"It acts like a Putting Green Mower on the Fairways,"—
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LEHIGH COUNTRY CLUB
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"On our two courses we have standardized on Toro Tractor Mowers.
"Our seven-year-old Push-Type outfit is still on the job every day and most of the original reels are still in excellent condition.
"In spite of the greatly reduced budget, I feel that our purchase of a Master Seven-Unit outfit is real economy. In speed, economy, and excellence of operation, the Master Seven is unsurpassed.
"It acts like a putting green mower on the fairways. A true Master of Mowing."

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Here are facts: A number of clubs who last year replaced hand mowers with Ideal Power Greensmowers have provided actual figures showing an average saving of $313.55 per mower for the season. The above figures are three of many taken from actual cases.

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The Ideal Bulldog Fairway Mower is built for years of fast going

Lighter, yet stronger than ever. Seven-blade Bulldog cutting units are pulled so that they hug the ground—cut smoothly into every hollow, over every hillock. Cutting is smoother.

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Ideal Golf Course Equipment

How To Kill The Beetle

The Asiatic and Japanese Beetles and Their Control on Golf Courses

By DR. WALTER E. FLEMING

Bureau of Entomology, United States Department of Agriculture,
Moorestown, New Jersey

The Japanese beetle, *Popillia japonica* Newman, the Asiatic beetle, *Anomala orientalis* Waterhouse, and the Asiatic garden beetle, *Autoserica castanea* Arrow, have become established at several localities in the northeastern part of the United States. The larvae of these beetles feed on the roots of grass and, where abundant, have caused severe damage to turf.

Poisoning turf with lead arsenate was developed by the Bureau of Entomology to control larvae of the Japanese beetle and it has since been found to be effective in protecting turf from injury by the Asiatic beetle and the Asiatic garden beetle.

The adults of these beetles appear in early summer and begin to deposit eggs, preferably in well-kept lawns and golf courses. The period of oviposition extends throughout July and August. The eggs hatch in a few days and the young larvae, or grubs, begin to feed on roots and humus immediately below the surface of the ground.

The depth at which the larvae continue to feed in the soil during the active season is dependent upon the moisture; when the soil is moist, they are close to the surface but when the upper layer of the ground becomes dry, they burrow downward until a satisfactory degree of moisture is reached. The larvae grow rapidly, causing more damage as their root-consuming capacity increases, and become fully developed in the early fall.

The most pronounced injury to turf usually appears in the fall, particularly if the season is dry. As cold weather approaches, the larvae burrow deeper into the soil where they remain relatively inactive during the winter. In the spring they return to the surface, feed for a few weeks and then transform into adult beetles.

The density of the larval population in turf varies considerably with the season and the local conditions. In years where there is considerable rainfall during the summer, the infestation is more uniformly distributed than in periods of drought. In dry summers there is a tendency for the beetles to deposit eggs in the moister portions of the turf. The larvae are usually found in large numbers in open grasslands but only rarely are many found in turf which is shaded.

**Nature of Injury**

When the root system of grass is damaged by feeding of these larvae, the turf may not be able to draw a sufficient supply of nutrients and moisture from the soil to maintain a good sward. It has been the general experience that with careful attention a good sward can be maintained even though there be in each square foot of turf 11 to 16 larvae of either the Japanese beetle, or the Asiatic beetle, or 16 to 22 larvae of the Asiatic garden beetle.
If the growth of the grass is retarded by unfavorable environment, low fertility, or lack of moisture, a larval population of these densities is sufficient to cause extensive damage. It is impossible to maintain a good sward even under favorable conditions when these larvae are more numerous.

The appearance of turf suffering from injury by these larvae is similar, in the early stages, to turf retarded by an inadequate supply of moisture or nutrients. If a portion of this turf is examined and a large number of these larvae are found, one may be certain that the larvae are causing the damage. As the injury becomes more extensive, the aerial portion of the grass is often completely severed from the roots. Turf which is seriously damaged by these larvae is soft and spongy because of the extensive burrowing of the insects immediately below the surface of the ground.

**HOW LEAD ARSENATE CONTROLS THE BEETLES**

Lead arsenate which is used for the treatment of turf, is a white, fluffy, impalpable powder. It has been found that the lead arsenate on the market which satisfies the standard requirements of the chemical, when used as an agricultural spray, is satisfactory for the treatment of grass.

The application of lead arsenate to turf does not prevent the adult beetle from ovipositing in the soil, but it destroys the larvae after hatching from the eggs. A larvae while burrowing and feeding infests some soil. If the soil contains sufficient lead arsenate, the larva will eventually die. The period of time required for the larva to consume a lethal dose of the poison is dependent upon the activity of the insect and the concentration of lead arsenate in the soil.

It is apparent that the greater the concentration of lead arsenate in the soil, the shorter the interval before the larvae obtains a fatal dose. The larva, however, eat very little after the arsenic begins to affect them and soon become flabby and discolors.

When the lead arsenate is distributed only through the upper layer of soil some of the larvae may continue to live for several months before consuming a fatal dose of the poison, because they may remain most of the time below the poisoned layer of soil. The application of lead arsenate has proved to be a practical method for reducing the density of the larval population below that which causes serious damage to turf, although it is rarely exterminative except in the case of a light infestation.

**APPLICATION OF LEAD ARSENATE TO TURF**

It is possible to protect turf from injury by building up a poisoned layer of soil at the surface. An application of lead arsenate at the rate of 5 pounds to 1000 square feet of surface, before oviposition, has been found to reduce a light infestation of less than 11 larvae to a square foot, so that damage did not occur, but it is necessary to apply the chemical at the rate of 15 pounds to 1000 square feet to assure protection when 40 or more larvae are found in each square foot of turf.

Chemical analyses of treated turf in different localities between Boston, Mass., and Cape Charles, Va., show that only a small part of the arsenical applied to the surface penetrates below three inches and that the most of the poison remains in the upper inch of soil. It is possible, therefore, to apply the treatment of 15 pounds in one application, or gradually build up a poisoned layer of this concentration by successive applications of lesser amounts.

To obtain the necessary uniform distribution over the surface these small quantities of lead arsenate must be diluted. It is largely a matter of personal choice whether the chemical is applied in water, or in a dry state mixed with sand, soil, or other material.

In applying the lead arsenate with water, the chemical should be mixed with the smallest volume of water that can be used to give a uniform distribution without flooding the turf. With power sprayers, satisfactory results have been obtained with a mixture of one pound of lead arsenate to two gallons of water, and in some cases with a concentration of one pound to one gallon of water. It should be applied in a fan-shaped spray with a pressure of 250 to 300 pounds.

A power sprayer is usually too heavy to take on to the turf; therefore most of the liquid treatments have been applied by placing the sprayer at the most advantageous position and laying one or more lines of hose to the area to be treated. After the spray is applied, the turf should be well watered to wash the chemical off the grass before it dries.

When lead arsenate is applied in the dry state by hand, it should be mixed with about twenty-five times its volume of moist sand or soil. When applied with a spreader or distributing machine the
June, 1932

The National Greenkeeper

BROWN PATCH PROTECTION

COSTS LESS NOW!

America's finest fungicides
at new low prices!

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<th>SEMESAN</th>
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The new 1932 prices on Du Bay fungicides make it utterly unnecessary to risk the health of greens to unknown and unproved brown patch disinfectants. Now you can use either Semesan or Nu-Green regularly at surprisingly low cost! And know your greens are safe!

Semesan is recommended where the soil is normally fertile. Nu-Green (the only brown patch disinfectant licensed under U. S. Patent No. 1,787,581) is advised where poor fertility prevails, since it stimulates grass growth. Sold by your seedsman or golf supply house.

New Free Pamphlet: "Brown Patch Diseases: Their Prevention and Control" tells how to recognize principal grass diseases; when they occur; how to prevent them with Du Bay fungicides. Ask your seedsman or golf supply house, or write Bayer-Semesan Co., Inc., Dept. 95-A, 105 Hudson St., New York.
Diluting material should be dry, finely ground and free from a tendency to clog. Satisfactory mixtures for applying in commercial distributors can be made by mixing one part of lead arsenate with two parts of activated sludge and four parts of sand. Tankage may be substituted for the activated sludge.

**THE USE OF FERTILIZERS**

Turf treated with lead arsenate can be fertilized with manure, ammonium sulphate, sodium nitrate, potassium chloride, superphosphate and the organic fertilizers such as bone meal, cottonseed meal, activated sludge and tankage. The use of lime is not recommended, unless required to correct soil acidity, because it has been found to reduce the insecticidal value of the treatment.

It is advised that the inorganic fertilizers be applied separately from lead arsenates, particularly during the growing season, because in some cases some injury has resulted to the grass.

**GROWTH OF GRASS IN POISONED SOIL**

Grass seed in poisoned soil is normally somewhat slower in germinating, the foliage is darker and the growth slower during the first few weeks but when the grass is established, there is little difference in appearance from a good sward in unpoisoned soil. Kentucky blue grass, red top, perennial rye grass, Chewing's red fescue and white clover grow satisfactorily in soil containing lead arsenate.

**PERIOD OF EFFECTIVENESS**

It is difficult to predict the period of time that turf treated with lead arsenate will be protected from injury as this will depend upon the amount of poison applied, the soil conditions, and the density of the larval population. It is expected, however, under normal conditions, that an application of 15 pounds to 1000 square feet of surface will protect the grass for at least five years.

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**Concrete Putting Greens**

**IMPracticable? Foolish?**

But is it? Most greens harden too darn quickly, and it is then, when they are too much like concrete, that your trouble begins.

**THE PROBLEM IS—**

how to build greens that won't become hard; or, how to keep them soft, cushion-like and resilient in spite of hard usage.

**Build so they won't turn to hardpan**

A great many years of experience in working with golf course designers, greenkeepers and greens committee members has permitted us to gather volumes of the most important sort of information. We have encountered every conceivable type of soil and climatic condition. We have helped with greens using many kinds and combinations of soil, humus and compost. We can show you some of these greens that are as soft and resilient today as they were years ago when first put into play. We can tell you how to build this type of green on your course.

**How to renovate most effectively**

Naturally when the basic conditions are not correct, it is more difficult to renovate and make a satisfactory job. But you can renovate with SORBEX by working "from the top, down" and ultimately produce a satisfactory condition, because SORBEX is a moss peat humus that is 25 times finer than any peat moss, and it will penetrate right down to the root soil.

And then, through the use of DRICONURE you can maintain better conditions — for DRICONURE both feeds and improves the mechanical condition of the soil. Furthermore, as a natural, organic fertilizer (concentrated cow manure and peat moss) Driconure never burns or harms in any way, never creates a toxic condition — it always improves.

We would like to send you further information, or have one of our turf experts discuss this matter with you.

Atkins & Durbrow, Inc., K-165, John Street, New York, N. Y.
Rebuilding and Resodding of Putting Greens and Tees

By JOS. WILLIAMSON, Greenkeeper
Crescent Athletic-Hamilton Club, Huntington, L. I.

Read at the 6th Annual Educational Conference of the National Association of Greenkeepers of America, held at New York City, January 19-22.

The subject which it is my pleasure to speak upon at this gathering of greenkeepers in convention is of great importance inasmuch as it is of interest to everyone present. It is "The Rebuilding and ReSodding of Putting Greens and Tees." This work is a task which necessitates a deal of thought and preparation by the greenkeeper before he starts the job of rebuilding. First, he should know the past history of the old green and why it did not function properly. He should satisfy himself that he knows the reason of its failure so that he may profit by the mistakes made in the old green.

There can be and are many and various reasons why a putting green goes wrong and fails to give the results and satisfaction which are naturally expected, after it has been in use for a time and why it does not thrive as it should, causing the greenkeeper much concern and worry. For it is not always the methods used in its care which are to blame for its decline; but more often than not it is the faulty construction which is the cause of the whole trouble, and, more likely than not, the lack of proper drainage.

Putting Greens Too Hurriedly Built

Many of you know of putting greens which have been hurriedly built and thrown together with any and all kinds of clay and soils regardless of its make-up or quality as a proper composition equal to the requirements which are absolutely essential and necessary in the soil elements for the growing of putting green grasses, which are expected to grow and continue to thrive in the best condition for a long time after it is once a putting green. In this case it is too late to remedy the faults of construction after it has been sodded, seeded, or stolonized. So the rebuilding which has become necessary should be given much thought and the mistakes made in the old green rectified in the new.

It is the opinion of many qualified to speak on this subject that the life of a putting green is far over-estimated and that we expect entirely too much from the soil under the sod, for it becomes worn out and dead long before we are willing to admit that the trouble of a bad green lies in the soil itself. When we stop to consider what a green goes through during the years of its use and what we have done to it, it is only reasonable to admit that its life is gone and we must renew the soil which has become worn out, poisoned, and lifeless. So under these conditions it is only natural that after a few years the old green should be torn up and rebuilt.

Soil Should Be Given First Thought

When this is to be done it is only proper that the soil should be given first thought, that it will be of such quality and content that the grasses will grow and thrive mostly from the soil itself rather than by the everlasting purging with the use of commercial fertilizers and patent manures that have taken the place of the old compost pile which was in the past and is today the most satisfactory to the well being of any putting green.

I do not know of any reason why the soil of today should be any different for the growing of good grasses than that of years ago, but I am quite sure that is is far better to know that you have a good, fertile and porous soil than to depend upon concentrated manures and fertilizers and get fooled in the end.
For the past ten years or since the introduction of the bent grasses which are now in general use throughout the country, there seems to have crept into the minds of many that the soil of a putting green is of little importance and that the bents would grow in any old clay if you kept it well watered and used plenty of fertilizer of this and that which has flooded the market for this purpose and which has been used to the extent and cost of many greenkeepers' jobs, and which has killed more putting greens by overdoing than anything else, regardless of the drainage. I believe this fertilization has been carried on to a degree that the poor greenkeeper was at his wit's end and could not figure out how it all came about that this and that green went bad, became toxic and compact, and would not respond only to brown patch—which reminds me of the poem "only God can make a tree," but I honestly believe that the devil himself had a lot to do with the making of some of our putting greens.

The soil should be composed of a mixture of about one-third good, loamy, fibrous top soil, one-third sharp sand which will not pack, and one-third humus such as old rotted stable manure and peat moss or leaf mould with a little wood ashes thoroughly mixed so that the entire top soil of the green is about the same composition. This will assure a good friable condition which will accept water, light, and air and which will be of a texture that the bents especially will thrive in, besides being porous enough for good, quick drainage which is most important to keep a green in good condition at all times.

Having made sure that you are satisfied with the soil which is to be used in the new green, let us take up the condition of the subsoil. If it is of heavy clay which is generally the case, I would suggest plowing it up and mixing in a few loads of clean fine cinders or common sand to break it up a little. Then give it a good, rough grading that will be something like the contour of the surface of the green when finished.

**DRAINAGE CONTROLS LIFE OF GREEN**

Draining is the next job to be done and it is of vital importance, for upon the drainage depends the life and success of the green whether you have a good soil for the top or not. If the green is not well drained, the life of the soil cannot last long and very soon will turn toxic, soggy, and compact and a sure victim to the ravages of brown patch. Very often this work is much neglected, poorly done, or not done at all; and it is impossible to expect a good grass growth on a hard compact soil which is caused by the lack of proper drainage. A green should be so well drained that the water from the rains or sprinklers will have quick access through the soil and be carried off before the soil can become waterlogged or soggy.

Most greens as a rule are built sloping slightly to the approach, and in this case the drains should be laid crosswise of the green, the trenches dug about eighteen or twenty inches deep at the start with a gradual fall to the main which would be on one side of the green, falling to the lowest corner and the most convenient outlet. The trenches should be on an average of twelve to fifteen feet apart and either three or four-inch drain tile used and placed close together in a straight line making connections to the main with tees which are made for this purpose, and should be back-filled with one and one-half inch crushed rock to within ten or twelve inches of the finished surface of the top soil.

After the drains have been filled with the rock, the sub-soil should be rough-graded between the drain trenches and sloped a little from the center to the line of tile, taking care that there are no low pockets lying between the drains in the subsoil. However, I would suggest not to cover the rock with the subsoil, but to leave it open and let it be covered with the top soil when you are filling the surface. This will give perfect drainage of the sub-soil to the trenches, and the top soil on the rock will assure a complete porosity from the finished surface to the drains below. If this system is carried