

If contacts, sliding bars, connections and wires all seem to be correct, then the motor should be checked. The brush cover should be removed and the brushes then inspected for positive pressure against the commutator and free movement in the brush holder. To do this, pull on the brush pigtail then release the brush. The brush should snap back positively against the commutator.

For a car with fully charged batteries but will not run, the cause has to be due to an incomplete electrical connection in one of the areas described above. Depending on the nature of the failure will dictate whether the car will have to be returned for more extensive analysis and repair.

Another type of malfunction is the "sudden take off" of the car. This is almost always experienced in solenoid systems and indicates that either one solenoid is permanently closed or more than one solenoid is closing at a time when the foot pedal is pressed. Listening to the clicks of the solenoids will give a definite clue to the offending solenoid, or solenoids, in this instance. If diodes are used in the solenoid activating circuit, then they should

also be suspect.

A car that runs slowly could also be experiencing malfunctions in the speed control system. This could be caused by solenoids not pulling in when required. Again, check out the solenoids as described above. Also, check the motor brushes for wear and contact with the commutator. Worn down or broken brushes should be replaced. In addition, check the commutator for appearance. It should be fairly clean and only faintly scarred by brush wear. Badly marked and scarred commutator should be cleaned.

Last, but by all means not least, is the charge condition of the batteries. Battery failure is by far the most common cause of vehicles not performing properly.

This type of problem opens up a whole Pandora's box of complexities since it includes as well as the batteries, the charging systems, the maintenance aspect of the vehicle and the way the vehicles are used.

Good care of the batteries is essential if maximum performance and life is to be realized. This comprises of making sure that batteries are fully charged before sending the cars out for 36 holes of play. This

avoids deep discharge cycling of the batteries which is detrimental to the battery. Also maintain an adequate level of distilled water in the batteries. The cell plates should never be exposed to the atmosphere. This causes oxidation and renders the area exposed as useless. The vehicle should be in good mechanical order, check particularly tire inflation pressure, wheel bearings and brake adjustment. This is to eliminate unnecessary rolling friction from the vehicle and, thereby, reduce the electrical load on the battery.

Finally, poor battery performance could be attributed to inadequate or failed charging systems. This can easily be ascertained by checking the batteries with a hydrometer after recharging the batteries for the recommended time period. If a recharging problem is experienced, rotate the charger to other cars. If the problem still persists, then the chances are the charger is at fault. If the problem only persists with one particular car then the batteries are suspect, possible sulfated and will not recharge.

The above thus describes broadly the functions and generalities of golf car electrical problems most commonly encountered. □



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If rising labor costs are keeping you from doing the kind of mowing and pruning job you know should be done, maybe the answer you're looking for is Slo-Gro.

Slo-Gro is a unique chemical growth retardant that economically controls the growth of trees, grass, shrubs and ivy. In tough-to-control areas, Slo-Gro can usually do the job

better, and at less expense than mechanical methods.

It's fast, systemic, safe, and produces no persistent residue. For complete details write: Uniroyal Chemical, Division of Uniroyal, Inc., Naugatuck, CT 06770.

As with any growth regulant, always follow instructions on the label.



Roadside Grass Control. Slo-Gro is recommended for use on all "commercial" turf areas that require regular maintenance, but are difficult to mow. Maintenance situations like highway medians, airfields, steep embankments, ditches, and grassed areas around fences and guard rails.



Growth Control on Trees. Slo-Gro inhibits tree growth by stopping the terminal growth of woody plants. Primary applications include control of tree size under power lines, along streets, or wherever excessive foliage is a problem.



Golf Course Maintenance. While Slo-Gro is not recommended for general use on fine grass areas such as residential or commercial lawns, it has been used extensively on golf course roughs. It can also be used in conjunction with herbicides wherever weed control is required.

Positives And Negatives Of Battery Care

By ARVID HALLA

Sales Manager, GBC Brands Div.
General Battery Corporation



GOLF CARS, turf vehicles, maintenance equipment can be operated on noiseless, low-polluting battery power efficiently and economically if the power source is purchased and maintained properly.

There is never any excuse for a battery-powered vehicle breaking down because of battery failure. Few caddy masters would send a gas-powered golf car out without a full tank of fuel; yet, there are some who, for some reason or other, permit the fuel supplies in these individual vehicles to run low.

The same parallel may be drawn for the battery-powered vehicles. On one hand, there are many who swear by the battery-powered golf car while many others swear at them. Who's to blame? The battery maker? The pro? The caddymaster? The maintenance crew?

In truth, probably all of us are partially to blame because we have not effectively communicated the simple maintenance steps through to the people who have the responsibility to keep up battery charges and electrolyte level. Perhaps, the wrong capacity battery is installed and incapable of meeting the specific course terrain.

SELECTING THE RIGHT BATTERY

Let's start off with choosing the right battery that is compatible with the course.

Generally, there are two sizes of electric vehicle batteries available. However, General Battery Corp. will soon offer three sizes. Individual battery construction varies the same as in batteries used in the automotive industry. In effect, you get what you pay for and, you may not need the top of the line battery to meet your course demands. Although then, again, you may, depending upon terrain, length of season, age of cars, etc.

For instance, our high performance battery offers direct point-to-point energy to offer maximum power and extra life and a 107-minute rating. Although this is the biggest, it offers the lowest cost per round because it is engineered for more payload and greater distance.

Our medium range battery offers 90 minutes of performance reliability. Both batteries with polypropylene container and cover are available with either the wing-nut or nut and bolt connector. GBC is currently experiencing a demand for a "Super" electric vehicle (E.V.) battery with even more performance than the top of the line. It will be introduced soon. This is an indication of more sophistication and knowledge on the part of the E. V. buyer.

The batteries are all tested in accordance with standards established by the American Golf Car Manufacturers' Association. Carefully analyse your course requirements to make the proper selection.

NEW BATTERY CARE

Incoming shipments of batteries should always be inspected for damage incurred in shipping. Look for any damage to the battery cases — wet spots on the carton may indicate a cracked or broken battery. If any breaks are found, get acknowledgment from the shipper and file a claim against the transportation company — and be sure to contact your supplier for replacement batteries.

Batteries are normally shipped in a wet charge state. If you receive wet charge batteries that are not immediately put into service, they must be charged at regular intervals as follows:

Storage temperature	Charge
Below 40°F.	None needed
40°F. to 60°F.	Every two months
60°F. and above	Every month

Storage—Never stack one battery atop another. If they must be stored, place supporting boards between layers and **never** stack more than three high. Be sure to rotate stock to use the oldest batteries received first.

Installation — Follow the vehicle manufacturer's instructions. Connections should be tight to assure good contact and always charge sets of batteries immediately after installation.

MAINTENANCE: KEY TO LONG LIFE

The biggest mistake that can be made in operating a fleet of battery-powered vehicles is to neglect proper maintenance. Maintenance, too frequently is simply thought of as "adding water and a charge", and the job is handed to the low man on the totem pole.

No problems will be encountered, even using the "low man", if certain basic steps are outlined — and frequently checked by the individual responsible for fleet maintenance.

Water batteries at least once each week — preferably on a fixed schedule. Water with high mineral content can shorten battery life. Therefore, certain areas may require distilled water. Check with your battery supplier if in doubt.

Before charging, be sure that the electrolyte level is above the top of the plates (but do not overfill).

After charging, fill all cells to their proper level. Do not overfill and do not take a shortcut often seen on golf courses by using a high pressure watering hose. This method floods the cells, dilutes the electrolyte and affects performance. Check periodically, in between charges, to make sure that water level doesn't drop drastically.

If a battery seems to be using excessive water, check for one of the
(continued on page RR)



The laughter.

Here's the 9-gang giant that will take on the biggest mowing event you can come up with and turn it into a laughter.

Grady Hassell can tell you about it. He's with Lawn & Turf, Inc. in Conyers, Georgia.

As a Jacobsen Distributor he has all the answers about Jacobsen equipment. Like the huge F20 9-gang mower.

He'll tell you that it cuts a wide 19-foot swath. It has a gargantuan appetite that can cut through 76 acres in one work day. And that's mowing at a realistic pace.

But it's easily tamed for more delicate chores because the operator can raise and lower any of the reels with a finger-tip control. Things like median strips can be mowed from the road shoulder with the outboard reels, for example.

Just because it's big doesn't mean it's clumsy. Far from it.

There's a ground-gripping front drive that gives sure traction on grades and sidehills.

And the rear wheel steering means that the reels turn in the same arc as the steering wheels. No skidding, no skipping, no uneven cutting in the turns. And no wheel streaks in the straightaways, either.

If you have big mowing chores ahead of you, ask your Jacobsen Distributor about how the mighty F20 can help you. An actual demonstration should put a happy smile on your face.

What it does with your turf will make you chuckle.

Your Jacobsen Distributors.

Before we sell it, we buy it.

For the name of the distributor near you write: Jacobsen Turf Distributor Directory, 1721 Packard Avenue, Racine, Wisconsin 53403.

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GOLF CAR BATTERIES (from page CC)

weight of the passengers, the degree of the slopes or hills on the golf course, the efficiency of the transmission, the temperature conditions under which the golf car is operated and the horse power of the motor.

If the average battery has a cost of \$25 and each golf car contains six batteries (\$150 worth of batteries) it obviously can make a great deal of difference in a course's net profit from golf car rentals if one obtains 800 battery charges as against only 200 battery charges and, at the same time, cuts his electricity costs for charging batteries in half.

DON'T BE CHEATED ON BATTERIES

It has been reported in several areas that golf course executives are unknowingly evaluating electric golf cars containing six of the more expensive 106-minute (220-amp) batteries and then getting only 75-minute (180-amp) batteries in the golf cars when they are delivered. This is being done by some golf car salesmen to circumvent the lighter weight of other golf cars and make it appear on testing that their golf car can obtain the necessary distance (minimum of two rounds) between battery charges without deep-cycling the batteries.

Unfortunately, the amperage or rating in minutes is not identified on many batteries. Some of the 88-minute and higher priced 106-minute batteries are packaged in a casing of exactly the same dimensions. **The only sure way to tell the difference is to weigh the batteries.** Both batteries contain 19 plates per cell (57 plates), but the 88-minute battery weighs 598 pounds and the 106-minute battery weighs 65.1 pounds.

Make certain you ask all golf car salesmen to identify what amperage batteries are in the demonstrator golf cars you are evaluating and what amperage their golf car pulls on a level grass surface with an average 360 pounds of passenger weight. Then ask for a guarantee that the test golf car contains the same amperage batteries you expect to pay for and receive when your golf cars are delivered.

If you wanted to buy a boat having a 20 h.p. motor, it wouldn't be fair if one salesman demonstrated his boat equipped with the 20 h.p. motor, but another salesman demonstrated with a more expensive 50 h.p. motor.

Insist on demonstrator golf cars being equipped in exactly the same

way you expect to buy and pay for them. □

PRIVATE vs. CLUB CARS (from page DD)

proof, corrosion proof and never needs painting.

Many clubs with large golf car fleets hire a maintenance man for about \$6,000.00 to \$7,000.00 per year who maintains that fleet in good working order, paying off in the long run. A golf car that is not out on the course is not producing revenue.

Since the profitability of owning a golf car fleet is evident, how do you go about establishing a fleet, especially if your club now allows individual ownership of golf cars.

If your members now have their own cars, you can purchase the cars from them outright, rent them back to them or use the cars as trade-ins on a new fleet.

Or you can acquire a new fleet outright, and let the individual car owners dispose of their own cars.

And just how does a club acquire a new fleet without a tremendous outlay of capital, capital most clubs just don't have?

It is recommended that a course have one golf car for every eight golfing members. If your membership is 400, that means 50 golf cars at a purchase price of approximately \$75,000.00.

Don't let that figure throw you. There are many ways to acquire that fleet without huge assessments to members and without using capital earmarked for other more critical uses, such as course repairs, new facilities, etc.

For instance, Otis and other golf car companies have worked out multiple ways in which you can acquire cars without capital outlay.

One is a lease program with a purchase option whereby you have a set monthly payment of approximately \$45.00 per car. Compare this investment with the income of \$8.00 per

round, five rounds per week or \$40.00 times 4½ weeks and you have a gross profit for the month of \$130.00. This multiplied by 12, then multiplied by the total number of cars in your fleet comes to a real tidy profit for your club.

Now, this lease program also gives you the right to purchase these cars at any time during the lease. However, why purchase? Upgrade your fleet by phasing out old cars and bringing in new ones on the lease program without increasing your monthly expenses. Two important reasons for upgrading a fleet: 1, you keep your members happy, and 2, you keep your maintenance costs low.

The second plan, becoming more popular with many customers, is the rental participation agreement. A club's responsibility for maintenance is kept to a minimum and there is no investment required. The club's car requirements are based on past history or estimated utilization. The dealer places the fleet at the club and each time the car is rented, the club divides the income with the dealer at a predetermined percentage.

But, remember, the dealer has his capital invested, not the club's. The dealer also provides a back-up "tournament fleet" with pick up and delivery service.

Both leasing and rental present another benefit to the golf club or facility. When introducing an initial fleet, a club may not be sure of just how many cars would be needed. Both a lease or rental program allows for adjustment to the size of the fleet. Therefore, the club is not committing itself to a golf car fleet. Therefore, the club is not committing itself to a golf car fleet which will not be totally operational and therefore, revenue producing.

In the long run, the decision to acquire a golf car fleet must be based on the growth the club or facility hopes to attain. The profit potential from one golf car has already been outlined. The potential from 10 times that many or 100 times that many can spell financial profit for the club willing to take the initial step.

And what club or facility could not use that extra revenue? Aside from cutting members yearly assessments, you could use the added revenue to make that much needed expansion to your present facilities, install golf car pathways, or maybe even build a swimming pool to further enhance your facilities.

Anyway you look at it, the golf club without its own fleet is not on a par with those who have them. □



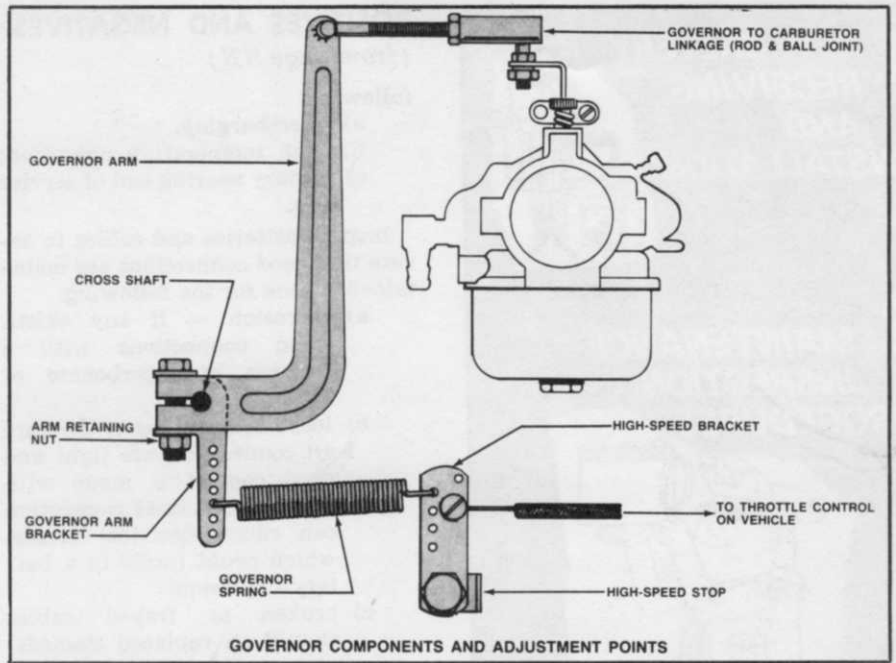
SMOOTH RUNNING ENGINES

(from page GG)

setting). Finally, turn the screw back in until it is positioned half way between lean and over-rich settings. A properly adjusted carburetor will allow the engine to accelerate smoothly and operate with steady governor action.

Idle adjustment — A rough idle usually is caused by the idle speed being set too low, or the idle mixture screw misadjusted. First, turn the "idle speed" screw in clockwise to increase speed. If the engine still idles poorly, stop it and turn the "idle fuel" screw all the way in clockwise until it bottoms lightly (**don't force it**), and then back out 1¼ turns. Next (re-start the engine and check the idle by turning the needle in or out ¼ turn at a time until a smooth idle is reached. The engine should operate satisfactorily when the carburetor is adjusted within the range of the manufacturer's specifications. If it does not operate satisfactorily, the carburetor needs cleaning or an abnormal condition exists in the engine.

Governor Adjustment: Governors, which maintain engine speed under



changing load conditions, are set at the factory and further adjustment shouldn't be required unless the linkage becomes worn or broken. The governor should not be readjusted so that engine r.p.m.'s exceed the manufacturer's recommendation. If this is done, it will generally re-

sult in a blown engine.

However, the butterfly or throttle plate in the carburetor should be checked to make sure that it is in a wide-open position when the foot feed is clear to the floor. This check should be made with the engine stopped. □

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Because we designed this self-propelled sprinkler with smaller irrigation operations in mind, settings may be easily adjusted by one man. And, Mini Boss requires no man hours on the trip!

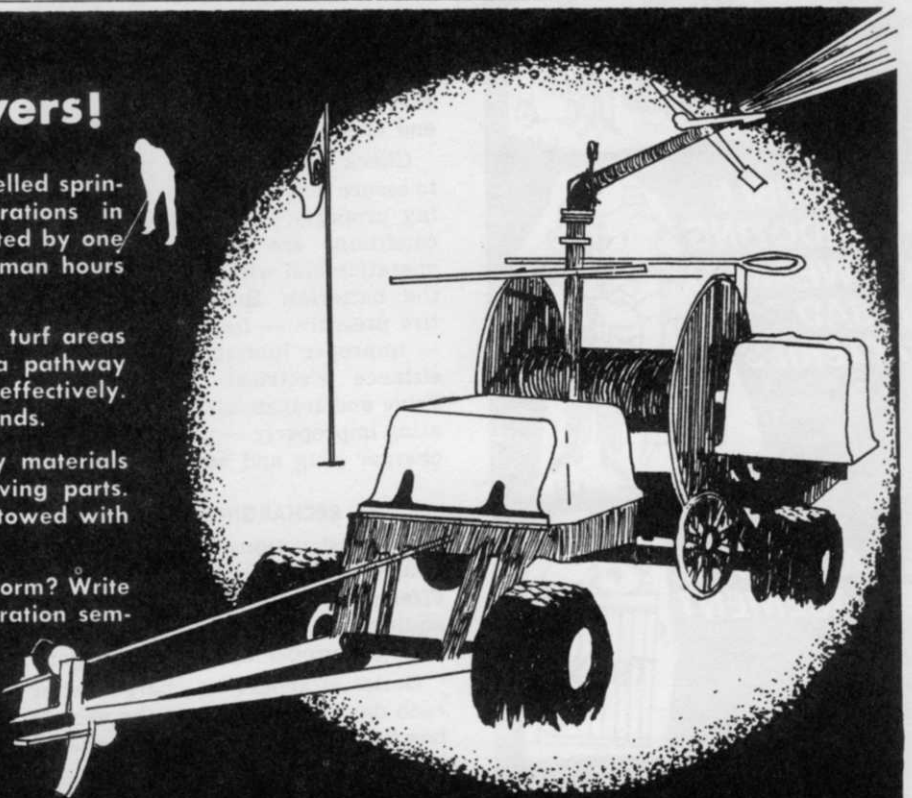
It's perfect for odd-shaped grass or turf areas and rough terrain, because only a pathway is needed for this unit to water effectively. Also, may be set for prevailing winds.

Mini Boss is built with top-quality materials and the minimum number of moving parts. Sturdy, yet lightweight, it may be towed with a light service vehicle.

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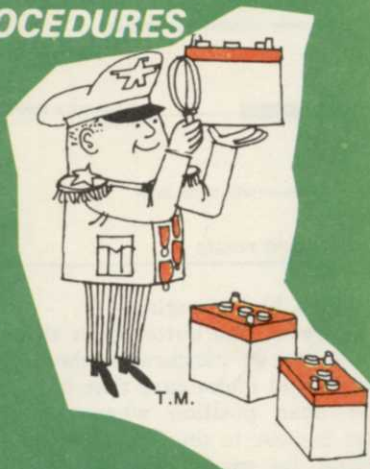
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1. NEW BATTERY RECEIVING AND INSTALLATION



2. MAINTENANCE-INSPECTION PROCEDURES



3. CHARGING PROCEDURE



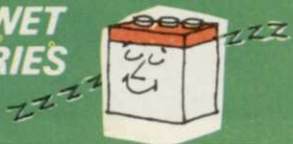
4. TROUBLE SHOOTING FOR WEAK OR BAD BATTERIES



5. BATTERY REPLACEMENT



6. WINTER STORAGE OF WET BATTERIES



POSITIVES AND NEGATIVES (from page NN)

following:

- overcharging;
- high temperature operation;
- battery nearing end of service life.

Inspect batteries and cables to assure that good connections are maintained. Check for the following:

- corrosion — if any exists, clean connections with a solution of bicarbonate of soda and water;
- loose connections — be sure all connections are tight and good contact is made with terminals. A loose connection can cause electrical arcing, which could result in a battery explosion.
- broken or frayed cables should be replaced immediately;
- grease and dirt on top of batteries should be cleaned off, as this may act as a current path and could cause discharge.

Check specific gravity of electrolyte periodically — following charge, be certain that two or more pilot cells in different batteries read between 1.250 and 1.280. If readings are low, check the charger to insure that proper charge is being returned to the batteries; check connections; check to see if batteries are nearing end of service life.

Check car operation periodically to assure that the vehicle is functioning properly. Any of the following conditions are detrimental to car operation and will shorten the life of the batteries: Brake drag — low tire pressure — improper alignment — improper lubrication — high resistance electrical connections — drive and transmission system operating improperly — poor condition of charger plug and receptacle in car.

RECHARGING HINTS

The instructions that come with your chargers have been prepared to offer you maximum benefit from the equipment. Familiarize your staff with the proper use of the chargers.

Batteries should be charged after each day's use as soon as the vehicle has finished its job. You may charge between rounds if time permits. Be certain cars are not released unless the batteries are fully charged.

Even though most vehicles are operated out in the open, it is important to remember that batteries produce explosive gases and sparks and flames must be kept away from

them. Every battery should have this warning on it. "Batteries produce explosive gases. Keep sparks, flame, cigarettes away. Ventilate when charging or using in enclosed space. If sulfuric acid from battery contacts eyes, skin or clothing, flush well with water. For contact with eyes get medical attention. **KEEP AWAY FROM CHILDREN.**" A further step to prevent accidents would be to only charge the vehicles in well ventilated areas.

TROUBLESHOOTING YOUR PROBLEMS

If you've maintained your batteries properly and still find that a vehicle performs less than a complete round of golf, don't give up. Recheck terminal connections for corrosion or loose connectors, broken or frayed cables. If these are okay, then test each cell of each battery for specific gravity. A variance of .030 between cells may spell trouble. Recharge the battery and retest for specific gravity of between 1.250 and 1.280. If a variance still exists, you should use a load tester to determine remaining life in the battery.

If the load tester indicates that batteries are no longer serviceable, replace them with new batteries. Should only one in the series of batteries be the weak link, it may be replaced with another battery of comparable age. This assures a relatively balanced electrical system.

REPLACING BATTERIES

Worn out batteries should be removed and battery trays, cables and holddown bars should be cleaned and reconditioned. Replacement batteries should be fully charged and checked for defects — broken cases or covers — and electrolyte level before installation.

Be certain that holddowns are firm, but not too tight. Replace cables, in series (positive to negative), after cleaning connectors and posts to assure the connection is tight.

WINTER STORAGE

In the winter all batteries not used should be cleaned, fully charged and electrolyte properly leveled. The same storage/charge cycle as for new-stored batteries applies. When put back into service, the same procedures as for startup of new batteries should be applied and batteries should be fully charged before use.

With this proper attention to battery maintenance detail, there's no reason for problems with your electric car fleet.

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4th hole at Pine Valley

The country's top golf courses use TORO irrigation systems. For a number of very good reasons:

REPEAT CYCLE WATERING—TORO makes it practical. So you automatically get just the right amount of water for your soil and terrain. At the right time. And for the right price.

CUSTOM TAILORING—TORO automatic sprinkling systems are tailored to your specific requirements. No two golf courses are alike...so no two TORO systems are the same.

THE STRONG, SILENT TYPE—TORO sprinkler heads are made of tough CYCOLAC. Gear driven so they're consistent and night-time quiet. Self-contained and sealed so a few grains of sand can't bring things to a grinding halt.

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VARIABLE SPEED GEAR DRIVES—Nobody but TORO lets your sprinkling patterns overlap without overwatering.

EASY EVERYTHING—Easy servicing...from top to bottom instead of vice versa. Easy installation. Easy conversion...with TORO's big, adaptable assortment of head sizes and variations.

MORE THAN 50 YEARS OF EXPERTISE—TORO's learned a lot about total turf care in 50 years. And all that experience is available to you whenever you need it through our distributor network.

If you've seen a totally TORO golf course lately, we'll let the results speak for themselves. If you haven't, let us tell you more. Write TORO Irrigation Division, Dept. W-1273, P.O. Box 489, Riverside, CA 92502.

For More Details Circle (124) on Reply Card

We drove the Otis Turf-Aul hard in the rough to make sure it went easy on the green.



Otis driver Lee Trevino found out what grounds crews have known for years: The Otis® Turf-Aul does everything better—and for less. Hauling, spreading, irrigating, or whatever, the Otis Turf-Aul saves time and manpower because it's the toughest vehicle of its kind. Tough—but with a gentle touch. The Otis Turf-Aul has wide, wide tires that never damage turf. In fact, you can even drive it on greens without leaving a trace.

The 3-wheel Otis Turf-Aul offers a broad range of attachments and modifications. There's a combination available that will suit your needs exactly. Write the factory for the name of your Otis dealer, and prove it for yourself.

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Stockton, California 95204



**Just ask
our driver.**

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TREE CARE (from page 14)

will be up to two percent or 20,000 ppm.

The improved formulation of this product is unique to the widely acclaimed acid solubilized benomyl fungicide. Fungi-Sol is practically neutral (pH 6.8) as compared to the highly acid pH 1-4 range previously reported.

In another extension of the presently approved method, the non-pressurized capsules are replaced by a manifold system of plastic tubing fed and pressurized by a pressure sprayer containing benomyl suspension. Field test experience in 1973 pointed to the fact that lower pressure (10 psi) permitted greater amounts of the fluid to enter the tree than did higher pressure. While the manifold system is not registered yet, it too holds promise for the future.

We believe the Mauget feeder tube method offers yet another advantage. The tube is placed into the active xylem tissues of the tree (the last two or three growth rings). Systemic fluids are promptly carried away from this point and diluted by the fluids of the tree. This widens the formulating parameters and minimizes the difficulty experienced with high density woods.

By comparison, slant hole drilling goes well beyond the active xylem tissues. When many materials remain there for extended periods, a considerable amount of discoloration and cell degradation takes place. This further compounds the problem of healing and greatly increases the time of exposure to insects and disease.

As with the medical profession, the arborist who treats trees that are the property of others must be responsible for the residual amounts of chemical. In addition, the amount of liability assumed increases greatly. With both the quantity and quality of the contents in closed capsule systems established by extensive testing and Federal registration, an applicator is on much firmer ground in event of litigation.

In the medical field, chemotherapy is considered a high technology. There are obvious reasons why it should receive the same consideration in the tree care field. The corresponding level of professional responsibility has been established. Seminars on tree injection have been conducted by our company in cities across the nation. More will be conducted this year.

Additionally, the more than 500 experienced and highly trained ar-

borists in the country utilizing the Mauget Process will provide a practical, continuing testing laboratory. They provide the means whereby new developments may be field tested to achieve more knowledge quickly. This network of "field scientists" will augment the university scientific force tremendously.

With greater knowledge, better communication, new systemic chemicals, improved methods of evaluation and application, it may be possible to overcome the pitifully small amount of funds expended into research on shade and ornamental trees. □

ONE INCH OF RAIN on an acre of ground amounts to 27,154 gallons of water. How is this determined? According to the Du Pont Company, one inch of rain on 43,560 square feet = 6,272,640 cubic inches of water or 3,630 cubic feet. A cubic foot of water weighs 62.4 pounds, so 3,630 cubic feet equals 226,615 pounds or 113¼ short tons. The weight of one gallon of water is 8.3 pounds, so an inch of water equals 27,154 gallons.

Mitts & Merrill Brush Chippers For...

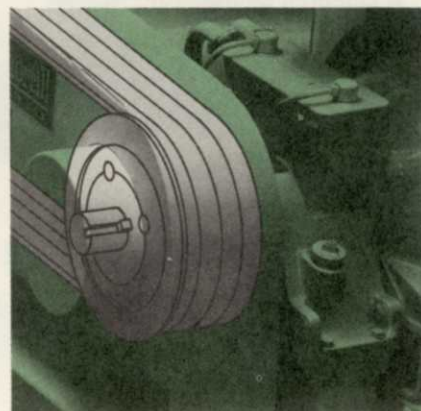


better design... more efficiency

For more than 115 years Mitts & Merrill has been making specialized machinery for industry. A major part of our business is equipment to reduce scrap and waste. This experience is incorporated into design features on our brush chippers that result in higher efficiency and longer, trouble-free service for you. Only Mitts & Merrill brush chippers offer features like these:



Staggered knife pattern for smoother cutting action. Mounted on an all-steel cylinder that, even without an external flywheel, is heaviest in the industry. Each cylinder revolution gives more cuts, produces smaller chips of uniform size. Self-adjusting knives are reversible; give twice the service between sharpening.



Optional torque converter isolates engine and transmission from cutting shock to minimize maintenance. Makes operation virtually fully automatic; increases operator productive time. Available on all models.

Plus...

• **Positive safety-lock pin** for greater operator safety • **Swing-away, folding feed chute** protects cutting chamber; allows instant access and increases maneuverability • **Heavy duty construction** includes coil spring, torsion-type suspension, and box tubular steel frame.

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OPERATIONAL MAINTENANCE (from page 23)

ly drained of all coolant and if the engine contained only water, enough water might be trapped in the engine after draining so that a cold snap could still cause cracking or other damage in the engine. Therefore, if antifreeze is going to be needed for winter storage anyway, it might just as well be used for the year-round coolant. When adding to a cooling system containing antifreeze, the operator should insure that even during the summer the additive consists of the proper ratio of water and antifreeze.

The use of the proper oil in an irrigation engine is the one area where more operators fail to follow the manufacturers recommendations and consequently shorten the life of their unit. Different fuels in the same basic engine require different oils. The type of oil that is just right for a diesel engine is not the right oil for a dry fuel engine. This is an area where the manufacturers recommendations should be checked before using any oil, and if an operator has to add oil during opera-

tional maintenance checks, he should insure that he adds only the recommended oil to the engine.

Each irrigation engine should be tagged by the operator with a label identifying the proper oil for that engine. Adding the wrong oil to an engine in many cases will do more harm than good to the engine. This is, of course, the time to check and clean all of the engine filters, and here again the manufacturers recommendations should be followed.

I would like to point out, while on the subject of manufacturers recommendations, that although all pump or engine manufacturers send out a packet of operation and maintenance instructions with their product, many times we find that these instructions are lost or misplaced during assembly or installation of the units and never reach the operator. It is important that distributors and installers of this type of equipment insure that the instructions reach the operator of the equipment or he has nothing to refer to in order to follow proper maintenance procedures.

If the pumping unit is powered by an electric motor instead of an

internal combustion engine, the pump and maintenance remains the same, but the motor maintenance would consist of following a regular schedule of motor lubrication as recommended by the manufacturer.

Electric motors should not be greased every day, and, when greasing, the proper steps for flushing the old grease when installing new should be followed. Motor bearings can be ruined just as quickly by over greasing as by under greasing.

One other step to follow during operational maintenance of an electric motor driven unit is to insure that the area of air intake for the motor is free of weeds and trash that would prevent a full flow of air to the motor for cooling. The base or supports of the electric motor should be such that it will not trap and hold water directly under the air intake of the motor. Should water be held in this area it can be pulled into the motor along with the air by the cooling fan. Although most motor windings today are protected against this type of moisture, minerals contained in this water can sometimes attack the windings causing early winding failure. □

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#24 STECO SAW
 #102-N TREE SADDLE
 #103-F SAW SCABBARD
 #107 AXE GUARD
 #72 BRUSH HOOK GUARD
 #20 HEAD and SAW
 #105 POLE SAW CASE
 #103-D SAW SCABBARD

Equipment meets O.S.H.A. standards