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MY MAINTENANCE METHODS

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TO SYSTEMATIZE, I have divided the subject of golf course maintenance into categories as outlined in chart 1. You will notice I have shown the main line of responsibility as one of descending importance. While each is a link in a chain, I have endeavored to arrange each division as bearing more importance on the one below rather than the one above. For instance, in following down the line of expense, I have placed the water system above the cost of fertilizer, etc. We see the chain of responsibility from the executive board coming down through the green-chairman to the greenkeeper, thence to active operations of maintenance. I have placed the green-chairman to the left of the main line merely to indicate that if he is average, he will be mostly interested or concerned over the expense angle of the yearly maintenance. Therefore I have listed the expense on his side of the line. To the greenkeeper devolves the actual execution so the operations are classified on his side of the line.

Let us all be green-chairmen for a few moments and consider the budget, which is in short, anticipated expense of annual maintenance. Here I have Chart 2 showing past history for the last five years. This general grouping of items is simple enough so that any one in my audience can almost memorize them should he want to set them down beside his own experience. These figures show percentages; that is, in 1931 out of every $100 spent on this particular course, $74 went to supervision and labor. On the whole these items run uniformly and any deviation from the average is readily explained. For instance, under equipment there is a decided rise in 1935 accounted for by the purchase of new items such as a new mower set or a new tractor. Very few courses run their books on an accrual system, so it is quite

Chart 1.

Executive Board

Chairman— —Greenkeeper

Expense	Operations
1. Labor	1. Mowing
2. Equipment, gasoline and oil	2. Watering
3. Watering system, power, repairs and alterations.	3. Disease control
4. Fertilizer, fungicide, insecticide, seed.	4. Fertilizing and top-dressing
5. Sand, playing supplies and other expense	5. Clean up
	6. Course alteration and repair

Chart 2—Expense Distribution by Percentage

Year	1931	1932	1933	1934	1935
1. Labor and supervision	74%	61%	68%	67%	67%
2. Equipment, gasoline and oil	10	11	12	8	16
3. Water	8	10	13	13	8
4. Fertilizer and fungicide, etc.	7	15	5	8	7
5. Other expense	1	3	2	4	2

to be expected that cash accounting will make this line a bit jumpy.

Under water expense, which in this case includes fairway watering, we see very clearly indicated a climatic cycle which everyone here well remembers. The dry years of '32, '33, and '34 will linger in our memories for some time to come. In connection with this particular point I remember talking last fall with a forester and mentioning that the two previous years of drought had been responsible for the heavy mortality among the oaks. He corrected me and said it was the three dry years the trees suffered from and though I did not realize it at the time these irrigation costs bear out his statement. The cost of fertilizer shows a big increase in 1932 due to a bargain price on a particular brand when a big supply was purchased, enough to carry over well into the following year. Under 'other expense' is classed all the items that could not rightly be placed in the other four. The biggest here is sand, the others mostly incidentals.

Labor Cost Analysis Shows How and Where of Work

I should like to discuss in greater detail the labor bracket. Chart 3 shows the distribution of this expense. Cost is shown in man hours, so that anyone may easily figure what it would cost him by merely multiplying by his hourly rate of pay. As the chart clearly shows, the handwork is considerable. Greens are cut by hand-mowers. Tees are plugged daily and the rough which is of equal acreage to the fairways, calls for much handwork. These three items account for more than 50% of the total labor bill on operating expense. The topdressing is screened by a rotary sieve and applied by machine. Mercury, sulphate of ammonia and arsenate of lead are broadcast by hand and watered in. The fairways are mown with a seven unit gang mower cutting a sixteen-foot swath, and as much of the rough as possible by the same tractor with a sickle sidebar. Fairway fertilizing is with a lime spreader relying on the agitators in the machine to do the mixing, and fairway watering is with hose. That in brief, is the labor setup.

Turning next to equipment expense we find it has a direct proportion to labor bill. On such courses where it is convenient and satisfactory to eliminate a large share of hand labor and perform these same operations with power-driven machinery, there will of course be a moderate increase in the cost and operation of mechanical tools. It is decidedly in the best wisdom for every course to make the fullest use possible of labor-saving devices in the regular routine of maintenance. It is well however, to consider carefully before investing in equipment that is seldom used or might be expensive to keep in repair for the few times it will be called into service.

New Machinery Cuts Fairway Mowing Costs Sharply

The past few years have seen tremendous strides in the development of course machinery, particularly among mowers. In this I refer especially to the increased efficiency of fairway and rough mowing outfits. The increased rate of travel and

Chart 3—Distribution of Labor Time—1935

Season consisted roughly of 26 weeks or 183 days.

	Operation men	Operation hrs.	How often	Total hours	
Green and tees					
Mowing, watering, etc.	6	4	183	4,400	
Repairing tees, walks, etc.	1	9	130	1,200	
Screening compost	11	9	3		
Topdressing	15	9	3		
Hauling material	2	135	1	975	
Applying chemicals	3	5	6		
Mixing chemicals	1	100	1	190	6,765
Fairways					
Mowing thrice weekly	1	9	78	702	
Fertilizing	4	45	2	360	
Watering (night)	2	7½	23	345	
(day)				250	1,657
Rough					
Machine mowing	1	45	10	450	
Hand mowing	1	99	10	990	
Trimming bunkers, raking traps, etc.	6	14	26	2,180	3,620
Nursery					
Mowing and watering	1	9	26	234	
Weeding	10	36		360	
Cultivating, planting, seeding, etc.	10	36		360	954
Watering system					
Spring repair and inspection	5	18		90	
Fall draining and blowing	5	18		90	180
Miscellaneous					
labor				750	750
					13,926
Extraordinary					
Course alteration, new work, ditching, tiling, landscaping, etc., etc.					4,805
Total labor hours					18,731

the wider swath by adding more units to the gang has cut down the time for cutting 18 fairways so much that models five and six years old are completely outmoded.

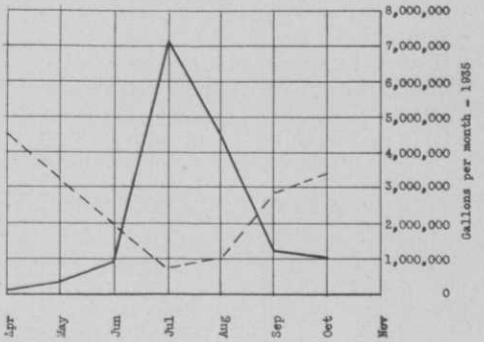
Many clubs do not realize they lag behind in this respect and are unaware that they could reduce the cut of mowing fairways and keep them in better shape by bringing their tractor mowing set up to date. I have in mind when I say this, those courses that have introduced fairway sprinkling lately and are carrying on with early type machines. Watered fairways require frequent and speedy cutting which a slow-moving gang cannot handle.

There is still a good demand for these outfits on the unwatered courses so my advice is to sell, if you find that the grass is growing so fast that it cannot be handled with the old type equipment. Machines that have been well cared for and in good repair will sell readily. The last year or two has seen the introduction of the side bar sickle for attachment to the light weight fairway tractor. This has proved a real time saver for cutting rough where there is a good deal of maneuvering among trees, on banks, etc.

Power Mowers Cut Greens' Costs

The use of power mowers for cutting greens is advocated by many and opposed by others. I do not feel competent nor consider it wise to make a sweeping statement for or against because we find many conditions warranting either one or the other. Cost can be reduced remarkably by power mowers, especially those of the gang type, a factor of importance where labor costs are high and expense must be closely watched. On the other hand quite a few greenkeepers prefer to cut their green by hand, claiming that the turf shows less effect from mowing by the old method, and while admitting that hand cutting is more expensive, they feel it is a luxury that the club can well afford.

Looking at the water systems as an expense (we are still eyeing things from the budget viewpoint) we have in review the biggest single factor in golf course investment in recent years. The general trend nowadays is to put more emphasis on developing the fairways. This is perhaps the natural evolution in higher greenkeeping; from 1920 to 1930 marked tremendous progress in putting green development as a scientific as well as artistic accomplishment while from 1931 we have seen more work done to perfect the fairways.



Solid line indicates monthly water consumption. Dotted line shows cost per thousand gallons decreases as volume goes up.

Still Much Study Required on Watering

The first step in this direction is the general introduction of irrigation, a change that meant in most cases the complete revamping of water systems from pumphouse to the farthest opening on the pipe layout. As an item of operating expense, the yearly cost of running these systems still show that we have not emerged completely from the experimental phase and it is quite likely that for some seasons yet, we shall witness further development both in installation and in mode of operating. I feel sure there is much to learn about the application of water and its results upon different types of soils.

Effective and economical use of water require much study. While it is fine to have all the water we can use, at any time we think we need it, it is found that systems of unlimited capacity or more correctly, of capacity to handle our largest demands, do not operate efficiently during those periods of less usage. It would seem to me that in designing and managing our water systems we should give this some thought and consider the most effective capacity in relation to the investment rather than the maximum capacity.

Chart 4 indicates the water usage by months during the season of 1935. You will see that from a low water consumption in April we rise to more than 7,000,000 gallons in July. This includes uses other than for the golf course but the relationship is the same. Now it is only reasonable to suppose that the cost of pumping 7,000,000 gallons, in cents per thousand gallons, is much less than, say, 400,000 gallons. And this is actually the case. The

investment charge is the same whether the pump is used or not.

I would recommend to those who are contemplating the installation of fairway systems that they give close study, together with the watering equipment companys' experts, to help work this problem out. If the water is purchased through a meter, this factor may not be so important, but it is a vital one when the water must be drawn from a well, especially a deep one without ample surface storage. Many greenkeepers have felt at times that they may have been too lavish with water though it was not realized until afterwards when ill effects became apparent in the condition and character of the turf. There are other angles to this question to which I will refer later.

The fertilizer expense is largely for sewage sludge which is bought in Milwaukee from which there is only a short haul of 65 miles. To this is added sulphate of ammonia, of which a carload will last three or four years, and other chemical fertilizer as may be required. I recommend buying in quantity and storing against future use. It is assurance that the material will be on hand when wanted and allows for the purchase of supplies on favorable markets. This applies equally well to the chemicals required for the control of insects and diseases; every course should be provided with plenty of ammunition to withstand attack from any quarter.

Let us now turn to a short review of the operations whereby we turn the money into a medium of pleasurable and exciting golf for the members—pleasant hours, we hope, for the golfers though sometimes agonizing ones for the greenkeepers when weather and play bear down with a heavy hand. In this discussion I will again draw freely on my own experiences which I confess are by no means infallible and will gladly encourage criticism if it should provoke a healthy argument on methods of procedure.

Grass Cutting Now Competitive Factor At Courses

The most continuous operation within the greenkeeper's routine from spring to fall is cutting grass. I sometimes doubt if there is a moment during the working hours on most courses that there is not some one mowing, whether it be shaving off the greens in early morning or hacking at the long grass on the ditch banks in the afternoon. When I look over the imposing array of fairway mowers, green hand-mowers, green power-mowers, tee mowers, bunker mowers, rough mowers, all kinds of mowers, mowers to pull and mowers to push, mowers to ride on and mowers to walk with, and see too, the sickles, the scythes, and grass hooks, the fire guns and all the other devices man's ingenuity has conceived for this purpose, I am quite at a loss in wonderment that we have made such a complicated affair of the simple task that, until a few years ago, was pretty well handled by a flock of sheep.

But joking aside, a good selection of mowers of all kinds is of great assistance and is quite a factor in cutting down the amount of hand labor. Power mowers and power sickles enable a man to cover the ground so many more times or if necessary trim more territory.

Courses Must Be Cut More Frequently

With the increasing demand for finer turf and the friendly rivalry in course excellence between clubs, the tendency is towards more frequent trimming of the grass, and to accomplish this we must be well provided with implements. Not so many years ago it was quite satisfactory to trim off the bunkers and rough a couple of times a season. And players accepted these conditions as normal and made no comment if the course had the appearance of a man who shaves once a week. Now, however, we must shave almost every day if we would be respectable.

Fairway watering has been largely responsible because the grass along the edges and around bunkers now grows so fast that it becomes unmanageable if left for very long. We cut our fairways every second day at least and plan on getting around the rough every week during the fast growing part of the season, particularly those places most likely to be played into.

We try to maintain a regular height from spring to fall along the rough just as we do in the fairways so that playing conditions are about the same throughout the season. This adds to the cost but the appearance achieved is well worth the effort. I need not remind you that fairways cut frequently can be allowed to stand higher without unfavorable remarks from the membership and that nothing stirs up sour comment quicker than fairways ragged from long pauses of the mowing outfit. On the whole our mow-

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Green Section's prime mover presents Dr. Piper's idea on the threshold of its period of greatest development and service. And this can be accomplished if there are golf club officials who can compare the turf technical situation of 15 years ago with that of today and prevail upon their clubs to act in accepting their pro-rata financing of a service that has demonstrated its value to every golfer.

Massachusetts Golf Assn. Issues Helpful Greens Booklet

ANNUAL diary of the Massachusetts Golf Assn., of which Edward J. Poor is chairman and Frank Wilson, James McCormack, John Counsell and Harry P. Hood constitute the sub-committee on course maintenance, again presents a helpful notebook to the state's greenkeepers.

The book contains articles on Fairway Watering by Harold Pierce; Liming Grassed Areas by H. B. Sprague; Lead Arsenate to Control Turf Insects by W. D. Whitcomb; Soil Acidity and Turf by H. F. A. North; Essentials of A Fairway Fertilizer Program by O. J. Noer; Common Turf Diseases; Caddie Tips; and miscellaneous data, together with the daily diary and memo space.

MY MAINTENANCE METHODS

(*Continued from page 18*)

ing practices have become so standardized that there is little I can say regarding the methods on one particular course that are different from those on a thousand or more other courses.

Wide Variation In Watering Methods

By comparison, our watering practices show great diversity, due not only to differences in greenkeeping practice but to variations in soil type, character of turf, exposure, climatic influence and a number of other factors that make very small piece of grass an individual greenkeeping problem. These variations are so manifold that it would be impossible to lay down any one set of rules by which a novice could confidently expect to gain satisfactory results. Watering plants, whether they be flowers or grass, whether growing in a greenhouse or outside, require a technique that must be acquired by actual experience, to which must be added a certain intuition.

Greensmen learn with practice just about how much water it takes to satisfy

a green though they might be hard put to explain why some dry out quicker than others even though they might have helped to build them. Two courses lie across the road from each other both on the same type of soil, but each greenkeeper follows a system of watering different from the other and both are successful. I follow my way and get along but if I try your way which I know is successful with you, I will likely come to grief, so I prefer to avoid laying down any rules about it.

Prefers Early Morning Hand Watering

Speaking of greens, our practice is to water by hand in the early morning, using the full flow from the end of an inch hose and spreading the stream by holding the thumb over the opening. The average green which is from 5,500 to 6,500 square feet takes from 25 minutes to half an hour. The soil is a heavy clay. I have tried night watering with machines but could not do so well though there are courses all around that sprinkle that way all the season and keep their greens in splendid shape. It is the human element cropping out. The tees and all other turf we do with sprinklers. Hand watering is done daily, in the daytime so that the man can see what he is doing. It also places the responsibility with the man who has charge of the green. By watering daily the soil is kept at approximately the same moisture content and we do not lose contact with the subsoil moisture. As I mentioned before, the soil is a tight clay and is hard to wet down once it has dried out. Our evaporation losses are light due to the compact mat of metropolitan bent, transpiration is not rapid; the morning wash seems to replenish well enough. I might add that this operation replaces the whipping that is practiced quite generally to disperse the dew.

The increase in the practice of fairway watering and development of newer and more efficient types of pumps and sprinklers is sufficient to make this a subject of discussion in itself. Each year brings in a large crop of new systems, incorporating new ideas and improving the method of water application.

Each year as more clubs make installations we are adding to the sum of knowledge concerning this phase of irrigation. The recommendations of today are not the same as those five or more years ago. In this respect I am referring to the eastern

half of this continent, particularly the north central states.

Introduction of these systems has so improved playing conditions that we find many clubs are practically forced to make the investment in order to hold the membership and I rather doubt if any other expense has been more gratifying to the members.

Hopes for Soil Improvement From This Winter's Conditions

As in green watering, we find many factors influencing the effect of water applied to fairways. There is a world of difference in the water requirements of a sandy soil and a heavy clay soil. There is a different response from varying species of herbage; some types of grass love the dryer soils, others are more tolerant of damper ground. It is only logical that unwise use of water might easily change the character of the turf. Everyone has noticed how clover will run riot in many places under the influence of heavy rains and heavy sprinkling. From my observation, I am inclined to think that there is a tendency to over-water, that is, where the supply is ample. The clover experience taught us to use caution but now it seems that after many seasons of watering, our heavy clay soils are beginning to show effects not altogether satisfactory, a sort of puddling as it were.

This winter, which is a severe one, may be beneficial since the frost will help considerably to break up the colloidal nature of this soil. Prior to this winter it has been many years since we had the right sort of freezing and thawing and to aggravate the situation we have had three seasons of drought through which we have watered heavily.

If we could cultivate our soil after the manner of the farmer or orchardist we could overcome some of this condition but we have to keep in mind that the soil cannot be disturbed. Consequently I am of the opinion that on the heavier soils anyway, we must study to make the least amount of water do the most work and that any over the required minimum is an unwarranted expense and a hazard to the soil.

Of the three recognized fairway system layouts, the long hose, the short hose and the hoseless, I think we as greenkeepers would be unanimous in choosing the latter if we had the money. The simplicity attached to the operation—one man starting out with no more equipment than he can carry on his back! What a comparison with the long hose course where a couple of men are busy two or three hours a day picking up and depositing a good sized truck load of hose and sprinklers. We might condemn the hoseless installation for the extra cost in pipe and fittings and the higher working cost due to higher pressures carried but on the other hand the replacement on hose is quite a big thing on the older type systems.

I see nothing to favor the old style where the pipes are run along the rough, requiring from 100 to 200 feet of hose to reach the farthest point of sprinkling, but there are many who hold to the short hose with the pipes located in the middle of the fairway where 25 to 50 feet is sufficient to supply the movable sprinklers and I would make a guess that systems of this sort will long be popular.

For the convenience of golfers night watering is most satisfactory and I follow that practice during the dry weather. At other times I water or set out the sprinklers for a while on days of quiet play.

Readiness for Disease and Insect Control Is Important

Of next importance I place disease and insect control though some here might figure that fertilizing should be given priority. And they may be right for fertilizing wisely should build up disease resistance. However I place it here rather to stress the necessity of being prepared against sudden attack and also to hint gently that unduly heavy fertilizing has been as much responsible for green trouble as neglect of feeding.

The practice in applying fungicides is divided into two schools; those who put it on wet through sprayer or barrel cart and those who prefer to mix it dry with sand or soil and apply it broadcast or with a topdresser. I think those who prefer to spray or sprinkle are largely users of organic mercury compounds and those who apply dry chemical lean towards the inorganic forms. Referring to our own practice, we broadcast all our chemicals dry and follow up with a light sprinkling when we want it washed off the leaves. We have three or four men who are skillful broadcasters and I seldom notice any injury from too great concentration or from uneven distribution. By using the dry method we have a means of quickly attacking any outbreak of disease. We always have a supply of material (bulked with sand) on hand and a list hanging in

the shed shows how many pails of this mixture are required for a full dose for each green. Half or quarter of the fungicide is followed immediately by light washing with water. Forty-eight hours later we broadcast a light dose of sulphate of ammonia. We have found that this program works in very smoothly with our labor routine. These applications are made in the evening, the men coming back after their supper. Four men usually are sufficient and they work for two or three hours.

Arsenate of lead is spread the same way for cutworm control and a few years ago when sod webworms were a menace we found it sufficient to hold the injury in reasonable check. With us, cutworms have been so persistent we have not had to add arsenate of lead to the greens to keep earthworms away.

Mention of earthworms brings up the observation that through the Middle West, the custom is growing of treating the fairways with arsenate of lead. This is an old story to those in the Japanese beetle area but until recently very few courses in the Chicago district went after the earthworms on such large scale.

Fertilizing and topdressing are major operations and demand an important place in the yearly schedule, as we all know very well. One of the most noticeable phases in connection with topdressing is the diminished importance of manure. Not so many years ago the compost pile, of which at least a third or more was good manure, was considered the hallmark of good greenkeeping, but with the increasing difficulty of getting adequate supplies of good quality, we have dropped it from the purchase list and are using instead peaty humus or enriched topsoil fortified with commercial manures and fertilizers.

We have not used any composted manure on our greens in the last eight years. Our topdressing material is made of approximately equal parts of top soil, muck soil and sand. For the first dressing in the spring we add one bag of Milorganite for each green. We topdress lightly, 3 times a season, 1½ yds. or less per green. Material is applied with a topdresser, dragged or raked and mown if the surface looks ragged. Inequalities in the surface as a

result of settling are filled by hand and worked well down through the mat.

Fairway fertilization must be given serious attention nowadays. I mention this because it seems to be commonly supposed among golfers that irrigation will take the place of fertilization. This is decidedly not so. Watering will supplement the use of fertilizers but will not replace them. To make the point stronger I will state it this way: that with the particular soil with which I am familiar, I could promise after several seasons to have a much better turf at less cost, by fertilizing without water than by watering without fertilizers.

While many have the habit of applying fertilizers in the spring when making one annual dressing, the practice is changing to early fall. Observers point to the latter as being more satisfactory where crabgrass is a menace. It is also probable that this custom might help in clover management by encouraging a strong growth of grass in the cool season and at the same time bring about a softer condition in the clover plants to make them susceptible to winter-kill. Our general practice in the past has been to put on the fertilizer early in the spring; it got the job out of the way and it gave the grass the full advantage of the spring growth.

GOLF'S MARKET PLACE

The 1936 carton and box for Tommy Armour golf balls will make a colorful display in pro-shop display cases. **Worthington Ball Company,** Elyria, Ohio, report heavy advance orders indicate a great year for this ball.

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Carpenter Lawn Mower Sharpener, distributed by Stoneacres, Princeton, N. J., is meeting with fine reception by greenkeepers. All types of mowers, hand or power-operated up to 36-inch blades, can be handled on the machine, and blades are