THE
GOLF COURSE

A MONTHLY BULLETIN DEVOTED TO THE DISCUSSION OF MODERN METHODS AS APPLIED TO GOLF COURSE CONSTRUCTION AND UPKEEP

Soils

By Leonard Macomber

TEXT books classify "clayey soil," "loam," "light sandy soil," and the like and the average person looks at his lawn, which to him is only plain "ground" and is quite at a loss to know its real description.

The principal ingredients of soil are sand, clay, gravel, and humus; and it is the proportion in which these are mixed that determines the kind of soil.

A loam, as far as plants are concerned, is a workable and a most digestible mixture of clay, sand, silt and humus, but when one or another of the ingredients predominates, it gives its name to the loam—viz.: sandy loam or clay loam.

A sandy soil, by adding humus, can be converted into a sandy loam, and a heavy clay soil by adding sand, peat, leafmould, and often lime is necessary, can be converted into a clayey loam.

An Easy Soil Analysis

Aside from the feel of soil and its appearance, there are mechanical tests which are not so difficult to apply. First get a fair sample of the soil from several different places (say a quart). Weigh this and put down the weight. Next put the soil in a pan at the back of the stove and let it stand until thoroughly dry, but it must not be allowed to burn. Weigh again and the difference between this and the first weight is the amount of water the soil holds.

Now put it in a hot oven for three or four hours; then weigh again. The humus will have burnt and the difference between the second and third weights gives the amount of humus.

Now in your pan is clay, sand and silt. Put this soil in a wide-mouthed glass bottle or jar—a two-quart jar will do; the larger the better. Fill it with water and then shake it violently. Then set it down on a table and observe.

The sand or gravel being heaviest will settle first; next the silt; while the clay will remain in the water for hours. After a day or so, it will be seen that there are no sharp divisions, but yet the different elements are separated definitely enough to give a fairly good idea of the proportions. You can then work and treat your soil accordingly to make it well balanced.

It is hardly ever necessary to make a complete chemical and mechanical analysis of soil, unless one knows for certain that its failure to carry the desired crop is entirely due to the structure or chemical constituents, and not to position or environment or the climate conditions ruling in the district.

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The GOLF COURSE

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R. O. SINCLAIRE, *Editor*

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WE take this opportunity of expressing our thanks to the many Chairmen and members of Green Committees who have given us such hearty coöperation since the origin of THE GOLF COURSE last January.

When we conceived the idea of establishing THE GOLF COURSE as a monthly service bulletin we believed such a publication would prove unique and fill the need long felt by Green Committees and others interested in turf production for authoritative information. THE GOLF COURSE is the first publication of its kind ever attempted.

The Committeemen from the very first have made plain their appreciation of our efforts. Numerous letters have been received requesting that new names be added to our mailing list and stating that THE GOLF COURSE was giving real aid to those aiming to apply efficient and modern methods in connection with golf course construction and upkeep.

We have endeavored to go still further in our desire to co-operate with Green Committees, and one of our several turf experts has been sent this year to visit nearly every prominent golf course east of Minneapolis with instructions to offer his services in an advisory capacity, should the committee in charge be confronted with questions on which our expert's opinion was desired. No charge has been made for this service and we have tried to make it clearly understood that the club placed itself under no obligation whatsoever.

The reception accorded our men has been most gratifying, for we find that in almost every case those interested in the welfare of a club have been only too glad to give our representative a most satisfactory hearing, usually taking sufficient time to accompany him on a visit to the grounds and assist at a thorough inspection of soil conditions, etc. Without such co-operation our efforts to be of service would have failed dismally, and we wish to thank all those who have helped us so materially in our work.

Our service plan has met with such encouraging results that we are aiming every day to improve it and broaden its scope. Capable men are continually being added to our staff and from now on we mean to cover even more thoroughly by personal visits our list of Golf and Country Clubs, which is increasing in number at a very rapid rate.

We intend also to improve THE GOLF COURSE and in this endeavor you, "Mr. Reader," can help us. We are only too glad to receive contributions from anyone who cares to express an opinion on any topic pertaining to subjects suitable for this bulletin, for we all have much to learn and many of our readers can cite experiences of their own which will prove of real worth and aid us to broaden the purpose of our publication. Soil and climatic conditions, for instance, vary so greatly in different sections of the country that it is almost impossible for even the best authorities to write and cover thoroughly questions having to do with turf production, etc., when local conditions oftentimes play such an important part in the proper methods to be applied.

Leaf Mould

By R. Vander Beken

NEXT to farmyard manure, leaf-mould is one of the chief agents by means of which the gardener improves the soil. Whenever he has reason to know that specially congenial conditions must be established for the roots of his plants, the gardener incorporates leaf-mould with his compost. If possible he selects the decayed remains of Oak or Beech, but if these are unobtainable he takes what he can get in the way of decayed leaves. The wise greenkeeper does not, however, wait upon Nature to set up decay. He collects the leaves as they fall, and, pressing them down into close heaps, prepares his own stock of leaf-mould, or gets sufficient for a layer of about a foot in thickness for his compost heap in the making.

It is evident that the changes which the leaves undergo in becoming mould are several and various. The heap develops a considerable temperature—the sure sign of bacterial and fungus activity. The closer the leaves are packed the higher the temperature rises.

Of the orderly series of changes which set up leaf-decay and lead to its consummation in mould, little is known. Nevertheless, the broad features are clear. For decay to be complete, and to result in a sweet humus suitable for grasses, a certain amount of moisture is necessary. Otherwise decay is arrested, and a sour peat-like mass not at all conducive to healthy plant growth is produced. Lime is also necessary, whether it be applied in light dustings of agricultural lime while making the heap, or whether it be applied by the leaves themselves. It may come as a surprise to some to learn that leaves contain a considerable amount of lime, but it is a fact.

Thus in their content of lime, the leaves bear, as it were, the seeds of their decay. One part, and perhaps the most important, which is played by lime in helping decay, consists in the neutralization of the acids contained in leaves, for, as is well-known, fresh leaves contain considerable quantities of acid—enough to give to incompletely decayed leaves a distinct acid reaction. Hence, unless the decay has proceeded far enough, leaf-mould used in large quantities may produce an initial ill-effect on grasses, especially those still in their tender stages of growth. However, if the dressing is applied in the form of compost, that is the leaf-mould mixed with soil or other ingredients any acidity may be quickly neutralised. Nevertheless, the wise greenkeeper adheres to his general rule of choosing for his composts the nice well-decayed débris, feeling kindly to his skilled fingers.

One may notice in woodlands, that only certain kinds of plants thrive, and this is due to the acidity remaining in the decaying leaves, and is most noticeable where rainfall and lime are deficient. On the other hand under proper conditions the acidity is lost, and the mould becomes alkaline in reaction in the course of a few months. Many greenkeepers are often inclined to be too much on their guard against using leaf-mould from such situations, but they need have no fear; let them collect this partially rotted mould, dust it with lime, and expose it to the weather, and in the course of a year or less they will have an admirable material for dressings.

In the Fall of the year dead leaves can be gathered in large quantities on most of our golf courses, and their value should not be under-estimated; but as it takes a year or so to turn them into suitable material for top-dressing the greens and "approaches," etc., I cannot do better than recommend Rex Humus, which is an admirable substitute. I had occasion to see some greens in Canada, apparently very deficient in organic manure treated with this "Yeast of the Earth," and within one month from the first dressing, those greens showed such a good recovery

that it was applied to each green of this particular course with the same results. The effect of humus on the mechanical conditions of the soil are well-known. Clay is flocculated by it, and, in consequence, becomes more open; sandy soil, on the other hand, becomes more retentive of water. The chemical value of humus is understood in a general way only, and no special importance should be attached to an analysis. Humus contains more or less nitrogen and small quantities of other elements, but its principal effects in the soil are mechanical and bacterial. Be careful that the humus you use is not allowed to get too dry and be especially careful of material that is mechanically dried. The heating process kills the bacteria and no amount of after-innoculation is of any avail. This can be easily proven by a comparative test. The moist, natural product will give better results every time. Bacteria have been found by careful research to thrive best in humus when the moisture content is between 35% and 40%. Even natural humus is ruined by the heat necessary to drive off the moisture. The biological effect of humus is no less, and perhaps more, important; for that substance serves as a store of food for bacteria, and the latter in the process of living, break down the humus into compounds which are capable of being absorbed by the roots of the grass plants.

The main conclusion is clear: organic manure in one form or another is essential. If sufficient dung cannot be obtained for incorporating in the compost heap, recourse must be had to other forms of organic manures.

Finally, since the difference between organic and inorganic manure lies in the fact that the former contains humus and that the latter does not, the superior results due to the organic manures must be attributed to the beneficent action of the humus.

TREES

Little, and very often no attention is paid to some of the beautiful trees on the courses, although sometimes but a single tree might give a much finer character to a hole if it were in proper order; therefore, a little "doctoring" in time will help to make that piece of the fairway or approach and green have its dominating landscape note. Since trees take so many years to mature, take every care to preserve and safeguard them sufficiently to give singularity and character. The beginner or poor player has sometimes opportunity to admire the surrounding scenery, as he it is who often forgets to keep his head down and his eye on the ball.

Greenkeeping Notes

A large percentage of the complaints received by seedsmen regarding weed-seeds in their seed may be traced to the fact that top-soil has been used in the top-dressings. Top-soil very frequently seems to be of good quality in every way and is therefore used on a golf course either as a dressing or in building a new green. Nearly all top-soil contains a large number of weed-seeds, which may have been there for years in a dormant state. As soon as the soil is disturbed in order to move it, these seeds are moved into more favorable growing conditions and at once sprout. This naturally results in the trouble being blamed on the seedsman. No matter if the source of the soil is carefully inspected and found to be free from weeds, a large number are nearly always buried in it and are just waiting for a chance to grow. Probably the only way to remove them is to burn the soil, unless the ground can be allowed to lie fallow for a long time and the plants which grow removed. The burning will greatly improve a heavy clay soil, but it removes nearly all the fertilizing properties of the soil. Soil which has been burnt should be carefully manured with a combination of artificial manures and natural humus. This treatment will be found to restore the ground to good heart almost at once and seeding may be carried on without fear of much trouble from weeds.

Worms in Putting Greens, Should They be Removed?

By Peter W. Lees

WE are fast approaching the season where, on inland courses especially, worm casts on the putting greens will become a nuisance to the player and accurate putting become almost an impossibility. This subject is one that has to be treated very carefully, as it is one that is open to a great amount of discussion. Some people hold that worms in the soil act the part of a natural drainage; others take an entirely opposite view and I beg to cast my lot with the latter.

My experience is that worms have no place in the soil where a clean, firm, true and even carpet of turf is necessary. On a putting green it is absolutely essential that the surface should be as clean as possible, as the slightest unevenness will divert the ball on its way to the hole no matter how expert a putter the player may be. I say emphatically get rid of the worms.

This may seem to some people a bold assertion to make and especially to those who hold the view that the worms drain the soil. My experience is that where worms are allowed to burrow and throw up their casts all over the surface, the ground is in a much more wet and sour condition by a very long way than it is where the worms have been removed. Let anyone try it and watch the results.

The notion that a worm is Nature's drainer is without doubt an old fashioned idea and is entirely exploded. I believe that I can safely say that I, myself, was amongst the first, if not the very first to tackle this question. I well remember when I started in I was told by one of the very best players on the other side that I was assuredly killing my turf and that in six months' time my putting greens would go all to wreck. They did not, but on the contrary they improved out of all recognition, and what is more they were played on all year round, never had a rest and when I left after eleven and a half years they were better than ever. Formerly, relief or winter greens had to be played during the wet winter months.

I have tried and also have seen tried a great many experiments in the way of keeping all the worms from coming to the surface. One I have noticed and which seems to be the most favored, that is when building a putting green, to put a thick layer of ashes below in the belief that this will keep the worms from coming through. It may help for a short time, but eventually the worms will get through and when once they do so, this green will be far worse than one that has not been treated.

I have come to the conclusion, gained by long and careful study, that the only way to deal with the pests is to get rid of them by killing them out. There are a great many so called worm destroyers on the market, but I would warn anyone to be very careful of the one they select. Some are deadly poison and no doubt kill the worms out without at the time seemingly doing any harm to the grass. My experience is that in time, however, they leave their mark behind and the greenkeeper must decide suddenly why his greens have gone wrong, little dreaming it was the worm killer he had applied.

I think I can safely say I have tried all the "Killers" known, but the one I have found to be the most effective, simple and at the same time absolutely safest, is Messrs. Carter's. There is no danger whatsoever in using it, but on the contrary it acts also as a fertilizer. If the instructions given are carefully carried out no further trouble will be had from worm casts, but a healthy, clean carpet of turf will take the place of the dirty, muddy one on which it will be a pleasure to putt on.

Soils

(*Continued from Page 101*)

If soil is known to be barren, it is necessary to make a close analysis of it to find out why it is barren. If however, soil is not barren, but does not carry a crop well or is under suspicion, it is well to test for nitrogen, phosphoric acid, potash and lime, but unnecessary to test for iron, magnesia, sulphuric acid, silica, soda, or chlorine, because the latter are so generally present that they can be almost ignored.

It is almost always better to work from a description and an examination of samples of soil in prescribing than from the closest and cleverest analysis, unless the soil is known to be barren.

The analysis of soil can only be approximately true for these reasons:

If the sample is taken from one place and represents several acres, it may be absolutely misleading. The presence of a leguminous plant growing on the spot, the stalling of a beast, or the presence of a piece of refuse, might throw the analysis right out of gear.

If the area to be analyzed is plotted and samples carefully taken from each plot, the whole mixed and a small portion analyzed—the result would be substantially correct, but in all probability if portions of the one sample were sent to different chemists for analysis, each one would give a slightly different result.

To sum up, science in regard to agriculture is a good servant, but a cruel master—or in other words, a crop cannot be grown by thumb and rule, and unless rainfall, temperature, the humidity of the air, the quality of the soil, its conditions, drainage, power to conserve water, and all such factors are taken into account, and are more or less favorable—soil may be barren, although it may be proved by analysis to be rich and fertile.

The analysis of poor soil placed against a good soil is pretty confusing to the ordinary man, and so hopelessly unintelligible to the majority, that they rarely exist except in text books.

Example:	Poor Light Soils	Poor Heavy Soils	Good Heavy Soils
Nitrogen	0.10	0.12	0.19
Potash	0.02	1.11	0.60
Lime	0.10	0.00	2.61
Phosphoric Acid	0.05	0.05	0.27

The usual chemical analysis of a soil consists in finding out the amounts of the above elements present and also the percentage of magnesia and humus contained. These materials, except the humus, are extracted from the soil by strong acids, and the action of these acids is many times stronger than is ever brought to bear by plants on the soil in its normal condition in the field. It is therefore impossible at present to draw any certain conclusions from the results of such an analysis that are applicable to field conditions, since the acids used in the laboratory dissolve out much more of the plant-food in the soil than is ever in solution in normal soil water. If, however, an analysis shows only a very small amount of nitrogen, then one can certainly conclude that the soil is deficient in this element and would probably be benefited by its application. In inspecting new property and judging the qualities of the soil it is always advisable to observe the natural plant growth.

A soil deficient in nitrogen is constantly showing its condition in the growth of the plants on it. Short growth of straw and vine, failure to develop a full dark green color in the foliage and the growth of sorrell and ox-eye daisy, all tell as accurately as the chemist, with all his skill, that the soil lacks nitrogen. It is the same with the other constituents.

It is only when a soil is extremely deficient in certain plant foods that a chemical analysis of it shows the cause of the trouble. Usually an examination by an expert will suffice.

The Cost of Golf Course Construction

IN the August issue of THE GOLF COURSE we announced for an early date a series of discussions on the cost of constructing a first class golf course and at that time we appealed to our readers for their assistance in supplying the necessary data to make the discussion as valuable as possible.

We have received an exceedingly interesting and exhaustive report from the Scioto Country Club, Columbus, Ohio, which takes up in very great detail the cost of each portion of the course together with a very careful description of the methods and materials used. The directors of the club have very kindly given us their permission to discuss their report in the hope that their experience will be of value to those contemplating the construction of new courses.

The work at the Scioto Country Club was subject to more than the usual labor difficulties and in addition the extremely unseasonable weather which was experienced during the Summer made it impossible to obtain as great efficiency at all times as might otherwise be expected. The work was delayed and much additional expense was incurred on account of rains, which were unprecedented in the history of the local weather bureau. The excessive rainfall, in addition to increasing the labor problem, caused much loss through the washing out of various greens and fairways and the total cost of construction is conservatively estimated to have been increased by about thirty per cent. However, the committee in charge of the work believes that the very wet season had its favorable side in that it gave great experience with drainage conditions and caused many precautions to be taken which saved much future expense and inconvenience in case the trouble had developed after the opening of the course.

Space this month will not permit us to go into any detail regarding the Committee's report, but in the next issue of THE GOLF COURSE we will present a careful study of the whole work and take up the various items of cost.

The responce to our request for assistance from our readers in this discussion has been very gratifying, but we are anxious to get still more data from as many different localites as possible. We feel sure that nearly every country club can supply much information which will be of great value to the golfing world and we greatly hope that a large number of our readers will take time to aid us in this work.

The Covering of Putting Greens for the Winter

By LEONARD MACOMBER

IT must first of all be understood that turf does not suffer much from the cold Winter weather. Therefore, it is not necessary to protect putting greens with any heavy blanket covering of straw, manure, or leaves.

Winter killing takes place usually in the late Winter or early Spring season where the surface drainage is not correct, and in the low spots, any standing water alternately freezes and thaws.

Of course, on very exposed positions, turf often suffers from the cold winds and ice, and it is advisable to use some artificial means to help matters—such as the laying of clean branches around the greens and sometimes on them, so as to help collect the snow. A covering of snow has a very beneficial effect on turf, as it protects it from extreme temperatures, cold winds and keeps it comparatively warm and with the final Spring thaw, the soil has an abundant supply of moisture.

It is always well to top-dress putting greens late in the Fall, just before the cold weather becomes settled, with a quarter to half-inch layer of sand or compost, depending upon the nature and condition of the soil, and sometimes add charcoal for sweetening. Work the dressing into the existing turf with birch brooms or the backs of rakes and

roll if the ground is not frozen.

This quarter-inch covering, while not absolutely necessary serves as a protection for the roots of the grass plants, and at the same time, working into the soil improves its mechanical condition.

There are a few golf clubs who, after top-dressing their greens, make a practice of covering them with a very thin layer of clean straw through which the turf can easily be seen—the idea being to help prevent the ground from thawing out in the middle of the day during moderate weather and freezing again at night.

This sort of covering is all right where conditions are severe, but it is fatal to apply any heavy covering of straw or manure, as the turf becomes tender, and in the early Spring, when the covering is removed, the turf is easily killed by an unexpected return of cold weather and frost.

Grass Diseases

(Continued from the September Issue)

II.—Rust Group

We now come to another group called the *Puccinia,* which causes the well-known *rust* on grass. This is a more troublesome group of fungi, as it attacks the leaves and stems of grasses in all stages of their growth, even when growing strongly under good conditions. Nearly all greens and lawns will show a more or less badly rusted patch of grass in a dry Spring or at the end of a dry Summer; in fact, it is the most widely-distributed of all fungoid pests, attacking corn, tea, coffee plants, and chrysanthemum, etc., and attacks nearly a hundred species of grass.

The commonest form of rust found on grass is *Puccinia avenæ,* found on *foxtail, tall oat grass,* and *cocksfoot. Puc. airæ* is found on *Aira cæspitosa* on open heath lands; whilst *Puc. agrostides* is nearly always found on *Agrostis alba* and *A. canina.* I have seen large patches of both these grasses attacked by rust on Wimbledon Common; and on Horsell Heath, near Woking, several varieties of grasses will be seen infested with various rusts. *Puc. poæ* confines itself to the various *Poas,* and will be seen on *Poa pratensis* and *Poa compressa,* even when these are shaded by trees. Another rust, *Puc. coronifera,* produces the spores in the form of a small crown on the leaves of *foxtail, rye grass, tall fescue, Yorkshire fog,* etc. In America *Timothy* is commonly attacked by *Puc. Phleii pratensis,* but it is comparatively rare in this country. Several of these *Rusts* also grow on buttercups, nettles and docks. It is, therefore, desirable to keep these weeds down as much as possible whenever the grass appears liable to attacks of rust. A usual sign of turf being infested by rust is in the turf turning a dingy brown or gray color, which afterwards becomes white as the stems and leaves die and get bleached. Directly these patches are noticed a mixture of copper sulphate, lime and water should be applied, if it is late in the season; or permanganate of potash (using a quarter-ounce to five gallons of water) if the rust occurs in the spring.

There is another disease allied to the rusts that causes long brown stripes on barley as well as grass leaves: this may be called the "grass leaf stripe," *Pyrenophora trichostoma.* It was found to have broken out very badly in Norfolk and eastern counties in 1908, and I came across specimens of *Poas cocksfoot, Sheep's fescue, tall oat grass, &c.,* all badly diseased. It is presumed that the disease was spread in that year by the large quantity of cut hay left lying on the fields during the two previous bad haymaking years: and it certainly seems that where cut grass is left on the ground the spread of disease is hastened, more especially amongst the *Poas* and softer meadow grasses.

The next group of fungoid diseases are the *Mildews.* Although there are several of these that attack grasses, the commonest species is a white powder-like *Mildew, erysiphe graminis,* which grows on several grasses, and can be found in almost any hedgerow during

September, and also where grass grows rankly on damp, badly-drained soils. It forms irregular brownish white spots on the sheaves and blades of the grass and the tips of the grass shoots are covered with a very minute mould. Another *Mildew, Phytium de baryanum,* is that which causes the damping-off of seedlings, and those of you interested in gardening know the effect of this disease when it gets a start in a box of seedlings. It also attacks seedling grasses at the neck when these are growing on a very alkaline soil, or if a spell of wet weather comes just after the seed has sprouted, but, unlike the gardener's seedlings, the grass does not appear to be destroyed by the mildew, and grows away from it directly the weather becomes dry again. In cases where this damping-off occurs a good dressing of sand or a dusting of fine dry lime will often check it. As a rule, this *Phytium mildew* is more often found where grass seed has been sown on a sour kitchen garden soil.

The different mildews only attack the *Poas* and softer grasses, as a rule, and it is seldom that *Fescues,* etc., get attacked. The disease breaks out at any time of the year whenever the weather is muggy, damp and foggy, though it is seldom noticed in wind-swept places, and is therefore more common on inland courses than those by the sea coast.

In addition to these mildews, there is a small red mould which sometimes attacks grasses named *Fusarium heterosporum.* This will be found on *Yorkshire fog, rye grass,* and grasses with downy leaves or stems. Although not so common in England, it breaks out periodically in most European countries. I came across several cases of this disease last July near Witham, Essex, the grass flower-heads and shoots being covered with a red or orange-colored gelatinous substance, which became very slimy after a shower of rain. One species of mould, *Fusarium loliacum,* only attacks Italian rye grass, and is seen on sewage farms where the soil is excessively manured. It indicates itself by producing well-defined brown spots on the leaves, these spots developing into a dense mass of mould, which ultimately causes the leaves to rot off.

III.—Cladochytrium Graminis

I now come to one of the most troublesome of the mildews, which can best be described as the *blood mildew.* This is a comparatively new grass disease which broke out in various parts of the country six years ago, where my firm sent some of the first specimens to Kew for examination. It seems only to attack grasses in the seedling stage when they have grown about one to two inches high. Whilst previous to being attacked the grass may have grown strongly and evenly, it will suddenly be seen to turn a brownish or blood-red color in small patches which rapidly extend outwards, and at the same time the ground is seen covered with a very minute reddish-gray mould. If the affected grasses are examined it will be seen that all the tissue is infected with the disease, but that the *seminal node* or *callus* is alive, and this soon puts forth two little tillering shoots, and in a month or so later the lawn is perfectly green again. This will also be hastened by a little stimulant in the way of a weak solution of Kainit.

It is a curious coincidence that the majority of the outbreaks of this disease brought to my notice have occurred immediately after a thunderstorm, and it is possible that sudden atmospherical changes may account for the rapid spread of the disease. Last year it was particularly bad, and I saw many varieties of grasses attacked, including *Poas,* for as a rule only the *Fescues* and down grasses are attacked. I am glad to say that all the lawns that were attacked last year are now in good condition, and, in fact, it is interesting to say that one of the most badly infested lawns was one in Putney, which was so bad that an inspector was sent from the Board of Agriculture to discuss the matter with me as to what could be done to arrest the spread of the disease. In some places the turf looked quite destroyed and dead at the

end of March, but in July the lawn was being used for croquet without another ounce of seed being sown, and in September an almost perfect "sole" of turf had been formed.

Where this *Cladochytrium* or *blood mildew* breaks out it is inadvisable to roll the lawn until the turf has recovered. The treatment consists of applying a weak solution of sulphate of iron followed by a solution of Kainit. Paraffin has been tried with sometimes successful results, but I do not recommend this. I have also tried solutions of sulphide of potassium, and this may be used as a very weak solution applied in the evening in very bad cases, but should not be done unless the circumstances render it imperative, as I am inclined to think that the liquid injures the young tillering shoots springing from the *callus* or *basal node* of the plant.

Another cause of alarm is when the grass is seen to turn yellow in the autumn, but this is a very minor ailment and no harm occurs through it. It is due to a kind of "influenza" attack that the grass suffers from, caused by changes of temperature, and is more often seen when the nights are cold after a hot day. The grasses most liable to attack are the different species of *Poas, Aira, Lolium,* etc. If the leaves are examined they are found crowded with small whitish yellow spores which grow into irregular shaped masses. These spread and connect with each other, destroying the chlorophyll, which causes the leaves to turn yellow and appear to be dying. It is commoner on soils containing an excess of potassic salts or on a strong alkaloid soil. No special treatment is necessary, but a little quick-acting manure soon puts matters right, and if, as is sometimes the case, it is due to an excess of carbonate of lime in the soil, a one-per-cent. solution of iron will often counteract it.

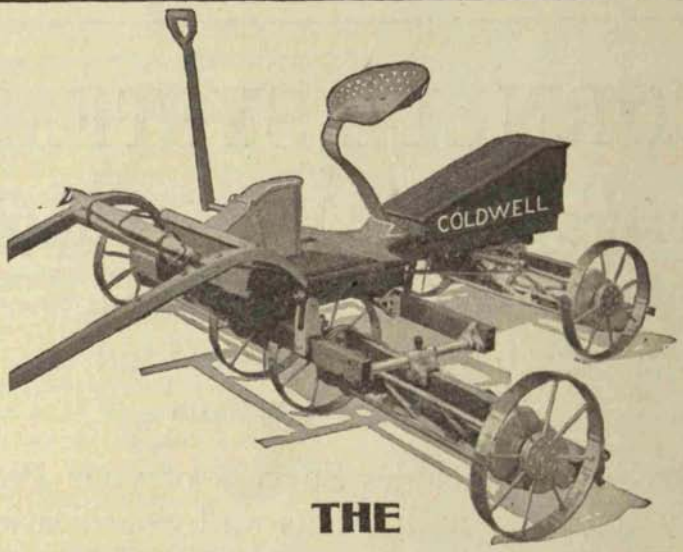
Besides the above microscopical moulds there are other fungi that live as actual parasites on the grass, taking their food from the host plant, *Isaria fuciformis.*

This is a common fungoid parasite that attacks the leaves of *Fescues* and temporarily causes the "flag" to rot off, thought the plant itself does not appear to be injured. Where noticed it is a good plan to try a dusting of dry quicklime, followed by a solution of nitrate of soda or Kainit, and this will check the pest and enable the grass to withstand its attacks. It is generally found on light or calcareous soils, more especially in Herts, Surrey and Kent. It does not do much damage in this country, however, though in Australia it is sometimes rather troublesome, where it attacks all sorts of grasses. It is said by some authorities that this *Isaria* fungus is an early stage of the *Cordyceps* fungus which lives as a parasite on caterpillars and other insects. The *Isaria* has the peculiar property of being bright and luminous under certain conditions.

Ergot in Rye

I should make a passing reference to the Ergots, *Claviceps purpurea,* which are very troublesome to the farmer, as they attack rye and sometimes barley. The *Ergot* will also be found to attack grass in fairly large patches on pastures adjoining roadsides or where a footpath runs through a field. It is chiefly troublesome in July, when the flowers or spikes of rye grass, barley grass, etc., will be found to contain small black spore masses called *Sclerotium.* Its only harm as far as the greenkeeper is concerned is that grass attacked by *Ergot* has a tendency to throw up a large number of embryonic flower stems instead of tillering, so that the grass becomes coarse. Cattle are said to be poisoned by the *Ergots,* though some authorities dispute this, and there appears to be no absolute proof of this happening. Where grass is badly *Ergoted* the grass should be mown with a scythe and then raked and burned on the spot, if possible.

(*To be Continued*)



THE COLDWELL "THREESOME"

We call your particular attention to the features mentioned hereafter, as they are absolutely essential to a perfect machine of this type and are *found only in the Coldwell "Threesome."*

1—All gears and axles of drive wheels are run in dust proof grease cases, which only need filling once in four or five months. This means easy draft, long life to the machine and a great saving of time.

2—The **Back Rollers** are made in three sections, which insures against tearing the lawn when turning circles. These rollers are each provided with bronze bearings, turning on a hollow grease-filled shaft. This shaft, once filled, needs no further attention for months.

3—The **Drive Wheels** have malleable hubs, steel spokes, wrought-iron rims and are made fast to shafts which turn on ball bearings inside the grease case. (All wear easily taken up from inside of case.)

4—**No springs are necessary** to keep the back roller from jumping up, as the Lawn Mowers are swung from the main frame by large friction surface hangers, which hold it down.

5—A single lever at the operator's right enables him to lift all three cutting knives free from the ground at once. It also permits him to throw out of gear all three revolving cutters without leaving his seat.

6—The weight of the super-structure and operator is evenly divided over the three Lawn Mowers. The combination of the carrying frame and a very simple draw rod mechanism makes one of the most desirable features of this machine, and it is this combination that makes absolutely positive the accurate position of the rear machine relative to the two front machines, insuring at all times, and under all conditions, the proper overlapping of the cuts. This valuable feature is found only in this machine.

This style of machine is designed for cutting wide swaths on grounds that are settled and dry, also where rolling and fine cutting are not the first consideration. On fine lawns where the turf is right and where pride is taken in having fine cutting and a beautiful velvety surface, free from horse marking, streaks, etc., there is only one type to use, that is the motor-driven Lawn Mower, which rolls the lawn every time it is cut. We make several varieties of this type, including both the "Walk" and "Ride" types, circulars of which we will be pleased to furnish on application.

COLDWELL LAWN MOWER CO. NEWBURGH, N.Y.