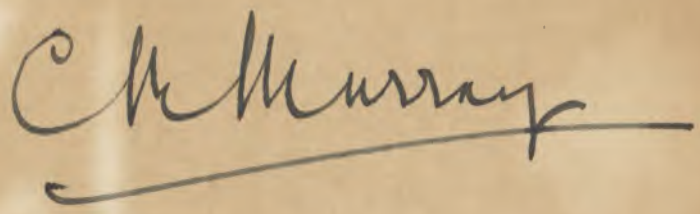

GRASS

GRASS

A new and thoroughly practical book on Grass
for ornamental Lawns and all purposes
of Sports and Games.

By

A. J. MACSELF

Drawings by G. E. LEE

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PREFACE

THE making and maintenance of lawns and greens concerns a wide circle. The owner of a garden wants a perfect lawn, but seldom realises all that is involved in the task of gratifying his desire. The officials and committees of sports clubs are expected to provide their members with ideal courts, greens, or playing pitches, but lack of technical knowledge of grass becomes their stumbling-block.

The gardener or the greenkeeper who knows "all about grass" will take no heed of books, but what of that? There are men, and many of them, who have their livelihood to make from the management of grass, and who are eager for knowledge of a subject to which there is no finality. This book is written for such.

Of necessity there is much in these pages that is common knowledge to the experienced; will they please be tolerant for the sake of the novice and the inexperienced; but I venture to hope there may be something of interest and value in my work for all who handle grass.

The work is not infallible, because it is my work, but it is of my best. The illustrations by Mr. G. E. Lee not merely decorate but enhance the value of the book, and we jointly express our gratitude to the authorities of the Natural History Museum and the Royal Botanical Gardens, Kew, for facilities readily granted for examination of material for the drawings.

A. J. MACSELF

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CHAPTER I

GRASS

The Earth's Richest Garment

APPEALED to by a youth whose ambition was to achieve greatness in the horticultural world, for advice as to the best branch of the whole realm of horticulture in which he might specialise, I responded with the one word " Grass," and he, first thinking I was joking, smiled, and then, gradually realising that I really suggested that he should devote his time and energy to the study of grass with the object and hope of making a livelihood and career, simply gazed at me in blank amazement, and almost with disgust, that I should make so preposterous a proposition. Few, I imagine, to whom such a suggestion might be made would be less surprised and disappointed than my youthful friend, for, despite the fact that all who love a garden consider a lawn an indispensable feature of every good garden, it is but a small minority who possess sufficient knowledge of grass to have any conception of what it means to become a grass specialist.

It seems perfectly natural for a man to specialise in fruit, in roses, in herbaceous and alpine plants, or in orchids, for it is so obvious that to excel in either of these popular and much patronised branches of the gardener's craft one requires to make it his main, if not his sole study ; but grass that is green

only, and not of many gorgeous colours ; grass that grows to be mown and rolled, and mown and rolled again ; grass that so often grows in the flower beds where it is not wanted, and even on the gravel drives and paths from which it has to be eradicated with irksome labour—what need, indeed, can there be to specialise in this ? That need would be more apparent if a knowledge of grasses were more prevalent even among the gardeners who tend the lawns in the course of their general routine, for, strangely enough, although few gardens are without grass, and many have good lawns, very few gardeners are expert in their knowledge of grass.

In the vast majority of cases when advice is sought about lawns, the reply received is that the grass must be mown regularly and well rolled as often as possible, advice which is excellent so far as it goes, but really that is but a very little way.

Discussions are frequent over the relative merits of turf-laying and seed-sowing, some maintaining that good turf is preferable, having the advantage of making an immediately serviceable lawn, whilst others will argue that by sowing a good mixture a better and more even sward will be produced. Unfortunately for the former, the greater proportion of the turf to be obtained is far from being of good quality, and in regard to the latter, the frequency with which attempts to create a lawn by seed-sowing prove to be disappointing failures, justifies the conclusion that either the mixture is of unsatisfactory character or the workmanship is defective. My contention is that in either case the failures plainly

indicate a lack of essential knowledge, and prove beyond doubt the urgent need of closer study of grass. It is astonishing how many people have the idea that all grass is practically alike. Without giving the matter much real thought they have a hazy sort of notion that the weed grass that disfigures the gravel walks is one and the same plant with the grass of the lawn ; and since the weed grass seems to be capable of growing under adverse circumstances and without nourishment and other cultural aids, it is considered quite unnecessary to look upon lawn grass as requiring special cultural treatment. Herein, indeed, lies the secret of many failures in the treatment of lawns, for the first essential to success is a close acquaintance with the many species and varieties of grasses, their natural characteristics, the conditions under which they thrive, and the amount of hard wear they are capable of enduring. Thus only can we arrive at a clear understanding of the kinds that can thrive in a particular soil or situation, and are enabled to blend mixtures that will suit particular purposes.

There are fine grasses that will produce a smooth even sward that will make a perfect bowling green or a putting green on golf links, but such would be totally unfit for the purposes of hockey or cricket grounds ; and, vice versa, the hard-wearing, strong grasses that are all that can be desired for the latter would be hopeless failures if used on a bowling green.

A lawn is required to be a permanent feature of a garden, and so, too, when a sports ground or

playing green is made, the desire and intention is to provide a greensward that will endure for years, for at its lowest the cost for making is too great to be incurred at frequently recurring intervals. This being so, coupled with the fact that errors and carelessness in the original work of preparation and laying of either turf or seed can rarely be fully rectified later without entirely reconstructing the lawn or green, should suffice to show the immense importance of exercising all possible care in the first instance, and to emphasise the utter folly of striving to be too economical in regard to the initial outlay.

All too often the turf used for lawn making is merely rough coarse grass with an appalling mixture of troublesome weeds taken from some pasture field. No thought is given to what are the predominant species of grasses contained in the turf, and whether they are calculated to make a satisfactory lawn, and the consequence is we often find that the weeds in their new environment thrive with greater vigour, whilst the grasses, except the very coarsest and least suitable, deteriorate and gradually die out. The whole consideration at the time of purchase seems too often to be to get the turf that costs least money, and thus very often the whole outlay proves to be utterly wasted. In the same way, when a seedsman is approached the foremost question is generally as to what are his prices for grass seed, and in the majority of cases it is the cheapest mixture that is bought. At best one generally finds it considered to be quite adequate

to buy a ready-made stock mixture, and truth to tell this is as much as many seedsmen are able to offer, for whilst most find it profitable to deal in grass seed because of the incessant demand, very few even among seedsmen have made that close and special study of the subject that leads them to adopt the desirable and even essential course of preparing special blends after an inspection of the soil and site and investigation of the real purpose for which the seed is particularly required.

Why should not grass be thus studied by the horticulturist? We read much and hear much about choosing flowering plants that are suitable for particular soils and situations. We pay heed to certain kinds of stocks upon which to graft certain kinds of fruit, but will put down what should be a permanent feature of an estate or garden without troubling to assure ourselves that what we are putting down is capable of fulfilling its purpose. Nor is it always in striving after cheapness that the errors are made. It would be an astonishing revelation if statistics were forthcoming to show the amount of fine Cumberland turf that has been despatched to all parts of England to make lawns and greens at great expense, but under conditions that render success utterly impossible. The quality of Cumberland turf is unquestioned, but it is composed of exceptionally fine grass, generally almost confined to one species. It grows on a soil of peculiar character, composed very largely of decayed vegetable matter, impregnated with a large proportion of loose sand. To transfer such turf to a harsh gravel

soil, in a position exposed to full sunheat during long periods of drought, or, on the other hand, to lay it upon a cold, stagnant, unyielding clay, into which the fine roots of this particular kind of grass can never satisfactorily penetrate, is to doom it to sure collapse after a struggle for existence that will last just so long as there remains any virtue in the depth of the turf itself.

Many a bowling green laid with the very finest Cumberland turf is that much of a failure that only by annual renovations on such a scale that within four or five years the whole original turf is replaced with new, can the green be maintained in playing condition ; whereas if prejudice could be overcome and expert knowledge be utilised, the area could be sown with a proper blend of seed that would thrive and improve in quality year by year.

No fond notion is entertained in my mind that everything in this book shall be accepted as infallibly correct, but I do crave that readers will peruse its pages with an open mind, prepared, if necessary, to lay aside established convictions, and willing to meditate upon the suggestions made and to put to the test the propositions regarding the practical and rational treatment and management of grass.

It is high time vast reductions should be made in the number of lawns, playing greens, and sports grounds in Britain which from one cause or another are lamentably unsatisfactory.

CHAPTER II

ON THE PRELIMINARY TREATMENT OF SOIL

QUITE orthodox is the plan of commencing a treatise on cultural matters with a chapter on soils and their proper treatment, but from observation I am driven to the conclusion that the idea largely prevails that there is little need to study very closely the preparation of the soil that is to be covered with grass. It is but necessary to reflect for a moment to become convinced that since we have but one opportunity, and that afforded at the outset, before the ground is covered with what is intended to be a permanent covering, it is of supreme importance that the preparatory work should be very carefully and very thoroughly done. It is, indeed, extreme folly to unduly hurry or to scamp this task.

It must be borne in mind that although the grass of a regularly mown lawn rises but little above the ground level, many of the grasses make a great deal of root, and it is by extending their roots far in search of moisture that the turf is enabled to maintain a fresh green through a long period of drought. It must also be remembered that a dense mass of fine, fibrous, but ravenous roots requires an abundant supply of nourishment to maintain the thickly crowded plants in robust health. To start with an

impoverished, badly prepared soil must obviously be to court failure. It is frequently maintained that since grass must always be well rolled to keep it in good order, it is quite unnecessary to break up the earth where turf is to be laid or grass seed sown, and far too often a lawn is laid on quite a hard base. In point of fact, trenching is as often as not a vital necessity before a lawn can be well and properly made, but the manner in which the ground is trenched is a point of vast importance. It will never do to turn over the ground in great clods, rake down the surface when dry and proceed to put down grass. There will undoubtedly be settling down, with the result that the surface will soon be hopelessly uneven.

The clods must be broken small, especially those that are buried. The surface may be left rough for a period during winter, frost having a powerful effect upon freshly dug land ; in fact, so essential is it that trenched land shall have a winter's weathering before being put down to grass, that when it is impossible to allow the time it is better to dispense with trenching and content ourselves with merely digging the top spit to a depth of six or eight inches. It is during this preparatory digging we have the one opportunity of nourishing the soil and of improving its texture. The exact measures to be adopted must obviously depend upon the natural character of the soil.

It is customary in gardening books to define an ideal soil as being a medium loam, containing fibre and sand, but not an excess of stone or very stiff,

tenacious clay; but since we cannot always pick and choose, but have to accept the soil that happens to be on a convenient site, we must exercise ingenuity to bring that soil as nearly as possible to the ideal character.

Thus a cold, heavy clay, lacking in porosity and in humus, should be well dressed with sharp sand and with well-rotted stable manure. A stony, gravelly soil on chalk may be immensely improved by the aid of fairly strong loam, cow dung, or rich garden soil, and during the process of levelling and reducing the surface to a fine tilth as many of the larger stones as possible should be removed. Very loose sandy soil is about the most unsuitable, perhaps even worse than the sour, lifeless soil of a small enclosed town garden that has been badly neglected. The latter will respond to the sweetening effects of digging and exposure to frost, and to a dressing of ground lime, after which manure will greatly improve its quality, but loose sand will absorb liberal dressings of manure and rapidly lose the benefit accruing.

In practically every text-book on any branch of horticulture, including those that deal with lawns, lime is upheld as one of the greatest essentials to satisfactory condition of the soil. To suggest that lime can be other than a boon and a blessing is treason, surely, for its songs of praise are omnipresent, and he who gardens by his books may well believe that in the use of lime he can do no wrong. As a matter of fact, lime wants using with discretion in every gardening operation, and especially so in

the case of grass culture. Some of the Fescues grow best in lime-free soil, and by dressing such with lime their stamina is impaired and their life shortened. The coarser and softer grasses are, generally speaking, lime lovers, but if these are liberally dressed with lime they become soft, succulent, and easily bruised. It must not be assumed that I condemn lime under all circumstances, for that would be foolish, but I would emphasise the necessity for careful consideration before liming for grass. A stubborn clay will probably benefit, but that is due more to the mechanical than the chemical action of the lime. One objects to the glib utterances that peaty soils, sandy soils, and every other kind of soil should be limed, because very often the grasses that would thrive on these soils will dwindle when lime is applied, and other grasses will still fail.

A great point is that whatever is incorporated with the soil, whether it be animal manure, chemicals, sand, or imported soil, it must be mixed with perfect evenness over the entire area. Uneven patches or dense masses are certain to lead to trouble. The surest way of securing perfect mixture is first to spread very evenly over the whole surface and then dig over twice or even thrice, breaking all lumps and solid masses that turn up during each operation. In regard to the term " dig " it will be understood I refer to areas of reasonable dimensions, and it is taken for granted that on very extensive areas the plough must, for economic reasons, take the place of the spade. I would always insist that when a plough is used it must be used with double ordinary

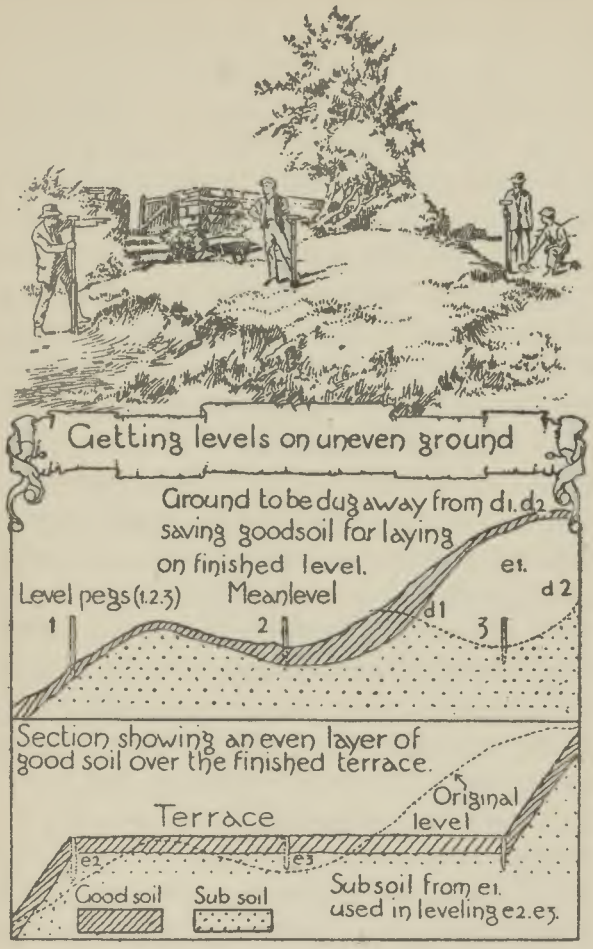
care, the furrows being taken at the narrowest possible width, and that much use be made of the harrow during a lengthy period of fallowing. The more thoroughly the breaking up and mixing of incorporations is done the better, but with the best of cultivation a considerable time must be allowed for settling.

Land that is heavy and adhesive in character will require a deal of coaxing to get it into a nice workable tilth, either for seed sowing or turf laying, and it is such stiff untractable soil that is most likely to justify the use of lime. Even here the greatest improvement that can be effected in the surface on which grass is to be laid will probably be secured by broadcasting over its surface a good dressing of coarse, sharp sand, rolling well in. River sand, passed through a sieve with sixteen holes to the square inch, makes a capital dressing for this purpose.

CHAPTER III

FURTHER DETAILS REGARDING SOIL PREPARATION

GRIEVOUS are the mistakes made in bringing very uneven ground to a proper level for lawn making. Too often it is deemed to be quite satisfactory to level sloping ground by removing the top soil from the highest part to the lower end. This obviously results in providing the lower end with a double depth of good aerated top soil, and robbing the other half, so that nothing but uncultivated subsoil remains upon which to place the turf or sow the seed. It is quite a common occurrence for the question to be asked: "Why is it that the grass grows luxuriantly on one half of the lawn and is always sickly and weak on the other?" The reason is, generally, that the mistake above referred to was made when the site was levelled. Another frequent mistake is to fill in deep holes with weeds and all manner of garden rubbish, and cover over with soil. The inevitable result is that the rubbish rots, and an ugly hollow appears. Much the same thing happens when rough field grass is buried, together with the additional risk that weeds and rough grasses will grow through wherever the old turf is not buried deeply enough to ensure their decay. The rough turf should first be ploughed or forked up roughly, beaten well out



when the earth about the roots is fairly dry, and then burnt in heaps on the site, the ashes affording good nourishment when evenly spread over the whole area.

For levelling properly the only course is first to wheel off all the top spit of soil, banking it up along

the ends and sides of the plot. Then level the base in the usual manner, first having carefully ascertained by the use of the " boning " rod the level at which it is necessary to arrive, and return the top spit evenly over the whole. It is a good plan to cut a trench across the middle of the area until pegs can be driven in at the depth to which the soil must be removed, and with a line drawn to the same level right across, the guides should be ample for the subsoil levelling. This is admittedly a laborious and expensive *modus operandi*, but as it is the only method of ensuring a satisfactory result, it is in the long run the most economical.

During the working of soil large stones should be removed, but it is a dangerous plan to take away all stone, because of the tendency of perpetual rolling to so compress the soil that drainage is rendered defective. One sometimes sees sifting advocated as a good method of preparing soil for grass, but in my opinion it is in the vast majority of cases about the last thing to resort to, for it inevitably means robbing the soil of its natural porosity ; and when, in very exceptional cases, such as the presence of particularly noxious weed roots, sifting is the only means of properly cleaning, it is highly essential that a heavy dressing of coarse sand shall be applied to restore an open texture.

A Waterlogged Soil

To bring excessively wet or waterlogged soil into condition for grass is at best a troublesome matter, for grass cannot grow in stagnant moisture, nor can

ground that is always soft and sodden like a wet sponge be comfortable or serviceable for the purpose of any sports or games.

For large grounds such as cricket pitches, football grounds and the like, it may be practically unavoidable, where water is troublesome, to adopt a full system of pipe drainage. This is a subject of sufficent importance to justify separate treatment; but for smaller areas, such as purely ornamental lawns and even croquet lawns and tennis courts, it is well to study other means of improving the condition of the site, especially in view of the difficulty, or maybe impossibility, of providing a proper outlet for the drains where a garden is enclosed and surrounded by other people's property.

It may in some cases be possible, by cutting a pathway around the lawn, using the soil to raise the level for the grass, to secure the necessary elevation from the water-level. Another plan, easily managed where the surrounding ground is naturally sloping, is to dig a deep pit at the lowest corner, beyond the site of the lawn, and fill this to within eighteen inches of the surface with brick rubble, clinkers, or large stones, covering either with a flat slab of stone or slate, or with a stout wooden lid, over which soil and even grass may be laid. A narrow trench, or, if necessary, more than one, may then be opened diagonally across the ground, deepening as it approaches the sink-away, and these trenches similarly based with a thick layer of rough rubble with some kind of covering, slates, tiles, or anything flat that will not rot, to prevent the soil above from filling the

interstices between the rubble. Such a method of drainage will be far cheaper than pipe draining, and will, except in very bad places, be found effective. It is not claimed to be ideal, but is a very good makeshift where the ideal is impracticable. The chief requirement to ensure the success of such methods is that there shall be at least a slight fall to facilitate the passage of water through the trenches into the pit. Obviously it would be of but little service to follow out this plan in a situation of an absolutely boggy or marshy character, not in a hollow valley surrounded by hills. Where one's garden is beside a river, and practically at the water-level, the only really satisfactory plan is to raise the lawn table-land fashion, with either grass-covered slopes around or rock banks, and the latter may frequently be made a distinctive and attractive feature. Sometimes, on perfectly level ground, springs will cause a perpetual sponginess that renders it difficult to maintain a good firm surface such as is required for games, although the conditions may be quite favourable to a healthy growth of the grass.

It is in such cases that it is of immense advantage to make liberal use of river sand in the preparation of the top spit before putting down the grass, and I have known many cases where a vast improvement has been effected by applying two or three successive top dressings of river sand to the turf during a single winter, rolling from time to time until the sand has worked well into the rooting medium. I have on occasion used as much as six tons of river

sand on one tennis court between the close of one playing season and the opening of the next, and the effect has been a transformation from a soft spongy surface to a firm and satisfactory court. The result may be readily accounted for thus. The river sand is entirely made up of minute particles of stone, generally of a non-porous character. The sand, pressed by the roller into the surface soil, occupies space that would otherwise be occupied by moisture drawn by capillary attraction from the water below. The sand, moreover, has greater power of resistance than the soft, saturated soil, and still further it increases the porosity of the rooting medium, with the result that the grass makes an abundance of fine fibrous roots, and as the mass of roots near the surface increases in density the sand is gripped so that it does not work down to a depth where its benefits would be lost.

Let it not be supposed that I am suggesting surface treatment of this nature is a cure complete for the ills of waterlogged soil. Those ills, alas, are not so simply or readily cured, and if it is a necessity to make lawns or greens where subterranean water is seriously troublesome there is no alternative to

A Proper System of Pipe Drainage

So much has been written upon this subject that there should be no need to write more ; but observation convinces that many have learnt to make narrow trenches and bury drainpipes without grasping the fundamental principles of drainage systems. It appears to be considered by some people that

every drainpipe buried is bound to do good work, but it must be remembered a drainpipe does not dry up water, but will collect it and, if properly laid and connected, will serve as a channel through which the water collected may pass through to a lower level. There must, therefore, be a fall, perfect union between each pipe and its neighbours, and an outlet at the lowest point. It is futile to bury pipes that are not connected with an outlet to convey the water right away from the treated area.

From the way pipe-draining is sometimes dealt with, and spoken of, it would appear that the purpose of the pipes is supposed to be to catch the rain water as it soaks downward from the surface. If that were the sum total of their benefit the expense and trouble of draining might well be dispensed with. The real necessity for drainage arises from the existence of a natural water level which is nearer to the surface than is good for the warmth and aeration of the soil. When, after heavy rains, a greater volume of water is in the soil the water level rises, and the purpose of the drainpipes is to arrest that rise, and by collecting and carrying off the water to relieve the soil above from saturation. The deeper the natural water level the deeper must be the drains, but it is not good policy to lay deep drains where the water level is high, unless a lower course of big pipes is supplemented by a shallow course of smaller pipes, and that is only justifiable where a very swampy piece of land must be drained.

The main drain should be connected with feeders at regular distances apart, that distance being

regulated at anything between ten feet and thirty feet according to the nature of the soil. The stiffer and heavier the soil the closer, and the lighter and looser the soil the wider apart the drains must be.

The actual digging of the trenches and laying the pipes is work any intelligent agricultural labourer can do, but when disturbing sour subsoil in the course of this work a watchful care should be taken that it does not get to the surface to come in contact with the roots of the grass.

Preparation of the Surface

The preliminary work of digging, manuring, and rough levelling having been accomplished, the preparation of the actual surface will claim skilful and careful attention, and the method of procedure will be practically the same whether turf is to be used or seed sown. However carefully the digging, etc., may have been done, it will not have produced a perfectly true or level surface. To secure this it will be necessary to bring into use sufficient square-headed wooden pegs to drive into the soil at convenient intervals over the whole area. Starting at the corners of the boundaries, the pegs should be placed somewhere about ten feet apart; a stout board with perfectly straight edges should be placed from peg to peg in all directions successively, and with the aid of a spirit-level it may thus be ascertained whether any particular peg requires tapping down or raising to bring it into perfect level with the rest. Having got all the pegs to a uniform level, it will be a simple matter to detect any unevenness

in the soil surface, and by raking the crest of a convex area into a near-at-hand depression the whole may be made " table level."

When work has advanced to this stage it is of great advantage to be able to allow the ground to lie for a period, as, for instance, from late spring until early autumn, or from late autumn until the following spring. All too often, unfortunately, the owner only thinks of commencing operations when he requires the lawn to be made with all possible speed, but if the probable results of undue haste were realised such impatience would surely, in the majority of cases, be curbed. The inevitable settlement of the most carefully dug soil should be allowed to take place before turf or seeds are put down, and this is the more necessary where manure has been used. By allowing the ground to lie, any seeds or roots of weeds that may be near the surface will start to grow, and the seedlings can be destroyed by hoeing, and roots of perennial weeds can be forked out, thus cleansing the bed of the greater part of the weeds that would prove troublesome if allowed to push their way through after the lawn has been laid. When one considers how rarely a plot of ground is met with, however industriously it may be cultivated, that does not grow some weeds, and often very troublesome ones, the desirability of using every possible means of reducing their legions whilst the land is free from grass must be apparent, and there should be no further necessity to urge that the making of a permanent lawn should not be unduly hurried.

It may be well to remark that during the " fallow " the rains and winds will cause the formation of a close, hardened crust over the surface of the soil, and that crust must be very thoroughly broken by means of a surface cultivator if the area is large, or by rake-scratching in the case of areas of moderate dimensions ; and it is of course essential that this task shall be performed in such a manner that the level is not impaired but is rather improved thereby, the spirit-level and straight-edge being brought into use to ensure this fact, both after rake-scratching and re-rolling.

Improvement of Impoverished and Hungry Soils

Good grass cannot be grown on a very poor soil, for like any other plant that makes abundant root, and has a growing season extending over the greater part of the year, grass absorbs a great deal of nourishment from the soil, and the fact that it is a permanent occupant of its situation, and not one that can be periodically lifted and transferred to other quarters, makes it imperative that, in the initial stages, all that is possible should be done to enrich and improve the soil. The difficulty of manuring in the ordinary way, as for garden crops, is that by digging in liberal quantities of organic manure, the level is considerably but only temporarily raised, and when decomposition causes settling down of the soil there is bound to follow unevenness. This would be particularly so if stable manure mixed with straw were used. The best animal manure for a sandy or gravelly soil is that of stall-fed bullocks, the plasticity

of this manure being of considerable assistance toward conserving moisture and preventing contraction of newly-laid turves. On a heavy clay soil sheep manure is better, because drier than that from oxen. Starved soil may also be considerably improved by dressing with hoof and horn shavings, or coarse bone meal, these being powerful fertilisers of a lasting character.

There is the considerable consolation of knowing that grass responds readily and benefits greatly by periodical top dressings of suitable concentrated manures and chemical fertilisers, but as these are dealt with in a later chapter it is unnecessary to duplicate the information.

CHAPTER IV

TURF

THERE are advocates of turfing for the formation of lawns, who contend that the advantages of turf over seed are great and undeniable, and I have heard it stoutly maintained that the successes of seed-sown lawns are no greater in proportion to their failures than the failures of turf are in proportion to its successes. Asked to be explicit, the defender of turf replied that he would estimate both to be about one in twenty, or five per cent. There are strenuous opponents of this view, and many grass experts will go so far as to say turf-laying can never produce a lawn that is free from serious and permanent defects, and that the only means of securing a lawn that approaches perfection is by sowing seed. Personal interests frequently mould our views, and it may be readily understood that a man who has large breadths of turf to sell may hold and express views decidedly at variance with those of a seed merchant who specialises in grass seeds.

To one who has laid many thousands of turves, and sown many hundredweights of lawn grass seeds, it may be possible to give an unbiassed opinion, and for my part, whilst I would readily admit that I would much prefer that a lawn of my own should be formed by sowing a carefully blended mixture of the

finest grasses, I would also maintain that conditions and circumstances are frequently such as to render turf-laying necessary and indeed even preferable to the sowing of seed ; and I would also unhesitatingly state that I have seen very many turf-laid lawns that, if not flawless, were at any rate highly satisfactory. The great thing is to select really good turf, suitable for the soil and situation it is to occupy, to get it into thoroughly good condition prior to cutting, and to cut and lay it in a skilful manner.

Let us first turn our attention to

The Selection of Suitable Turf

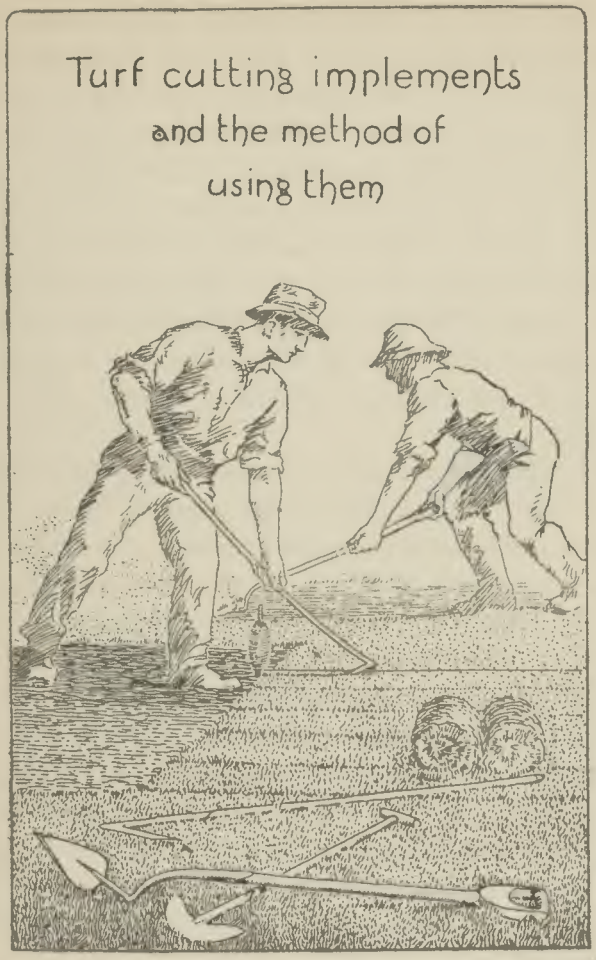
This is a matter that is likely to prove extremely difficult, for we have not only to find the turf which is suitable, but the owner who has the right or the inclination to part with it. It occasionally happens that a really good lawn has to be sacrificed to the builder, or perhaps in the course of extensive alterations to gardens or pleasure grounds ; but the occurrence of such an incident, conveniently near a spot where turf is at the moment required, must be considered a somewhat rare coincidence. It is much more common to find that the only turf within reach is the coarse sward of some field that has passed into the hands of the speculative builder, and it is the frequent use of such turf, unsuitable in character, utterly unprepared, and badly cut, that is responsible for the unsatisfactory results too often obtained.

The majority of pasture fields, and a greater majority of odd plots of vacant building land in

urban districts, are inhabited by the coarsest and most unsuitable grasses for lawn construction, whilst weeds of the most obnoxious and obstinate character frequently abound to such an extent as to ruin the chances of the turf for ever making a decent lawn. My present object is not to concern myself with turf that can never be really good turf, for I know full well that even though I condemn it with the greatest vehemence, there will still be those who will use the very worst if it is the very cheapest. My concern is for those who desire quality and success, and my word to them is select the turf that is growing on soil as nearly as possible like that on which the lawn is to be laid, and be careful to observe that the turf is either free from weeds or that the weeds it contains are of a character that can be removed with ease. To judge turf is a very easy matter to one who is well acquainted with the various species of grasses; to one who is not, I know of few things more difficult and hopeless. In the section of this book that describes the grasses individually, and in the illustrations of the various grasses, the reader may find material aid, but the difficulty is one can never find the mixture of grasses that would be ideal, and at the best it must always be a compromise between environment for the grasses and adaptability of the grasses to the environment. The far-famed turf of the Cumberland Firth sides is worthy of the high esteem in which it is held, but to transport that turf from its deep porous soil, with abundance of moisture from above, to a wet plastic clay that is sodden half

the year, and baked like bricks during periods of drought and heat, is to involve a risk of sorry failure. Likewise, to take soft grasses from low-lying marshes and transfer them to gravelly soil on exposed hillsides is folly, but if one finds a turf containing a good percentage of Poas, and especially Poa pratensis, he may rest fairly confident of his chances of success. Having chosen the turf, the first thing to do is to get it cut, swept, or harrowed with a small chain harrow, and well rolled. The oftener this can be done during the summer preceding lifting the better. To cut the turf into the customary lengths, three feet by one foot, the procedure is first to place a stout line straight across the plot, and with a keen-edged cutter make a perpendicular incision to a depth of two inches, cutting in a continuous line close beside the guiding line. Next move the line one foot, and cut again, proceeding thus until the required area is covered. The next thing is to proceed to cut in similar manner at right angles to the first cuttings, moving the line three feet each time instead of one foot. The orthodox tool for this work is a half-moon edging iron, but the work can be far more deftly done by using a narrow blade fixed in a slanting position to the end of a strong but pliable rod. By getting the blade firmly inserted at the starting point, the knife may be propelled forward by steady pressure, and with a little practice it will be possible to drive the tool forward at a reasonable walking pace.

The turfing iron is next brought into requisition for flaying the turf from the soil. Our illustration



shows a good pattern of turfing iron, and the aim must be to get the blade in a perfectly flat position, well under the crown roots of the turf, and holding the handle firmly with one hand, with the other hand gripping the stem about the middle, give steady pressure with the knee behind the handle so

that the blade is thrust forward to cut the roots. It is highly necessary to keep the blade perfectly flat so that the turf shall be cut of one even thickness. Often, in order to save weight when the turf has to travel a considerable distance, an effort is made to cut the turf as thin as possible, but it is very unwise to cut turf too thin, for in the first place it means cutting practically the whole of the descending roots away, and in the second place the thinner the turf the greater the risk of its drying up completely before it can establish a hold upon the soil of its new site.

One frequently sees turf consisting of nothing more than the crowns of the grasses, flayed at an inch or little more from the surface. I would much prefer to exceed a thickness of two inches than be content with one and a half inches, but it is very important that there shall be uniformity. He is not a good turf-cutter who allows his implement to dip or rise so that a turf is thicker at one end than the other, or even that one turf shall be thick and another thin. Turf cut for laying a bowling green on a properly constructed foundation, necessitates a totally different method than for ordinary lawns or tennis courts, but this will be dealt with in the special chapter on bowling greens.

The Treatment of Turf in Roll

When once turf is cut and rolled the aim should be to get it relaid with as little delay as possible, and with the minimum of handling.

An immense amount of damage may be done, and is frequently done, by conveying turf by barrow to lorry, from lorry to railway van, again to lorry and barrow to a stack, and yet again from the stack by barrow to the prepared site that is to be its last resting place. It is an extraordinary thing that many men who are constantly handling and laying turf seem to be utterly careless as to how many times a turf is handled and bumped about. One has only to note, if the turf is but slightly dry, and especially if cut from a fairly light or friable soil, how much earth is loosened and shaken from the roots at every handling ; and it is as vitally important to keep the soil of a turf intact as to keep the " ball " of a pot plant or a conifer unbroken, for it is on that soil the turf must live until its roots can once more attach themselves to Mother Earth. Moreover, every handling means additional labour, and therefore expense, and in this one point alone we have a strong argument in favour of utilising as far as possible turf available near at hand, in preference to bringing it from far afield. When, of necessity, turf has to be obtained from a distance, it is worth considerable effort to secure a broad-tyred motor lorry that can draw close up to the cutting ground, load, and deliver direct to destination, thus reducing handling to the very minimum.

When deliveries are so large and rapid that stacking is inevitable, it is better to arrange in narrow wall-like formation on all sides of the site, than to build a great block in one place. The turves in the centre of a great square heap will quickly

heat, causing discolouration of the herbage and rapid deterioration of vitality in the roots.

If the weather happens to be either sunny, windy, or frosty, the turf awaiting laying should be kept covered, either with canvas, tarpaulin, or straw.

It may be thought that I am making over much of the care of turf in roll, but the amount of damage suffered through lack of such consideration justifies the view that this is really a vital matter which is far too commonly overlooked or ignored. We do not permit trees and shrubs to be tossed about in haphazard manner, or to be thrown in heaps and left with their roots exposed to the weather for several days, but how frequently is turf thus harshly treated ; alas, far too often, and that has a great deal to do with many an avoidable failure and unsatisfactory result.

Whilst it must be admitted that by adoption of the orthodox size (3 ft. by 1 ft.) of turves some economy of labour is effected, there are very strong reasons for preferring that they should be cut in one foot squares, and handled flat instead of rolled. The fact that this is the method adopted by all the best makers of bowling greens suffices to indicate its superiority, but one often hears it stated that it is quite unnecessary for tennis courts and ornamental lawns. My contention is that what is necessary for the very best and most exacting work is equally essential for all good lawns, and the ease and accuracy with which squares can be laid, as compared with rolls, requires but one demonstration to convert all but the wilfully obstinate.

Turf Laying

Now let us deal with the actual operation of laying turf. We will take first the level ground, such as a tennis court or croquet lawn, which we will assume has been prepared and rested as already described.

The first row of turves should be laid diagonally across from north-east corner to south-west, or from north-west to south-east, cutting the area into two triangular sections. The turves should be so placed that at least half an inch, but less than an inch of space, remains between them, to allow for the inevitable expansion that will result from beating and rolling. When three or four rows have been laid, the turves should be beaten and tested for level, the slightest discrepancy being immediately rectified by packing soil under a shallow turf or raking out surplus soil where a perceptible bulge is noticed. No watering can be permitted during turf laying, nor should the work be continued during or immediately after heavy rainfall. To churn wet soil into a muddy or pasty condition is extremely detrimental, and to lay turf when frosts prevail is sheer folly.

In regard to the use of the beater discretion is necessary. It is quite in order, and, in fact, essential, that the turf shall be made tolerably firm, but it is as fallacious to suppose that turf can endure such thrashing with a beater that it is flattened out like a pancake as to abuse the legitimate purpose of the roller. Both these implements are sheer instruments of torture and wanton mischief in many hands.

When the whole area has been laid and beaten, a top dressing of finely sifted soil, preferably a mixture of light loam, leaf mould, and sharp, gritty sand, should be evenly spread over the whole surface and brushed with a good birch broom until all the spaces between the turves are filled in. Whether or not the roller should be used immediately after laying must be governed by the condition of moisture at the time. As a general rule, having well beaten the turf, I prefer not to roll until two or three weeks have elapsed, but there are possible circumstances that would justify immediate rolling. If, for instance, the weather had been dry during the whole process of laying and beating, and a gentle rain followed immediately after, it would be beneficial to run the roller over slowly and carefully, first north to south, and then east to west; but it would be useless if turf and soil remained dry, and unwise if saturated by heavy downpours. In the dry condition rolling would cause the shifting of the turf and consequent severance of tender young roots that are just gaining hold of the soil underneath, whilst if the turf and soil beneath are sodden, the weight of the roller will squeeze and compress both, to the detriment of the new root action that is taking place.

The fact is, the question of rolling newly laid turf demands very careful judgment, and whilst the immediate effect of rolling may be an apparent improvement of surface, the smoothness may very easily be obtained at the expense of the lasting welfare of the grass. After a few weeks the roots will have gained sufficient strength to endure careful

rolling, always providing a day is chosen when there is just a moderate, but not excessive, degree of moisture in the turf.

If the work is carried out early in the autumn, and the grass makes an appreciable amount of growth, as it may do if the weather is still good, it may be advisable to cut once before the end of autumn, but this should preferably be done with a keen-edged scythe. The lawn should, from this time onward until early spring, be left pretty much to itself, interference during the winter months being calculated to be more injurious than beneficial.

The task of laying turf on sloping banks is somewhat more difficult than on the flat, especially where the banks are built up of freshly moved earth. It is doubly prudent in such cases to allow ample time for settlement of the soil before covering with turf, for the whole appearance of an otherwise fine lawn will be sadly marred if the banks subside in places after the turf is down.

An even gradient on a sloping bank may best be secured by running a straight-edged batten along the top and bottom margins of the slope, and placing other battens at frequent intervals at right angles, meeting the two marginal lines. The soil can then be evenly raked to the exact slope of the cross battens. As the bank is built every load of soil should be evenly spread and well trodden, thus minimising the subsidence which is bound to take place. In laying the turf on slopes the beater must be relied upon since rolling is impracticable, but a keen watchful eye is necessary to guard against irregularity

arising from too much or too little beating.

Banks which curve or vary in outline to conform with their immediate surroundings, such as pathways, lily pools, or other salient features, involve the taking of measurements from various points, but a practised eye is a guide which must largely be relied upon wherever straight lines are impracticable. In all cases effort should be made to secure the most gradual slope possible. A steep bank is a source of endless trouble. Cutting and rolling may be instanced as the most laborious tasks involved in the care of steep grass banks, but the utter impossibility of keeping the grass growing becomes apparent upon the first occasion of drought. Artificial watering is practically useless, and even rain does little good when the slope is steep, for only the foot of the bank receives the full benefit.

As a general rule the most satisfactory method of placing turf on a bank is to run a row lengthwise at top and bottom, and fill the intervening space by running the turves from the top row downward. If the bank is steep it is a wise precaution to drive wooden pegs through the turves of the top and bottom rows to hold them in position, but take care not to use pegs of willow, poplar, or any wood that may be likely to strike root and grow, or considerable trouble will result. Narrow sloping verges may best be laid by using squares of turf instead of long rolls. The top dressing soil must be well brushed into the crevices after laying. Banks can seldom be satisfactorily seeded, either drought or heavy rains preventing satisfactory growth.

CHAPTER V

LAWN MAKING FROM SEEDS

TO dogmatise as to the relative merits of turf-lain and seed-sown lawns is easy, but it is also foolish, for from whatever standpoint one may argue, that the one or the other is the only correct way, a practical man with ready wit may shatter the dogma of prejudice with irrefutable fact. The strongest point in favour of turf is the fact that it provides a serviceable lawn in the shortest possible space of time. The most forcible argument in favour of seeding is that it is by far the cheaper method, but the permanent success and satisfaction of either depends upon quality of materials and excellence of workmanship. A good lawn cannot be made with rough weedy turf, neither will a poor mixture of grass seeds produce satisfactory results. Turf, even of good quality, will fail if it is composed of grasses unsuitable for the particular soil or situation upon which it is to be lain ; but equally so, it is courting failure to sow even good grass seed without paying due attention to selection of varieties and careful blending. In regard to preparation and treatment of the soil, the need of thoroughness is imperative in both cases. This much I will say, if the soil is well prepared and a properly prescribed mixture of grass seeds is sown and well tended, a highly satisfactory lawn may be produced at a cost

much below that of good turf, and where circumstances and patience admit of waiting from eighteen months to two years before the lawn is to be subjected to hard wear, my vote would certainly be cast in favour of seed.

For the moment we will not be concerned with the consideration of the suitability of particular grasses for particular soils. The characteristics of the best grasses are separately dealt with in a later chapter, and assuming that the importance and necessity of securing a well-balanced prescription of grasses requires no further emphasis, the handling and treatment will be practically alike for all, and it is this phase of lawn making that for the present concerns us. We need not go again over the details of soil preparation, levelling, etc., as this is the same for land that is to be sown as for that which is to be lain with turf. The longer this work can be done in advance of seeding time the better, not only because of the importance of obtaining proper settlement after digging and manuring, but that seeds and roots of weeds in the soil may have opportunity to germinate and grow, to be eradicated before the grass seed is sown.

During the period of "fallow," the technical term for resting land after ploughing or digging, it will be beneficial to fork over the surface at frequent intervals to a depth of three or four inches, selecting opportunities for the task when the soil is in a fairly dry and easily worked condition, the ultimate end in view being to secure a fine tilth, an even surface, and a firm bottom.

There are two sowing seasons, spring and autumn, and normally, or perhaps we may say theoretically, the spring season is the month of March, and the autumn season September; but he would be a poor grass specialist who would tie himself rigidly down to calendar restrictions, ignoring the elasticity that is rendered imperative by reason of the vagaries of our extremely variable climate.

There are seasons when the climatic and soil conditions in the month of March are decidedly unfavourable to the sowing of grass seeds, and when snows, frosts, or drenching rains render the soil unworkable, it is sheer madness to sow simply because a certain date has been reached. I have frequently found it advisable to postpone sowing until April is well advanced, and occasionally have even sown in May with satisfactory results, although I would add that, generally speaking, it is courting risk of scorching the young seedlings to delay sowing until the fifth month of the year.

In autumn we sometimes have a period of great heat and severe drought in September, and under such conditions it is certainly prudent to await rainfall. In the excessively dry summer of 1921, the ground was extremely dry and very hot during September, and thermometer tests showed that quite late in October the temperature of the soil was up to the normal degree for summer. That season I sowed large quantities of grass seed during the last twelve days of October, and could not wish for better results. Therefore, whilst March and September are mentioned as the normally correct

months, I strongly urge that intelligence and discretion shall always be exercised in deciding just when grass seed should be sown.

I have no doubt many readers will be anxious to read clear instructions as to the quantity of seed that must be sown to ensure a good thick lawn, and it would undoubtedly be a serious omission to ignore so important a matter. Before I proceed to mention quantities it is desirable to remark that considerable elasticity must be allowed in consequence of variations in the seed mixtures used, the soils of which seed beds may consist, the purposes for which the lawns are required, and the length of time for growth that can be allowed.

In the case of a bowling green where nothing but the finest and smoothest grasses are to be used, and where a dense carpet-like growth must be obtained, the weight of seeds must be far greater than is essential for an ornamental lawn or even for an average tennis court. The smaller grasses have small seeds, and a pound of seed consisting mainly of Festucas will not cover as large an area as a mixture containing a large proportion of Lolium perenne and Cynosurus cristatus.

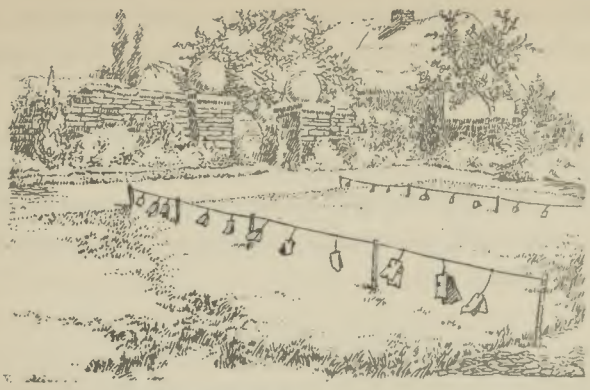
For a bowling green on a properly built foundation, it is not extravagant to sow from ninety to a hundred pounds weight of seeds over the area of forty-two yards square (1,764 yds. super.). A tennis court with fairly good run-back and side margins may very well be granted a bushel of seed, unless clover and yarrow are allowed in the mixture, in which case sowing need not be so thick ; whereas if the mixture

contains neither clover, yarrow, nor perennial rye grass, the quantity may well be increased by at least half a peck.

Cricket grounds, football pitches, and other large areas demanding harder and somewhat coarser grasses than those used for tennis courts, will be well sown if the proper blends of grasses are used at the rate of four bushels per acre ; but it is noteworthy that whereas with almost every kind of garden seed it is prudent to urge the importance of sowing thinly, it is just the reverse in regard to grasses, for thick sowing not only shortens the space of time required to produce a usable sward, but induces a very much finer growth and absence of coarse tufts that will generally appear where the seedlings have much room for development.

The actual task of sowing grass seeds is one that requires considerable practice ere it can be faultlessly performed. Broadcasting, skilfully done, is preferable to the work of any machine I have yet tried, although for large areas a seed barrow fitted with a revolving propeller-like attachment, constitutes to all intents and purposes a mechanical broadcaster, which is vastly superior to the drills that distribute the seeds in rows with regular spaces between. The aim of the sower must be to scatter the seeds so evenly that they effectually cover the surface of the ground, with neither dense patches nor blanks. A calm windless day is essential, and for the rest success depends upon the acquisition of a perfect rhythmical movement embracing an even stride and regular swing of the arm. The seed

should be carried in a fairly deep box, slung by a strap from the sower's neck, in a position convenient for access of both hands. Grasping the seed, the arms are outstretched and the seed liberated as the hands are brought with a sweeping movement until they pass each other. Some sowers use only one hand, but for speed and even sowing the double-handed method is preferable. Having covered the whole area, working up and down the plot, a second sowing should be made working at right angles to the first. A shallow-toothed rake must next be used to work the seed into the soil. The raking is also a task that calls for the exercise of care. If the teeth of the rake enter too deeply into the soil much of the seed will be buried beyond the depth at which it will germinate, whilst on the other hand seed left entirely uncovered will either perish from exposure or fall a prey to birds. The raking cannot be properly done when the surface of the soil is at all wet or sticky, but when the soil is in fit condition for raking in the seed it will also be suitable for rolling, and the roller (preferably a light, smooth wooden roller) should be slowly drawn over from north to south and then from east to west. Perfectly flat-soled shoes must be worn during these operations, and if the operator can accustom himself to walk with boards strapped to his feet so much the better. The boards should be about four inches longer and two inches wider than the sole of the boot. Having sown the seed and rolled it in, the next thing is to protect against the ravages of birds. Where practicable the plot should be covered with



Tin and Glass Bird Scares on Seedling Grass.

fish netting, held up by rods or wires a few inches above the soil. On large areas, however, this is scarcely a practical proposition, and the provision of some sort of bird scare is about the best substitute. The old-fashioned scarecrow, to wit, the discarded garment and hat stuck on a wooden support, is almost futile, since birds lose terror of it in a very short space of time. Far more effective are bits of polished tin, glass, and oddments of mirror-glass, suspended from lines stretched over the ground. The glass and metal should be clustered at intervals so that they tinkle when moved by the wind, and also throw out spasmodic gleams when the sun shines upon them. Such a contrivance, placed so that the dangling fragments just miss the ground, will mystify and terrify birds for a longer period than anything I have tried, with the possible exception of black thread stretched to and fro over a seed bed, which again is scarcely a plan that can be adopted on very large areas. The employment

of lads to scare away birds on large grounds was formerly a reasonable idea, but with the shorter hours now in vogue (early morning work is imperative for the purpose) and the high wages demanded for even the simplest of tasks, it can scarcely be thus described to-day, and the festoons of tin and glass will generally be found the best bird scare within reach.

To Water or not to Water?

The last word on this question will not be uttered yet awhile, but for my part the answer is in the negative. There are many reasons to urge against watering grass seeds, and at the very outset we are confronted with the choice of two serious evils ; for water must either be driven a considerable distance, involving the use of force sufficient to wash the light covering of soil from the seed, and displacing the seed itself, or it will be necessary to tread over the ground in order to direct a gentle spray to its desired destination, and to tread on newly sown ground, especially when the surface is moistened, is bound to have disastrous results. Artificial watering tends to compress the soil so that when it dries it forms a hardened crust through which the tender young shoots of the germinating seed cannot penetrate. That crust cannot be broken with the rake or hoe as is possible in the case of ordinary beds of flowers or vegetables, and to this cause alone may be attributed many failures of grass seeds which have been hastened into germination by a supply of moisture during hot weather only to be suffocated

and killed by the hardening of the soil through which the germs strive in vain to penetrate.

A further difficulty is to ensure even distribution of a sufficiency of water to be of substantial benefit. A great deal of water is required to thoroughly moisten even an inch depth of dry, sun-baked soil, but the seed being immediately under the surface gets the benefit of even a light sprinkling and sprouts very quickly. A day's hot sun dries up the light sprinkling, and the tender young roots, unable to endure scorching, die almost as soon as formed. It is infinitely better that the seed should lie dormant, as it will do for quite a long time during drought, to start into healthy natural growth after a good rain.

A different problem faces us, however, when rains sufficient to start growth are followed by a lengthy period of drought. Such circumstances involve risk of loss of a large proportion of the young seedlings. Even so, my advice is still that one should be reluctant to start watering. It is far better to afford some protection to the young roots by thinly and evenly covering the whole ground with short clippings from a closely cut lawn, or a dressing of malt culms, or even of sifted leaf mould. Needless to say, neither of these mulchings may be so thickly distributed as to smother the young blades, but even a thin dusting over the soil will have a considerably beneficial effect. I have known instances where exposed lawns on light dry soil have been covered during severe drought with straw lightly shaken over the ground to afford

shade, but it is essential that such a covering shall be removed immediately conditions become favourable to growth, otherwise the young blades will become weak and unhealthy through lack of chlorophyl, the green colouring matter in the leaf. When watering is resorted to, and this applies in the case of established lawns as well as seedling grounds, a form or pattern of sprinkler should be used that will distribute the water with perfect evenness. Too many revolving sprinklers deposit the bulk of the water discharged within a narrow circle, whilst a small proportion of the water is flung out in a much wider circle. The result is a patch is heavily saturated whilst a large circle is merely sprinkled sufficiently to present a wet appearance but not sufficiently to soak the roots. There are certain patterns of lawn sprinklers that are so constructed that as the jets revolve they change angles, with consequent continual variation in the zone upon which the greater proportion of the water falls. With such a sprinkler it is possible, by allowing it to remain a sufficient length of time in one place, to ensure the whole area of its capacity being well and evenly soaked, and one thorough soaking is vastly more beneficial than a dozen mere surface moistenings.

CHAPTER VI

THE CARE OF YOUNG SEEDLING GRASS

HOWEVER carefully a seed bed has been prepared, and however thoroughly roots and seedlings of weeds may have been cleared off during the following period, there will inevitably be some weeds by the time the grass seedlings are fairly advanced. Trouble of this nature may be minimised by exercising care in preventing weeds in surrounding ground from producing and ripening seed, but despite all care seeds will be brought by winds from waste land, roadsides, or the garden of some neglectful neighbour, and an important item in the programme of caring for young grass is hand weeding, which must be done immediately the weeds are distinguishable from the grass. This may be termed a simple task, but even so, it must not be taken in hand with the slightest degree of carelessness, for it is quite an easy matter to inflict more serious injury on the grass than even would result from leaving the weeds. In the first place precautions must be taken to avoid breaking the even surface of the lawn, this being best achieved by using fairly broad planks on which to kneel whilst weeding. The condition of the soil must be studied, for weeding must not be done while the soil is very dry, else the majority of the weeds will break off leaving the roots in the ground, and those that are drawn in

entirely will so disturb the soil that the roots of the young grass will be destroyed. On the other hand, if the soil is in a very wet and sticky condition the work cannot be properly done, for too much soil will adhere to the roots of the weeds and the moving of the planks will cause much damage. Choose, therefore, a time when the soil is just sufficiently moist to allow the weed roots to be easily and cleanly drawn ; place the fingers of one hand on the soil on either side of a weed and draw the weed upward with the other hand. By this means the soil is pressed back in position as the weed rises, and no hole will be made to expose the roots of the grass. Confine operations to a space of convenient breadth, not so broad as to necessitate moving to and fro along the plank, but when one strip from end to end of the lawn has been cleaned work back on another similar strip, and so on until the whole lawn is cleaned. At the close of each day's work pass a light roller (a wooden one for preference) over the weeded portion to firm any of the grass roots that may have been loosened. Of course every weed must be placed in a box or basket for removal, not thrown on the young grass, but in moving the receptacle take care to lift and put it down without dragging along the grass. Autumn weeding should not be done on seedling grass after the end of September. A night frost, even though but slight, will be injurious to the grass after the disturbance of the soil which is unavoidable when weeding.

Possibly whilst weeding one may detect a few stray seedling grasses of a noticeably coarse character.

It will be prudent to pull these out, and drop a tiny pinch of good seed in the vacant space. Likewise advantage should be taken of the opportunity to scatter new seed on any patches seen to be bare or sparsely furnished with grass.

The first cutting of young seedling grass demands judgment and skill. Far too often this task is postponed until growth has attained a length of several inches, the jobbing gardener frequently advising that it will kill the young grass to cut it. One is tempted to opine that this assertion is made in order to escape the necessity of exposing inability to deftly use a scythe, an admittedly difficult task where quite young grass is concerned, but no other implement should be used for the first cutting. It is a lamentable fact that it is almost as rare to find a man who is skilled in the use of the scythe as one who can score a bullseye with a bow and arrow; but whoever would be an expert in the care of grass should determine to make himself proficient with the scythe.

The first step is to secure a good well-tempered blade and a convenient handle. See that the scythe is so adjusted that it will make a clean sweep when the handle is held at a comfortable angle. Learn how to properly sharpen the blade, and always carefully choose a hone of the right texture. Always carry a sheath for the hone and replace it in the sheath after using. To throw a hone on the ground will quickly spoil it, and a damaged hone soon means a damaged scythe. For the rest practice alone will make perfect. Start with some fairly stiff, mature

grass, and persevere until the correct, even sweep is acquired that will cut the grass clean and even. At the commencement the point of the scythe will seem to be intent upon ploughing into the earth, but by leaning a little more forward, and holding the left hand a merest trifle higher, and by slightly swinging the body round in unison with the scythe the right knack will soon be learned, and when able to cut stiff grass practice may be extended to younger growth. It will always be found that the scythe will do its work very much better when the dew is on the grass, or immediately after a slight shower of rain. For the beginner mowing with a scythe is extremely tiring work, and an hour's steady practice will make one stiff and sore for a couple of days, but, as with most things, one soon becomes accustomed, and after a while an active workman will find the task no more fatiguing than using a mowing machine. Let the first mowing be when the seedlings are about three inches high, and take only about an inch from the tops of the young blades. For autumn-sown seed one mowing will very likely suffice before winter sets in, but with a warm autumn and a fair amount of rain, a second mowing may be necessary. From November to February the grass should not be cut and seldom rolled, unless the weather be particularly open and the soil in a tolerably dry condition.

The date of starting cutting in early spring must be governed by weather conditions. Never meddle with grass, especially that which is young, immediately after frost or when a frosty night seems

imminent. Much damage may be caused by rolling during periods of night frosts, even footprints on frosted grass will frequently reveal themselves in blackened blades.

Sometimes we enjoy very open weather even as early as the month of February, and rather than allow the young lawn to acquire too lengthy a growth it may be quite advisable to mow, but not too closely.

If the season is late the start of the mowing must of necessity be postponed, but in this, as in many other details of management, one's discretion must be exercised. As spring advances, and after the scythe has been used twice, or perhaps three times, and the rooting medium has been nicely firmed by judicious rolling, the mowing machine may be brought into use.

It is highly essential that the machine used on a young plant must be in first-class order, the bottom plate and knives being well ground and the latter set " high," for we must still beware of cutting too closely. A grass seedling starts out from the ground with a single stem, a joint appearing well clear of the ground line. By cutting the blade above that joint the young plant is induced to branch out into fresh growths, but if severed below that first joint it is obviously prevented from branching into secondary growth.

A seed bed will sometimes suffer serious damage through the throwing up of a profuse quantity of worm casts, the disturbance and loosening of the soil and the burying of a large proportion of seed preventing an even and satisfactory growth.

To deal with worm casts on a newly sown seed bed is a matter of considerable difficulty, and all things considered, it is the better plan to deal with the worms before the seeds are sown. The simplest plan is to prepare sufficient lime water to drench the whole area of ground, the effect of which will be to bring the worms quickly to the surface, when they may be swept up and destroyed by immersion in strong salt water. To make lime water all that is necessary is to stir freshly burned lime into water at the rate of a peck to a thirty-six gallon barrel. After well stirring, allow the water to stand until the lime settles at the bottom of the barrel. The clear water is then ready for use, and should be applied by means of a rosed water-can.

The same method may be adopted when worms are troublesome on an established lawn, and the lime water will confer considerable benefit on the grass.

CHAPTER VII

THE FINER GRASSES

Their Distinctive Characteristics and Individual Values

TIME and again, throughout the chapters of this book, emphasis has been laid upon the important facts that grasses of varying characters are adaptable to certain purposes; that some will thrive on light dry soils, some on heavy soils, where moisture is more prevalent; that grasses of specially fine texture and even growth are essential on a bowling green, and comparatively coarse, hard grasses are more suitable for football or hockey pitches; and it has also been pointed out that in making a lawn a carefully blended mixture of grasses is more serviceable than a sowing of a single kind.

The blending of grass seeds is the special study of experts, and uniform success cannot be attained by adhering strictly to the most excellent formula or following slavishly any set code of rules. Undoubtedly, however, it is of supreme importance to become as closely acquainted as possible with the characteristics of the grasses, and to acquire a knowledge of their preferences and prejudices in regard to soil and situation, and of their durability, drought-resisting capabilities, etc.

No attempt will be made to name or describe all

the grasses that may be found on British lawns or sports grounds. Such an effort would be impracticable, as will readily be understood when it is mentioned that their number would total considerably more than three hundred. A very large proportion of these are, however, of little or no actual importance, and so far as the general run of ornamental or playing lawns and greens are concerned, about a dozen kinds of grasses are as many as we need be concerned with, but in the case of more extensive athletic grounds, and especially golf links, a larger number will come under observation and merit some attention.

Some of the most important of the finer grasses are illustrated, and although, of course, one has no opportunity of seeing fully developed, flowering, and seeding plants on continually mown grass, the inflorescence is shown in the drawings because therein lies the principal means of identification.

The ability to identify grasses at sight is a valuable asset to the maker of lawns and greens, for it enables him, when inspecting proposed sites for new formations, to take note of the grasses that prevail in a natural or wild state in the neighbourhood, saving himself a deal of trouble in ascertaining soil conditions and the character of turf he must aim at providing, or of seeds he must sow. The same advantage applies when investigating sources of supply of turves, for if meadows are found to be prolific in the finer grasses the turf will be worth buying, or if only coarse and undesirable grasses are present, much trouble and disappointment will be saved by

the discovery of that fact before purchase and use.

The blade and stem formation, and the root system, are features of fundamental importance from our present point of view, and although all grass is grass to the casual observer, a closer

inspection, which will be considerably aided by the drawings from life, will show many differences in form, density, and habit of growth. It must be borne in mind that the crowded culture necessary to secure a close turf, and the frequent cutting of the grass on a lawn, both tend to fine down the stems and blades, and on that account it is generally advisable when sowing a lawn that is to endure constant and hard wear, to use a considerable proportion of the stouter, coarser grasses. It is frequently assumed that if a grass grows naturally on a very light, dry sandy soil, it will, if planted in richer, stronger and comparatively wetter soil, grow with far greater vigour. Such is by no means always or even generally the case ; in fact, it frequently happens that by enriching the soil the grasses that naturally grow on harsh, hungry soil will sicken and languish, and sometimes die right out. It is even a practical method of eliminating undesirable grasses that are too rough and coarse for pleasure lawns to apply liberal dressings of nutritious manures and chemicals that will foster the development of the finer grasses and overwhelm the coarser. There are, happily, some quite fine and serviceable grasses that will grow well on sandy soils, and these are a boon to those who have to maintain lawns on the loose sandy soils near by the sea ; but it must be added that prudence bids the makers of lawns in such places to take advantage of every opportunity to improve the texture of the soil, thus facilitating a widening of the range of grasses that may be successfully utilised.

Cynosurus Cristatus (*Crested Dog's Tail*)

First among our illustrations we have an exceptionally useful grass. It makes a mass of fine, fibrous roots which spread near the surface, and in consequence assists materially in producing a turf of firm texture, with plenty of spring to the tread and of excellent wearing quality. The stems are slender and the blade fine, whilst there is no excessive development of tussock or crown. With regular mowing the plant becomes dense and even, and the colour is rich and exceptionally resistant to the bleaching effects of the sun.

Cynosurus cristatus grows naturally on hillsides, and may frequently be seen thriving on a thin layer of gravelly soil over chalk. It is consequently a grass that should be made much use of for harsh soils in dry, exposed situations. Its substance is fine enough for tennis courts and putting greens, whilst its constitution and stamina are equal to good service on teeing grounds, cricket pitches, and grass walks. It is not happy in low-lying, swampy places, or on spongy soil.

Lolium Perenne (*Perennial Rye Grass*)

The companion illustration to the foregoing depicts a stronger and somewhat coarser grass that is possessed of merits that make it very useful for many purposes, but has also defects that under some circumstances justify the prejudice which is sometimes met with regarding its use for fine lawns.

The drawing clearly shows the tendency of even

a young plant to develop a stout, prominent crown. With increasing age the crowns multiply and become still further accentuated, and it is a grass that soon becomes rank if the lawn is neglected.

Lolium perenne is, however, a very excellent grass in many respects, and must not be too lightly condemned. It is one of the freest growing of grasses, its seed germinates very rapidly, and is consequently much appreciated when a lawn from seed is quickly required. *Lolium perenne* is cheaper than many grasses, and is a good stand-by for seed merchants who put up general lawn mixtures. The quick growth of the seedlings helps to shade and shelter the smaller and slower growing grasses, and so long as the mower is kept in regular use a good proportion of this grass is by no means to be despised for ordinary ornamental lawns, for football, hockey and cricket pitches, and for the fairways of golf links ; and it may be added that the variety is by no means fastidious in regard to soil.

There is one point worthy of mention, and it probably offers an explanation of the chief cause of the prejudice that has arisen in some quarters against the grass. In mixing seeds to be sold at a fairly good price, the frequent stipulation is to include only a small proportion of perennial Rye grass, the assumption being that with a small proportion only no detriment will be noticeable, but that a large proportion would give rise to coarseness in the turf. In actual fact the reverse is the case ; a few seeds widely distributed through a bulk of finer grasses will result in a sprinkling of individual plants, and

being able to develop much quicker than their neighbours, these scattered plants become quite large tufts, the crowns of which will rise perceptibly higher than the rest of the grass. On the other hand, a larger proportion of the seed will result in several falling close together, and the thicker the soil is

occupied with their roots the less vigorous and rampant will be the growth. In fact, very thick sowing of *Lolium perenne* produces quite a fine, close sward.

Festuca Rubra (*Red Fescue*)

Here we have a valuable grass of small and slender proportions, combined with a good constitution. A glance at the illustration will convey an excellent idea of the form and character of its roots. It will be noticed that they grow in a spreading manner, are much branched, and are of a wiry appearance. The stems, too, are jointed at frequent intervals, a fact that is of importance in a grass that has to be kept closely mown, because new blades will quickly appear from the joints below the cut of the mower. With rolling the jointed stems are pressed down to the soil and roots are emitted from these joints so that the grass assumes a creeping habit, and although *Festuca rubra* is naturally a grass of small growth, it quickly spreads over a considerable area and forms a fine velvety turf. It is an ideal grass for bowling greens and for putting greens, whilst a proportion is beneficial in any mixture to be used where a good close turf is required. It is fortunate that so fine a grass is good-natured, and moderate in its demands regarding soil. It will indeed grow in the driest sand, and on the peaty moors as well as near the sea. At the same time it will grow well on soil of a more solid and substantial nature, and whilst it readily shows appreciation of refreshing rains, it has a remarkable power of resistance to drought.

Festuca Ovina (*Sheep's Fescue*)

The Sheep's Fescue is a grass of peculiar character, fine, slender and soft in all its parts, yet hardy and simple in its requirements. It is frequently found on wastes approaching the shore, and near the estuaries of tidal rivers, but always on the poor soil beyond the areas enriched by the sediments washed up by the tides. Rank or rich feeding kills this grass, and this fact accounts largely for the frequency with which we hear the assertion that Sheep's Fescue won't stand the wear of a lawn. It is the system of manuring all grasses alike that more often than not kills the Fescue, whilst other grasses revel in the richness of their feeding. On golf links where the soil is poor and porous, such as is often the case on seaside links or on heather-clad moors, *Festuca ovina* is a serviceable grass that cannot wisely be ignored ; but for garden use, where soil of good heart and tolerably rich is available, there are other grasses and other varieties of *Festuca* that may be considered more useful.

Festuca Ovina Tenuifolia (*the Fine-leaved Sheep's Fescue*)

For several reasons this variety, distinguishable from the ordinary type by a more attenuated but nevertheless a harder and more wiry growth, is the better variety for general purposes, and it is a grass so fine and so rich in the tone of its greenness that its presence adds lustre to any lawn. It will be noticeable in the illustration that the roots descend

in practically a direct, perpendicular manner, and to this may be attributed the power which so fragile and dainty-looking a plant displays of enduring prolonged drought and scorching sun. Generally speaking the blades are even more slender and thread-like than would appear from the particular plant illustrated, but the finer the individual blade the more numerous they are, and the plant assumes the form of a little tufted plume. The tendency is to maintain independence and compactness, rather than to adopt an intertwining method of growth. It is on this account just the grass to fill in the small spaces between other grasses, and a good mixture will not contain a large proportion of *Festuca ovina tenuifolia* because it is not a good grass to closely cover a patch of considerable size, a thin sprinkling being infinitely more satisfactory.

Festuca Duriuscula (*Hard Fescue*)

The *Festuca* family provides us with the best and most useful of small grasses, and the best among them is *Festuca duriuscula*. Although of small growth the plant makes a great deal of root, and the stems and leaves are of wiry texture, whilst the stems are jointed at short intervals, and new blades are rapidly produced in profusion. The green of this grass is of a peculiar, almost bluish tint, but is pleasing and fast in its colour. It is credited with extreme hardiness, and certainly even in the north, and during hard weather, it is among the first of the grasses to put forth new growth and give a lawn a fresh, lively appearance. Another good point about

the hard Fescue is its wonderful drought-resisting qualities. On hillsides, on sand, gravel, chalk, or any of the harsh and unkind soils, this grass will hold its own in a surprising manner, and even when drought is so prolonged that it becomes at length scorched and seared, it will break away into

new growth in immediate response to a grateful shower.

There is one word of caution to utter. Excellent as the grass may be, and great though its merits, it should not form too large a proportion of any mixture, for it is not a grass to grow by itself, since it does not spread and intermingle one plant with another. As an associate with other and coarser grasses it is ideal, and with the one exception of very wet grounds, it may with advantage be incorporated in mixtures for all purposes.

Poa Nemoralis (*Woodland Meadow Grass*)

Whilst we are more generally concerned about the sun-resisting and drought-enduring qualities of grasses, there are times and circumstances where grass is required that will thrive in shade, and perhaps endure more than an ordinary amount of moisture. *Poa nemoralis* is a grass that may be commended to notice in this connection, for it is a grass that grows naturally under trees, in shady woods and low-lying meadows. It is of somewhat thin, elongated growth if left to itself, but under constant mowing it will attain a pleasing density and fineness, and will spread itself freely over a considerable area, rooting at intervals from joints in its procumbent stems. Although *Poa nemoralis* thrives well in shade, it is by no means afraid of the sun, and will withstand considerable drought. It is therefore worthy of inclusion among the best grasses for general purposes.

Poa Trivialis (*Rough-stalked Meadow Grass*)

This is another shade-loving grass of special merit for cold, wet soils. The root system is of a spreading character, and more or less confined to

the surface, thus ensuring the maximum of air and warmth, a necessary factor where plants grow in soil that is prone to saturation. *Poa trivialis* is not a good grass for light, hungry soils, but where the supply of nourishment is adequate it will luxuriate even when quite overhung by trees. It produces slender, creeping stems, which root at intervals and send up hairy stems clothed with down-coated blades. Mowing and rolling will enhance the density of the growth, and should the grass at any time show signs of loss of vitality, a dressing of sulphate of potash, and perhaps a sprinkling of lime, will soon restore a healthy colour and sturdy growth.

Poa Pratensis (*Smooth-stalked Meadow Grass*)

Belonging to the same family as the foregoing, *Poa pratensis* differs from its relatives in its preference for exposure and comparative dryness at the root. This may appear strange when one notes its shallow rooting character, but although the roots run near the surface they are produced so freely, and ramify to such an extent, that they command an extended area of moisture supply, and with a comparatively small amount of top growth to support, the variety is one of the best of dry-ground grasses. Although it withstands drought remarkably well it will not tolerate starvation, but demands a well-manured soil or liberal top dressings of nourishing fertilisers.

In the early seedling stage it is one of the slowest growing of grasses, and makes a somewhat

POA
PRATENSIS

disappointing show the first season, but the second year it bestirs itself and makes rapid progress, and thenceforward it maintains a dense and very fine sward.

CHAPTER VIII

A FEW GRASSES OF LESSER IMPORTANCE

Agrostis Vulgaris

IF we were dealing only with fine lawns, tennis courts and bowling greens, *Agrostis vulgaris* would be classed among undesirable grasses, because it is prone to produce "bents," as the long, spiky seed stalks are termed, and these are a nuisance where close mowing is essestial, as they bend under the blade of the mower and escape the knives.

The presence of bents on either a tennis court or bowling green will of a certainty lead to trouble, because a ball coming into forcible contact with them will glance off in a most erratic manner. We cannot, however, afford to ignore *Agrostis vulgaris* because it is a grass that has a remarkable constitution, and is capable of thriving on soils of such poor character that most grasses would scarcely maintain an existence. On golf links the creeping, mat-like growth of *Agrostis vulgaris* makes an excellent carpet for fairways, especially where the soil is either peat or sand. It is also capable of doing good service on hockey and Rugby grounds, and on the practice or drill grounds of schools. Long grass walks through pleasure grounds may be benefited by the presence of a fair amount of *Agrostis vulgaris*, and it is also a useful variety for promenades and public parks by the seaside.

Dactylis Glomerata (*Cock's Foot*)

The companion illustration to the last named is not a suitable grass for lawns, but it is one of the free-growing ornamental kinds which may be recommended for clumps in suitable positions on the

golf links. *Dactylis glomerata* is well known under its common name Cock's Foot, and is a familiar object among the wild grasses of the countryside. It is far too coarse, and much too stout in crown to be countenanced where machine mowing has to be done, but at the foot or end of a bunker, or just clear of the fairway, its growth and flower heads will be a feature of beauty. The question of advisability of adopting this method of providing ornamental features of golf links must be left to the discretion of those concerned, since it depends upon natural conditions and environment, and whether an adequate supply of shrubs, etc., is available as an alternative.

Two Other Ornamental Grasses

For a like purpose are *Bromus inermis* and *Phleum pratense*, herewith illustrated. Neither are permissible in lawn mixtures, for, as the drawings show, the growth is rough and the rootstock much too coarse for short-cut sward. The plumes of *Bromus inermis* are, however, among the most ornamental of grasses, and wherever they can be grown in clumps, both the *Bromus* and *Phleum pratense* are capable of producing very pleasing effects. The strong-growing *Phalaris arundinacea*, commonly known as Gardener's Garter, with its creamy-white and green-striped blades, is a general favourite among the ornamental grasses, and it may well form the subject of clumps in borders around pavilions, a good companion being *Gynerium argenteum*, or more correctly *Cortaderia argentea*, although

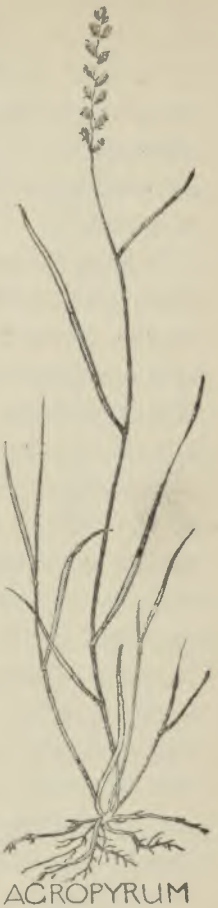
the former is still the better known name applied to the universally admired pampas grass. It generally falls to the lot of the greenkeeper to maintain some show of embellishment of the environs of club houses or pavilions, and there certainly seems to be something very appropriate in utilising some of the

very beautiful grasses for such positions. *Brachypodium distachyon* is an annual grass that may be sown during spring, and there are other Brachypodiums, such as *sylvaticum* and *pinnatum*, which are suitable for odd corners of golf links, etc.

A Few Undesirable Grasses

We have already had under notice certain grasses that are not to be highly recommended for the best lawns, but which possess certain qualities and capabilities that bring them into service where finer and better grasses would fail. There are, however, still other kinds that should be rigorously barred and looked upon as useless and objectionable. *Agropyrum repens* (couch grass) is too well known in its full stage of development to require much description, its white, wiry, many-jointed roots being a pest to all who have had either to make new or renovate old gardens. There is, however, a considerable difference between an old strong root of couch grass and a young plant just developing from seed, and the accompanying illustration may serve to assist readers to detect any young seedlings of this pernicious grass that may happen to spring up in the lawn, and will, if left undisturbed, rapidly develop to the serious detriment of the turf. It will be noticed that the seedling has only just begun to throw out a couple of its ramifying stoloniferous stems, and is not yet as coarse in stem and leaf as couch grass is known to be. It will also be noticed that even this young plant has managed to throw up a main stem, to produce flower and seed. The

trouble is that if such a seedling appears among the fine grasses of a lawn, and that central stem is cut back by scythe or mower before it perfects its flower, the check to top growth has the immediate effect of stimulating rapid development of the underground stems, and as soon as these have spread and attained sufficient strength up will come the coarse blades we all know so well, and we are confronted with the problem of eradicating them, which, as explained in the chapter on weeds, can rarely be accomplished thoroughly except by bodily lifting big patches of turf. It is therefore highly important to learn to identify the seedlings and promptly remove them.



ACROPYRUM REPENS

Poa Annua

This is the common grass that grows anywhere and everywhere, even upon the hard gravel paths, and in both flower beds and vegetable quarters. It is extremely difficult to make many people understand that this grass, which will so rapidly cover a hard pathway, is not capable of making a lawn, and should in fact be looked upon as being a pest and a nuisance when it encroaches on a lawn, as much as it

is on the footpath or carriage drive. Here are the charges against the character of *Poa annua*. It is first of all a plant of only annual duration, depending upon self-sown seed for reproduction of the species. If grown on a lawn it must therefore be allowed to produce seed or the lawn would be bare in a year.

It may be granted that this is more easily allowed than prevented, because the short seed stems bend to the ground and make it extremely difficult for any machine to snip them off. Even so, there is an objection here, for the stalks are sheathed with an almost transparent membranous skin or shield which turns yellow or almost white after the growth of the stalk is complete, and produces a bleached or seared appearance all over the lawn. Furthermore, there is no surety that the seeds will fall just where required to fill up bare patches, and the probability is many of these will appear on the lawn whilst the seeds migrate, carried by breezes to surrounding paths, flower beds, and other places where grass is not desired. Still another objection is that the blades of *Poa annua* are so soft and sappy that they bruise very badly underfoot, and consequently can never make a good hard-wearing turf suitable for any games.

Poa Compressa

Another annual weed of similar character to the foregoing, but with smaller and more compact inflorescence. A similar list of objections might be repeated in regard to this as to the other, and my

POA ANNUA POA COMPRESSA

advice is, keep these two grasses not only off the lawns but at a safe distance, by clearing it off all surrounding paths, beds and borders, for otherwise it will simply be a perpetual zigzag between the one and the other, for the seeds will never confine themselves to either.

Every treatise and handbook on lawn grass condemns *Holcus lanatus* (Yorkshire Fog), a rough, coarse grass with pale-coloured, hoary leaves that even in the young state mar the rich appearance of the lawn. Should the first small patches be ignored—and be it noted this grass has a knack of appearing spontaneously, or more correctly speaking, it is indigenous to many parts of the country—it will very soon spread to such an extent that half the finer grasses will be smothered or crowded out. The careful removal of the small seedlings at the earliest opportunity will save an immense amount of trouble, and may be quoted as an instance of the truth of the old adage, " A stitch in time saves nine."

Lolium temulentum (Darnel) and *Agrostis stolonifera* (creeping spear grass) are other two that will work havoc on any turf that they may infest, although the last named is quite ornamental on a bank, which it may be allowed to occupy out of reach of mown turf.

CHAPTER IX

CONCERNING THE NOURISHMENT OF ESTABLISHED GRASS

WE are all familiar with the old yarn about the gardener who told the American that the way to obtain a perfect lawn is to mow it and roll it, and continue to mow and roll it for about a hundred years, but if that were really all that needs to be said on the matter there would be no useful purpose in this book. The management of grass is a complex and intricate task demanding knowledge, experience, and forethought, as well as manual labour. Mowing and rolling are essential, but both are frequently done in a manner that denotes lack of knowledge, whilst several other matters of fully equal importance are frequently neglected and ignored.

It should be borne in mind that every time a lawn is mown a great deal of grass-growth is cut and removed, the production of which has exhausted nourishment from the soil.

No gardener or farmer expects to grow food crops or flowers continuously for a succession of years without manuring the land, and it is equally futile to expect to maintain a lawn in fine condition without periodically replenishing the store of plant food upon which the roots of the grass may feed. It is of first importance to secure a fine healthy

growth of grass, for otherwise the cutting will ere long become unnecessary.

We cannot manure turf as we manure a potato plot or a flower border, nor is it practicable to spread thick dressings of manure over a tennis court as a good farmer spreads it over his hay fields or pasture meadows. The feeding of lawns must be accomplished by finer methods, and may well be made a subject of careful consideration.

It will be obvious that whatever nourishment is to be applied it must be given in the form of a top dressing, and it is therefore desirable that highly concentrated plant foods shall be used, thus reducing bulk to a minimum, and further that they shall be quickly soluble that they may be readily washed down to the roots of the turf by rain, leaving the surface clean and undamaged.

Upon the character of soil depends to a large degree the nature of the manure it requires to improve its productive power, and to a certain extent this dictum may apply to lawns, especially to those which were sown with seed not more than three years previously. In the case of turf, however, it must be borne in mind that the soil of the turf requires consideration more than the base upon which it is laid, for by enriching the surface we may strengthen the turf without appreciably affecting the under soil, and so long as food is available the roots will remain close to the surface, making a tough but elastic and hard-wearing turf. This is advantageous where the natural soil is a stiff, cold, moisture-retaining clay, or a soft, spongy or peaty

soil. It may, on the other hand, be rather a disadvantage where both the soil of the turf and of the bed are light, porous, and dry. Heavy clay soils are frequently deficient in lime, and a light dressing of finely ground lime or of freshly slaked quicklime will be an acceptable aid to healthy growth. It is not advisable to apply heavy quantities at one time to established lawns, but just sufficient to whiten all the surface of the lawn, and this should be applied not less than a fortnight before, or a fortnight after, any dressing of manure or fertiliser.

On very wet soils basic slag is a useful fertiliser, and may be used as an autumn top-dressing at the rate of 1½ lbs. to 2 lbs. per square rod. Bone meal is very nourishing and may be given in conjunction with basic slag on heavy soils, or with superphosphate on light soils, 2 lbs. of each per square rod making a good dressing.

Where sparse, sickly growth indicates the extreme poverty of the soil a good grade of Peruvian guano, applied at the rate of 2 lbs. per square rod, will quickly produce a marked effect.

It is well to take note that basic slag has a tendency to invigorate clover, and where, as in the case of a tennis lawn or putting green, the presence of clover is open to objection, it is preferable to apply sulphate of ammonia rather than basic slag. Not more than 1½ lbs. per square rod should be used, and this preferably in spring (about the middle of April), as sulphate of ammonia is a powerful and quick-acting stimulant to grass. The effect of application will be to deter the progress of the clovers, but quicken the

growth and darken the colour of the grass, which will soon occupy the space hitherto occupied by the clover. The action is, however, more that of a tonic or stimulant than of a stamina-producing food, and on this account it is prudent, after an interval of a few weeks, to give another light top-dressing of a more substantial food such as guano.

Whatever of the foregoing may be used, it is wise to mix beforehand with finely sifted soil of a rich, light character. At least four times the bulk of soil to that of the chemicals should be used, but frequently it is of advantage to mix the requirements of a tennis court or similar sized lawn with a good cartload of finely sifted soil, spreading the whole evenly and working it well down by brushing to and fro with a new birch broom. Leaf mould makes a good top-dressing for heavy clay soils, but on lighter soils a good full-bodied loam is better. Care must, however, be taken that soil used for top-dressing is quite free from weed seeds. It is better first to burn the soil than to risk fouling the lawn with imported weed seeds. In fact, burnt earth is very beneficial to grass, as also is wood ash and powdered charcoal, the latter being particularly useful where through stagnation the soil has become sour and a growth of moss chokes the grass.

Lawns on thin gravelly soils, or on sand, may be vastly improved by dressing with old, thoroughly decayed stable manure, such as that obtainable from an exhausted hot bed, or a cucumber bed. The last named may be sifted when dry through a quarter-inch sieve and applied direct, soil having

been already used with the manure in making the bed. The former will be better mixed with an equal bulk of finely sifted soil. It is never good to apply a heavy top-dressing, but the best plan is to just cover the surface as early as convenient in autumn, rake well in, and leave the rain to wash into the turf. By the New Year all trace of the top-dressing will have disappeared, and during an open spell, when there is no frost, a second dressing may be given. If some old weathered soot is available it may be mixed with the top-dressing, and no opportunity should be lost of utilising in the same manner any wood ashes that can be obtained. The wood ash is rich in potash, and that is an extremely valuable grass food.

Another good method of feeding lawns is by the use of liquid manure. Any kind of manure may be used for the purpose, but avoid giving it at high strength. It is far better to apply weak and often. Liquid manure should never be given when the turf is in a dry state, but always after rain. On that account it is a more suitable method of feeding lawns on light, porous soil than on cold, heavy clay. The only satisfactory method of applying liquid manure is to dilute it in a tank and apply by means of a rosed watering-can, taking care to distribute evenly over the whole surface.

There are a few further points worthy of notice before we quit the subject of feeding grass. Among the various chemicals recommended there are some that may be mixed together, and others that should never be mixed owing to chemical reaction that is set up by their being brought into contact. Sulphate

of ammonia and nitrate of soda may be mixed. Nitrate of soda penetrates deep into the soil, and will nourish the deeper rooting grasses, whereas sulphate of ammonia spends itself near the surface and stimulates the shallow roots.

Sulphate of ammonia may be mixed with double its weight of superphosphate, and such a mixture makes a good dressing at the rate of 3 lbs. per square rod.

Superphosphate should not be mixed with nitrate of soda. Sulphate of ammonia should not be mixed with either lime or basic slag, neither should basic slag be mixed with superphosphate. Lime will not mix with soot, nor with guano, neither should it be added to top-dressing containing stable manure.

The best form of potash to use for light, hungry soil is muriate of potash. Clay soils frequently contain potash that can be liberated by a dressing of ground lime, but a heavy soil that is deficient in potash will benefit most by the use of sulphate of potash. For convenience of ready reference a summary of the main points regarding manures for top-dressing grass is here given, but no tabulated list should be looked upon as other than an approximate guide. The quantities advised may be taken as a fair average of what may be wisely used under ordinary circumstances. Lawns that lie upon soil of good heart, and that have regularly been nourished for years, may require less than my stated quantities. Starved turf may not be fully restored by such a dressing, but in such cases it would be distinctly unwise to increase the quantity at one dressing, the

more judicious course being to apply one dressing in the autumn and another, or one of some other character, in early spring. By manuring lawns that are badly infested with weeds we shall, generally speaking, add to their vigour, even in some cases to the greater detriment of the grass, and on that account it is advisable to do what weeding is possible before applying the manure. There is the added advantage that the top-dressing will fill in the holes from whence the weed roots have been extracted.

Summarised Notes on Fertilisers for Grass

Ammonia.—Sulphate of ammonia is a stimulant rather than a food, and may be applied at from ½ oz. to 1 oz. per square yard in spring to quicken growth of grass, improve colour, and check development of clover. Is not good for chalky soils.

Basic Slag.—A good fertiliser for wet and clay soils. Autumn application at the rate of 1½ to 2 lbs. per rod. Has tendency to promote growth of clover. Should not be mixed with sulphate of ammonia, superphosphate, or guano.

Bone Meal.—Used in the fine form, commonly called bone flour, makes a good autumn dressing at the rate of 2 lbs. per square rod in conjunction with either basic slag or superphosphates (not with both), or at double the rate alone.

Bone Black or *Bone Charcoal.*—Rich in phosphates, and is highly beneficial where stagnant moisture encourages growth of moss. Four ounces to the square yard makes a rich dressing.

Chalk.—Calcium carbonate is excellent in powdered form for grasses growing on soils deficient in lime. Light applications at frequent intervals are preferable to heavy dressings : 1 lb. to 2 lbs. per square rod will suffice for one application. It is admirable for very light soils, and suits these better than ground or fresh-slaked lime. In the case of moorland peats that have become well covered with indigenous grasses it is advisable to top-dress with lime or chalk.

Charcoal.—In powdered form has a sweetening effect on acid and wet soils. Checks the growth of moss and fungoid diseases. Should be lightly dusted over the surface just sufficiently to produce a blackened appearance.

Guano.—Peruvian guano, of an analysis that shows a good percentage of nitrogen, is an excellent feed for spring dressing : 2 lbs. per square rod should be the maximum.

Ground Lime.—May be used on heavy soils in place of chalk. Autumn and early spring : 1 lb. to 1½ lbs. per square rod at each dressing.

Kainit.—A potash salt that may be used with advantage on soils that are deficient in potash. Autumn is the best time for application : 4 lbs. per rod.

Muriate of Potash.—The best form for light, sandy soils : 2 lbs. to 3 lbs. per square rod.

Sulphate of Potash.—Is only of service where grass on heavy soils is seen to lack potash. Most clay soils have potash that may be liberated by lime, but when required a dressing of 2 lbs. to 3 lbs. per square rod may be given.

Nitrate of Soda.—A quick-acting stimulant that nourishes the deeper rooting grasses. May be mixed with equal proportions of sulphate of ammonia but not with superphosphate. Given alone the quantity should be 1 oz. per square yard. Apply in spring.

Superphosphate of Lime.—One of the best fertilisers for grass on chalky and gravel soils. Provides phosphoric acid. 4 lbs. per square rod. On other than chalky soils may with advantage be mixed with sulphate of ammonia. The combination of one part ammonia to two parts superphosphate will promote growth of the best grasses and greatly check the growth of clover : 3 lbs. of the combined fertiliser per rod.

Soot.—Is useful as a top-dressing, but should be mixed with soil and applied in autumn only. It is not required in the case of grass situated near London or other large towns, where sooty deposits result from rains descending through polluted atmosphere.

CHAPTER X

MOWING, ROLLING, AND OTHER DETAILS OF ROUTINE WORK

ASSUMING that by observance of the instructions given in the preceding chapters the lawn is in a good healthy condition, and the grass making satisfactory growth, the necessity will arise to tackle the question of mowing, and there is a great deal more in this than merely pushing a mowing machine backwards and forwards at regularly stated intervals. As with most operations appertaining to gardening or the land, no hard and fast rule can be laid down as to when mowing should commence, how frequently it should be done, or when it should cease for the year. It must depend upon the season, and to a certain degree upon the individual lawn with which we are dealing.

Generally speaking, perhaps, it may be said that a lawn may be mown beneficially before the month of February is out, but sometimes February is a wintry month, and grass should most emphatically not be mown while frosts prevail or when snowfalls appear imminent. If the weather is open and the days sunny, it is quite reasonable to cut the old beard from the turf, but I would far rather wait a week or two, or even a month, if bad weather hangs on. The first cutting is much better done with a scythe than with the mowing machine. The tough

old "bents," as the long, hard seed stalks are termed, will escape the knives of the machine but will be severed by a well-sharpened and deftly-wielded scythe. The best time for this operation is whilst the grass is wet with dew, or from a light shower, but machine mowing can only be satisfactorily carried on while the grass is dry. A deal depends upon the character and quality of a mowing machine; but apart from the fact that a trumpery implement, built solely for cheapness, cannot be expected to do satisfactory work, there is nothing much but personal preference or prejudice to influence the selection of one pattern or make of machine. Several British manufacturers of lawn mowers make machines that differ in minor details from other makes, but no well-known maker would attach his name to an incompetent machine.

For extensive lawns and real hard work a mower of British manufacture is in the long run most economical, but for small plots of grass in villa gardens some of the better class, lightly built, wooden-handled machines are quite satisfactory, generally speaking easy to run, and considerably cheaper than the heavier and more substantial implements. A one-man machine should not have larger than 12-inch cutting blade, anything over that size requiring a lad or man to pull at the head of the machine. A 24-inch machine is large enough to require a donkey, and a strong pony should be available for use with a 30-inch machine. Horse-drawn machines may be of any size from 3 ft. to 4 ft.

Of recent years motor-driven mowers have come

largely into use for sports grounds and for large areas of grass in the pleasure grounds of private estates. Their manufacturers publish literature descriptive of their machines and providing instructions upon their handling and management. In addition to the ordinary types of lawn mowers, special machines may be obtained for cutting narrow verges, edges of lawns, steep banks, etc., whilst shears of various shapes, with long or short handles, and with guide wheels for edging, are also made.

The care of mowing machines is of extreme importance, not only on the score of economy—a well-kept machine will outwear a couple of neglected and ill-used mowers—but because the quality of the work and ease with which it is accomplished may be measured by the attention given to the cleaning and proper storage of the implement.

Each time a mower is used some dirt and grit will be picked up, the sap of the grass will form an adhesive for both dirt and the flying bits of cut grass, and the oil, without which easy running is impossible, will also corrode and help to soil and clog the machine. Whilst moist all the grime and grease may be easily wiped away with a dry cloth, and this should always be considered the last part of the day's work, for a mower should never be put away without such cleaning. It should be almost unnecessary to mention that a mower should always be put into a dry shed or tool house at night, but yet I feel the point must be mentioned, for so often one finds a machine left out in readiness for

continuation of work next morning. Even in fine summer weather night dews foster rusting of the steel parts, whilst an unexpected storm or shower will do serious damage that may so easily be avoided.

The lubrication of the machine must never be neglected, and it is wise to use only the best sperm oil, the difference in cost between the best and inferior oils being but trifling in comparison with their efficiency.

The adjustment of the cutting blades is a technical detail of no mean importance. The cylinder must be so accurately adjusted to the blade that a piece of tissue paper may be cleanly cut through at any point along the blade. The height at which the cutting blade is fixed—regulated by dropping or raising the front rollers—will determine the length at which the grass is to be mown, and this brings us to a question that a good greenkeeper considers very carefully.

Every player, whether it be of tennis, croquet or golf, loves a closely cropped turf, and the wish of the keeper is to provide that which pleases the players ; but the lawn or green that is continuously close shaven regardless of the weather and the condition of the soil will be sure to suffer serious and maybe irreparable harm. In showery weather close cutting is quite all right, but during spells of hot dry weather the machine blade must be raised so that sufficient length of grass remains to afford some shelter to the roots. This is especially necessary on porous, sandy soils.

The use of the collecting box is another matter

that calls for some discretion. If the grass is growing rapidly as a result of abundant moisture, it is prudent and in fact essential to use the collecting box, but in time of drought and scorching sun, or in the case of young and rather thin grass, there is much advantage and practically no valid objection attaching to the practice of allowing the mower to scatter the severed portions of the grass blades over the lawn. For the first few hours the cut grass affords quite an appreciable amount of shade for the roots, and when eventually it becomes dried and shrivelled a certain amount of manurial value remains in the vegetable fibre of the grass. The actual amount of humus accruing from one cutting is of course trifling, but during a whole season the total will assume proportions that cannot be other than a beneficial mulch.

There is, of course, the point to consider that some players of bowls, golf and croquet are prone to complain that loose grass on the green spoils their play, but except where the grass has been allowed to grow very long there cannot be any serious ground for such objection, and, in fact, if players realised the real effect upon the turf the general objection would be to the use of the collecting box.

Next to cutting we must consider rolling, and, as previously hinted, the judicious use of the roller is a matter that calls for the exercise of considered judgment, for whilst it is highly essential that a lawn should be rolled as much as necessary to maintain a firm root run for the grass and a smooth, even surface for play, it is a grave error to overdo

the rolling. A great deal of harm may be done, and often is done, by using too heavy a roller, especially where the lawn lies upon a clay soil. Rolling when the turf is saturated with moisture is calculated to do more harm than good, and to roll grass immediately before or during even slight frost is folly.

Let us bear in mind that healthy growth and proper functioning of roots is impossible when air is excluded from the soil. Sandy or stony soil may be rolled a great deal and still allow access of air, simply because stones and gritty particles of sand cannot be bound tightly together, but will maintain a fair degree of openness or porosity in the soil. On heavy loam or clay soils far less rolling may be done, for the soil yields readily to pressure and easily becomes so solidified that air cannot penetrate the closely-bound mass, and natural evaporation of moisture from below is impeded until after prolonged resistance the hardened crust cracks and opens up wide fissures through which moisture escapes at too rapid a pace, and leaves roots exposed to the scorching influence of the sun and the parching of dry winds.

Where the soil is heavy and retentive of moisture, rolling should be done when the ground is tolerably dry, but never immediately after a heavy rain. It is sheer waste of time to roll either heavy or light soil when dry and hard. It will thus be apparent that instead of adhering to a strict rule that a lawn or green must be rolled at regular intervals, a watch must be kept upon conditions and advantage taken of every opportunity when these are favourable.

The size and weight of the roller must be governed by circumstances. It may be quite reasonable to use a large, heavy, horse-drawn roller on a big sports ground where hard, coarse grasses of substantial thickness have to be dealt with, and where by reason of the extent of the grounds and cost of labour one rolling has to suffice for as long a period as possible, but for the finer grasses of bowling greens, tennis courts, etc., and for young lawns from seed a very heavy roller should never be used. A light roller passed slowly over the turf, first from north to south and then from east to west, will give far better results than a crushing weight. Rollers should have a double cylinder, because such can be easily turned without damaging the grass, whereas a single cylinder is liable to graze and chafe the crowns of the grass whenever it has to be turned. It is of very great advantage to have a roller that runs on ball-bearings. The ease with which such a roller can be started and either pushed or pulled across a level lawn allows the workman to walk easily and lightly, whilst to work an ordinary roller of moderate weight necessitates putting considerable pressure on the feet, often resulting in unsightly impressions being left on the turf. For the finest lawns, putting greens, bowling greens, etc., the best roller to use is a good wooden implement, but to keep this in good order it should always be well cleaned and rubbed down immediately after use, and should be stored in a weather-proof shed. A wooden roller should not be bumped over sharp-edged curb stones or dragged along gravel paths, but should either be taken to

and from the lawn on a cradle or flat trolley, or have an old carpet laid along any pathways over which it has to be drawn. A well-cared-for wooden roller will last for years indefinite, but a little carelessness may quickly ruin it.

One of the objects of rolling is to counteract the trouble caused by worm casts. When these are just sufficiently dry the roller will pulverise the worm casts, but when they are wet it will pick them up. This will be satisfactory if the roller is continually scraped clean and the soil adhering is cleared away, but if this operation is neglected and the cylinder is allowed to become thickly caked with sticky soil, much damage will be done to the turf.

A good sweeping with a new birch broom before rolling will do a deal of good, especially if the worm casts are just in the condition to break down to a fine powder. The distribution of this fine soil which has passed through the interior anatomy of the worms is one of Nature's schemes for the nourishment of the earth's vegetation.

Such treatment is infinitely better than too readily destroying every possible worm, for their good offices in reality far outweigh the trouble they cause. By their unremitting labour of tunnelling through the soil the worms greatly assist drainage and access of air, and when this work ceases the grass is in imminent danger of suffering sickness through stagnation of the soil, and also starvation through lack of aeration, without which there can be no root activity.

Even apart from the destruction of worms, incessant

treading and rolling, which although undeniably beneficial up to a point is sometimes overdone owing to the erroneous idea that rolling being good, a lawn cannot have too much of it, will in course of time prove to be a source of danger, owing to compression of the soil to such a degree that air is excluded from the root run. It is absolutely essential that a certain amount of air shall enter the soil for the purpose of aiding the conversion of chemicals into available or soluble plant food, and it should always be considered an urgent necessity at the close of a season's wear and tear to rake-scratch the surface of the lawn. On large areas a spike harrow, well weighted, may be drawn by a horse wearing lawn boots, first north to south, and then east to west ; but where the work can be done by hand rakes so much the better.

In the case of heavy soils that form a particularly hard crust more drastic treatment is necessary. Formerly the usual custom was to thrust a fork perpendicularly to a depth of several inches into the turf, and at frequent intervals over its entire surface ; but we have now available a spiked roller, as shown in the accompanying illustration, and by passing this roller both ways across a lawn the whole will be perforated with small holes that will afford ample means of access of air to the roots. The perforations should be permitted to remain open for several days, after which the lawn should be top-dressed with finely sifted soil, which if brushed well in will fill the holes, thus affording fresh nourishment for the roots.

Patching and Reseeding

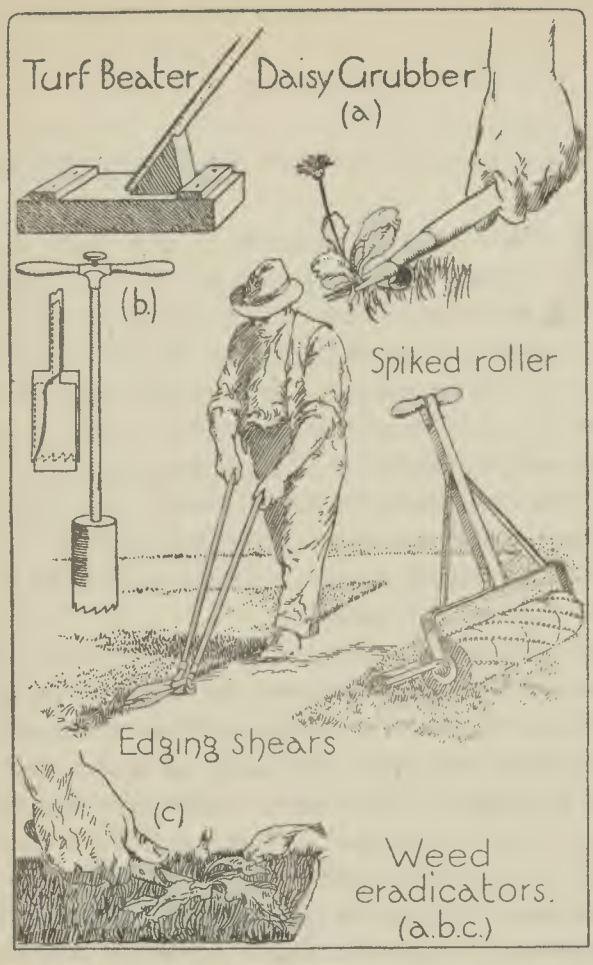
However well the lawns and greens may be kept and nourished, the hard wear of a season's sports and games will inevitably result in some patches wearing bare and uneven, and each autumn it will be necessary to do a certain amount of repairing these patches. These may be either returfed or reseeded according to preference and the requirements of individual cases. Where a fine lawn or putting green, which might be marred by the introduction of turf of a rougher calibre, has to be dealt with, and provided sufficient rest from use can be allowed, it is undoubtedly best to sow seeds of a proper blend of grasses ; but where a tennis court, bowling green, or other playing pitch has to be made ready for the opening of another hard season's wear, returfing the bare parts is the more practical method. It is for such purposes that a nursery plot, where turf can be prepared by raising from seed, will prove a great boon.

In either case the first thing to do, as early in the autumn as circumstances will allow, is to line out the bare patches, taking in sufficient area to cut into the margin of healthy turf, cut close along the lines to a depth of two inches, using a sharp edging iron thrust vertically into the turf, then with a turf cutter pare off all the exhausted turf and remove it to the compost heap to rot for future use as top-dressing soil. Fork over the soil laid bare to a depth of three or four inches, breaking down as finely as possible, and then leave for a few days that exposure to air

may sweeten the soil. Fork over a second time, working in some kind of manure or fertiliser according to the character of the soil, and also work in sufficient clean new soil to restore a good level when raked down. If turf is to be used the level should be brought almost to that of the surrounding turf, so that when the new turf is laid it requires a good beating to leave the new turf just perceptibly higher than the old. Do not misunderstand " a good beating " to mean the excessive use of an implement that, whilst quite useful, may be turned into an instrument of torture and destruction. Excessive beating of turf is murderous in its effects.

Natural settlement and further rolling will then give the patch an ultimate level corresponding with its surroundings, whereas if laid to that level at the start settlement is bound to result in a hollow. If the patch is to be seeded the additional soil introduced should be sufficient to raise the patch almost an inch above the normal level, settlement and rolling will then bring the young grass to its proper position. The turves should be fitted as neatly as possible, made firm by beating, and then a top-dressing of fine soil should be spread and brushed into the crevices between the turves. The whole will then knit together in such a way as to hide the joins within a few months. In seeding do not stint the quantity, but distribute as evenly as possible right to the edges of the patch. Rake carefully into the soil and spread just a slight covering of sifted sandy soil over the whole.

The first day the soil is dry enough to avoid



sticking to the roller it should be rolled both ways, and if birds are likely to be troublesome either net the patches or fix up a few of the tin and glass bird scares on lines as shown in our illustration. Future treatment of the seeded patches should correspond to that advised for seedling lawns.

CHAPTER XI

WEEDS AND THEIR ERADICATION

A WEEDLESS lawn is a rarity indeed, but it should be the perpetual aim and supreme ambition of every lawn and green keeper to free his grass from weeds. The nature of the task involved will be imagined by anyone who contemplates a lawn infested with any of the more prevalent weeds such as dandelion, daisy, plantain, and buttercup, but it can only be realised with any degree of accuracy by those who have personally striven to clean a good-sized lawn that has been allowed to get into a very weedy condition.

The success of efforts to eradicate weeds from grass depends upon the particular method adopted, but the particular method that shall be adjudged best depends mainly upon the kinds of weeds that are to be eradicated, and in some cases may also partly depend upon the character and condition of the soil on which the turf is laid.

One may very easily generalise, and it has been a common custom to deal somewhat summarily with the question of weeds in grass, sometimes by advocating the liberal use of proprietary lawn sands, which are impregnated with chemicals of a caustic nature, and sometimes by urging that it is only by dogged perseverance in the irksome task of gouging out the weeds by their roots that they can be

destroyed, and with the scantily comforting information thus conveyed the subject is dismissed.

The problem of grappling with weeds is of an importance that claims careful consideration, and the complexities and difficulties that have to be confronted render it impossible to dispose of the subject in a casual manner. It is always easier to adopt right methods when something has been learned about the object of our attentions, and it will thus be advisable to study the character and structure of the weeds that infest lawns, their varying root systems, methods of growth, and of reproduction, for thus we shall be enabled to adopt the best of the several treatments that are advocated, all of which are effective against certain weeds, but none of which can claim to be entirely satisfactory in every case.

There are weeds of extremely deep-rooting character which are too frequently allowed to become serious disfigurements to lawns, simply because the ground was carelessly prepared prior to the laying of turf or sowing seed. Docks, botanically known as *Rumex*, of which there are several species, have, with a few exceptions, massive roots almost like a beetroot in appearance, but quite unlike it in respect of its tenacity to life. If the top of a beetroot is cut off with a spade the rest of the root will quickly decay, but if the crown of a dock is severed the root stock quickly forms several fresh crowns and grows again with increased vigour. Furthermore, if the side thongs are broken from the main root stock by careless work, those side thongs will form crowns

and thus increase the number of plants. Thistles, coltsfoot, horse-radish, which must be classed among the worst of weeds when it appears in a lawn, as it sometimes does, are all deep-rooted plants that are capable of forming young crowns on broken pieces of root, and even though the broken portion may be buried a foot below the surface it will make its way through and flourish anew. The wild convolvulus, or bell-bine, is even more troublesome, since it penetrates to a depth of several feet, and is almost certain to break when an effort is made to extract it.

The roots of couch grass, *Argropyrum repens*, do not penetrate so deeply, but ramble rampantly just below the surface and soon form a dense entangled network from which rough coarse stems and blades will appear in prodigious quantity, to the great detriment of the useful grasses. Unfortunately the roots are many-jointed and brittle, and even a broken piece a couple of inches long will grow and quickly become the centre of a spreading patch of rough unsightliness.

It will be obvious that the only wise course, when a lawn is to be made on a site which is infested with weeds of the character of any of the foregoing, is to take every care in thoroughly cleaning the ground prior to seeding or turfing. It may be necessary even to bastard trench the ground to ensure the extraction of deep-running roots, and although it is frequently held to be unwise to dig deeply because of the difficulty of avoiding uneven settling of the soil, it must surely be better to make full use of the only opportunity to eradicate the weeds, even though

it may necessitate fallowing the land for a whole year before finally making the lawn.

Where docks, thistles, coltsfoot, horse-radish, or bell-bine make their appearance in an established lawn, it becomes a case of doggedly and patiently

cutting away every new leaf that is formed, for if any plant is prevented from carrying foliage it will in time be killed, for the leaves are the respiratory organs of a plant and are therefore vital to its continued health.

A patch of couch grass, however, will defy the most persistent efforts of the shears or scythe, and the best plan to adopt is to sacrifice a sufficiently large patch of turf to enable the roots of couch grass to be carefully forked out. When this is done the patch may be filled in with good soil, rolled, and left for a while to settle, after which it may be either patched with good clean turf or sown with seed.

The common daisy, *Bellis perennis*, is among the commonest of lawn weeds, and the plant is so well known that maybe it will be considered quite unnecessary to discuss its character. Nevertheless, I am disposed to opine that greater success would frequently attend the efforts to eradicate daisies if the nature of the plant were more clearly understood. In the first place it is useless to merely cut away the rosettes of foliage with the idea of killing the plants, for the roots left in the soil will simply produce fresh crowns in enlarged clusters. The flowering season of the daisy extends from early spring throughout the summer. The flower heads and stalks bend before the roller of the mower and escape the knives. The seed ripens very quickly, sheds itself over the surrounding ground and rapidly germinates. When daisies bloom they should be cut with a sharp scythe and the blooms swept up and destroyed. Where the plants are not too numerous they may

be lifted entirely with a two-pronged daisy fork, but in the case of patches where the daisies are in dense masses it is best to cut out the entire patch to a depth of three or four inches and replace with clean turf.

Chemical lawn sand may very well be used for destroying daisies on areas that are of greater extent than can conveniently be dealt with in the foregoing manner, and with careful handling it will be found more economical than hired labour for hand weeding. It has often occurred to me that manufacturers of lawn sand err against their own best interests by refraining from making their instructions for using lawn sand as explicit and comprehensive as possible. One may read that there is no danger in the use of lawn sand, and that the grass and weeds alike may be covered at the rate of so many ounces to the square yard, or so many pounds per rod. It may very likely be that some lawn owners will upon these instructions buy a good deal more lawn sand than is really necessary, but I am convinced that many more are reluctant to give it a trial under the supposition that a sufficient quantity to do any good would cost an extravagant sum, and I am also sure that in very frequent instances larger quantities are actually used than are at all necessary to achieve the desired result. It is quite unnecessary to delve into the secrets of composition of proprietary brands of lawn sand, but the principle of its action may be explained, and thus the user may obtain a clear idea as to the method of application that will be at once most effective and economical.

If lawn sand is spread over a lawn, all that which

rests on the broad flat leaves of daisies or other weeds will have a caustic action upon those leaves, and will burn both foliage and crowns to the ground line. Such portion of the lawn sand as may find its way past all foliage and thus come to rest on the earth will expend its strength in a futile effort to burn the soil. As the blades of grass are narrow, smooth, and more or less erect, a light sprinkling of lawn sand will pass between them and reach the soil. That is why a lawn may be dressed all over without detriment to the grass, but if it is carelessly thrown down in handfuls so that parts of the grass become buried in little heaps, those buried portions will be burned.

Will it not occur to the reader that it is needless extravagance to dress the whole lawn, grass as well as weeds, with lawn sand? By making use of an ordinary tin canister of convenient size, perforating the lid with holes which may be punched with a French nail, and starting with the canister three-quarters full of lawn sand, every patch of flat-leaved weeds may be "peppered," and every patch of good grass missed. It is wise to line off a strip about three feet wide from end to end of the lawn and confine attention to the weeds in that strip before moving the line to a further three feet. The lawn sand will go about four times as far under this method, and the material is more costly than the additional labour. The lining-off idea should also be adopted whenever hand weeding grass is undertaken, otherwise it is almost impossible to avoid irregularity in the work.

Lawn sand should not be used while the grass or weeds are very wet, nor when a heavy rainfall seems imminent. An excellent time for application is during the sunny hours of a day that promises to be followed by a dewy night. Manufacturers generally mention spring as the best season for use of lawn sand, and the effects are certainly rapid —and shall I say demonstrative?—when the weed foliage is young and succulent; but after a wide experience, the use of many tons, and careful observation, my conviction is that early autumn use produces the most durable results. The best explanation or support for my contention is that in spring the soft young leaves are quickly burned up, and a good proportion of the lawn sand reaches the ground to be transformed into plant food. The vigour and strength of weed roots and crowns is very great in spring, and such as are not killed outright are able to recover, and some time during summer may make new growth, from a multiplied number of crowns.

In autumn the foliage is harder, broader, and considerably tougher. The consequence is the sand is held longer, burning all the while until even the stout heart of the weed is badly damaged. The growing season is too near its end for vigorous efforts at recovery, and a weed that although not killed outright has to endure the hardships of winter in a weakened, damaged state, is most likely to be dead before spring.

It invariably happens that the first effect of an application of lawn sand is the temporary

disfigurement of the lawn by the blackening of all foliage on which the lawn sand rests. Nothing should, however, be done for three or perhaps four weeks. A flat-toothed rake should then be used, scratching with some vigour, and in all probability the weeds will rake out dead. If it is found the majority have tenacity sufficient to hold their positions, suspend the rake-scratching for a few days. In very bad cases it may be advisable to give a second dressing of lawn sand, but this should be in spring if the first was in autumn, or vice versa.

I have coupled my remarks on lawn sand with the paragraph on daisies because the daisy is one of the most tedious of weeds to eradicate by hand, but easy to kill with lawn sand. As, however, all broad, flat-leaved weeds may be dressed in the same way with lawn sand, except such as have bulbous or tuberous roots deep below the surface, it will be unnecessary to reiterate this information.

CHAPTER XII

MORE CONCERNING WEEDS

HIERACEUM pilosella is in size of leaf and to the casual glance, somewhat similar to the daisy; but for capability of giving trouble it is infinitely worse than even the persistent *Bellis perennis*, and it has the added indictment of being a " host " plant for aphis (green fly), which may always be found in rapidly breeding swarms upon its succulent stalks and soft foliage. The *Hieraceum* bears a small composite flower something like a miniature dandelion and rather pretty, but, unfortunately, it produces an abundance of seed which germinates as soon as it reaches the ground.

Even if this were all it might not be difficult to grapple with, but, alas, the plants even while still small begin to send out creeping rhizomatous stems, radiating in all directions from the central plant, rooting as they go, and forming in an incredibly short time a dense unbroken carpet of rooted stems and soft downy foliage. There is nothing for it but to cut out such patches and replace with new turf, but—this is a point frequently overlooked with disastrous results—the margins of the patch should be minutely examined to ascertain whether any quite small ends of the runners or stoloniferous stems extend at any point beyond the proposed line of the knife, for if such small pieces are left they will

develop to cause the same trouble a year hence. Even with smaller patches which may be lifted the work might almost as well be left undone unless the first step be to pull from the ground one by one the runners and then lift the plant bodily. If an attempt be first made with the central plant some of the small runners are sure to become detached and left behind. That is in a vast number of cases the reason we hear owners of even small villa grass plots declare that it is useless to do hand weeding. With a little closer observation of the character of the weeds and a little less eagerness for speed in the first weeding, quite a success might be made of many lawns in a single year, and even the most stubborn intruders must succumb to dogged perseverance.

Ranunculus (*Buttercup*).—Who knows a daisy knows a buttercup too. Nobody may feel disposed to dispute that trite saying, for even as children we learned to admire the glowing golden blossoms of the buttercups with which the verdant pastures throughout the land are bestrewn. It is scarcely sufficient for our purpose to agree that everyone knows the buttercup, for the *Ranunculus*, to give the family its botanical name, embraces very many species which not only differ in details of structure and habit of growth, but also, and very widely, in regard to the conditions and situations in which they will flourish. It may be comforting to know that only a very small proportion of the species of ranunculus are commonly found growing in grass such as is used for ornamental lawns, but there are sufficient to cause a deal of

RANUNCULUS ACRIS

RANUNCULUS BULBOSUS

trouble, for those that do infest the closer growing grasses are of very prolific character and will hold their own against a good deal of punishment.

The so-called " common," or " meadow " buttercup is botanically known as *Ranunculus acris*. It is a plant that is commonly found in turf cut from

pasture meadows, whilst being a prolific bearer of seed which is likely to be carried by birds from surrounding meadows to the fertile lawns of private grounds, even clean lawns may at any time become infested with young plants. It is of a tufted habit of growth, making rather large leaves, divided into several deeply-cut segments with prettily cut edges. The flowers are large and borne on rather long stalks. The plant should never be allowed to bloom on a lawn that professes to be well kept, and advantage should be taken of the earliest opportunity of a tolerably moist condition of the soil to carefully heave out the entire plant, roots and all, even though it may leave a hole that necessitates refilling with clean soil and sowing with seed, or patching with a piece of clean turf.

Quite probably it will be anticipated by readers that I shall recommend the plan of dipping a sharpened metal rod into sulphuric acid and stabbing into the fleshy root stock of this and various other weeds, such as docks, dandelions, and plantains. This, of course, is frequently done with successful results, but may I without undue vanity express the hope that this book is destined to pass into the hands of innumerable novices and beginners, and it is my careful aim to give such advice and instruction as may be acted upon without fear or risk of disastrous consequences, and on that account I urge that it is preferable to work long and hard at safe methods than to trifle with the highly poisonous and corrosive sulphuric acid, and more especially so in consideration of the fact that young lads are

so frequently set to the task of weeding and sweeping lawns.

Ranunculus repens is commonly and aptly called the " creeping " buttercup, and a glance at our illustration will doubtless enable the reader to recognise this as a familiar and very troublesome enemy.

In the case of all but newly-established patches, which may with much patience and perseverance be grubbed up with the small weed extractor, the quickest and generally most satisfactory plan is to cut out entirely the closely matted colonies, digging the turf out in solid lumps deep enough to get below the roots, fill in with good clean soil, and after allowing time for settlement either sow thickly with seed or patch with clean turf. This is one of the weeds that we must always be careful to trace considerably further afield than the margin of the patch that is to be cut out, for the runners root at every joint, even to the tips of the young growths.

Of a different habit of growth, making compact individual plants instead of a rambling, tangled mass, is *Ranunculus bulbosus*, the bulbous buttercup. It is not so completely destructive of the fine grasses as *R. repens*, but is somewhat difficult to eradicate because when endeavouring to uproot the plant some of the small nut-like corms or bulbs are almost sure to become detached and left in the ground, and it is from these corms that growth emanates.

R. bulbosus favours soils of a porous, rather drier character than most of its relatives, and

likes a certain amount of lime or chalk about its roots. Where the turf is shallow it is sometimes possible, immediately after a heavy rain, to draw out the entire plants, corms attached, but in so doing the roots of the grass will be considerably disturbed, and it will be necessary a day or so after hand weeding to top-dress the lawn with finely sifted soil and roll well. On deeper turf, if the weed is prevalent it may be necessary to cut the turf in strips at a thickness of about three inches, turn the strips over and pick out the corms, afterwards relaying, beating, and rolling the turf.

Still another buttercup, entirely different in growth and foliage from those already mentioned, is *Ranunculus ficaria*, often called the lesser celandine, or figwort. It has an entire, or uncut leaf, the outline of which is practically heart-shaped, and the foliage is glossy and of a particularly bright and conspicuous shade of green. *R. ficaria* grows in dense carpets, and makes an abundance of fibrous roots.

It also, unfortunately, produces innumerable small tubers, and consequently when the weed has firmly established itself the quickest and surest plan is to cut out the whole patch, removing the soil to a depth that ensures leaving no roots behind ; fill in with good soil and either sow or returf. Hand weeding is practically futile.

Another troublesome family of weeds remains to be dealt with, viz., the Plantains. Of these there are several native species or varieties, and all are of tough, strong growth, deep rooting, and prolific in their capacity for seed bearing. Their foliage grows

in rosettes, radiating from a central crown, and, as will be seen from the illustrations, the size and form of leaf and their angle of growth is calculated, especially in the case of *Plantago major*, to smother a good deal of grass. Fortunately, however, the plantains are among the easiest of weeds to kill

Plantago major Plantago media

with lawn sand, whilst they are also fairly easy to draw out when the soil is moist by the aid of a strong weeding fork, but the roots must be entirely lifted, owing to the capability of broken main roots developing fresh crowns. It is for this reason worse than useless to merely cut the heads of plantains

with a knife at, or just below, the ground level. The inevitable result of that practice is to multiply the number of crowns manifold.

P. media is not so broad or extensive in foliage as *P. major*, but it squats flat on the ground, always escaping the mower, and by reason

of its habit of throwing offsets, or supplementary crowns, soon covers a considerable area; and its slippery leaves make tennis balls bounce off erratically, and are also likely to cause players to fall. *P. maritima* is quite a narrow-leaved plant, and

it grows more erect than either of its relatives. This species is common on seaside wastes, but it may frequently be found in grass growing on light sandy soils. It is not so easy to treat *P. maritima* with lawn sand, but the fact that it grows more generally in loose sandy soils facilitates extraction by hand weeding. *P. lanceolata* is distinguishable by its spear-like leaves and by its short, thick seed heads. These are commonly called " hard heads," a not inappropriate name. The roots of *P. lanceolata* take a very firm hold of the soil

and require a strong wrist to heave them out in entirety. The remaining illustration is of *P. coronopus*, a miniature with rather pretty rosettes of scalloped leaves. It is, however, a troublesome weed and must be ruthlessly burnt out with lawn sand.

Taraxacum (*Dandelion*).—Most of the remarks

regarding plantains might be repeated as being applicable to the dandelion. One point may be mentioned, that is, if the leaves of dandelions are repeatedly cut while quite young, without getting down to the crown or fleshy root, the plant will become so weakened that it will languish and die. Another point is that seedling plants make one straight tapering root, and therefore it may be extracted by the use of the T-handled weed extractor shown in illustration (b), page 95. The method of using this instrument is to place the cutting cylinder directly over the weed, with the stem of the handle perfectly erect. With a hand on each end of the handle press down firmly, give the handle a sharp turn so that a complete circle of turf surrounding the weed is cut. Draw the cutter straight out, and the weed will come clean away, leaving a smooth-sided hole in the turf. Expel the weed by pressing the knob of the plunger. Next press the cutter into a clean turf ready at hand for the purpose, turn handle to cut, and place the cutter exactly over the hole in the lawn, press down the plunger, and the hole will be filled by a perfect-fitting disc of clean turf.

One further point in regard to the dandelion ; if a blossom is left ignored either on the lawn or in the immediate surroundings, seed will be quickly formed, and with its feathery parachute it will be blown by the first gust of wind that catches it as soon as ripe, and will probably come to rest on a clean patch of turf. Thus a comparatively clean lawn may rapidly become bestrewn with the golden-flowered weed.

Prunella vulgaris.—If the reader is unacquainted

with this weed, which according to the "simple names" advocates should be called "Self-Heal," a glance at our illustration will convey an idea of what it is like, and for the lawn owner's peace of mind I would wish that his acquaintance with the

plant may not extend to a meeting on his lawn, for not only is *P. vulgaris* a difficult plant to eradicate, but its presence among grass generally indicates an excess of moisture, and most likely defective drainage. It is very little use laboriously endeavouring to clear a lawn of *P. vulgaris* by hand weeding, and whenever it is seen the plant should be dug clean out and the patch returfed.

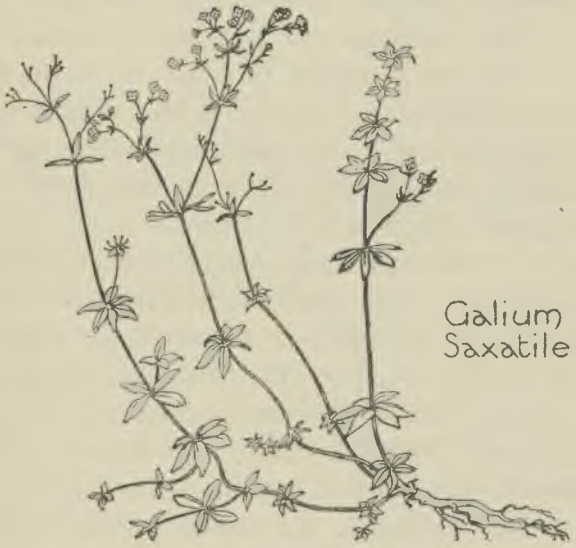
If when the turf is cut the soil is found to be sodden

it will be well to strip a larger piece so that a hole can be dug sufficiently large to sink a good-sized bottomless barrel, so that the rim shall be a foot below the surface. Fill the barrel with broken bricks and stones, with no soil between, cover the barrel with loose slates and pack coarse ashes around the sides, afterwards covering with soil and replacing the turf. Such a soak-away will greatly assist drainage, and probably prevent the prunella re-establishing itself. There is no suggestion that the method is equal to a thorough system of pipe-drainage, but this is dealt with elsewhere.

Two prostrate woody-stemmed plants that are very similar in appearance to the casual glance are the creeping thyme, *Thymus serphyllum*, and the thyme-leaved speedwell, *Veronica serphyllifolia*, and although they are two totally distinct plants their presence on a lawn is productive of closely similar effects, and both demand the same drastic treatment. Cutting serves only to thicken the dense carpet of twiggy stems and small but innumerable leaves. Pulling will do no more than break pieces from the plant, leaving the strong base to throw up a fresh crop of shoots. Not only does the dense matted growth smother the grass, but the patches of either speedwell or thyme become slippery to the point of danger to players of tennis, football or other fast games. Here, then, we are again driven to the necessity of cutting out entirely and returfing.

Galium saxatile, known as " Bedstraw," is a loose-growing plant with slender rambling stems lightly clothed with narrow " airy " foliage. A plant makes

a lot of growth from one centre, and the best method of treatment is to gather the stems together in the hand and with steady, firm pulling in an upward direction, to draw the roots from the turf. By taking the task in hand before the plants are fully developed a great deal of hard labour may be avoided.



Leontodon hirtus is a weed that is prevalent in certain districts and scarcely known in others. Where it makes itself at home it grows with troublesome vigour, but with hand weeding, supplemented by dressing with lawn sand, it proves by no means one of the most difficult pests to eradicate.

Quite a number of annual weeds have to be contended with, and especially in the case of young lawns from seed.

Common Groundsel is almost sure to crop up

where the site of the lawn has previously been tilled land. On poor gravelly soils Camomile, or May weed, is often troublesome, but this is a weed that will languish and finally die out if the lawn is periodically enriched with good fertilisers. In the meantime, of course, it is necessary to attend to hand weeding and to be careful that no plants shall remain long enough to produce blossoms and seeds. This latter applies forcibly to all weeds of an annual character, for it is in the abundance of seed produced and the readiness with which it germinates that the safety of the species rests.

Common Chickweed is generally to be counted among the hindrances to the growth of seedling grass, its soft, leafy stems spreading over a surprising area in the space of two or three weeks. It is easy enough to draw the young seedlings with roots intact, but a developed plant will make so extensive and dense a mass of roots that removal involves spoiling a whole patch of young grass.

Cerastium vulgatum, commonly called " Mouse-ear Chickweed," is in habit of growth and smothering capabilities very similar to the foregoing, and should likewise be drawn by hand while in the young stage. If it so happens that a neglected lawn is overrun with either of the chickweeds, the best method of getting them cleared is to clip as closely as possible with the shears, and having raked off the herbage smother the patches with lawn sand. This will burn the bases of the stems and check fresh growth.

On gravelly and sandy soils, the Fumitory, *Fumaria officinalis*, is so prolific that it is almost certain to

put in an appearance on a young lawn, and this also is a semi-prostrate, fleshy-stemmed plant that produces a deal of foliage and injures young grass by smothering. Fumaria does not take a very firm root hold, and much of it can be drawn out by means of

Leontodon hirtus Cerastium vulgatum

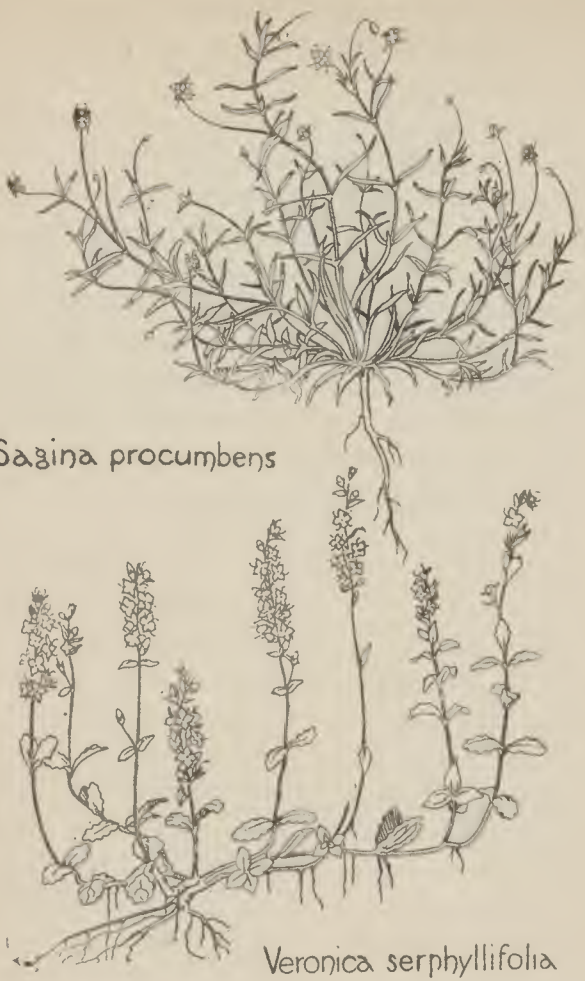
a rake after a shower of rain. Where grass is kept closely mown the fumaria soon succumbs to constant cutting and bruising.

Scleranthus annuus, *Sherardia arvensis*, and *Alchemilla arvensis* are three other annual weeds which may be mastered by the frequent use of the

rake and the mower, but hand weeding is the only reliable method of getting rid of Shepherd's Purse, *Capsella bursa-pastoris*. This weed should never be allowed to seed either on the lawn or on surrounding ground for a considerable distance. Its appearance on

a young seed bed cannot be avoided, but it can soon be completely ousted, and its presence on an established lawn must be looked upon as evidence of neglect and poor culture.

Sagina procumbens is a close-growing plant of



slender growth, the stems being clothed with tiny narrow leaves of a bright shining green. Often the weed is mistaken for grass itself, and it is by no means displeasing in appearance. Still, it is a weed, and not grass. Moreover, it produces an enormous

quantity of seed, and will quickly spread itself in dense carpets over large areas of ground to the destruction of the grass.

This may appear to be all right for a while, but whenever a severe winter happens along and keen frosts prevail for a considerable spell, the whole of the sagina will probably be killed outright, leaving the ground bare. It is wise, therefore, to keep *S. procumbens* at bay. A good scratching with a flat-toothed rake will go a long way toward clearing the grass, and if the raking is followed by top-dressing with fine soil mixed with finely ground bone flour, the grasses will be encouraged to grow and secure the mastery over the weed.

CHAPTER XIII

A FEW OTHER UNWELCOME INTRUDERS

Moss on Lawns

IT seems to be quite a prevalent idea that moss will only develop on a lawn when there is an excess of moisture, and often one hears the remark that the only thing to do to get rid of moss is to drain the soil. It is perfectly true that bad drainage and stagnation will foster the development of moss, and in situations where drainage is bad it naturally follows that moss becomes more rampant during, or immediately after, periods of heavy rainfall. It is, however, equally true that on some very light, sandy soils, through which rain filters as rapidly as through an ash-heap, moss is very troublesome, and in such places the trouble may be observed to be greater after periods of exceptional drought. We must therefore look for some other predisposing cause than mere excess of moisture as being the main factor in moss production, and close study and experience teaches that this predisposing cause is poverty of the soil.

A little moss is not unsightly while fresh and green, and on that account the temptation is to ignore its presence, but that is dangerous, for when once it gains a foothold moss develops rapidly and will soon choke the grass and monopolise the ground.

The next stage is the loss of the pleasing fresh green tint, which gives way to rustiness and a variation of colours from a bleached green to a dead brown.

The first thing to do as soon as moss is noticed is to thoroughly rake-scratch the surface of the turf, tearing out as much of the moss as possible and loosening the soil about the roots of the grass. Next mix some good Peruvian guano with finely sifted soil of a sharp gritty nature. Four pounds of guano to a barrow-load of the sifted soil, with the addition of four pounds of powdered charcoal, will make a good dressing for a square rod of turf, and after spreading as evenly as possible the dressing may be left a few days, then vigorously brushed in with a stiff birch broom, afterwards rolling with a light roller. It will generally be found that this top-dressing will encourage healthy growth of grass, and that the moss will be ousted. On heavy clay soils, a dressing of finely powdered lime will often have a beneficial effect, while on light sandy soils chalk, finely ground, is to be preferred.

Clover on Lawns

Despite the fact that some people aver that they like to see some clover among the grass, and that much seed mixture is sold into which clover is added, there is no doubt in my mind that for all lawns on which games are played the incorporation of clover is an error of judgment ; and most players of tennis, bowls, or croquet will agree that clover, so far as their courts and greens are concerned, should be reckoned as undesirable as weeds.

The faults of clover are that the foliage is soft and succulent, bruising and discolouring very quickly under hard wear, that it suffers more from frost than grass, but greatest of all, that it becomes so slippery that comfortable play is seriously marred, especially after rain. The trouble is clover is extremely difficult to eradicate when once it gets a foothold on a well-kept lawn, and furthermore, the small white clover is indigenous to many parts of the country, and is wont to make an apparently spontaneous appearance on some lawns where never a seed was wilfully sown. The length of time clover seed will be dormant in soil is a moot point, but there can be no doubt many a lawn has suddenly become infested with clover through the use of casually obtained soil for top-dressing, and it is highly important that great care should be exercised in regard to the selection of soil for this purpose, otherwise endless trouble may ensue not only from the introduction of clover, but other troublesome weeds.

Very frequently the clover trouble is greatly aggravated by injudicious selection of chemicals used for nourishment of the grass. There are several fertilisers of considerable value to grass which are, unfortunately for the lawn and green keeper, particularly favourable to the rapid increase and luxuriance of clover. From the agricultural point of view this is cause for naught but gratification, but we happen for once to have interests at variance with those of the agriculturist, and must in consequence utter a word of warning against the hasty use of a few

admittedly excellent fertilisers. In a previous chapter I have extolled the merits of both superphosphate and potash, and I have nothing to detract from what has been written ; but where clover is troublesome, and it is desired to get rid of it, these two chemicals must by no means be used in conjunction, because superphosphate and either sulphate or muriate of potash combined will have quite a remarkable effect upon the vigour and luxuriance of clover. Bone meal, again, is an excellent food for grass, but if there is the tiniest bit of clover on a lawn and a top-dressing containing bone meal is applied, away will romp the bit of clover at a surprising pace. Basic slag is another substance that promotes the growth of clover, and as it happens to be a cheap fertiliser that is used a good deal by farmers on pasture fields, it is very frequently recommended as an excellent lawn dressing by would-be experts who do not think of the possibility that it may do harm in the wrong place.

It is well to know that there are other fertilisers that will encourage grass and at the same time check, if not destroy clover. Sulphate of ammonia and nitrate of soda, either separately or combined, will have a marked effect in this direction. The trouble is both these chemicals are stimulants to grass rather than food, and they must not be applied repeatedly, as would be necessary to actually drive out the clover, without an intervening application of real soil nourishment. A top-dressing of old hot-bed manure, finely sifted, is the best thing to use for this purpose.

One light dressing may be given in October, and a second in February, the ammonia or soda being used in September and again in March. Although superphosphate and potash combined will encourage clover, a mixture of superphosphate and sulphate of ammonia will help to destroy clover and greatly improve the grass. Use half the quantity in bulk of ammonia to that of superphosphate, and apply about three pounds of the mixture to a square rod. With the superphosphate there is less need for the top-dressing of stable manure.

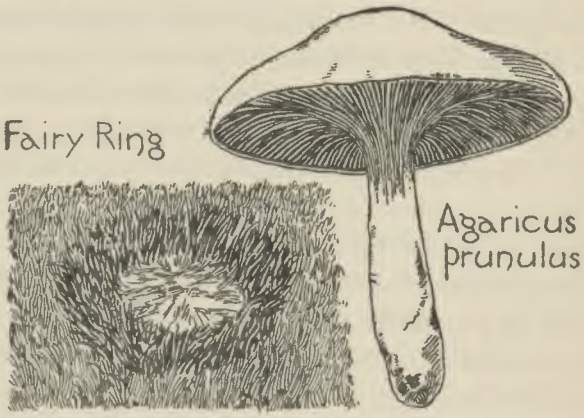
Another point about clover is it does not like the rake.

It is a good plan to tease the plants with a rake, pulling loose the trailing stems and then either pulling them out by hand or cutting them with the scythe. It will be noticed I have no short-notice evictions of clover to recommend. It is, as with most grass problems, a question of dogged perseverance to gain the end in view without detriment to the grass.

Fairy Rings

There are numerous fungi that are likely to make an appearance on lawns and are capable of doing damage, which takes the form of causing rings to appear in the grass. The rings at first have the appearance of exceptional health and vigour in the grass, but eventually the grass collapses, leaving the ring brown and bare. The following season a larger ring may probably appear around the outer edge of the brown patch, and in this way the fungus spreads

and disfigures large areas over the lawn. Whether the fungus happens to be the Mushroom (*Agaricus*), or the Champignon (*Marasimus*), or some other member of the extensive order of fungi, the simplest method of dealing with it is to drench the turf for a good space around the rings with a solution of permanganate of potash. An ounce of permanganate



will make a solution of four gallons, simply by dropping the crystals gradually into the water, stirring the while until all the permanganate of potash is dissolved.

It is also a good plan to use sulphate of iron in a similar manner, but considerably more of this chemical must be used. A quarter of a pound to a gallon of water will serve the purpose, but it should be dissolved in an earthenware vessel. The grass all around the fairy ring should be cut close for a yard's breadth, and with a small enamelled pan the solution may be evenly distributed in sufficient quantity to make the surface tolerably wet.

Grass Mildew

A fungus that is at times troublesome to grass, especially during spells of wet weather, with frequent thunderstorms in summer, is *Erysiphe graminis*, the Grass Mildew. Grassy ditches, damp pastures, and rank marsh grasses near at hand serve as breeding grounds for the mildew, and it is where such are the environment of football grounds, golf links, etc., that the grasses with which we are concerned are most likely to become troubled with mildew. Only in the case of bad drainage and neglect should garden lawns, tennis courts, etc., run risk in this respect.

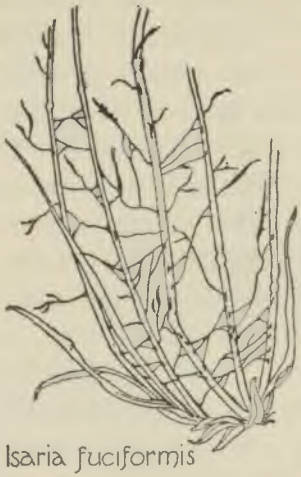
The presence of *E. graminis* is evidenced by the appearance of dirty white spots and blotches on the leaf-sheaths of the grass, which in time become coated over with a slimy mess. A mixture of flowers of sulphur and limbux in equal proportions by bulk, distributed over the grass by means of a dry powder-sprayer, will check and eventually destroy the disease.

Gelatinous Mould

Many lawns, and particularly bowling greens, become splashed, as it were, with patches of a soft gelatinous matter of a bright and peculiar colour, which may vary from a light to a dark red. This is the fungus *Isaria fuciformis*, or Gelantinous Mould.

The fungus throws out tiny filaments which attach themselves to the stems and blades of grass,

drawing them together as in the meshes of a clinging net, and thus strangling and stunting their growth. The first thing to do is to closely shave the grass



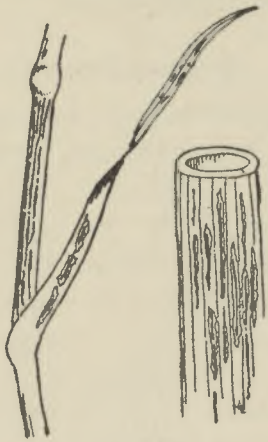
Isaria fuciformis

with a scythe, carefully cleaning up every particle of the cuttings. Dust over with sulphur and limbux as advised for mildew. Avoid the use of sulphate of ammonia or nitrate of soda, and substitute superphosphate for top-dressing.

Grass Rust

Another fungus that infests grass is *Puccinia graminis*, a fungus of which there are several forms, some of which affect corn only, whilst one or two attack certain grasses. The affected grass quickly assumes a deep orange tint, caused by the dust or spores of the fungus. Both leaves and stalks then become streaked and spotted with reddish-brown or brownish-orange, presenting an appearance as

that depicted in our illustration. The infested area should here also be closely shaved and the cuttings removed, and again nitrogenous manures should



Puccinia graminis

be withheld, using instead either superphosphate or potash, having regard to the greater need of either, in the decision of which a perusal of the chapter dealing with fertilisers will be of assistance.

Black Lichen

Defective drainage and sour soil may frequently give rise to a broad, flat, scaly growth that spreads over the turf, giving it a sooty or slaty-black appearance. The lichen will peel off in flakes if scratched vigorously with a sharp rake. A dressing of ground lime will help to check the growth of the lichen, but in bad cases the warning should be taken that drainage needs attention.

By cutting out the disfigured turf the soil below

may be excavated to a good depth, a quantity of brick rubble and clinkers can then be buried, covering with fresh earth. Make all firm and level for relaying with healthy turf.

Ergot or Ergotetia

It may be that reference to a pest that is of serious concern to farmers may at first glance appear strange, but my justification is that many sports' grounds are situated in the midst of agricultural land, and as ergot sometimes infests grasses as well as corn, it is well to draw attention to it if only that care may be exercised to prevent its development and migration to neighbouring cornfields. It is true that ergot develops in the flower heads of grass, and has little danger for closely mown greens, but it does frequently infest several of the coarser grasses, and where the boundaries of sports' grounds are occupied by Cocksfoot (*Dactylis*), *Brachypodium* (False Brome Grass), Perennial Rye Grass (*Lolium*), and other grasses that are more or less left to themselves, the unwitting result may be that serious disservice is done to the neighbouring farmer. Furthermore, ergot is poisonous and very injurious to cattle, and if, as is frequently the case, the sports' ground has cattle or sheep grazing for part of the year, they also may suffer. The ergot is easily identified in the inflorescence of grass, as it takes the form of a black seed-like body as shown in the illustration. These are compressed bodies of dormant mycelium, but in the active stage the fungus develops and spreads in the form of a sticky sweet

fluid. This fluid attracts flies and other insects and is carried by them probably to be transferred to other healthy grass or corn, there to set up a new infection and work greater mischief. Close cutting of all infested grass, burning the cuttings, and persistent attention to the cleaning of the waste corners, ditches and hedge banks, are the best preventive means of combating this pest.

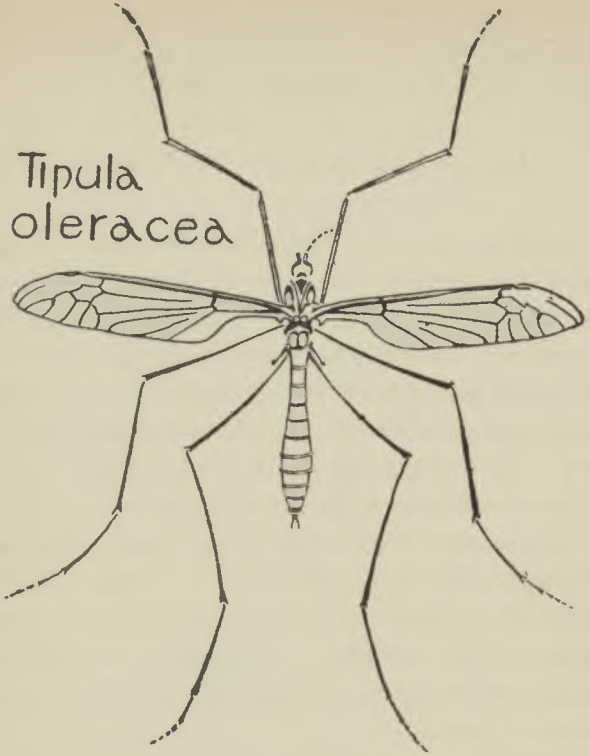
Ergotetia

CHAPTER XIV

INSECT ENEMIES OF GRASS

IN the majority of horticultural works, whatever the class of plants or trees with which they deal, a considerable amount of space is occupied with the problem of battling against numerous insect and other pests that work havoc among our cultures. By comparison with the troubles of the florist, the fruit-grower, or the vegetable-grower, the lawn and green-keeper is fortunate in having a small range of pests to combat ; but even grass suffers, sometimes very considerably, from the destructive attentions of a few species of insects, and these are of such a character that their numbers, and their capability of spreading unseen over large areas of turf, make them formidable and harassing foes that demand careful, patient, and persevering attention. In the cultivated parts of the garden opportunities occur for discovering the presence of such pests as Wireworm or Leather-jacket grub whilst digging or hoeing, and means of destruction of most garden pests are available for use at times when the ground is clear of crops, but lawns, with their covering of grass, afford a secure hiding place and a comparatively secure breeding ground for such grubs and larvæ as thrive upon either the roots or the stems of grass.

It is of vast benefit to every horticulturist to acquire some knowledge of garden entomology, for



Larva

acquaintance with the life history and habits of an insect enemy enables the gardener to identify it at sight, or to suspect its presence by reason of the distressed appearance of a plant, and to understand clearly the measures that may be taken with prospect of extermination of the pests or of preventing their

trespass upon hitherto clear ground. The complaint is sometimes heard that too much is expected of the gardener, that he is supposed to be a botanist, a chemist, an artist or architectural draughtsman, an entomologist and a deal else ; but suppose we accept the point of view that it is unreasonable to expect the gardener to know anything beyond the actual work of the garden, or the green-keeper to know anything beyond the ordinary routine work of lawns and greens; such a man would within a month be beset by difficulties and perplexed by mysterious troubles and problems that would cause him endless worry. It is the man whose knowledge is broadest and greatest whose work is easiest and whose success is assured, and instead of lightening his task by neglecting to study what he considers subjects outside his sphere, the short-sighted and narrow-minded policy simply quadruples the amount of labour, anxiety, and disappointment he will have to grapple with.

I have known gardeners who were quite well aware that wireworm troubled their carrots, beetroot and potatoes, and even their carnations, but who couldn't make out what caused so many dead patches on the lawn, and never realised that the wireworm, especially in its earliest stage, would also tunnel its way through the crowns of the grass. As a matter of fact, it often happens where one of the advertised soil fumigants has been used on beds near the lawn, the wireworms quit the bed and take up their abode in the turf, where they remain happily unmolested. Obviously the correct thing to have done would be

to treat the lawn at the same time as the beds thus rendering it impossible, or at any rate extremely difficult, for the wireworms to escape asphixiation.

All the insects here mentioned are familiar garden pests, but are not always recognised as being destructive to grass, whilst the methods by which a lawn may be freed from them differ somewhat from those applicable to arable land.

Ants

During hot, dry summers ants will frequently take up their abode in a lawn, bowling green, or in a grass bank, whilst they are frequently a great nuisance on golf links.

Their preference is markedly in favour of grass growing on light, sandy, or peaty soils, whilst lawns laid on a chalk subsoil will also attract them. The amount of damage they do is considerable, the hills of fine soil they throw up being detrimental to mowing, whilst the roots of the grass are injured and probably killed through the undermining of the root-hold.

Among many remedies or destroyers I have used, one of the safest where grass is concerned is to saturate the nest with strong camphor-water. An ounce of block camphor is dissolved in a cupful of hot water.

In the meantime a square of turf is lifted to expose the nest of the ants, and tipping the camphor liquor into a gallon of boiling water the nest is immediately saturated.

As soon as the soil is dry enough the patch can

be repaired with a good healthy turf well beaten in.

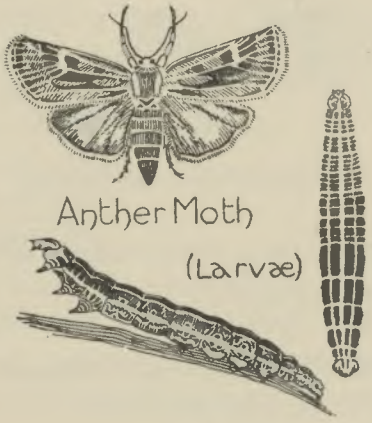
Other methods of destroying ants are to lay down sheets of brown paper smeared on both sides with treacle, or to make a syrup by boiling sugar in water, dipping pieces of flannel or sponge in the syrup, and dropping these into boiling water as soon as they become covered with ants. There are various chemicals of a volatile nature that are sometimes recommended, and which are unquestionably capable of killing ants, but they are, generally speaking, capable of killing many other creatures, including birds and domestic pets, and may also prove dangerous to human beings. In view of the fact that the above-mentioned methods are quite adequate to so simple a task as trapping or destroying ants, it is quite unnecessary to resort to the use of dangerous poisons and highly inflammable chemicals.

Antler Moth (*Charæas graminis*)

This moth is one of a small number of species that select the tufted crowns of various grasses among which to deposit their eggs. The eggs hatch in due course and the tiny young caterpillars begin first to feed upon the tenderest and smallest young blades, but as they grow they attack stronger growth, and the stalks as well as blades. Where a patch of turf has a considerable number of these caterpillars, the amount of damage assumes serious proportions, and unless steps are taken to annihilate the pest, the patches of one season will become broad expanses of dead and dying grass the next. The good offices of many of our insectivorous birds are

valuable in devouring large numbers of caterpillars. Fowls, where they can conveniently be run over the infested turf, will do their work well, whilst the roller will also crush the pests. Another excellent weapon is finely powdered lime, spread over the grass by means of a powder-sprayer.

[In the illustration of the antler moth the name is inadvertently spelt anther.]



Chafers

Chafer-beetles, of which there are several species, are not themselves destructive of grass, their food being the foliage of trees, shrubs and roses, but the trouble from our present point of view is that when the beetles find a well-kept lawn near by the shrubbery or rose beds upon which they feed, the females will burrow into the turf and deposit their eggs at the roots of the grass, and it is the grubs that do the damage by feeding on the roots and crowns of the grass.

The Garden Chafer (*Phyllopertha horticola*) is particularly fond of roses, and its grub is frequently found in grass surrounding rose beds. It is smaller than the larva of the Cock Chafer (*Melolontha vulgaris*), which, as shown by our illustration, is a large, fat-looking and strong-jawed grub, and both are greedy feeders. They do not wander far, but eat steadily

Phyllopertha horticola

away at the roots and crowns nearest at hand, consequently causing the death of the grass on the patch attacked. The grubs remain three years in the ground before emerging as beetles, the damage to the grass done by each individual during that time being extensive.

For the benefit of both grass and garden plants it is obviously wise to destroy every chafer beetle that can be captured and as they are creatures of slow movement and apparently lazy flight, they are easy to capture during warm summer evenings. When their larvæ are established in grass various schemes must be adopted to annihilate them. Needless to say, every grub revealed during preparations for making lawns or greens should be immediately destroyed. In this connection it is an advantage if the ground can lie fallow after rough digging, as

birds will thus have an opportunity to clear off a great many. Where small bare patches continually appear on a lawn it is well to take a small hand fork and turn up the soil to discover whether the trouble is due to chafer or leather-jacket grubs, and in the event of their discovery the worst patches may be lifted, the soil taken out to the depth of a few inches,

replaced with clean soil, and the surface repaired with new turves. Soil fumigants may be introduced by piercing the turf at frequent intervals, dropping the powder into the holes and filling in immediately with soil. Rolling with a heavy roller will crush many of the grubs, and if this operation is followed by perforating with a spiked roller, such as that shown in our illustration, still more insects may be killed, whilst any harm that might result from too great a consolidation of the turf by the heavy roller will be counteracted. The perforations can be filled in by distributing a dressing of finely sifted soil into which a good quantity of freshly slaked lime (reduced to a powder) has been incorporated. Vigorous

brushing with a birch broom will work the dressing into the holes, and the lime will both worry the insects that may have escaped all other attacks and at the same time stimulate the grass to stouter growth. It is noteworthy that the more vigorous the growth of the grass the less it will suffer from attacks of insects.

Crane Fly Grub (*Tipula oleracea*)

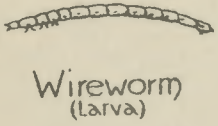
The Crane Fly, or Daddy Longlegs, is a common and well-known insect, and one may often see large numbers hovering over the grass on a summer evening, especially on such areas as football fields and golf courses, where larger and coarser tufts abound than are generally found on the lawns of private gardens. It is here the fly lays its eggs, and the larvæ hatched therefrom are the dull, blackish-looking, legless grubs known to the gardener as "leather-jackets." These grubs are voracious feeders and will do an immense amount of damage to grass.

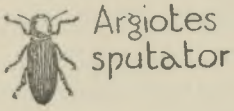
A good method of dealing with them is to soak the turf with lime-water, which will cause the grubs to come to the surface, where many of them will fall a prey to birds. Where it is convenient to temporarily run poultry over the grass, using a "colony" house such as farmers use on stubble fields, the fowls will make short work of the leather-jackets, and except during the playing season, will do good rather than harm on a large sports ground.

Rolling during the twilight of evening will destroy large numbers of leather-jackets, this being a time when they come near the surface to feed.

Click Beetles and Larvæ (*Elater or Argiotes*)

The larvæ of the Click Beetles are the detested Wireworms, which are destructive in the garden to all tap-rooted vegetables, potatoes, and a large number of flowering plants. A favourite breeding ground for the wireworm is old pasture, a fact that is brought prominently to notice when turf loam is cut for use as potting soil, and also when meadow





land is broken up for conversion into arable land. This affords indication that wireworms are partial to grass ; and many athletic grounds, golf links, and even lawns in private gardens, suffer greatly through the stronger and stouter rooting grasses being tunnelled through by quite small young wireworms.

The argument that only the coarsest grasses are strong enough to afford food for wireworms, and that the loss of these is of benefit rather than the reverse, might perhaps apply to the finer lawns of gardens and to tennis courts, but it cannot be accepted as sane reasoning in respect of golf links, football grounds, or any extensive areas where the coarser grasses, such as perennial rye grass, crested dogstail, cocksfoot, etc., legitimately form a considerable proportion of the herbage. There is a further point to consider in the case of the finer lawns which are situated near flower beds.

If the wireworms are left to themselves on the supposition that the grasses are too small to be of interest to them, it will soon be found that anything like carnations, sweet williams, polyanthus, or wall flowers, planted in the flower beds, will be visited by the wireworms. There are good liquid soil fumigants on the market that may be used for the purpose of destroying or driving away wireworms.

It is no part of my purpose to individualise in regard to proprietary articles of this kind, of which there are a number prepared by manufacturers who have too much at stake to associate their names with useless or unreliable goods. Carbolic acid, naphthalene, and other substances that generate gaseous fumes when brought into contact with the soil are used in the manufacture of these preparations, and the wisest course is to acquaint the manufacturer or dealer with the purpose in view and follow closely the instructions as to strength and method of application. Do not run the risk of damaging the grass by increasing the strength of the liquid in the hope of making doubly sure of the pests ; it is always better to give a second application than use at too great a strength. Soil fumigants in powder form may also be used, but this involves making holes in the turf and filling them in after dropping in the powder, a tedious and expensive task where a large area has to be dealt with.

CHAPTER XV

TENNIS AND CROQUET LAWNS

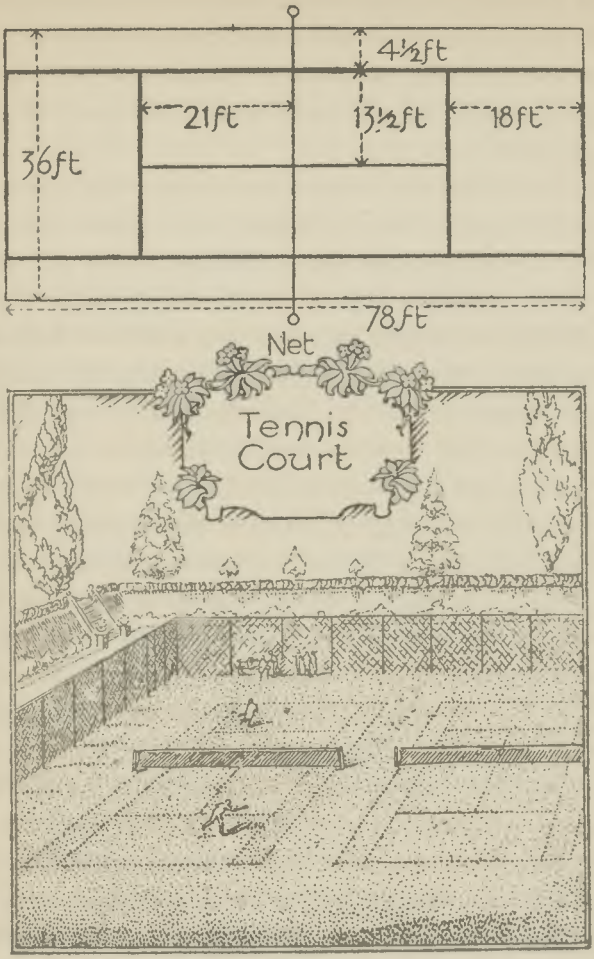
The Tennis Court

THE game of tennis, popular though it has long been in this country, has of recent years claimed an extraordinary amount of interest, and attracted an infinitely greater number of devotees than ever before, with the result that the number of both public and club courts has multiplied, whilst private courts may be said to have become an essential feature of every well-appointed garden. Alas, it can by no means be said that all these comparatively new courts have been well and truly laid, or satisfactorily maintained. Hence, indeed, the frequency with which disconsolate owners are heard to lament the wretched condition of their courts, whilst the criticisms of players anent the shortcomings of the courts they play on, and the incessant allegations that the unspeakable condition of the court was responsible for the loss of games, affords ample evidence that there is room and need for a closer study and more intimate knowledge of the proper construction and management of tennis lawns.

In the first place a large proportion of courts are cramped for space, and often, for the sake of saving

a few pounds on the initial outlay, the whole possibility of playing a comfortable and enjoyable game is sacrificed to the permanent chagrin of both owner and players. The official dimensions of a full-sized tennis court are 78 feet by 36 feet, but that is the actual area inside the base and outer side lines, and no proper game can be played on a lawn that provides no reasonable side margins and an ample run-back beyond each base line. A breadth of 50 feet, giving a margin of 7 feet beyond each side line, and a total length of 102 feet, allowing 12 feet run-back at either end, is the least that should be allowed, whilst the ideal court should not be less than 120 feet by 60 feet, allowing freedom of movement for the players without the inconvenience and irritation of constantly colliding with the boundary nets. To make such a lawn without any sloping banks around should involve the use of 2,400 turves of the regulation size, 3 feet by 1 foot, or 7,200 squares of 1 foot diameter. There will, however, in actual practice, be rather less turves laid, as explained at the end of the book under the heading " Brief Notes on Sundry Matters." If the court is to be sown with seed, not less than half a hundredweight of a well-blended mixture should be sown.

Much depends upon the situation of a tennis court, and whilst it is fully realised that circumstances do not always admit of an ideal choice, it is well to bear in mind, when selecting a site, certain points of serious disadvantage that should so far as possible be avoided. A tennis lawn in close proximity to large spreading trees is doomed to become a cause



of anxiety and disappointment. The drip and shade of overhanging branches will have a detrimental effect upon the grass, whilst large ramifying tree roots, running under the turf, will both impoverish the soil and create trouble through disturbance of

the level. A court should never run from east to west, for the simple reason that games cannot be played in comfort during summer evenings owing to the players facing west having the sun shining full in their eyes.

It sometimes happens that tennis courts have of necessity to be constructed on sloping ground. Under these circumstances there is need for much care and forethought. A level has to be secured, and, generally speaking, the most practicable method of arriving at the level is to cut down into the higher end to half the depth of the total fall, transferring the surplus soil to the lower half of the site. Here lies a pitfall into which many a lawn maker has fallen. The top foot of soil is always the sweetest and most fertile, and it is disastrous to take the top spit from the higher ground and dump it on the lower end, for whilst such a course doubles the depth of good soil on one part it leaves the acid, inert, and poor subsoil at the newly obtained surface at the other end. The result is, of course, that grass will refuse to grow at the one end whilst it luxuriates at the other, and a sound even turf throughout can never be secured. In all levelling operations the first thing to do is to remove the top spit of soil from the whole surface, wheeling it into heaps at convenient positions just clear of the area of work. Having thus safely preserved the good soil the levelling of the base can be proceeded with, and when this has been accomplished the good soil can be evenly distributed over the whole and a good level again obtained. The turf will thus be provided with

a uniform depth of sweet and fertile soil into which it may root with regular freedom.

The levelling of a lawn on a steep slope necessitates the formation of banks sloping down to the lawn at the one end, and away from the lawn, to the natural level, at the other end. Some forethought is necessary to ensure that these banks shall be neither an eyesore nor a source of inconvenience and danger.

If the banks are to be of grass they must not be too steep. An almost perpendicular bank can never be well kept, not only because of the difficulty of cutting, but because the grass is bound to suffer from lack of moisture.

It is essential that a lawn elevated at one part above the surrounding level shall be considerably larger than the actual size of the playing court, otherwise there will always be danger of players, in a fast game, over-balancing and perhaps suffering injury from falls. The risk of such incidents is frequently increased by the common practice of building up the banks with rocks and burrs. The boundaries of a lawn are not inappropriate positions for rock gardens, but if they are to be put to such purpose there should always be provided either a hedge or a low stone wall as a safeguard.

For reasons which it has always been difficult to precisely define, many people insist upon having a tennis court sunk below the surrounding level. The possible advantages of a sunken court may be a small degree of shelter from rough winds, the saving of a certain amount of depth in boundary netting, and in the case of porous, sandy soils, a reduction

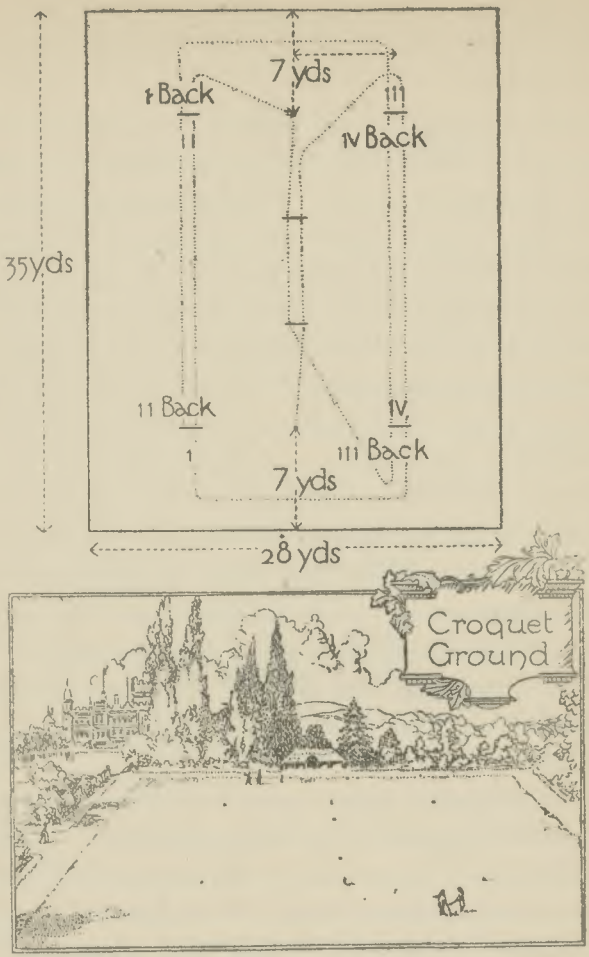
in the degree of punishment the turf suffers during periods of drought. When considering the question of a sunken versus a level court, it is well to bear in mind that the excavation of soil involved in the sinking of the court will be more costly than the few feet depth of netting saved, that on a wind-swept spot a court cannot be so deeply sunk as to dispense with the necessity for a sheltering hedge, belt of trees or wall, and that upon anything approaching a heavy, retentive soil the sinking below the level aggravates the danger of drainage troubles. There are certainly places where, owing to the exceptionally porous nature of the soil, a sunken court has its advantages in the way of conserving moisture, but it is highly essential that the work of construction shall be carried out with skill and care.

Here, as in all other cases, the top spit of soil must be reserved for the formation of the bed upon which the turf is to be laid or seed sown. Having placed the top spit safely on one side, the subsoil must be removed to the required depth, and then the permanent bottom must be forked over, well broken up, and brought to a perfect level. The good soil will then be evenly spread, well rolled, and left for a while to settle. The next operation is to rake-scratch the surface, retest for level, making any necessary adjustment, and roll again both ways. The bed should then be ready for turfing or seeding, provided, of course, that any deficiency in the fertility of the soil is rectified by the incorporation of manures or chemical fertilisers. If a sunken court is to be made on a subsoil of stiff, retentive clay, it

is essential that a layer, several inches thick, of porous rubble, clinkers and ashes shall be laid under the good top soil.

Riverside gardens and other low-lying wet situations present difficulties, as also do situations where water springs abound. Pipe drainage can only prove satisfactory where the drains can discharge on to some lower-lying level, and at best the expense of pipe draining is very great. In some cases much benefit will accrue from placing a layer of rubble, a foot thick, over the subsoil, finishing off with sifted ashes or river sand over which the good soil is spread, thus raising the turf about a foot above the normal level. If a trench a foot deep and two feet wide can then be opened all round the court the playing surface will be kept well freed from superfluous moisture. In such situations the annual top-dressings should largely, or even entirely, consist of clean river sand, with which, of course, necessary chemical nourishment and stimulants will be incorporated.

However good a tennis court may be, and however well tended, regular play throughout the season is bound to result in patches at the four corners, where players stand to serve, being worn bare of herbage. It does not necessarily follow that the roots and crowns of grass are destroyed, and very frequently, if the bare patches are perforated in September, rake-scratched, and top-dressed with good rich compost and a sprinkling of grass seeds, the turf will completely recover during the winter months. If, however, careful examination reveals the fact that the turf is



actually dead, the bare patches must be mended with good turf as early in the autumn as convenient.

Croquet Lawns

In its main essentials the croquet lawn should correspond with the tennis court, that is, so far as

level, fineness of turf, and freedom from coarse weeds and tussocks are concerned. The size of a full-sized croquet lawn is 120 feet by 90 feet, and on this area the hoops and pegs are placed at the distances shown in our diagram. Many croquet lawns are of considerably smaller dimensions, and indeed the game is frequently played on lawns that are too small to provide scope for tennis. Whatever the size of the lawn, the boundaries should be clearly and proportionately defined. The centre-line pegs should be placed one-fifth of the length of the ground from either end, the corner hoops parallel with the pegs and one-fourth the width of the ground from the peg on either side. The centre-line pegs must be equal distances from the pegs and each other.

The upkeep and treatment of a croquet lawn should be similar to that advised for a tennis court. Mowing, rolling, sweeping and weeding are all necessary to preserving a good turf and maintaining a smooth playing surface. Croquet does not involve as much hard wear of the turf as tennis, and there will be less need for extensive patching and renovation every autumn if the lawn is properly cared for throughout the summer months.

CHAPTER XVI

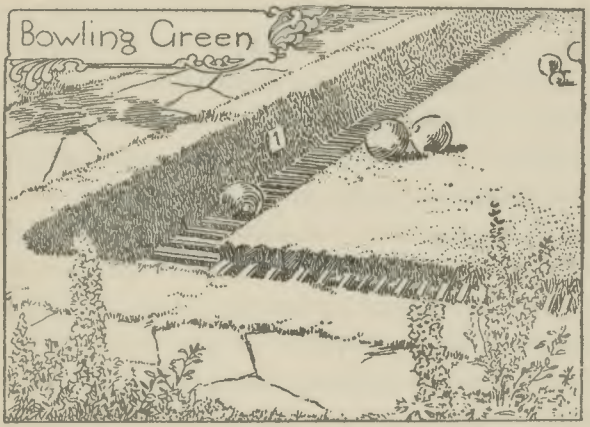
BOWLING GREENS

A REALLY first-class bowling green reaches the acme of perfection in grass, but such perfection is only obtainable by the exercise of extreme care and skilful treatment, and of necessity involves a considerable amount of expense. With the exception, perhaps, of county cricket, the game of bowls is supported by a class of enthusiasts who make a closer study of the greens on which they play than any other sportsmen, and I venture to say there is never a meeting of a bowling club without some discussion over the green and its management. The bowler fully realises the absolute necessity of a good green, and seldom begrudges his contribution toward the funds to secure it. Moreover, the bowler frequently possesses, or imagines he possesses, a good deal of technical knowledge of the subject of construction and maintenance of bowling greens, and is often prone to adopt a dictatorial attitude which may or may not be conducive to beneficial results.

On various occasions I have been told by bowlers that it is useless to entrust the making of a bowling green even to a horticulturist, if he is not himself a player of the game. However anxious one may be to contradict so strong a statement, it has to be admitted that many of the greens laid by

nurserymen or landscape gardeners fall far short of the ideal.

Too often it is assumed that it is quite sufficient to lay a bowling green in just the same manner as a tennis court, but only in a very small proportion of cases can that assumption prove correct.



On the other hand, the prevalent idea among bowlers themselves is that a perfect green can only be made by using the far-fame Cumberland turf, and so tenaciously is this notion hugged by many who claim to know all about it, that they have made a regular fetish of their idolised turf. I would not be so foolish as to say this idea is totally wrong, for I am well aware that quite a large proportion of the best bowling greens are, in fact, made of Cumberland turf. It is, however, beyond contradiction that very many instances occur where the whole expense involved in purchasing, transporting, and laying Cumberland turf proves to be an absolute fiasco and sheer waste of money. Explanation of both

successes and failures is not hard to furnish, and it will be instructive to give careful consideration to this matter.

The home of Cumberland turf is a great stretch of low-lying marshy land that stretches for miles along the valley of the Eden, Liddel Water, and right along the shore of the Solway Firth from above Carlisle, past Silloth, to the gate of the sea. The soil of this marsh is a deep bed of rich fine soil abounding in humus and sand that has been deposited by countless tides. Much of the area is still periodically flooded with salt water during high tides of spring and autumn, and every flood leaves its fresh deposit of rich vegetable matter and sand. The grasses that thrive here are necessarily such as are best suited to the prevailing conditions, and these are few in number, and of exceptionally slender and close growth.

Festuca ovina tenuifolia, the fine-leaved Sheep's Fescue, is largely predominant in this turf, and under the peculiar conditions of periodical nourishment it grows in a manner that frequently almost baffles identification, but is still fine and slender in all its parts as compared with such grasses as are generally found on harder upland soils.

Bearing in mind the deep, easily penetrable root run enjoyed, the periodical soakings, combined with almost sieve-like drainage, and the seasonal mulchings of rich, nourishing, tidal deposits, it is not difficult to understand that to transport this turf to an inland situation and lay it either upon a stiff, cold, retentive clay, or on a harsh, hungry, gravelly,

sandy, or a chalky bed, is to court disaster, for the soft, succulent roots will fail to penetrate the unfamiliar and forbidding soil; and whenever the grass has exhausted the nourishment from its own sod the roots will perish, the herbage die, leaving either bare sod or giving place to coarse, indigenous grasses or undesirable weeds.

Obviously a far saner plan is to well prepare the soil and sow a good blend of seeds of the finest grasses among which the fescues would naturally play a prominent part, so that the young grasses from the very start of germination would be acclimatised and become amenable to the soil in which they have to grow. So much for the cause of frequent failure of Cumberland turf. That leaves the successes still awaiting explanation. The greens upon which Cumberland turf succeeds are constructed in quite a special manner, and are maintained also in a totally different manner from that which is customary with ordinary lawns.

The usual plan of breaking up the subsoil and levelling the bed is totally inadequate for a first-class bowling green. The first step, after marking out the site, is to remove the natural soil to a depth ranging from one foot to two feet, according to circumstances, the former being the minimum for a good foundation, the greater depth being necessary where drainage is at all faulty. A foundation of porous material comprising bricks, stones and clinkers is then laid, commencing with a layer of large material, with a layer of smaller material above, and finishing with a layer of sifted ashes of

a thickness sufficient to cover all the rougher stone, etc., and provide a smooth, perfectly level surface. Having ascertained by spirit-level tests that the ash-bed is perfectly level, the whole is covered with clean, sharp sand to a depth of two to three or even four inches, and this again is left with a surface as smooth and level as a billiard-table. The Cumberland turf should be cut in squares a foot in diameter, *and with a sod three inches thick.*

The turf is laid directly upon the sand bed. With the sand-bed under the turf a perfect level is always obtainable by rolling, because the pressure of the sod upon the sand causes it to adjust itself to the level. The grass will not root into the sand, but having a sod of its native soil three inches thick it has sufficient rooting medium, and replenishment of nourishment is effected by surface feeding with either liquid manure or top-dressings of chemical fertilisers, whilst, of course, it is absolutely essential that during dry periods the turf shall be copiously watered.

It requires no telling that both the construction and maintenance of a bowling green as here described is very expensive, but such is nevertheless the method adopted by the best clubs.

There are many, however, who compromise somewhat and reduce the initial outlay by using good top-spit soil over the ash-bed instead of the sand, and cutting turf two inches thick instead of three, which, of course, considerably reduces the bill for transport. It depends entirely in this case upon whether the soil used is of a character that

enables the roots of the grass to establish themselves in the soil, as to the success of the green and length of life of the turf. There will inevitably, whatever the system, be occasional necessity for patching and renovation, especially at the ends of the rinks from whence the bowls are started. The wear of these ends is generally minimised by frequently changing the direction of play. A full-sized bowling green is 42 yards square. Many are made 40 yards, and the game is, as a matter of fact, played on many lawns of much smaller dimensions and unequal length and breadth. The advantage of having the full square, with properly constructed ditches and banks on all four sides, is that the six rinks may be lined out for play north and south, and as soon as the ends show slight signs of wear the lining can be changed over and the game played for a while from east to west. Where the size of the green prevents this it is desirable that one rink shall be rested for a while, and after recuperation the next rink can be temporarily closed and so on.

Whether the green is sunken below the normal level or raised above it, the margins of the playing area must be surrounded by ditches and banks and the ditches should have wooden lattice work raised an inch or two above the bottom so that bowls running into the ditch during a game may not become wet and soiled. The banks should be turfed, and must be kept closely mown and weed-free, not only for appearance sake but in order that no weed seeds may be blown upon the green to cause trouble. It is never advisable, even if the green itself is seeded,

to attempt to seed the steep surrounding banks, because rains are bound to wash the seeds to the bottom of the slope, whilst a spell of dry weather just as germination starts will cause the collapse of the seedlings because of the impossibility of effectively watering a steep slope.

It is far from my wish to discourage either individuals or clubs who desire to acquire a bowling green, but would be debarred by reason of the expense involved in making and maintaining such a green as I have described. Let me reiterate that the cheapest, and frequently the most satisfactory method of securing a really good green is to carefully prepare the site and sow a suitable blend of grasses, making good use of the fescues, and if on dry or chalky soil *Cynosurus cristatus* and *Poa nemoralis*, but avoiding perennial rye grass, dactylis and other kinds that make thick tufts or throw coarse bents. It will be necessary to nurse the young grass a year round before regular play can be commenced, but thenceforward a thoroughly satisfactory and serviceable green may be maintained with the care usually bestowed upon any properly managed lawn. It must be carefully borne in mind that a bowling green will not be a success on an excessively wet, water-logged base, and if such be the only site available it must be improved at the start either by pipe draining or building up on a porous rubble foundation with good deep ditches around.

If the green is wanted for use the first season it may be made with the best quality turf available near at hand, but it is hopeless to use very weedy

turf, as the cleverest bowler will be thwarted if the green is infested with dandelions, plantains, buttercups, etc. A good method when meadow turf has to be used is to cut into foot squares, lay each square on a flat table, and with an old table fork extract the weeds carefully. This will give the turf a ragged appearance, but if well beaten as soon as laid, and top-dressed with rich compost, an autumn-lain green will attain a good condition by about May of the following year.

Worm casts are a great nuisance on bowling greens. They are less likely to cause trouble on a green laid on a rubble and sand foundation, but when the turf rests on soil worms are practically certain to work through, especially after the greens have been top-dressed with rich compost. A sprinkling of fine lime will either drive away or kill worms ; or lime-water will bring them to the surface when they can be swept off. Sweeping before rolling is always beneficial, and should not be neglected.

CHAPTER XVII

CRICKET GROUNDS

IN a much-prized volume that engaged many hours of my early boyhood, the opening sentence of the chapter on cricket read: "The game of cricket is the noblest of English pastimes, and there is no game, either native or foreign, can compete with it for manliness, fairness, and healthfulness." That is a fine tribute to a game that vast numbers of our countrymen still delight in, despite the counter attractions of football, golf or tennis. Cricket is indeed a game that is played by raw youth and mature manhood, by rich and poor, and it follows as a natural consequence that it is played on pitches as widely varying in character as its players. The fervour and enthusiasm of the urchins' team, whose ground is any old patch of waste land, may be as great and true as that of the crack teams at Lords' and the Oval, and among the handicaps that thwart the prowess of the former, probably the greatest is the condition of the pitch, for even a practised player may have a fine willow bat, a capital ball, and plenty of skill, but will make a poor show on a bad pitch.

That the paramount importance of this point is fully appreciated by the County Cricket Clubs is evidenced by their liberal expenditure of money and the persistent care bestowed upon their grounds; but whilst it may readily be granted that many a

smaller club endures an imperfect ground because of limited funds, there is no doubt the imperfections are frequently greater than they need be through the false economy of engaging cheap labour instead of paying the price of a thoroughly competent groundsman, whose knowledge and experience would enable him to secure the very best results from even a moderate allowance for upkeep and improvement of the ground in his charge. No man can become a good groundsman who deems it sufficient to be able to push a mower and draw a roller periodically over the turf, and to sweep and generally tidy up after a match. The control and maintenance of a cricket ground calls for very close study of soils, drainage, grasses, fertilisers, and practically every phase of the subject of this book, and indeed the best of groundsmen are those who readily confess they are still learning.

Not every cricket club has absolute freedom of choice in regard to soil and situation of their ground, but these are points of great importance, and there are certain serious faults that must always be avoided if even a passably good cricket pitch is to be had. A badly drained, water-logged spot is intolerable. It is customary with some people to talk glibly of draining a field, but to pipe-drain a fair-sized cricket field at present-day cost of pipes and labour will involve expense that, to say the least of it, makes it prudent to pause and consider the advisability of seeking some other site.

It may, however, be quite a rational proposition to undertake to improve the drainage of the playing

square when an otherwise suitable field happens to be of too retentive a clay. A liberal quantity of sharp sand, worked into the soil, will in many cases make a vast difference to the surface, but it must be thoroughly incorporated with the clay. Such an operation should be carried out in early autumn, and if the bed can then be left exposed to the atmosphere for a few weeks the surface will become fairly friable, so that it can be finely broken down and levelled before turfing.

It is necessary for good play that the whole field shall be even in surface; a slight slope is tolerable, but undulations are objectionable, even in the outer reaches of the field.

Whenever the playing square is levelled independently of the "fielding" area beyond, it is essential that its margins shall be gradually merged into the natural lay of the field in order that there may be no ridges or sudden change of level to incur risk of falls when fielding a ball.

Next to an excessively wet site the most unsuitable soil for a cricket ground is a light, loose sand. A good wicket is impossible at any time on such soil, whilst in dry weather the pitch will be quite unusable, and, moreover, a good growth of grass can never be maintained.

The ideal to be aimed at is a rich, deep loam, slightly close in texture, but not so heavy as to become sticky after every slight shower. The strength of such a soil is conducive to good growth of the best grasses, whilst its texture enables a firm, fast wicket to be secured by a reasonable amount of rolling.

If the only fault of the natural soil is that it is rather too loose and sandy, much improvement may be effected by spreading a surface coating of marl or of mellow clay before turfing. The coating, which may be from three to six inches thick, should be spread in autumn and left exposed until frosts have broken it down sufficiently to enable it to be raked down to a fine tilth and perfect level. A sprinkling of ground lime will assist in disintegrating tenacious clay. Turf laying will of necessity be delayed until early spring when the surface has to be thus treated, and that means there must be no play for several months, and only an occasional game until the following year. The permanent improvement in the pitch, however, will more than justify the sacrifice of time.

Where room is available it is sometimes considered desirable to marl one pitch which may be used during very dry weather, and to sand a second in order to have a quickly drained pitch for play immediately after heavy rains. The sanding of a wicket must be carefully done. Sand will not nourish turf, and must, so far as a cricket pitch is concerned, be looked upon solely as an aid to drainage. On a heavy soil, therefore, the best method of procedure is as follows. First remove the soil to a depth of six to eight inches. Pass the sand through a quarter-inch sieve, spreading the larger riddlings evenly over the levelled base in an unmixed layer.

The finer sand should then be thoroughly incorporated with the soil taken from the surface, and in sufficient quantity to give that soil a free, porous

condition. The mixture is then evenly spread over the layer of shingle. When the surface is perfectly smoothed the turf may be laid, or, if desired, it is quite safe to sow seed on such a bed, but would not be advisable to sow on a marled bed.

If it is desired to marl a seedling green or wicket the seed should be sown in the autumn, the marl being spread on a hard floor in a yard and left exposed to frost. Two or three times during winter the whole of the marl should be turned over, giving a light dusting of ground lime as the work proceeds. In spring, await the opportunity of a dry condition of the marl to get it pulverised and sifted through a small-meshed sieve, then place it under a sheltering roof where it may be kept dry. Early in autumn spread a light dressing over the turf, and while perfectly dry pass a light roller over it. Later in autumn a second and third dressing may be applied, but freshly distributed marl or clay must not be rolled when moist or it will adhere to the roller and cause a deal of trouble.

In due time the grass will overgrow its top-dressing, and from thence onward rolling should of course be done when the ground is just sufficiently moist for the roller to make an impression. Quite naturally the wicket is the object of first attention, and every club and groundsman aims at getting it into first-class condition. It is to be feared that often the anxiety for a perfect wicket, coupled with the necessity for economy of expenditure, must be held responsible for neglect of the outer field. It is a great mistake, however, to belittle the importance

of the outer field, for all credit for a good wicket will be nullified if players find a long ball cannot run smoothly to the boundary.

Most of the important points in the maintenance of a cricket field are akin to those applicable to other lawns and greens ; thus information in regard to weeds, moss, ground pests, manuring, top-dressing and renovation will be found in former chapters and repetition is unnecessary.

As a general rule a heavy roller should not be used on match days, but about three days earlier. A final mowing will be necessary on the morning of the match, and it will frequently be found advantageous to brush the turf with a stiff broom before the machine is used. A wooden roller may be run over the wicket after mowing.

Among the chemical fertilisers of special use for cricket grounds, kainit occupies a prominent place. The potash contained is capable of fining down coarse growth, whereas superphosphates, bone, sulphate of ammonia, and nitrate of soda tend somewhat to encourage coarseness that is undesirable on a cricket ground, especially where the pitch is on a rather stiff, strong soil.

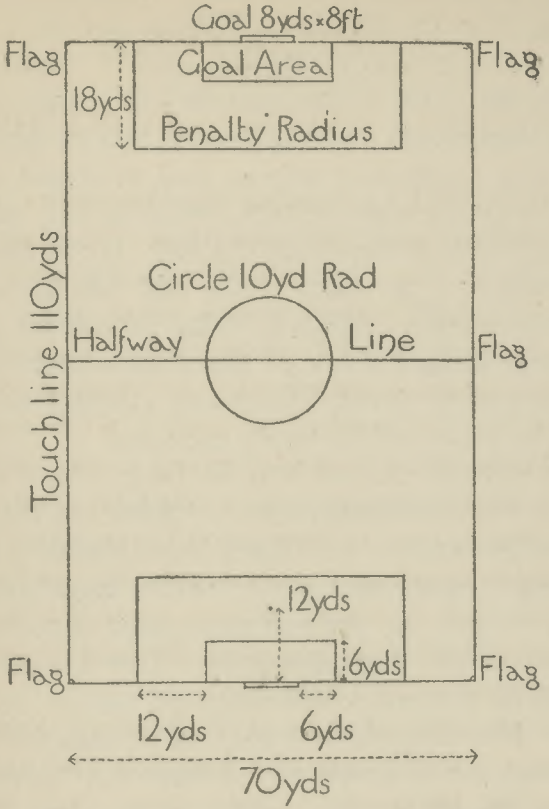
A hard-worked cricket ground requires a complete rest between seasons, and it is bad management to allow such games as football, hockey, etc., to be played on the ground during the winter months. It will do far more good to allow a few sheep to graze on the field during autumn, and if they are allowed some oil-cake during the period they will enrich and benefit the turf.

CHAPTER XVIII

FOOTBALL AND HOCKEY PITCHES

FOOTBALL, whether the Association or the Rugby game, and also Hockey, are fast, hard games that of necessity require a stout, thick turf of a harder texture than is required for any of the previously noticed games, and grasses of considerably coarser growth may be considered quite suitable for the football or hockey pitch than can be allowed on a bowling green, tennis court, or even a cricket pitch. Still, it must be granted that very many teams are invited to play on grounds that are far too rough and badly kept to be conducive to comfort and pleasure, whilst some pitches are positively dangerous and must be held responsible for unfortunate accidents.

The professional clubs of the Football League are alive to the importance of a good field and well-kept turf; but frequently private clubs, both football and hockey, are apparently indifferent to the quality and smoothness of their playing pitches, whilst many school fields are left in a condition that is far from creditable to their governors. A large proportion of football fields are just ordinary farm pastures. That would not be too bad if in the first place the level were good, and a reasonable amount of mowing and rolling were regularly done. A sloping field is very unsatisfactory, for it invariably favours one side



Association Football

of the players and handicaps the other. Still worse than a gently and evenly sloping field is one that has been ploughed in convex " lands " with furrows between, but such fields are often accepted by seekers after a cheap pitch.

Matters are very little improved when an effort is made at partial levelling by taking a shallow layer

of soil from the crown of each " land " and transferring it to the furrows. Ridges, bumps, and inequalities are thus multiplied, and if much soil is moved the grass in the furrows will suffer through being buried and a patchy growth will be the result. The only satisfactory way to deal with such a field is to strip the turf entirely, fork over the soil and properly level it, then relay the turf. It will be found that fully five per cent. of the turf will be surplus when it comes to relaying. That affords an opportunity to discard a few of the weak or very weedy turves, and if the levelling and relaying are well done the pitch will be vastly improved.

If a suitable pasture is to be taken over for conversion into a football or hockey field, the best time to take possession is at Lady Day (March quarter-day), for that allows a period of five months during which to get the ground into good trim for the opening of the football season. The first thing to do will be to draw a well-weighted harrow over the grass. If a roller brush, such as is used for street cleaning, can immediately follow the harrowing, good work will be done, and the next thing will be to cut the grass. If very long it must be scythed, but should be cut by a horse-drawn mower very shortly after. In the main the subsequent treatment should correspond with that for ordinary greens, but the extent of the ground and the hard wear endured render it necessary to utilise machines, rollers, and sweepers of large size. The weight of the roller it is prudent to use depends upon the character of the soil; but, as repeatedly urged,

excessive weight is undesirable under any circumstances, and frequently is positively dangerous, especially on clay soils or wet situations.

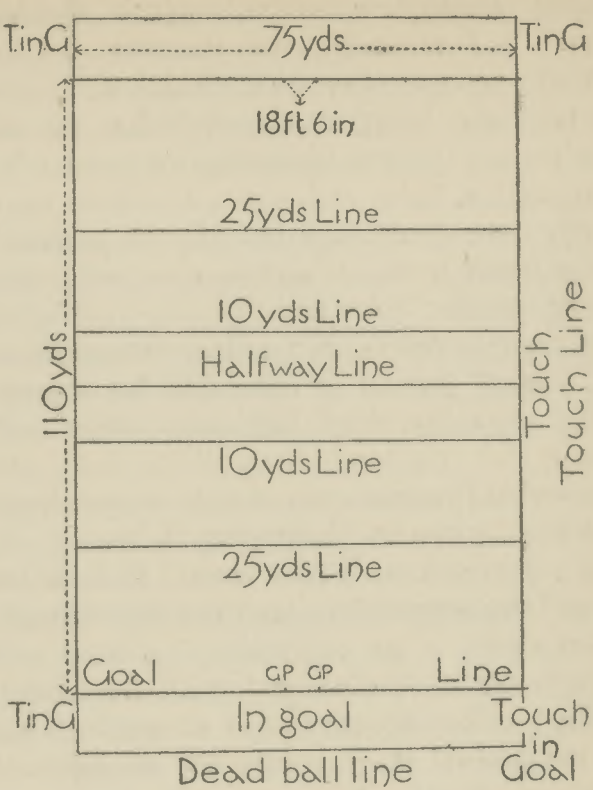
It is better to roll frequently when the soil is slightly moist (not sodden) than to use too heavy an implement.

Light, stony, or sandy soil may be treated with a much heavier roller, and may be rolled shortly after heavy rain.

A half-ton roller is not too heavy for summer use on a football ground of light soil, but during the playing season a roller half that weight will be sufficient.

On various occasions secretaries of clubs have explained to me that very fortunately the loan of a heavy steam roller has been offered them. It is difficult to convince the delighted secretary that once rolling with a six-ton roller is not equivalent to a dozen rollings with the half-ton implement, whilst frequently one is adjudged an impossible sort of crank if, having first emphasised the necessity for constant rolling to secure and maintain a smooth, even surface, he protests that a steam roller, capable of obliterating every bump at one operation, will do far more harm than good. Nevertheless, I am strongly opposed to such extreme measures as the use of steam rollers on grass, and am all in favour of restricting the weight of even the horse-drawn, relying more upon the quick judgment of conditions and frequent working immediately the ground is just right for rolling.

Top-dressing of football grounds is impracticable during autumn and winter because that is the games



Rugby Football

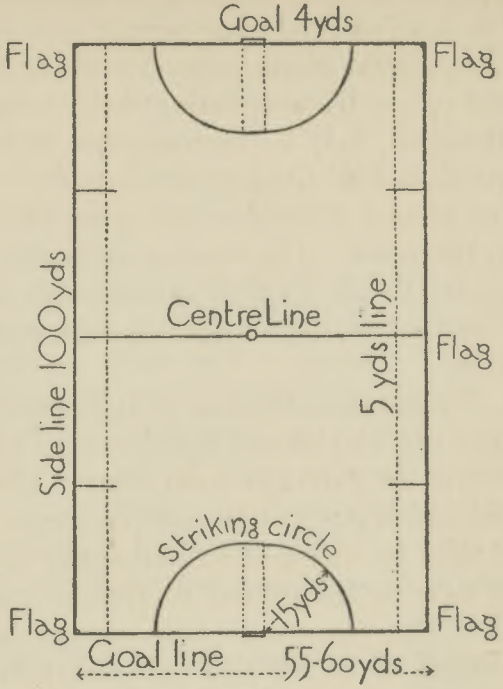
season. It is therefore necessary to top-dress during late spring and summer.

Immediately the last game has been played a spiked roller should be used over the whole area, rolling in both directions. The perforations should be left open for a few days for the purpose of thoroughly aerating the turf. In the meantime a

sufficient quantity of suitable compost should be prepared to completely cover the whole area to a depth of a quarter of an inch. Thick dressings are a mistake, this being another task that will admit of no merging of two dressings into one. If the natural soil is light, and inclined to kick up in a crumbly state, the basis of the top-dressing should be marl or heavy loam. If on the other hand the soil is a stiff clay that holds moisture and churns up like putty, there is nothing better than clean sharp river sand, passed through a fine sieve to remove all stones. On a heavy soil the best chemicals to use are basic slag or ground lime with the first dressing, bone meal or Peruvian guano for the second dressing, which may be applied about a month later.

For a light soil finely powdered chalk is generally preferable to ground lime, and muriate of potash is of great value.

The repair of football and hockey pitches is a difficult problem for the reason already mentioned, that the ground is in occupation throughout the autumn and winter. Where possible, patching with turf is best, provided it can be both watered and shaded during summer, but otherwise the patches that may have worn thin or bare are best renovated by means of seed, which will, however, not be capable of standing much wear by autumn. As previously mentioned, hard, strong-growing grasses are more suitable for the present purpose than those of finest texture, and the seed mixture should contain a good proportion of *Lolium perenne*, *Cynosurus cristatus*, *Poa pratensis*, and a smaller proportion of *Festuca*



Hockey

duriuscula. The addition of clovers is a debatable point, but in view of the fact that clover becomes very slippery when hard trodden, it is calculated to prove dangerous where fast games are played. The seeded patches should be carefully scythed as soon as growth has sufficiently advanced, the object being to hasten a sturdy basal growth. After once scything the mower may be used with the knives well up, and the lightest roller should be used. During severe drought the young seedlings may with advantage

be shaded by a light covering of straw, to be removed as soon as conditions permit.

Even during the playing season it will be decidedly beneficial to use the perforating roller occasionally, and although it may be impracticable to fill in the perforations by top-dressing, the ordinary roller used when the ground is comfortably moist will suffice to close in the holes. The chapter on pests will have an interest for the football groundsman, and persistent warfare must be waged against moles, ants, rabbits, etc.

It is of immense advantage if the position of the goal posts can be changed from time to time, as it is here that the turf gets most wear. Thus if the goal posts stand more or less east and west, and can after a time be changed to north and south, the heaviest wear is transferred to fresh portions, and, moreover, this manœuvre will sometimes enable worn patches to be returfed with safety before the close of the season that, except for the alteration, would be kicked up and have no chance of knitting together.

CHAPTER XIX

GOLF LINKS AND PUTTING GREENS

IT would be idle and ridiculous to suppose that one might sit at a desk and put into writing definite instructions on the planning and construction of golf links that will serve as a faithful guide under all circumstances and conditions.

Not one volume, but a series of books might well be written upon the subject, all full of interest and useful information, and in the end the final intimation would inevitably be that the designer must, whilst fully recognising the accepted theories and principles that more or less rigidly govern the lay-out of a golf course, always give particular consideration to the natural features of the territory to be dealt with, and drawing upon his originality, take fullest advantage of the salient points of the land as it is with a view to making the most of it at a minimum of expense.

It is exactly the same as in the making of a garden or laying out of a park. The subject is inexhaustible as a topic, but in spite of all that may be written or said, the first practical job tackled will present problems that have to be faced and solved and can only be solved on the spot.

We have many books that write round this subject of designing and constructing golf links, and there would be nothing new or really instructive in

elaborating the statement that the most suitable sites for golf links are moorlands, downs, and naturally undulating sandhills along the coast line. No man would undertake a contract to construct a golf course who did not know sufficient about the requirements of the game to appreciate the importance of such advantages as natural undulations and variations, with scope for long drives, intriguing bunkers, but not impossible obstacles to play from point to point; of the necessity for ample room for the eighteen holes, and suitably placed teeing greens, which in some cases, at all events, should be provided with alternatives. The point that has in these days of democratic golf to be considered is that many links are required that must for rigid reasons be situated within a circumscribed area, and it is when the course has to be constructed on a site that possesses no particular natural character from the golfing point of view that clever workmanship is required, and it is in such cases that grievous blunders are most frequently made.

When, in company with officials of a new club, a contractor surveys a stretch of plain grazing land and listens to the sighs and regrets that there are no hillocks and hollows, and that everything is so "beastly flat," the temptation may be to win their admiration and everlasting gratitude by assuring these disconsolate golfers that the flat meadows can be transformed into a delightful series of the irregularities so keenly desired. If that suggestion catches on, and the transformation is taken in hand, it is a moral certainty that both the contractor and the

club have taken a step in the dark that will lead on to a veritable quagmire of difficulties and disappointments. We have hitherto in this book concerned ourselves a good deal with the question of bringing sloping and uneven ground to a level surface. Errors to be avoided in striving for that end have been indicated and explained, and the correct methods have also been dealt with. There are men, and I have met a few of them, who consider themselves great on landscape work, but who argue that whilst there is admittedly cause for the exercise of care in levelling land, the breaking up of a level and creation of elevations and depressions presents no difficulty whatever. In actual practice—and I have seen examples in proof of the contention—as soon as the effort is made to turn a natural level into hillocks and hollows we find trouble both with subsoil and with drainage.

A level course must remain practically a level course. If the subsoil is porous and drainage excellent, bunkers may certainly be created by scooping out a shallow basin and banking the earth in a form to suit the purpose aimed at, but even this work must be done judiciously. It is just as necessary here as in levelling, that the top spit of soil shall first be removed to one side, the banking being formed of the subsoil, afterwards covering with the fertile top soil. In order to avoid the basin created becoming a puddle, a good depth of rough drainage, coated over with sharp sand, should take the place of part of the excavated soil.

Much may be done to make an otherwise tame

and monotonous course interesting, and sufficiently difficult to satisfy players of average proficiency, by the judicious placement and skilful construction of obstacles and bunkers ; but a great deal more can be done on plain or level ground by planting patches of suitable shrubs, low-growing bushes, etc., than by tampering recklessly with the levels of the course.

The formation of teeing grounds and greens may also, with careful handling, provide opportunities for slightly varying the contour.

Alternative tees are a feature of well-ordered courses. Where the soil is inclined to hold moisture one tee may well be elevated for the purpose of providing a dry tee for use in wet weather. For the benefit of beginners an alternative on an exposed course might be so protected as to afford some shelter, and so situated as to counteract to some extent the adverse influence of prevailing winds.

Where the soil is sandy, peaty, and free from lime, patches of heather make very good obstacles, whilst they add considerably to the beauty of the course. Clumps of common broom are also suitable, as they can be reduced at any time if they attain proportions that exceed the limits of reasonable obstacles. There is considerable objection to gorse in the direct line of play, because in time it will extend so rampantly that balls haplessly driven into the mass will be utterly irretrievable ; but there is a good deal to be said in favour of introducing clumps of strong-growing ornamental grasses in suitable positions, for whilst they serve the purpose

of emphasising the necessity for strong, straight driving in order to clear them, they do not too severely penalise beginners who fall foul of them; and furthermore, for a good part of the year such grasses as *Agrostis stolonifera*, *Bromus inermis*, *Phalaris arundinacea*, and the variegated varieties of *Dactylis glomerata* add considerably to the beauty of the links.

The slopes of the bunkers are far better planted with these grasses than covered with turf, which can only with a deal of labour and difficulty be kept in decent condition.

One word of caution is perhaps necessary. The grasses that are most suitable for the purpose here under consideration are of too coarse a character to be permitted on the putting green, and should therefore not be planted on bunkers quite near the greens lest their seeds may reach them and germinate to cause trouble.

The ideas of designers of golf courses vary almost as widely as the character of the sites on which they are laid, and unless a man has a clear enough conception of what is required to be strong enough to adhere to his own ideas in spite of what books may suggest, he will assuredly fail as a designer of links.

It is a far different proposition when we come to the question of upkeep and green management. The increasing popularity of the game and multiplicity of links throughout the country has provided a means of livelihood for a large number of men, and a considerable proportion of these are men who have since the war been obliged to take up a calling in

which they have had little previous experience, and it is for the benefit of these, rather than the contractors for constructional work, this book is intended.

The Greenkeeper's Task

Quite naturally, a man who has kept a plot of grass neat and tidy in a private garden, and has mown, rolled, swept and weeded, and perhaps patched and top-dressed in season, may consider himself qualified for the larger task of maintaining a golf course, arguing that it is precisely the same kind of work on a larger scale, with larger implements, etc., to get over the work.

That experience in the proper care of lawns will be of service to one who aspires to green keeping is not to be denied, but it will prove seriously inadequate if he should venture to shoulder at once the full responsibility for the upkeep of a golf course, that task being as distinct from ordinary lawn work as the cropping of an allotment or kitchen garden is from the entire management of a farm.

The golf course keeper has a very varied as well as extensive charge. The greens may be compared with the finest of lawns or bowling greens, but the fairways must also be kept under control, and this calls for entirely different methods than those applicable to the greens.

Then there are the teeing grounds and the bunkers to consider, and even the " rough," and the immediate environment of the actual course cannot be left entirely to itself, although it would be hopelessly wrong to attempt treatment on the same lines

as the course. The golf course keeper must be competent to grow turf on a reserve or nursery ground, to cut this turf and relay it for the purpose of renovating greens or teeing grounds, or of making new ones.

An intimate knowledge of weeds, insect and fungoid pests, ground vermin, and the surest and cheapest methods of getting rid of them, will be essential, and the golf course keeper must also have a wide knowledge of feeding grass, which of necessity differs considerably, where so large and varied an area is concerned, from the ordinary methods of nourishing a small lawn or tennis court.

One of the greatest difficulties to contend with is that whereas most lawn games are seasonal, leaving the grass free for rest and treatment for periods of considerable length, golf is played the whole year round, affording no such convenient and beneficent spells of idleness, and the danger here arises that a weakening patch may be allowed to go on and on, awaiting an opportunity for treatment that seems never to come until the patch collapses entirely and proves to be unredeemable. On badly planned courses this is a constant menace to the equanimity of the keeper, but the best courses provide greens so constructed that one half may be closed for rest and renovation while the other half is open for play, whilst with alternative tees there is likewise a possibility of putting one or another temporarily out of use.

The green is, of course, of paramount importance, and it is here that the finest of work is required. The

turf must be ideal, or at any rate it must be the aim of the keeper to make it so. No coarse grasses must be allowed on the green, but the Fescues, Poas, and, under certain conditions, one or two of the Agrostis family are the most desirable grasses, but the particular species or varieties of these grasses depends largely upon the nature of their rooting medium.

For instance, *Poa pratensis* is particularly good on light, dry soils, whereas *Poa nemoralis* is preferable where the ground is shaded from the sun, and *Poa trivialis* succeeds where the soil is wet. *Agrostis vulgaris* is a grass that might for preference be avoided on a green that is favourably situated for better grasses, because it has a tendency under good cultivation to throw rather coarse, spiky growths or " bents," but it is a grass that will thrive on poor, hungry, sand or peaty soils where many grasses languish, and golf courses frequently happen to be laid on such soils.

It is a debatable question whether seed or turf affords the best means of creating good greens. It is obviously a simpler task to secure the most appropriate blend of grasses when seeds are sown, but there are difficulties to contend with in creating putting greens from seed.

Birds, moles, rabbits, mice, etc., are sources of considerable trouble, whilst drought during the period of early growth is a further cause of anxiety. The length of time required for the maturing of young grass cannot often be spared on a golf course, and to commence the use of a green too soon is to ruin the young turf.

On the other hand, it is seldom one can secure turf that consists of just the best grasses, and is free from weeds. The simplest course will generally be to make use of the best turf available, to weed as well as possible before laying, fill in the holes with good sifted soil, and sow a fair sprinkling of the grasses that are best suited to the purpose and soil. By top-dressing and sowing seed as often as circumstances admit, the character of the turf will be steadily improved and a perfect green secured.

There should always be in connection with a golf course a reserve ground for the production of turf. It is here that opportunity is afforded to secure the ideal grasses and avoid the unsuitable, for the correct blend of seeds can be insisted upon, sown on well cleaned and cultivated ground, and carefully tended for two, or if possible three years before cutting for renovating worn greens or laying new ones. When any portion of the reserve ground is stripped of turf the bed should be forked over, manured, and allowed to lie rough for a while to sweeten. Ground lime may then be spread, raked in, and the surface brought to a perfect level for reseeding. The adoption of this method of repairing greens from home-grown turf is infinitely better than bringing in turf from other districts, and is also much more practicable than seed sowing on the greens, except to the extent of simply thickening the thin patches as already described. An immense benefit may be conferred on a young or a weak green during drought by resting it, and covering

with straw loosely shaken over the grass to afford shade from the scorching sun.

The fairways are never required to be so fine as the greens. Coarser grasses may predominate on the fairways, and *Cynosurus cristatus* is a very serviceable grass to encourage on both fairways and tees. *Agrostis vulgaris* is quite good for fairways, while the *Poas* and *Lolium perenne* will help by providing substance over the extensive areas concerned.

There are a few grasses that should be discouraged even on the fairways, although they may very well figure in the ornamental clumps advised for screening the ugliness of bunkers. *Phleum pratense*, *Dactylis glomerata*, *Agrostis stolonifera*, *Brachypodium pinnatum*, and *Bromus inermis* are among these, whilst the striped *Phalaris arundinacea* will make handsome clumps, and even a small hazard on its own account.

The fairways should have a certain amount of rolling with a tolerably heavy roller, although it is unnecessary to roll as frequently as the greens, where, however, a light roller used judiciously is preferable to excessive weight. The wooden roller is an invaluable implement on the green. The amount of cutting to be done on the fairways may be considerably reduced by grazing to sheep, which, however, should be kept from the greens. If the sheep are cake-fed their manure will serve to keep the fairways well nourished, but without the richer food the manure of sheep is of low fertilising value, and it will be necessary to periodically top-dress the grass as advised for other greensward. Cattle and

horses are frequently allowed to graze on the " rough," but it is advisable to strictly limit their numbers, for if the fairways are continually overrun by animals they will suffer and present a displeasing appearance.

On low-lying grounds where the soil is of a moisture-holding nature the coarse growth of the various grasses will sometimes be a source of trouble. It is here that sheep will be particularly helpful, whilst in the matter of fertilisers care must be taken to avoid guanos and such things as superphosphates and sulphate of ammonia, the probability being that kainit will have a more desirable and refining effect upon the grass. Sea sand is also an excellent substance for top-dressing on wet soils, and may be applied to the extent of two to three tons per acre, half the quantity being spread about the month of October and a second dressing in February.

CHAPTER XX

A CHAPTER OF MISCELLANIES

THE nearer my work approaches its end the more I feel the impossibility of completion, in the sense that the word should mean the inclusion of all that might be written on grass and its management. In an effort to provide a few further useful items my final chapter shall be made up of fragments, disjointed and heterogeneous, perhaps, but likely from time to time to be of service. As a matter of fact, although for convenience the book is divided into chapters, there are many portions in those chapters that should just as properly belong elsewhere, for much that applies to one kind of lawn and one kind of sports ground applies equally to another, but there are some points that it seems difficult to allocate to any chapter. For instance, I could scarcely include moles under the heading of insects, although they are most decidedly pests where lawns and greens are concerned.

There is also the question of yarrow (*Achillea millefolium*), which may be classed as a weed, but is frequently advocated as a foundation for lawns on soils that cannot sustain good grasses. A few notes on the equipment required for the making and maintenance of lawns and greens may be useful, and sundry other items must find a place in this chapter of miscellanies.

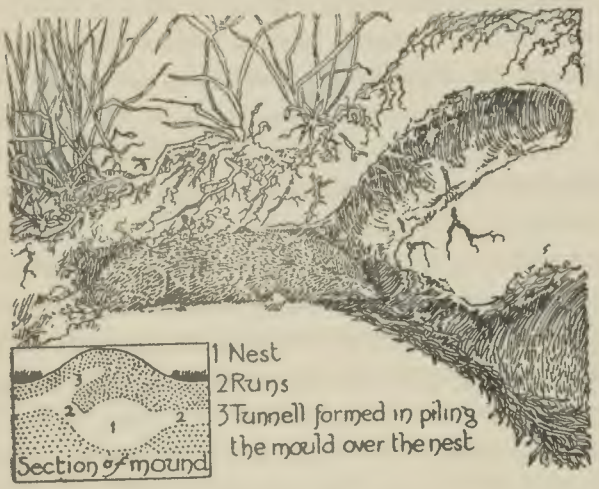
Moles

There is little need to describe the mischief and damage which moles are capable of doing, whether on pasture fields, lawn grass, or in the garden. The mounds of loosened soil they throw up are conspicuous and annoying, but do not constitute the sum total of the havoc. The roots of the grass may be disturbed for a considerable space to such an extent that growth is completely arrested, and many of the plants killed. The tunnelling also causes the rapid escape of rain water, sometimes to the serious detriment of the grass during periods of drought. Intolerable as moles are, and long though every cultivator of mole-infested land has waged wrathful war against them, little progress seems to have been made in devising simple and sure methods of extermination.

The trapping of moles is an art as cunning as the tickling of trout, and skill in this pursuit is as worthy of awards of cash or plate as many of the sports and pastimes that excite the interest of crowds ; but the obstacle to popularising mole-catching as a sport is that the presence of a crowd would destroy every chance of catching a mole, and the necessity for stillness and quiet spoils the pursuit as a spectacular pastime.

A comparatively minute proportion of our rural population practise mole trapping with sufficient patience and perseverance to become expert, and a mole catcher frequently plies his calling exempt from competition over a radius of many miles embracing several villages.

The whole secret of successful trapping is practice, coupled with close observation. The well-known points about trap-setting are that neither trap nor soil about it may be handled with naked hands, and that the run must be disturbed as little as possible in setting the trap. Another obvious point is that



whilst the hole made for insertion of the trap must be covered in to exclude light, some substance such as grass or root fibre must be used to prevent loose earth falling in to impede the snapping together of the jaws of the trap. The points that require some thinking over are the best spot in the run to fix the trap, the precise depth and angle at which it shall be placed, and, in the event of a first failure, to ascertain by close scrutiny of every detail what could possibly have warned the mole of the presence of danger.

Most mole-catchers prefer, whenever possible, to select a position near where the run rises after passing

under a hard footpath or similar obstacle, and the depth and angle for the trap must be so regulated that no part of it will be touched by the mole before it reaches the spring-disc or trigger that releases the jaws. The alternative plan of poisoning instead of trapping moles is sometimes advocated, but whilst it also demands both patience and skill it is not free from risks, and is certainly cruel, for the rodents may suffer for days before death.

Yarrow (*Achillea millefolium*)

This plant, or as some prefer to call it, " weed," is a subject of varied reputation. On many lawns where it has put in an unwelcome appearance it causes much heart-burning, for it is exceedingly tenacious, and defies strenuous and persistent efforts to eradicate it. There are, however, places where lawns are required where scarcely any of the best grasses can exist, and here yarrow becomes a boon, for it will thrive on the hungriest and thinnest of soils, and under close and regular mowing will produce a bright green sward, thick and velvety in appearance, soft and springy to the tread. Its foliage, long, narrow and finely cut, almost fern-like in appearance, is well known, but its chief fault in the eyes of bowlers, tennis players, cricketers and their greenkeepers is that the growth is of a clinging character that tends to hold any ball that strikes or runs into it. Its destruction is no easy matter if once it is allowed to become firmly established, the only way being to cut the whole patch out at a foot depth, replacing with fresh soil and clean turf. If

quite young plants are detected they may be lifted with a daisy fork.

Some cheap lawn grass mixtures have yarrow seed in them, but unless specially ordered a reputable firm would not supply yarrow with grass seed.

It is quite a reasonable and satisfactory scheme to use yarrow for sowing purely ornamental grounds, steep banks, seaside promenades and the spaces around bandstands in public parks, where the soil is harsh, stony, or otherwise too poor to nourish good grasses and in such cases it may make even as much as 25 per cent. of the mixture, with two or three of the grasses described as specially suitable for light, dry soils. A yarrow lawn must, however, never be neglected in regard to mowing, or its growth will become coarse and uneven, and its stems so short and tough that the machine will suffer damage.

A Word about Tools and Equipment for Grass Work

Many of the tools required for lawn and green work have been mentioned in the course of treatment of the various phases of the subject.

A useful appliance is a roller brush machine with collecting box for sweeping lawns, particularly in autumn when leaves from surrounding trees are bestrewn over the grass.

In appearance the sweeping machine resembles a mower with the roller brush in place of the cutting knives.

Various sizes, from a one-man power implement to a large horse-drawn or motor sweeper, may be

obtained, and some motors have interchangeable knives and brushes for use as both mowers and sweepers.

An excellent pattern of edging iron is one with a guide wheel attached, enabling both rapid and accurate work to be done, whilst there are edging machines on the market which work on a similar principle to the mowing machine.

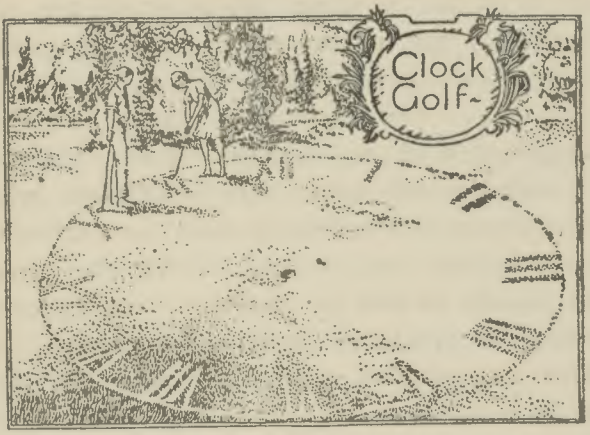
Whatever is used on grass in the way of wheeled implements, such as barrows, water carriers or horse reels, should have extra wide tyres in order that they may run smoothly over the turf without making depressions or ruts. Whenever possible broad planks should be laid for running on, but otherwise it should be made a strict rule that, if possible, the vehicle should be run right off the grass for turning, and if not, must be run round in a wide sweep, never turned on the grass at a sharp angle.

It is a mistake to permit armoured hose to be used on grass. The coiled wire catches and tears the grass, doing considerable damage, especially to young seedling grass.

Horse-boots are an essential wherever animals are used on grass, and it is imperative that these shall fit well and be kept in good repair. A badly-fitting or loosely fastened boot may easily cause as much damage as an unshod hoof. Too often this little detail is overlooked.

Lawn markers are implements that are frequently short-lived, simply because they are not well cleaned after use. Whilst the whiting is fresh and wet it is

little trouble to wash the machine, but when put away clogged with thick sediment which dries hard, the mechanism of the machine is choked and rendered inactive until violence is used to loosen the parts. A little boiled linseed oil in the whiting will



help to prevent obliteration of the markings by a casual shower of rain. Metal corner-pieces are a boon where tennis courts have to be marked out at short notice.

Brief Notes on Sundry Matters

Small plots of ornamental grass may be produced by sowing ½ oz. of seed per square yard, equivalent to 1 lb. per rod. 75-80 lbs. of seed is required to sow a full-sized bowling green. To sow the fairways of golf courses, 6-8 bushels per acre are required to ensure rapid and thick covering.

Putting greens require at least 25 per cent. more, the grasses being of the finer and smaller growing kinds.

Malt culms make an excellent mulch for seedling grass, serving to shade the ground and check evaporation of moisture.

The seeds of festucas, if new and vigorous, should germinate within ten days of sowing.

Lolium perenne germinates in about a week.

Poas take about a fortnight to germinate, and any good mixture should be showing well within that time.

Festuca rubra, *Poa pratensis* and *Poa trivialis* are of a creeping, procumbent habit. *Lolium perenne*, *Festuca duriuscula* and *Poa nemoralis* are more erect.

Sheep should never be turned on seedling grass until upwards of two years' growth. Younger grass is liable to be pulled up by the roots.

Marl dressings for cricket pitches should be applied in early autumn, in order that the marl may have a long period of exposure to become thoroughly sweetened and pulverised before spring preparation of pitches commences. Two thin coatings are better than one thick one.

Every sports groundsman should endeavour to secure a nursery ground for providing clean young turf by sowing a good mixture of the most suitable seeds, cutting, rolling and nourishing regularly until strong enough to use for patching. Turf thus raised on the site is infinitely more satisfactory than that which may be brought from other soils.

A roller on ball-bearings is a great labour-saver.

In estimating the number of turves required for a given area it may be reckoned that a five per cent. saving will be effected in the actual figures of three

turves per square yard. The reason of course is that the turves cannot be relaid as closely as they had been before cutting. For example, an acre of ground by measurement calculation should require 14,520 turves, 3 ft. by 1 ft., but if every turf is perfect 13,800 will cover the acre. Allowing a margin for waste and damaged turves, 14,000 is a fairly safe figure. Many odd pounds have been wasted through oversight of this point. The saving will be still increased if one-foot squares are used instead of the orthodox 3 ft. by 1 ft. turves.

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