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The casual observer may consider the latter group as having no use in the order of things, when in reality they are just as essential for the existence of all life as the former group. One could not live without the other. All forms of plant life depend upon the work done by this green substance, called chlorophyl, and all forms of animal life exist only on the results achieved by this action of chlorophyl.

It is interesting to observe that the leaf is the only laboratory where the raw products of sunlight, air, water and a very meager amount of mineral matter are converted into organic matter. Name an industry in which man is interested that does not depend on the work done by the leaves of plants. The basis of life, then, is the action of chlorophyl, and the basic principle of all industry.

Life Depends on Four Factors

ALL forms of life, whether animal, or vegetable, grow and thrive only when the four factors of sunlight, humidity, temperature, and food are evenly balanced for the particular type of life in question. Just as soon as we get an uneven balance with one or more of the above factors, then we are departing from a condition which will keep that form

thriving and growing. As soon as its growth is stopped, the other law, or the other part of the law of life, comes into action and the tissue starts a period of decomposition or destruction.

Now, let us consider the human body that we may try to get a better understanding of turf grasses, with which the greenkeeper is concerned or blooming flowers with which the florist is concerned. The health of a person is very closely related with the four factors of sunlight, temperature, humidity and food.

Strange as it may seem, if the temperature of the human body either drops or rises a few degrees, life is soon extinct unless that temperature is brought back to normal. If there is a change of moisture or a change in the supply of oxygen, great disturbances will arise, and if this disturbance is prolonged, it is only a short time until the other principle of life is brought into effect, and the body is destroyed.

Over-feeding Causes Disease

UNDOUBTEDLY, the greatest cause of disease in the human body is over-feeding, and I firmly believe that this same prin-



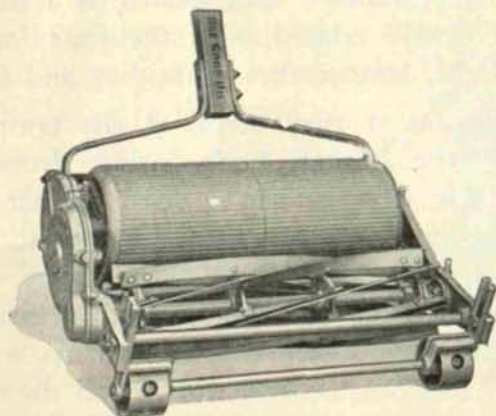
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ciple of over-feeding is the greatest contributing cause for disease in the turf grasses or of flowers. It is plain to us that a healthy, vigorous person, consumes more food than the sickly.

This same principle is applicable to grasses and flowering plants. Undoubtedly all forms of life vary in degrees of virility, or health. We know it does in the human, we know it does in grasses and flowering plants. Even the disease germs must vary in virility. It is common knowledge that epidemics of sickness vary in virility, and by that we mean, the small plants which produce sickness when in the body, vary in virility.

That we may get a better understanding of plants, let us remember that a normal healthy person takes air into the body eighteen times a minute. Yet we take food normally, three times a day. Make the comparison to plants. Only about three or four percent of the growth of a plant is made through the root system, the rest of the growth comes from the air by action of the leaf.

It seems that the greenkeeper or florist does not bear these two facts in mind. It seems that the florist or greenkeeper is over stressing food in the form of fertilizer. If we would know how much the growth of plants comes directly from the root system, take one hundred pounds of vegetable matter and burn it. The thin layer of ash will give it to you quite accurately.

The other substances because of their gaseous nature go back into the air, and only the elements taken by the root system remain. We get a very vivid optical illustration of this principle when we stop the human from breathing for a few minutes or let the same individual do without food. Life would be extinct in a few minutes without air, and it would require many days to make life extinct without food.

Plants Feed Only in Sunshine

WE MUST further remember that plants feed very little, if at all, in cloudy weather. The leaf which does the larger portion of the building, does its work only in sunshine. A florist knows very well the danger of trying to feed plants in a spell of

cloudy weather. Here is a thought for the greenkeeper.

The problem for the florist in this respect of feeding, in cloudy weather is a much larger one than it is for the greenkeeper in our latitude. The florist keeps his plants growing the year around, whereas, the greenkeeper is only required to have good plant action a portion of the year.

All know quite well what will happen when a human body contains food in the intestinal canal, which is not available. Isn't it reasonable then, that unhealthy conditions will set up in the soil, when the roots of turf grasses are surrounded with a quantity of food which they cannot use.

Who knows the chemical reaction that takes place in the soil when quantities of unavailable food is in the soil. We must learn that fertilizers are not all of it. I grant that it is not an easy task to know just how much food or fertilizers plants will take, but we must remember, that sickly plants cannot take the amount of food that healthy plants can.

You must remember too that the plants we desire to grow are utterly helpless to take food from the soil, unless it has been broken down, or made available by the action of very minute plants in the soil, which are known as soil bacteria. They must do their work first, or the plants cannot thrive.

Water-logged Soil Kills Bacteria

WE MUST remember too, that these soil bacteria are classified as aerobia. This group of plants can only thrive in the presence of oxygen as found in the air. All florists and greenkeepers soon learn, that if the soil in which our plants are growing, has the spaces between the particles of soil filled with water, that the plant soon sickens. Shut the air off entirely by getting the soil "water-logged" and these soil bacteria suffocate, which can be compared to drowning in animal life. This emphasizes the importance of drainage, that we do not drown "the cooks."

If you do not provide exits for this free water, fertilizers and everything else is of no avail. The question naturally arises then, under what conditions does the root system

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of plants work best. To illustrate this, if you take a cup of marbles and then fill the cup with water, you have the spaces between the marbles, filled with water. Place a screen over the cup and pour the water out, each marble will be coated with a film of water.

We know that plants thrive and grow best, only when there is a film of water on the particles of soil. It is very hard for either the florist or the greenkeeper to have this perfect state of film water at all times. If there is too much, air cannot enter, and the soil bacteria do not thrive, and the cell tissues of the plants become gorged with water, and a soft growth sets up, which is not at all healthy.

The Question of Watering

IF THERE is not enough water to produce this film around the particle of soil, growth is arrested. Undoubtedly, less trouble will arise with an arrested growth, by the latter reason than the former. The question of overwatering then is very important for the florist and greenkeeper alike.

Now comes the question of the transpiration of plants, which means the throwing off of water, through the leaves principally. This flow of water serves as a means of transportation for the various compounds used in the growth of plants. Transpiration bears a close relation to sunshine, and air wash—the movement of air around the leaves.

Plants do not transpire as freely in a cloudy spell of weather; certainly then, we should not water as freely in cloudy weather. All greenkeepers have seen the beads of moisture on the tips and edges of leaves in the morning after a night of no wind. In greenhouses the florists do not have currents of air around their plants and this condition of free water on the leaves of his plants will throw terror into his heart about as quickly as anything.

The greenkeeper has a dual trouble here, in this subject of watering. If the green is not soft enough to hold a back spin or niblick shot, the players will yell loud and long. The florist soon learns that he must let his soil dry out occasionally, not bone dry of course, and we are led to believe from this reckoning that if we would keep our putting

greens healthy, we must let up on the watering, from time to time.

I have had experiences with only one golf course, and that one is in central Missouri. And what I am going to say may not apply to all courses. I have seen brown patch on our fairways but I have never seen the grass killed with it. And while I may be in error, I have attributed it to the fact that fairway grasses have more vitality because of this drying out of the soil at times, as we do not water our fairways.

The Law of Life

AS I SEE it, there is a very definite law applicable to all forms of life, which may be stated as follows. When you have the favorable "set up" of sunlight, humidity, air and food, with temperature, a strong, healthy form of growth will result. Whenever this balance of the four or five principles above is broken, then disease starts. And then the other factor of this principle of life follows. The other forms of small plant life start their work of destruction, that the various elements in that form of life will be liberated to be used over and over again.

It is a continual process of growing, reproducing its form of life, dying, decomposition, that nothing is lost, and on and on. This law is just as applicable to our own body as it is to the other forms of organic matter. The undertaker with his formaldehyde can only hold in obedience, this law, for a very short time. What a mess it would be if this law could be interfered with. We should not worry however, as it cannot be. The whole thought then is, for the grower of vegetable crops to keep them healthy, and actively growing. We must bear in mind however that this cannot be prolonged always.

The grower has but one problem, and that is, in so far as he can, keep an evenly balanced equation of sunlight, heat, moisture, and food in the form of air and minerals. The more we understand these simple principles the better the results.

The question of feeding is a big one, and it is really hard to solve. We need to but recall the great reduction in the mortality

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rate of infants, to know that much can be learned about proper feeding.

Manure is Dangerous Food

UNDOUBTEDLY it is much safer for the grower to err on the sides of under-feeding rather than over-feeding. Now the question of food for plants comes up. I am convinced that we have depended too much on animal manure, largely because it was the line of least resistance. Animal manure is a very varying compound. It is an extremely complicated chemical mixture, and to my mind a very dangerous compound.

I believe the florist and greenkeeper will eventually find out that we can make a much better plant food, if we will depend upon the decomposition of the green crops instead of animal manure. I am convinced that the losses to the floral industry, because of the improper use of animal manures, is astounding.

I am not contending that it has no use, but I am contending that we should learn to produce better plant foods. If the grower would choose a location where green crops can be grown, especially the legumes, and

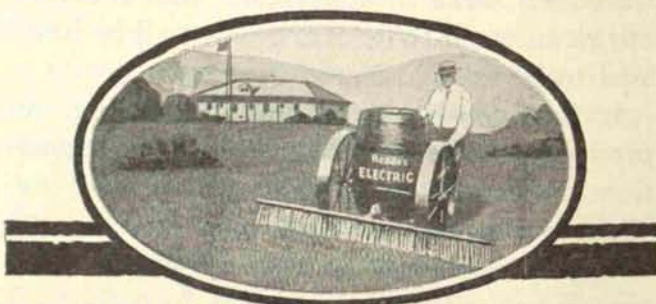
then proceed to produce his feed for plants, by growing these crops and turning them under at the height of the blooming period, I am convinced that he would be pleased with the results.

You will observe, I mention turning them under at the height of the blooming period. The reason is, that undoubtedly we have the maximum of plant elements in the green crops at the blooming period. When they start to fruit or form seed, undoubtedly the elements so consumed, are removed from the plant tissue, leaving an unbalanced form of organic matter, which does not decompose as perfectly.

I have had the experience of not being able to turn a green crop under at the height of the blooming period, and it has convinced me that it is far better to mow the crop and remove it, taking our chances with the next crop. I am not pretending that I know that I am right, but my experience has so convinced me.

Plant Physiology

Summing it all up, the grower must ac-



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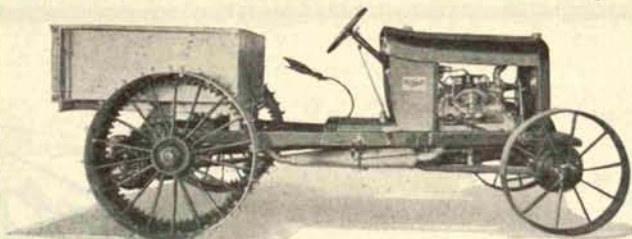
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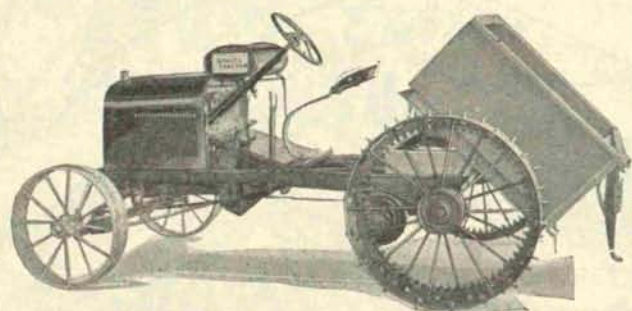
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quaint himself with the action in growth of plants, which is termed plant physiology. This is much easier to say than to do. I have said nothing of the cure for "brown spot", proceeding on the assumption that prevention is better than a cure. The term "brown spot," and "damping off," are terms used by growers, for a perfectly naturally decomposition of organic matter, and is the result of a cause, by an unbalanced condition, of the four or five factors above mentioned.

When this unbalanced condition arises, whether from an immature growth, or an unhealthy growth, it seems that it is a law that that growth should be destroyed, and another start made. It seems to me that we set up favorable conditions of the four or five factors, for the growth of the other small plants, whose duty it is to liberate the component parts for the use of other leaves.

To illustrate this principle, the members of a country club have learned when the set up is favorable, and all of us have seen them on the course, early in the morning

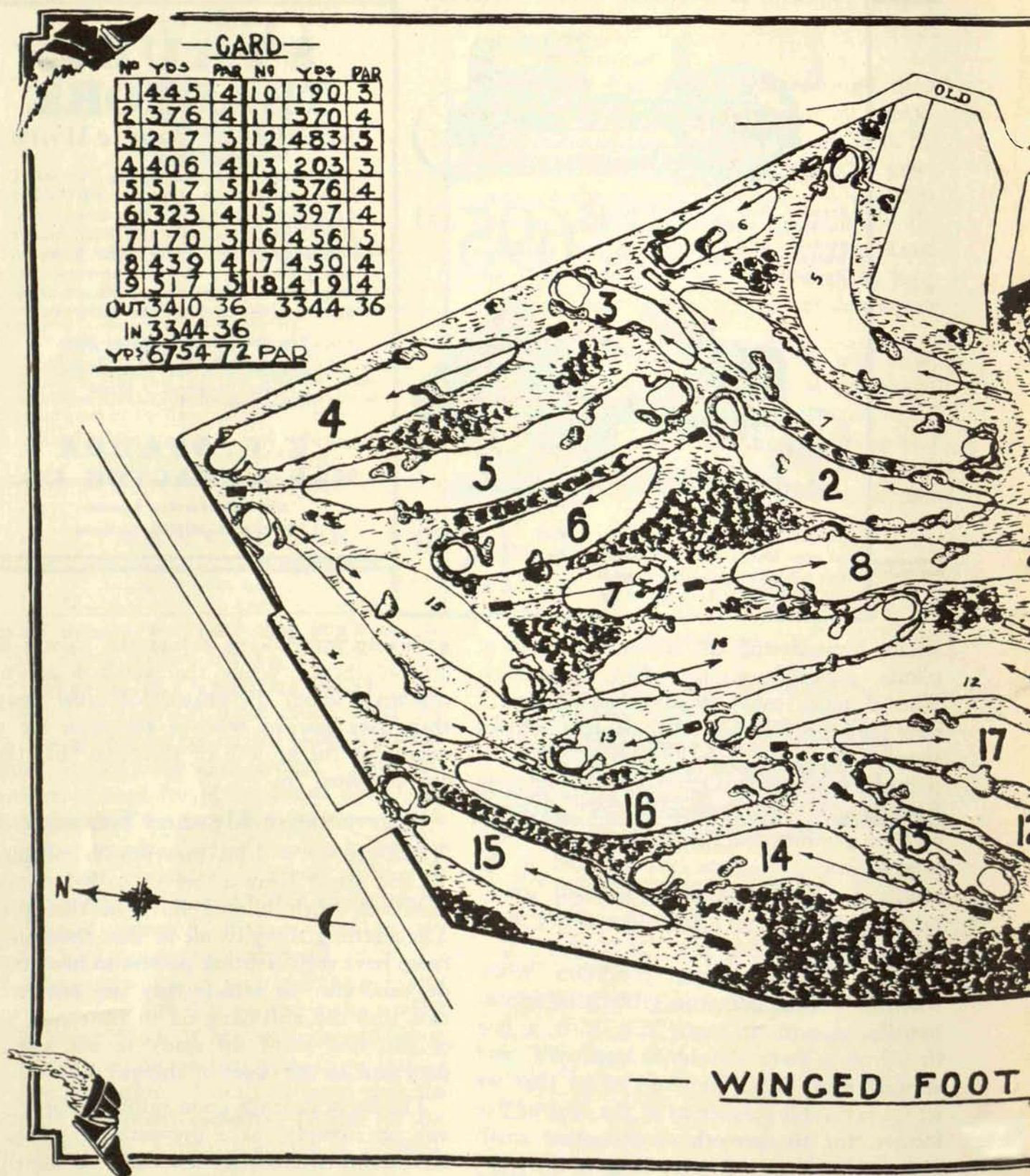
gathering mushrooms before the mower destroyed them. While the members are not concerned about the growth of other fungi, they have learned when a favorable set up comes for the growth of the form that they are interested in.

Preventative Measures Necessary

THE grower will use preventative measures, and apply them a day or so before they commence their allotted duty in this plan. The startling thing to me is, that these small fungi have such resisting powers to heat, cold, dry air, etc., to which they are subjected, that they can still hang on to their tiny bits of life, and show up ready to actively do their part in the order of things.

The florist depends upon sulphur more than any one remedy, as a preventative measure. He further realizes the necessity of ventilation, a lower degree of humidity, the changing of temperature, as effective weapons to prevent the growth of fungi. In reality he is making a more favorable set up to throw

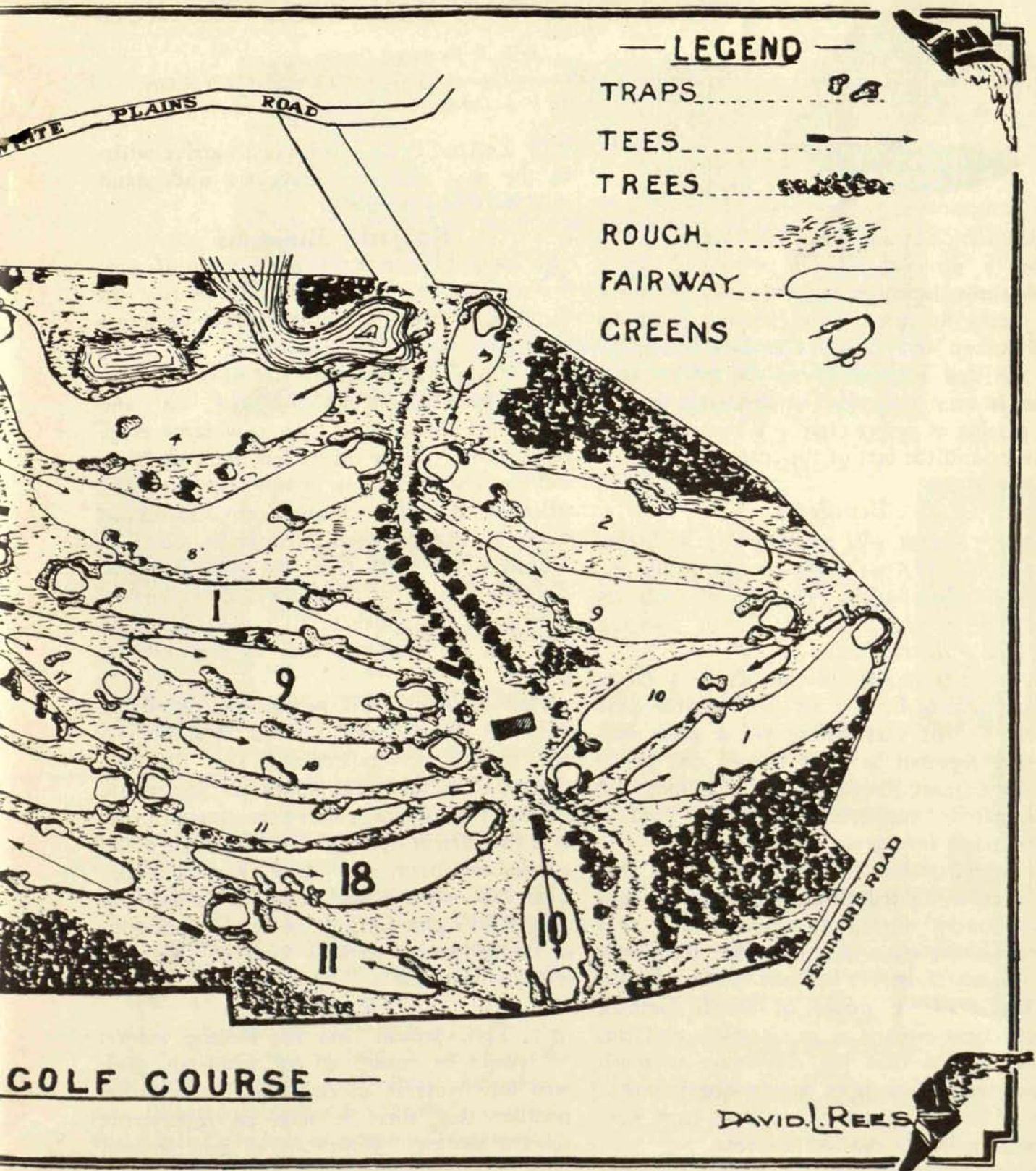
(Continued on Page 34)



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Forecasting the Fall Seed Markets

By E. E. PATTISON, Director

*International Seed Testing Laboratories, No. 11 Park Place, New York City
Formerly Seed Analyst U. S. Department of Agriculture, Washington, D. C.*

PROSPECTS are unusually bright for a heavy program of fall seeding by golf clubs throughout the country. Brisk demand for bents for greens and fescues, bluegrass and redtop for fairways is inevitable. So we feel that a discussion of the market situation is very opportune at this time because the placing of orders early will insure prompt delivery and the best of the crop.

—Editor's Note

Bentgrass

THIS market will undoubtedly be higher not only because of the proposed duty increase but because the reservoirs of seeds are low even in spite of a light Spring planting (especially in the East).

While the import records show a larger importation of Bent grass seed for the past year over the year before yet a great deal of seed reported as Bent turned out to be wholly or part Redtop and a great many of these parcels were returned or were used in commercial lawngrass mixtures.

It is said on very reliable information that the quantity of true Bentgrass imported into this country during the past season was much smaller than that imported the previous season. A survey has just been completed of the available stocks of South German Mixed Bent remaining in Germany and this survey shows that the carry-over is much below normal in other words, the importation of South German Mixed Bent from now on will be below that of last year.

It is understood that the available supply of Canadian Bent is also low.

The new crop German and Canadian Bents will not reach America in time for Fall seeding.

The importations of the 1929 crop of

New Zealand Bent will begin to arrive within the next month. These we understand will be about normal.

Kentucky Bluegrass

A MONTH ago it was the opinion of some of the better advised authorities that the Kentucky Bluegrass market would be lower after June 1st.

It is well known that the price of Kentucky Bluegrass is a "stabilized" one and that with the coming of a new large crop, the tendency of the controllers and merchants holding the 1928 crop would be to reduce prices to stimulate consumption. Conditions however have changed greatly in the last month and reports from the principal producing sections of Kentucky and Missouri now leads us to believe that the 1929 crop will not be anywhere near as large as expected.

Had the new Tariff schedule increased the duty on Rough Stalk, Wood Meadowgrass and fescues, it was expected that the controllers of the Kentucky Bluegrass crop would attempt to raise prices above the present levels. It is the present opinion of some of the better advised merchants that the price of Kentucky Bluegrass will this Fall be about the same as existed this past Spring; however, conditions in the producing sections from now on will tell the real tale.

Redtop

AT THE present time the Redtop market would be considered by wholesale grass seed merchants as an easy one. It is rather peculiar that there is such an indifference toward Redtop. Reservoirs of seed are not large, the prospects of the new crop are not overly good and the present price should be attractive to investors and speculators. Unless there is a pool formed or some attempt made to control this market, fall prices will probably be the same as existed this Spring.