TURF TROUBLE-SHOOTING

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NAGA Convention Address

IN describing some of the experiences encountered in the greenkeeping profession, we have drawn largely upon the status of the work in Pennsylvania where it is conducted by the department of agronomy of the Pennsylvania State College. One of the outstanding problems on turfed areas today, not entirely confined to the East, is that of poor drainage and the attendant ills of puddling and poor aeration which induce a shallow root system. Where this difficulty exists there is the tendency, due largely to the demands of the players for soft or resilient surfaces, to use water in excess to provide the conditions requested. This is not new. It has been the subject of many talks and articles over a period of years.

Let us take a look at a course where we were cordially invited to visit, ask questions and make suggestions for improvement.

A putting green had been located in a low spot below a long steep hillside. Close by, and almost on a level with the green surface, ran a small brook. Large trees were clustered about the green so as to partially shade the putting surface. Only in very dry seasons did this green need water due to the fact that the soil water table was close to the surface. For years it was virtually impossible to hold a turf throughout the year.

Sturdy Strains Answer Some Greens Problems

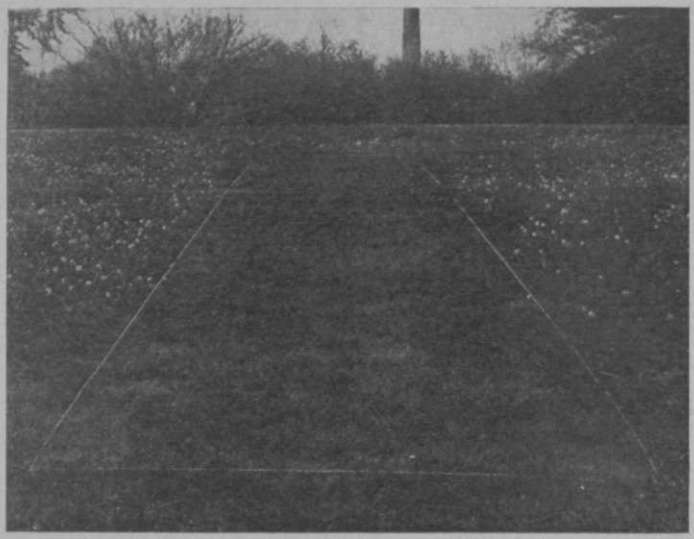
Unable to rebuild, this superintendent noticed, however, that one particular strain of creeping bent (it had originally been seeded to German mixed) seemed to like the location and insisted upon thriving in spite of the conditions. Patiently he lifted stolons of this strain of bent, replanted them in different parts of the green, and even more patiently watched them slowly spread and form a solid turf. His diligence was rewarded. Today that putting green is covered with a dense turf of an unnamed strain of bent that stands as a living testimonial to this man who saw and grasped the opportunity offered him. Not once since this unnamed strain completely covered the green surface has there occurred the former annual loss of turf.

We could name other similar experiences which give us confidence to suggest that, where an unknown strain is found doing well where no other pure strain will persist, this unknown be developed for that particular condition. This is more especially true where the budget is limited, or where physical or other circumstances do not permit rebuilding or changing conditions to fit the requirements of well-known strains.

Expanding Budgets Through Close Buying

Let us examine the facts surrounding another course which is representative of some of the smaller clubs and even some of the larger ones whose budgets have been cut to the bone in order to pay the interest on the clubhouse mortgage. The fairways are usually the first to exhibit the lack of attention and fertilizer. The putting greens are usually maintained in fairly good shape even after buckhorn and moss have taken possession of the areas that one hopes to hit on the tee shot. Obviously, the necessary item is plant food but where is the money coming from? This is a frequent occurrence and quite often we are able to point out that by a wise choice in the purchase of fertilizers, the greenkeeper can save enough on his fertilizer bill alone so that he can afford to fertilize the starved fairways without increasing the budget. We could name many true experiences that exemplify the point which in no way ridicule the profession but point out the great need for continued instruction in greenkeepers' schools and for an increase in the staff of extension men trained in this highly specialized field.

In another instance in northwestern Pennsylvania we were called upon to inspect some fescue greens that were spot-



An Arlington test plot on USGA Green Section control of weeds. Note weed eradication in old bluegrass turf formerly heavily infested with dandelions and other weeds. Cost of chemicals for some of the new weed treatments developed by the Green Section is as low as 80 cents an acre.

ted and patchy. We found German mixed greens—good ones at that—with only a touch of brown-patch. The real problem there was thin, spotted, weedy turf in the fairways while behind the compost shed lay several truckloads of "burnt fish" bones and ashes from a local fish processing plant. As much more of this material as they wanted was available for the hauling. The superintendent was frankly and openly surprised when he was told that this material was rich in phosphorus and had a high fertilizing value. Before we had left the course he had sent a truck to haul "burnt fish".

At a small course in central Pennsylvania we found the greenkeeper buying fertilizer from a distance which cost him upwards of $50 a ton for about 20 units of plant food—something like an 8-6-6. Within two miles of the course a local abbatoir was dispensing tankage analyzing 5-15-0 or higher at only $15 a ton.

Study Conditions to Outwit Low Budget

Another small central Pennsylvania course had trouble maintaining seaside bent on one green. They seeded and sodded but did not disturb the hard-packed clay which underlaid the few scanty inches of surface soil. The new sod or seed would hold until play started and out it would go—slowly, to be sure, but never was it healthy. Instead of ripping up the green (which should have been done but wasn't due to the low budget) a change was made to Washington creeping bent together with spiking and more favorable topdressing, liming and an increase in the amount of phosphorus in the fertilizer. At the latest reports the green was doing well and play was continuous. This same experience can be related on two other courses. This should not be construed to mean that seaside bent is not desirable—it simply failed under the conditions described. We can point to instances where seaside bent is used regularly and little trouble of any kind has been found. Drainage and soil conditions, however, are all that could be desired, as well as the fertilizer and topdressing program.

A very interesting case encountered in northwestern Pennsylvania was a fairway problem. The complaint was that, in spite of favorable rainfall, the fairways were continually dry. Within a few days after even a very heavy rain the soil would be so dry that the grass would begin to take on that characteristic parched look. The turf was red fescue but it was uneven and spotty, although springy. Neither lime nor fertilizer had been applied for years. The first plug of turf taken with a pocket knife indicated the reason for dryness. Later a soil test helped to confirm it. The pH value was down to 4.0, at which level any self-respecting bacteria that would decompose the organic matter of plant residues would refuse to work. As a result, the continual deposit of clippings from above and the accumulation of undecomposed roots and stems below, together with the passing effect of wheels on the surface, had formed a matted organic layer nearly half an inch thick through which water

simply refused to penetrate. The effect was that of a "thatched roof". The green-chairman looked at us in amazement and said: "No wonder all the rain that falls on the course runs into the lake." He had previously told us that during a rain the ditches on the course ran bank full and when the rain had stopped the soil beneath the fiber roof was as dry as ever.

Incidentally, when the course was built the fairways were seeded to a bluegrass-fescue mixture. Dry summers, grub injury, lack of plant food and the depletion of the available calcium all united to discourage the bluegrass and convert the turf to solid fescue. This is a common experience on Pennsylvania courses. Whereas the fescue turf on this particular course was uneven, there are many courses in the East that have perfect fescue fairways. These have had a small amount of plant food and some lime and had fortunately (not intentionally) been mowed slightly higher than most fairways are today. No good fescue fairway that we have seen has been the victim of a overuse of a sprinkling system. We do, however, know of some fescue fairways that were successfully established several years ago—a solid stand of fescue. Nitrogen was fed liberally and the turf was strongly watered. Today the fescue has been replaced largely by the bluegrass and white clover.

These experiences, together with a number of soil tests on these fescue fairways, indicate some of the preferences of good fescue turf. The best fescue turf found was thriving on soil that had a pH value of 5.6-6.0, high enough to permit the active growth of organisms that decompose plant residues, but not so high as to unduly encourage the bluegrasses and clover.

Soil Tests Need Supporting Data

The subject of soil tests on golf course soils is an interesting one and merits our earnest consideration. From the results of our experiences at Penn State we are forced to draw the following conclusions:

1. In most cases the results of soil tests without supporting data are worthless for diagnosing the cause of turf ailments. By supporting data we refer to management practices, location of the affected area, and other pertinent information.

2. Soil tests as we have them today are most valuable for detecting excesses of plant nutrients in the soil solution although we have not yet satisfactorily established the point at which they become toxic or detrimental to plant growth. Nor will this soon be accomplished due mainly to the very great differences in soils and their natural capacity for absorbing ions and for yielding them to the growing plant. We cannot yet satisfactorily determine the point at which the supply of plant nutrients is so low that the plants are insufficiently nourished.

Obviously, value will change due to the varying abilities of different species or strains of plants to tolerate high concentrations or to thrive on very low concentrations. As you well know, Kentucky bluegrass is a heavy feeder and requires a rich soil relatively high in calcium and phosphorus. Red fescue, on the other hand, thrives where the ion concentrations of these elements are so low that bluegrass will not grow. Bermuda grass, although, climatically different, succeeds on soils low in fertility. Some species will tolerate great excess of ion concentrations.

Affected Courses High in Nitrate-Nitrogen

Perhaps one of the outstanding examples of the limitation of the soil tests is that in connection with the disturbance of 1935 which hit several districts in the East and the Middle West. Many soil samples were collected from affected and non-affected areas and analyzed. The only significant difference between them was the relative concentration of nitrate-nitrogen which was usually higher in the affected areas. To have stated that the presence of the nitrate-nitrogen was the cause of the loss of turf would have been ruinous and a grave injustice to those in charge, but that it was a contributing factor cannot well be disputed. Also that the species of grass present was a factor is generally recognized. But to separate and correlate the combined effects of soil moisture, high temperatures, humidity, high nitrogen, unbalanced concentrations of plant nutrients, and other attendant factors must be left to those in charge of research.

At a very up-to-date course we were called in on a problem of weedy fairways. No doubt about it, the fairways were weedy and the bluegrass was thin. Yes, there had been some fertilizer applied but it didn't seem to help. It wasn't long before we learned that this superintendent was firmly convinced that by cutting his fairways as closely as possible the roots of the grass were strengthened and the bluegrass could then form a more solid turf.

You know the fallacy of that theory and so did we. Our work was to point out that recent research and countless experiences, —his own included—completely exploded his theory.

Topdressing Is Source of Puzzle

Referring again to hard greens we recall the course in northwestern Pennsylvania that asked for help because they could not seem to have soft greens without the excessive use of water. This proved to be a delicate problem because everything seemed to be done according to Hoyle. The construction and drainage were seemingly good, the fertilizer program adequate, and the topdressing mixture apparently satisfactory. We collected plugs from the greens and took samples of the topdressing mixture as well as some of the fine-looking, black material which was used as a source of organic matter. We found the solution to the problem in the so-called organic matter which analyzed only 13 per cent organic matter and contained nearly 80 per cent of silt. When wet, this material became slimy; when dry it could be cracked like hickory nuts. It was taken out of a swamp where the accumulation of the organic matter imparted a rich black color to the silty mud that collected these. Upon changing to a good fibrous, peaty material there was noted an almost immediate improvement in the condition of the greens.

We were called in to advise on the reestablishment of turf on the greens after all their Poa annua left them. Without enumerating all the facts in the case, we were able to point out that in spite of the conditions, they had large patches of a well-known strain of creeping bent that had not even been affected by the adverse conditions and they were rapidly spreading. This was a clear indication that by propagating these resistant strains, at least part of their difficulty would be solved. They were, at this time, rebuilding a putting green. When we were there it was raining and rain had fallen for a couple of days prior to that. They were then rough-grading the green with a tractor and a ship scoop. Mud clogged the wheels of the tractor, the wheels would spin, and the scoop had to be cleaned with a shovel to clear it. I haven't seen the green since, but I think we would agree that the physical condition of the soil on that green will not be all that might be desired.

We had occasion in June to visit a course that was troubled with earthworms (night-crawlers) on the greens. At the time of our visit the greenkeeper was deworming with bichloride of mercury in suspension, using a barrel sprinkler. He used a total of three pounds of bichloride on a green of 4500 square feet. We suggested that perhaps that was a bit strong but he thought not. We later heard that he had burned his greens very badly and was considering some other means of worm control.

Success in Weed Control

Now about turf weeds in general, and crab grass in particular. Since this work was begun in earnest by the Green Section there has been a great deal of interest in it, particularly since reduced budgets called for economy in the use of fertilizers and extra labor. All of the answers have not been found. Neither have all the questions been written. The work is progressing, however, and there are new developments each year. During the past year we are able to report many successful treatments with sodium chlorate. Several have used it to advantage on crab grass infested nurseries. Some are using it successfully in the bunkers. We have record of one course where crab grass threatened to take a green composed of 80 per cent velvet bent. Two applications of chlorate at the rate of one pound to 1000 square feet were made in June or July. When we saw the green in early August we noted a 90 per cent control of the crab grass and complete recovery of the bent.

In several instances in southeastern Pennsylvania we can report almost 100 per cent control of crab grass by the following procedure which, you will perceive, is not entirely one of chemical control, but where the chemical is an "assist" in the put-out.

In late July or early August there was made a single application of chlorate on athletic field, lawn, and fairway turf at the rate of 2½ pounds to 1000 square feet. In three weeks the area was raked, fertilized, and seeded. October found the turf in A-1 condition, healthy, green and solid.

URGES PRO-PLAYER CONTRACTS

By JAMES C. ROBERTSON
Derryfield CC, Manchester, N. H.
. . . as told to James L. Mahoney

ONE of the hardest assignments that can be given to any person who derives a living from golf is that of working out an annual budget. And of all those who could estimate a budget, the club professional is the chap who would have the hardest job. His income and his expenses are too indefinite from the day a club opens until the day it closes for him to determine even an approximate profit for his efforts.

It has always been easy for others to tell pros that a budget system should be adopted—that so much money should be allotted for this, so much for that. For the most part, suggestions how this may be done have been merely theoretical. Seldom are they coldly practical when applied to the pro's problem. The trouble is that the pro seldom knows what his income will be, so that when he attempts to budget figures on paper he is resorting to mere guesswork, and the result is too indefinite to be reliable.

If a professional is given some indication of a flat sum he is sure of earning during a season, then he may go ahead and form some estimate of how much he could spend for equipment, assistants, home life, etc.

There is a simple method by which he can do this. And, best of all, it is a method that will be welcomed by every golfer.

The plan is: pro-player contracts.

An immediate explanation of the plan will help further discussion. The player agrees to pay the professional a stipulated sum for lessons during the year, and for the care of his clubs. Any time during the season, if the player feels he is off his game, he may call on the pro for a 15-minute lesson to correct the fault. He may call at any time during the year, and the pro is under obligation to give him lessons under terms of the contract—or agreement. Some will ask for more lessons than others. There will be no rebate at the end of the summer.

In addition to giving lessons, the pro is obliged to care for the golf equipment of his special "pupil."

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At first glance this plan might appear to make the pro too much of a servant, and at the beck and call of many members. Second thought, though, should show that the more the pro is at the beck and call of members, the greater is his income. If he is overworked, then all the better—his income should console him.

A live-wire pro who is ambitious to increase his revenue will see the advantage of the plan if he signs enough contracts at the start of the season. Let us assume the contract price to be $20, though the sum should vary according to the ability of members to pay. If a pro were to sign 100 members early in the year, he knows then—and the season is not yet underway—that his minimum income will be $2,000!

By having this preliminary summer-long estimate of his minimum income, the pro's first benefit is that much-needed budget. With this lump sum to count on, he has a decided advantage over another pro who goes along haphazardly, counting his success by the day's receipts.

This plan should be especially beneficial to pros who live in the northern states and have but six or seven months in which to earn an income sufficient to carry them through the 12 months. The pro-player contract plan could be that very important step toward planning that nest egg of a bank account on which to live during the lean months, unless the pro is fortunate enough to have a spare time position while the snow flies.

There may be foundation for the argument that a pro would lose prestige and money by offering cheap lessons. But the day of pride has long since gone, and as mass production and mass selling is common in other business lines, the golf pro need not be embarrassed by offering the same inducement.

There is no defense for the contention

that the lessons would be cheap. But in how many clubs do more than a few members pay more than $10, or $25, or $35 for lessons (depending on the contract price which could be adopted). Very few.

What the pro does is forsake a small number of lessons for a small revenue for a greater number of lessons for a greater revenue. In the end the answer is—more money. He merely opens up a new source of income.

In the present, as in the past, a pro knows before his season starts that most of his lessons will be given to newcomers, and not to veterans of the links. At best, a member will call for three or four lessons, and then only because he is exasperated over a slice, or hook or another fault.

Under the pro-player contract, members of the club become the pro's biggests asset for lesson money, and the newcomers to the game take second place. I estimate the pro at the average club should double his lessons income.

It's More Work But It Will Pay Well

True, it will mean a great deal more work for the pro, but no one should complain of work if he is getting adequate compensation. It should take up practically all his leisure time, if he is successful in "selling" the idea when the season starts. Not only should it give him more to do when play is heavy, but on rainy days he could occupy his time.

Much depends on how the pro "sells" this idea. He could present the plan as a special favor to members of his club, or he could be frank and explain the mutual advantages to both parties. He must judge for himself, too, the financial condition of the prospects in setting the contract price.

Many golfers are short of money upon joining the club at the start of the year, a condition which proves that the sport is becoming more and more a source of recreation for the working man as well as for the rich man. In such cases, if the player is reliable, the pro should adopt the partial payment plan—for convenience in paying is an added attraction in the selling of any article. If the contract price is set at $20, it might be well to divide it into two payments of $10 each, the first to be paid a month from the date of signing. This sales inducement should win over many who could not possibly sign if immediate payment were demanded.

There are certain "tactics" for the pro, with profitable remuneration the following year. The live-wire fellow will himself discover faults in his pupil's game, and inform the player he is in need of a lesson. It is a good business proposition for him to do this. It takes up only 15 minutes of his spare time, and it pleases the player to such an extent that he praises the pro and the plan and resolves to sign again the following season, and in addition urges his friends to follow suit.

Pupils Make Fine Customers

The financial benefits do not stop at the initial contract price. There are other advantages which naturally follow. If the pro is a shrewd salesman, and approaches his pupils in a deft and friendly way, his income can be increased. The pro might invite the pupil to use a new club from the shop shelf. Invariably, a player gets good shots with a new club, and then he wants it in his bag. It's a matter of using simple psychology for the pro to make the sale.

When a new club is actually needed by a player, however, the pro must be careful not to inform the member too bluntly that his game is handicapped by the lack of a certain club. He should do it as a matter of suggestion, or by letting him use a new one. It should turn the sale, and in a gentle and polite manner.

Players, too, will otherwise benefit because of this step forward in pro-player fellowship. Besides becoming better acquainted with his teacher, his game should improve, and his golf equipment is always kept in tip-top shape. If the pro is on the job—and there is no use attempting this plan unless he intends to uphold his own end of the contract—the member need never bring a club to him for winding or other repairs. That work is done by the pro on quiet days.

There is often a wide bridge in fellowship between professionals and players. And it need not be so. Without slighting my brothers in the golf world, much of this indifference lies with pros who feel a superiority complex in their own shop. But if they are to adopt the pro-player contract plan a democratic, chummy attitude is necessary. Imagine shopping in any store where a sour-faced proprietor greets you at the door with a grunt for a welcome.

ROOTS MATTER MOST

NAGA Convention Paper

By HOWARD D. SPRAGUE
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A LARGE PORTION of the attention given to greens, tees, and fairways affects the grasses favorably or unfavorably through soil conditions and root behavior. Drainage, rolling, spiking, watering, fertilizing, and liming are beneficial or harmful as the case may be, by reason of the effect exerted on the grass plants through their root systems. Top-dressings, treatments for control of insects and diseases, and mowing, indirectly influence the vigor of the turf because of their influence on root development. Whether grasses are destined to succeed or fail on a given location depends largely on whether soil conditions are suitable for root growth and activity of the particular grass species planted.

In spite of the great importance of grass roots, there is a surprisingly small amount of reliable information available. Much is heresay and opinion and must continue to be so until more careful research is directed along these lines. Enough is known to indicate that information on roots of trees, shrubs, flowers and similar plants cannot be assumed to apply to grasses. Grasses have root systems which are finely fibrous in nature instead of possessing a central tap-root with branches, as in most plants. Moreover, the root systems of grasses are largely annual in nature and must be regenerated wholly or in part each season. This is not generally realized since the sod is perennial, though recognition of this fact is necessary to thoroughly understand turf culture. In addition, grass roots penetrate to depths of at least 4 to 6 inches on putting greens and to a foot or more on fairways when the soils and treatment are suitable.

The type of development differs within the type of grass. Thus, the working depth of red fescue was 11 in., that of bluegrass 9 in., and redtop 7 in. where these species were grown under identical soil conditions, with the turf mowed regularly at a 19-in. length. The total weight of roots below the first inch showed a similar relationship. Poa annua, which is popularly believed to be very shallow rooted, showed a root development fully as great as any of the permanent grasses, when grown under similar conditions. On loose soil the root growth of Poa annua exceeded that of all other grasses except red fescue. Further experiments not quoted here have shown us that Poa annua comes in on turf, not because of its shallower root system, but through its habit of propagating itself so readily from seed each year.

Development Depends on Soil Temperature and Moisture

The seasonal development of roots is closely related to soil temperature and moisture. We have found that Kentucky bluegrass will begin root and top growth much earlier in spring than redtop or the bent grasses. Also that regeneration of the root system is completed earlier with bluegrass than with the bents. Thus, new bluegrass roots penetrated to a depth of 9 in., by April 20, in contrast with May 18 for similar penetration of bent grass roots. No new roots were developed from either type of grass after May 25, and the turf was dependent on such spring growth during the remainder of the season. It is obvious that conditions and treatments given in spring are of prime importance, if the root system developed at that period determines the extent to which the soil is utilized for moisture and nutrients during the playing season.

There is a similar seasonal relation to the development of new creeping stems and shoots. Evans and Ely in northern Ohio have recently shown that new creeping stems of bluegrass usually develop from June to August, and that new shoots grow from these rhizomes in late fall and early spring. A similar relation exists for redtop and Canada bluegrass. No data is available on the other grasses at present. It is clear, however, that efforts to thicken poor turf must consider a gradual improve-

ment extending over a year or more, rather than any rapid recovery. The immediate response to fertilizers consists mostly in more luxuriant development of leaves on stems and shoots already in existence, particularly on fairway grasses. Even on creeping bent the restoration of thin or mangy turf to full vigor is a task of many months because of this seasonal relation of the development of roots, new stems and shoots.

Soil Factors and Water Govern Roots

The natural condition of the soil and the treatment given the turf, have a pronounced effect on root occupation of the soil and activity during the growing season. Adequate sub-surface drainage is particularly important in spring if new roots are to penetrate deeply into the soil.

If excess moisture limits the supply of oxygen in soil air in early spring, roots will be confined largely to the upper layers of soil and be unable to draw on lower depths for moisture and plant food in critical periods during the adverse weather of summer. Even though drainage be adequate for deep root growth in spring, unwise watering or excessive rains in summer may waterlog the soil to the extent that the roots in the lower levels are unable to function or may actually die.

We have rather conclusive evidence that strong soil acidity is injurious to grass roots. Under controlled conditions the roots of both Kentucky bluegrass and colonial bent grass were greatly reduced in depth and abundance by pH values of 5.0, particularly where sulfate of ammonia was used as a source of nitrogen. Although nitrates were less harmful to root growth, the use of this form of nitrogen did not overcome the effects of an acid growth medium.

Under field conditions, acid soils are responsible for the sod-bound condition frequently seen under Eastern conditions. This develops as a result of an accumulation of dead roots and stems. In spite of the fact that the plant continues to produce such parts yearly as long as it survives, the older roots and stems fail to decompose in strongly acid soils. Consequently, an accumulation occurs which prevents water and nutrients from penetrating the soil readily, and otherwise interferes with maintenance of turf. Plants which spread by surface creeping stems may become so badly matted that the turf dies from failure to root properly.

The remedy is to correct acidity by liming. However, lime is most difficult to work into the soil after the felty mass of stems and roots has accumulated.

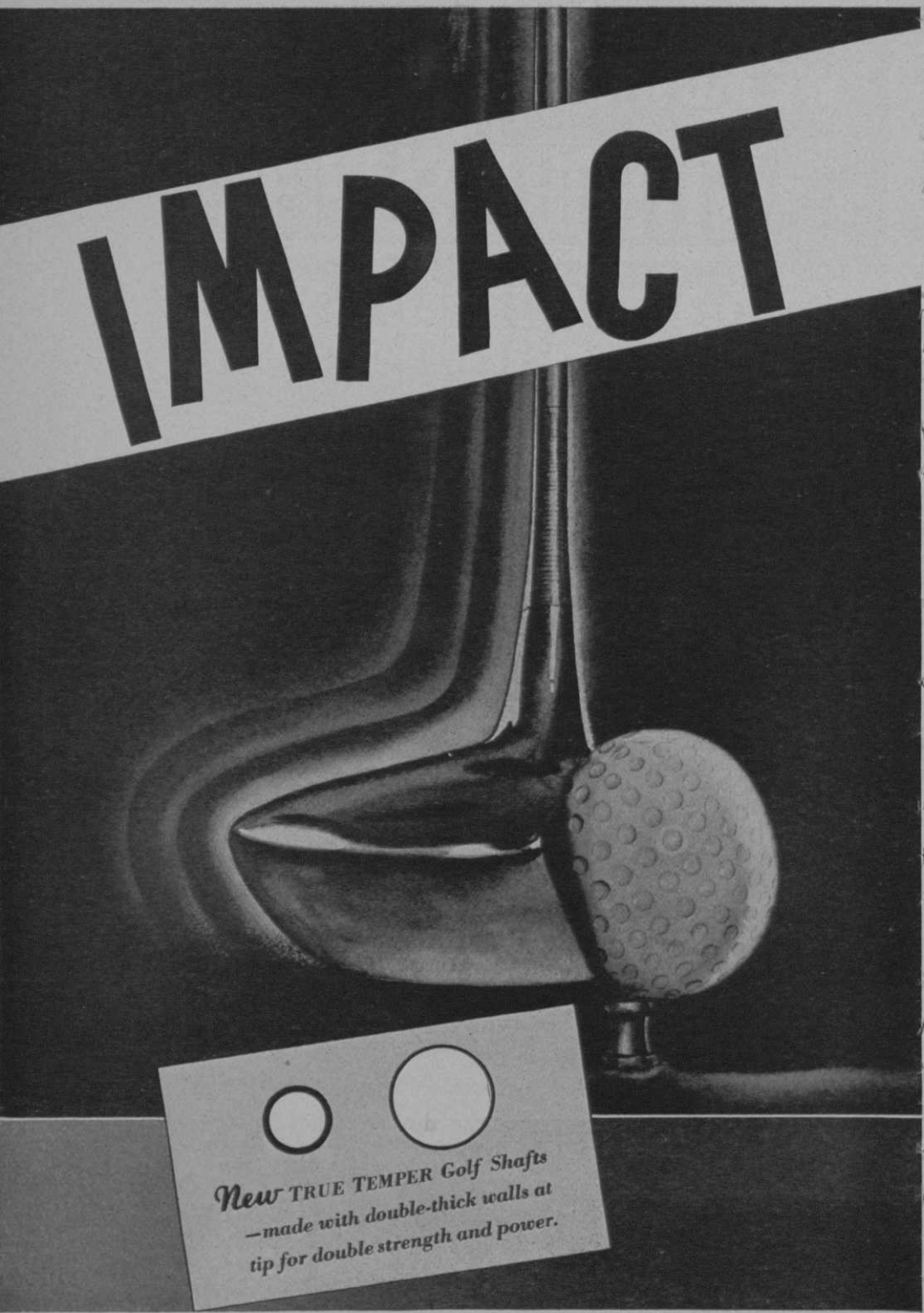
Grass should be credited with being one of the most valuable types of vegetation in permanent soil fertility. It has been shown that soils gradually improve in structure and value under grass cover. In a two-year experiment at New Jersey the actual increase in humus content was 1,350 lbs. per acre, in addition to a large accumulation of living roots and stems. Cultivated crops, trees, flowers, and shrubs—none of these produce an increase of humus within the soil itself. Thus, it is possible to gradually build up a poor soil by proper management of grass.

Treatment Balances Root and Top Growth

The effect of acid soils has been noted above. It should be remembered that certain fertilizers, particularly those containing ammonia, develop acidity in soil rather rapidly. Unless this is corrected by supplies of lime naturally present in the soil, or by additions of lime, the soil will soon become dangerously acid. We may then expect accumulations of roots and stems and the development of a sod-bound condition, failure of the sod to permit rapid penetration of rains and water, and an actual toxic effect from further fertilization with ammonia carrying plant foods.

Heavy feeding with nitrogen fertilizers in any form limits root growth and stimulates development of tops, thus producing a less favorable balance between roots and tops for grass which must endure unfavorable weather and heavy use.

Finally, height of cut has a tremendous effect on roots of all grasses. Even the bent grasses which tolerate close mowing, develop only 50 to 60 per cent as many roots under putting green conditions, than when cut at a length of 1 in. or more. This reduction is reflected in a greatly reduced working depth, which necessitates frequent watering and careful feeding to satisfy the requirements for growth. Although cutting at a length as short as 1 in. is harmful to root development of redtop, Kentucky bluegrass, and the better turf grasses are fully adjusted to these heights. Regular mowing at 1 in. or 1¼ in., permits maximum root development of the better fairway and lawn grasses, with consequent increase in vigor and tolerance of adverse conditions.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