Photo: H. A. Smith.)

ANNUAL POA (POA ANNUA).

An annual grass, often found infesting the turf of lawns.

machines fitted with revolving brushes, which gather up the leaves into a receptacle. They are made in several sizes, one to be worked by one man, and others for two men, a pony, and a horse. Messrs. Ransomes, Sims, and Jefferies, Lim., claim for their machine that it will pick up needles, stones, paper, fir cones, and worm casts, as well as leaves.

The action, too, of the revolving brushes upon the turf is most beneficial, the bristles detaching and picking up any moss they may come in contact with.

Edge Trimmers.—There are at least two different types of edge trimmers in the market. One is made by Messrs. Barford and Perkins, and is called the "New Lawn Edge Clipper." This is operated by a wheel running along the edge and a circular many-pointed knife, which will work backwards or forwards as required. "Ransomes' Edge Trimmer" has two handles, an iron-cylinder roller, and a five-bladed knife. It is a substantial machine, which does its work well and quickly.

Horse Boots, etc.—When a donkey, pony, or horse is used to draw a mowing machine on a lawn it must have its feet shod with boots to prevent its hoofs damaging the turf. Such boots are to be obtained made solely of leather, or with leather uppers and rubber soles. They are made to fit the hoofs, being secured to the latter by means of leather straps. The best form of boot is that provided with a rubber sole; this does no injury to the turf. The "Pattisson" Horse Boot is made in two forms. One consists of a steel plate turned up at the toe and furnished with an adjustable screw clamp, by means of which the plate is easily and securely fixed to the horse's shoe. The other has a leather upper instead of a clamp, and is secured to the hoof by means of straps. The soles are made of leather with rubber studs, or with solid motor tyre rubber. The advantage of the "Pattisson" boot is, it can be re-soled from time to time. Messrs. H. Pattisson and Co., Streatham, the manufacturers, are also the makers of a very handy steel Turfing Tool for cutting out in circular form bad patches of turf on putting and bowling greens in a neat manner without injuring the surrounding turf. A piece of new turf can be cut with the same tool and easily dropped into the space previously occupied by the bad turf. The same firm also supply "Tee Mats," "Sand," and "Water Boxes," and other golfing paraphernalia.

CHAPTER IV.

MISCELLANEOUS DATA.

The following data may be useful to some of our readers. If they fail to exactly agree with advice given in the text the difference is due to variation of opinion, the figures here given being the mean of those culled from various sources.

Grass Seeds:—

A bushel of grass seeds weighs, on the average, about 25lb.

One pound of seeds will sow a square rod of land (30¼ square yards).

One bushel of seeds will suffice for an area of 400 square yards (20 by 20 yards).

Three bushels of seeds will sow a bowling green (40 by 40 yards); cost, at 25s. per bushel, £3 15s.

One bushel of seeds will sow a tennis lawn 78ft. by 36ft., and two bushels a full-sized court, 120ft. by 60ft.

One bushel of clover seeds weighs about 60lb.

Seeds cost about 1s. 3d. to 1s. 6d. per lb.; 3s. to 4s. per gallon; and 18s. to 30s. per bushel.

Grass seeds germinate in about 14 to 18 days.

For ordinary lawns, sow 4 to 6 bushels of seed per acre.

Best times to sow, middle of March to end of April, earlier the better; or middle of August to middle of September.

Clover seeds best sown in spring; if sown in autumn liable to be killed by frost.

Lawns from spring-sown seeds ready for use early in August; those sown in September ready in June.

Worst possible time to sow grass seeds, May to August.

Best grass for shady lawns under trees is Poa trivialis.

Most suitable grass for hard wear is Festuca rubra.

Manures:—

Road grit, while good for top-dressing, is apt to be badly infested with weed seeds, and to do more harm than good.

Sea-sand beneficial to inland lawns or bowling greens; encourages growth of fine grasses; quantity, 10cwt. per quarter-acre; applied in autumn.

Charcoal very good for autumn dressing; absorbs superfluous food, and holds it in reserve for future absorption by grasses; encourages healthy, sturdy growth of grasses. See chapter on "Manures." Must be used in a finely-ground state. Good for peaty and clay soil.

Wood-ashes excellent for top-dressing lawns in spring or autumn; supply potash and phosphates; quantity, 10 bushels per quarter-acre.

Gypsum useful for top-dressing lawns on heavy soils; quantity, 10cwt. per acre; applied in autumn; supplies lime, which sweetens soil and encourages healthy growth.

Coal ashes good for lawns on heavy soils; encourages fine, sturdy growth; apply in autumn; quantity, 8cwt. per quarter-acre.

Marl sometimes used for cricket pitches, at the rate of 6 to 8 tons per acre, applied in autumn; promotes a fine growth.

Gas-lime too dangerous to use on a lawn.

An excellent artificial manure for top-dressing lawns, greens, etc., is Messrs. Barr and Son's "Lawn Phytobroma." Promotes a sturdy, fine growth.

Soils:—

Lime good for peaty soils. See "Gypsum," above.

Chalky soils improved by annual top-dressing of well-decayed manure, 20 tons per acre, and half-ton of sea sand; apply in autumn.

Sandy, poor soils best top-dressed with a compost of equal parts of rotten manure and fine soil sifted fine, applying two cartloads per quarter-acre.

Good general compost for lawns: equal parts loam, manure, and sea sand; allow to remain in heap for a year, then sift through half-inch screen.

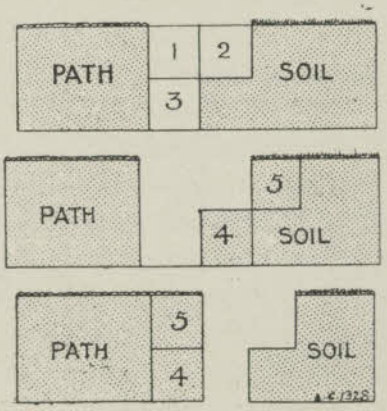
Waterlogged soils are cold and sour, and detrimental to the growth of grasses.

Well-drained soils are rendered warmer, more porous, and hence absorb rains and air, both rich in plant foods; consequently grasses make a healthier growth.

Sandy soils are usually deficient in potash, hence require kainit applied in autumn. Heavy soils abound in potash, and only require lime to liberate and render it available.

Watered Lawns.—Lawns heavily watered during the summer lose a good deal of their soluble plant food, the water washing this into the subsoil. Therefore, when a lawn has been heavily watered during the summer, it should be liberally top-dressed in autumn.

Read also the remarks on watering lawns in separate chapter.



METHOD OF TRENCHING SOIL.

Trenching and Digging.—Digging means turning the soil over one spit, i.e., about 1ft. in depth.

Trenching means digging the soil two spits, i.e., 2ft. deep, and breaking up the subsoil 1ft. deep by means of a steel fork. The operation is performed as follows: At one end of the plot open a trench two spits wide and one spit deep (see 1 and 2, section A). Wheel this soil to a heap at the opposite end of the plot. Next stand in this trench and take out a further one, one spit wide and deep (see 3, section A), and wheel this to a separate heap. With a steel fork break up the bottom of this trench, then add a layer of manure thereon, and turn over spit No. 4, section B, on

this; then add a layer of manure on top; and finally turn the top spit (5, section B) over it. The result will be as shown at 4 and 5, section C. Proceed in a similar way till the plot is trenched, when put the small heap of soil in trench 3, and the larger one in trench 1 and 2, section A, and the trenching is completed.

Do not make the mistake of opening a trench, throwing the top soil (1 and 2, section A) into the bottom, and bringing the sour subsoil (3, section A) to the surface. The object of trenching is to increase the depth of a layer, and merely turn each layer of soil over on its normal level.

Bastard trenching is simply digging the soil two spits deep.

Cost of Digging, etc.:—

Soil.	How Cultivated.	Cost per rod.	Cost per acre.	Time required.
		s. d.	£ s. d.	
Light ...	Dug 1 spit deep ...	0 2	1 6 8	14 days per acre
Ditto...	Trenching 2 spits deep	0 10	6 13 4	28 ,, ,,
Ditto...	Bastard Trenching ...	0 6	4 0 0	21 ,, ,,
Ditto...	Ploughing		0 12 0	1 day ,,
Heavy...	Dug 1 spit deep ...	0 3	2 0 0	18 days ,,
Ditto...	Trenching 2 spits deep	1 0	8 0 0	30 ,, ,,
Ditto...	Bastard Trenching ...	0 8	5 6 8	24 ,, ,,
Ditto...	Ploughing		0 16 0	1¼ ,, ,,
Ordinary	Steam Ploughing ...		0 15 0	8 acres per day
Ditto...	Steam Cultivating ...		0 12 0	6 to 10 acres
Ditto...	Steam Digging ...		0 12 0	10 acres per day
Ditto...	Harrowing		0 1 0	Ditto
Ditto...	Cultivating		0 3 0	3 to 5 acres per day
Ditto...	Rolling		0 0 9	8 to 10 ,, ,,

Cost of Excavation and Levelling Soil:—

Excavating soil 1ft. deep per yard super., 3d. to 4d.

Levelling surface per yard super., 3d.

Filling soil into barrow and wheeling same 20 yards, 3d.; every additional twenty yards, 2d.

A man will excavate 10 to 12 cubic yards in a day of ten hours.

A barrowload of soil equals one-seventh to one-tenth of a cubic yard of soil.

INDEX.

ILLUSTRATIONS.

The "PATTISSON" Horse Boots.

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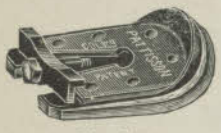

FIG. 1.

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FIG. 2.

THE 'Pattisson' Wood Rollers

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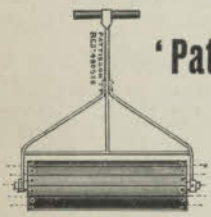

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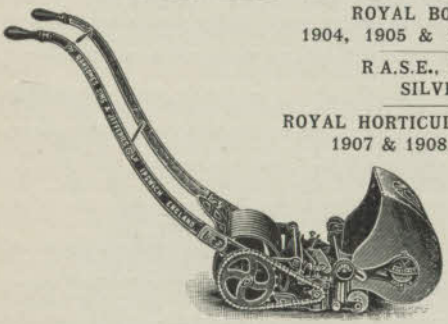

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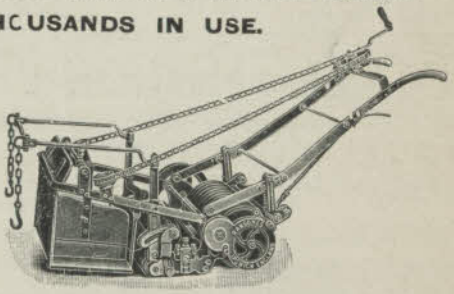

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