

# Maximum Service, Long Life Assured If Batteries Are Properly Charged

Care in making Hydrometer check prevents premature damage from overcharging or undercharging

By **DICK GODBER**

Sales VP, Trojan Battery Co.

**M**echanically, the electric golf car is quite simple and when maintained properly will operate practically trouble free for years. The motive force consists of batteries, switching mechanism and electric motor. When a golf car does not perform properly, the batteries should be first checked as a likely source of trouble, but this doesn't mean the fault may not lie elsewhere.



Godber

A good single-cell voltmeter is an essential tool. The meter should have an easily read scale between 2 and 2.1 volts. Only one-tenth (0.1) of a volt can be the difference between a discharged cell and a fully charged cell. Wide variations in the range between cells is a probable sign of a faulty battery. Immediately after coming off charge, an inaccurate voltage reading may be obtained, so the car should first be driven about 100 yards to remove the surface charge. Then, the check should be made.

## Beware False Reading

Battery plates charge and discharge from the outside in. Therefore, a short charging or discharging of a battery will give a false reading on a voltmeter as it shows only surface conditions. Many car manufacturers furnish a "percentage of charge" meter, or one showing "hours to charge." These are really voltmeters and must be read with caution unless the car has been standing for some time, or the condition on the surface of the battery

plates is being read and is not giving a true reading as to its actual charged state.

As a true reading just after a battery comes off charge can't be obtained, the same holds true for a car just coming in from the course. An immediate check is going to read lower than the actual state of charge of the batteries. The experienced person can use the meter to good advantage in deciding whether to send a car out for a second round although he must know the demands of the course's terrain and of his particular car in reading this type of meter.

## Avoid Overcharging, Undercharging

Charging procedures are most important in maintaining batteries so they will deliver maximum service. Overcharging or undercharging are extremely harmful and will greatly shorten the life of a set of batteries. Battery chargers have been improved since the advent of the first golf cars. Most now have some sort of control device to aid in properly caring for batteries during their useful life.

Some chargers have a tapering charge (starting at a high rate and tapering to a low rate) that operates in conjunction with a timer so that they shut off when a full charge has been attained. The length of charging time may be predetermined by taking a hydrometer reading as prescribed by the charger manufacturer, and also a percentage of charge voltmeter showing "hours to charge." As has already been pointed out, an immediate reading can be false and a "rest" period is required if a true reading is to be obtained.

Constant overcharging at even a low rate greatly reduces the useful life of batteries. Some chargers operate on a straight timer while others operate with a voltage-sensing voltage regulator which

activates a time clock for a pre-set period of finishing charge. Either one of these methods, if properly used, will perform adequately.

### Valuable Tool

How do we determine if we are following a proper charging procedure? The most overlooked tool in the golf car business is the hydrometer. The cost of a hydrometer is negligible and neglecting its use results in hundreds of thousands of dollars being lost annually in prematurely shortened battery life. This is a startling statement but we know it to be true after working with golf cars for 15 years.

The hydrometer's function is simple — it tells the state of charge in a battery. This is determined by testing the acid concentration. A full charge battery will be one with a hydrometer reading showing the strength of acid that the manufacturer used as finished acid strength when the battery was manufactured. Usually this is shown clearly on the battery connectors and may range from 1.225 to 1.260. After each discharge, during which the reading may drop to as low as 1.100 or 1.125, the acid must be brought back to full strength by charging. At the same time batteries shouldn't be charged any longer than necessary or their useful life is shortened.

### Experimentation Helps

A little experimentation with the hydrometer shows what charge should be sufficient to bring the acid gravity up to a prescribed reading and then shut off. This is really not difficult. The checking of a single cell in the entire set shows the approximate condition of charge in all of the batteries. What should be done is to fully charge the batteries in a pre-determined time. Observation of the hydrometer and different charging times shows the number of hours needed at a particular course for nine, eighteen, or thirty-six holes of golf.

Many chargers are said to be automatic, and under ideal conditions they are. The problem is that ideal conditions too often don't prevail. The hydrometer should often be used as a double check on your chargers and in determining charging periods. Charge as few hours

as necessary to bring the batteries up to gravity and no more. Just a few cells in the entire set will give this information if a hydrometer is used.

### Test of Quality

The importance of avoiding under-charging should be kept in mind. Golf car service simulates standard battery tests where batteries are purposely subjected to destruction by constantly discharging and charging. The measure of a battery's quality or performance capability is the number of these cycles it can withstand before failure.

Further, the more deeply a battery is discharged during these cycles, the more damage is done internally. It is easily seen that a battery only brought up to a 70 per cent charge, for example, will always be operating in the bottom range of its potential and will be destroyed prematurely. Conversely, a battery is only able to absorb a charge until it has reached 100 per cent or a full charged state. Beyond this, it shows resistance to being charged. This resistance creates a destructive internal heating situation and a corrosion of the positive plate structure.

### Life Cycle Factors

The useful life of a set of batteries depends on many factors. Golf cars are being used more now than ever before, and more charging cycles mean shorter life. It is essential from the standpoint of profitable operation that batteries be able to deliver 36 holes of golf during periods when the days are long and cars can be sent out twice a day. It takes only a few of these extra rounds to pay the entire cost of a set of batteries.

Trojan Battery Company has introduced a new golf car battery of 217 ampere hours which compares with batteries having an average of about 170 ampere hours that were used in the past. This added capacity gives nearly 40 per cent more distance. The real advantage of the extra capacity is that it assures many more months of 36-hole car performance. The new battery has the same dimensions as standard golf car batteries except that it is 1½ inches higher. But it will fit in most golf cars.

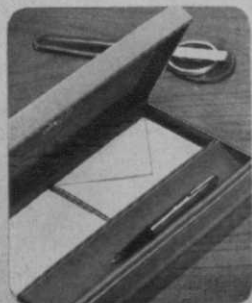
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# Tractor Maintenance



**An understanding of how the parts of an engine react to heat, carbon, lubrication, etc. gives mechanic more confidence in diagnosing trouble and making repairs**

(First of two articles)

In its manual, "Tractor Maintenance and Tune Up", International Harvester Co. observes that it takes only a fairly competent mechanic to make repairs or adjustments on almost any piece of machinery when the need or the trouble spot is pointed out to him. But a man who can detect what and where the trouble is, and then correct it, is doubly valuable. The manual has been prepared with the

purpose of helping the course mechanic or serviceman to make any diagnosis with confidence and then proceed to handle the necessary adjustments or overhaul. It also emphasizes that if proper adjustments are made periodically, the tractor always will be available for eight hours of work, and the life of the machine will be prolonged.

The first part of this series covers tractor engines. The second part, which will

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appear in October *Golfdom*, will cover the hydraulic system. Editor.

**A**s a matter of general information, it should be kept in mind that when an engine is started, especially in cold weather, some fuel enters the combustion chamber in liquid form. During the first few minutes of operation, the liquid fuel mixes with the oil on the cylinder walls and is forced past the piston rings into the crankcase, thus diluting the crankcase oil.

Combustion is liable to be erratic during this initial period. Cold cylinder walls condense some of the fuel out of the fuel-air mixture, thus adding more liquid fuel to the crankcase.

For every gallon of fuel burned in an engine, about one gallon of water is produced. Contamination from water and other combustion products is exaggerated during low temperature operations because of the cold cylinder walls and incomplete combustion. These contaminating products remain in the crankcase until the oil temperature becomes high enough to evaporate them. (Oil temperature must reach approximately 140 deg. F. to keep water vapor from condensing.)

#### Can Block Screen, Passages

Sludge formed by the mixture of water, oil and contaminants tends to settle to the bottom of the oil pan and if it col-

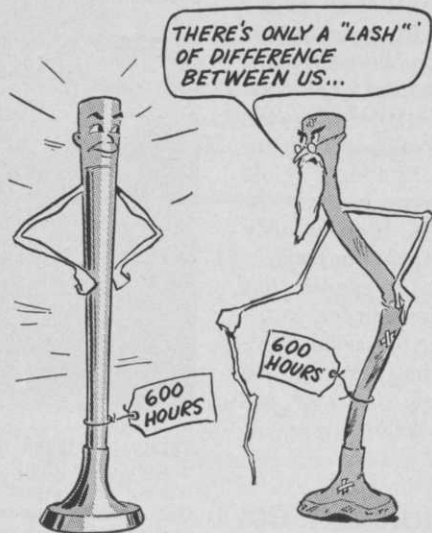
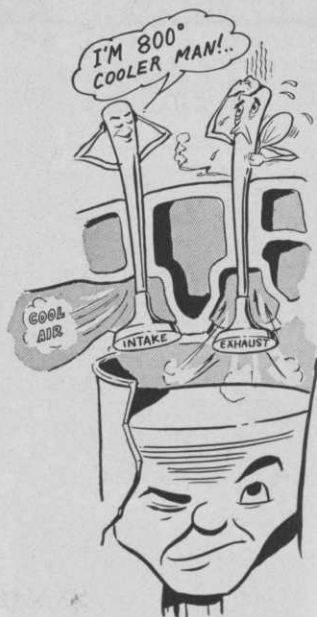
lects in sufficient quantity, it can block the oil pump screen or plug the oil passages. Crankcase and valve compartments are ventilated to aid in removing the water vapor. The crankcase breather must be clean to allow the vapor and other blowby products to escape and to reduce the sludge accumulation.

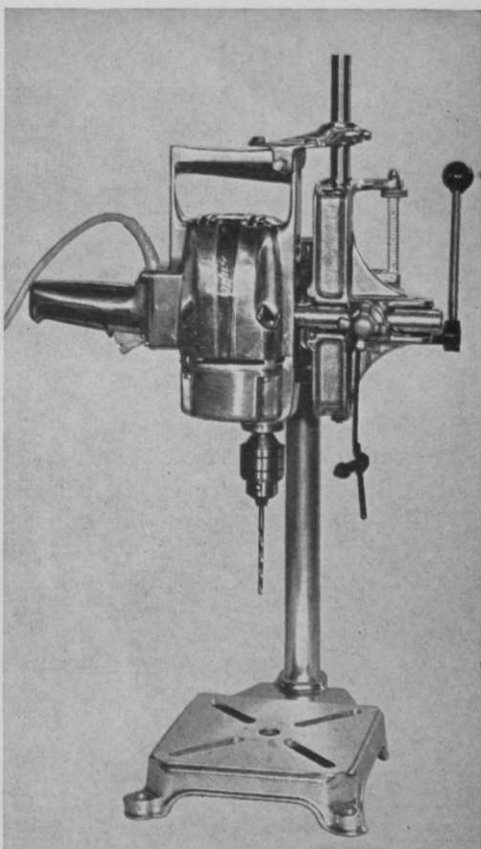
**Engine Corrosion** — The rusting of metal parts may result from the presence of water in the crankcase. Water alone causes rusting and in combination with blowby products may form acids which attack other metals such as copper or cadmium alloy. Water forms as the result of condensation of water vapor in the blowby products and in the air entering the crankcase, from low crankcase temperatures caused by worn-out thermostats, and from long periods of engine idling.

**Engine Varnish** — Unburned fuel that enters the crankcase in blowby gases contributes to the formation of varnish on engine parts. Deposits may then form on pistons and cause rings to stick. Similar deposits on valve stems result in sluggish valve action and "sticking" valves.

High speeds and temperatures and increased compression ratios with more power put new demands on engine valves. Im-

(Continued on page 62)





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## GRAU'S Answers to Turf Questions

BY FRED V. GRAU

### A Grass That's Free of Bugs and Disease

During late summer and fall we devote full time to the harvesting of our Penngift crownvetch seed crop.

Some fields lie next to heavy woods well-populated with deer, woodchucks (whistle pigs), racoons, rabbits and pheasants. We've even had a bear. It is discouraging to see the damage done by these animals as they gambol, seek food and just lie around. There isn't any seed where they operate.

Many of you have seen highway slope plantings of Penngift crownvetch and have remarked on the perfection of cover, the absence of weeds and erosion, the beauty of the blossoms, and the total lack of maintenance requirements.

A new use for this perennial legume was discussed during the first Crownvetch symposium held July 6-9, 1964, at Pennsylvania State University. Analyses of forages were presented and showed that protein and feeding value are equal to or better than alfalfa and birdsfoot trefoil. Many farmers have suffered severe losses of hay and of livestock through poison sprays used to kill weevil, spittlebug and other pests. For some unknown reason, Penngift crownvetch seems to be unaffected by bugs and diseases. This interests many farmers and should be of interest to supts. who keep livestock.

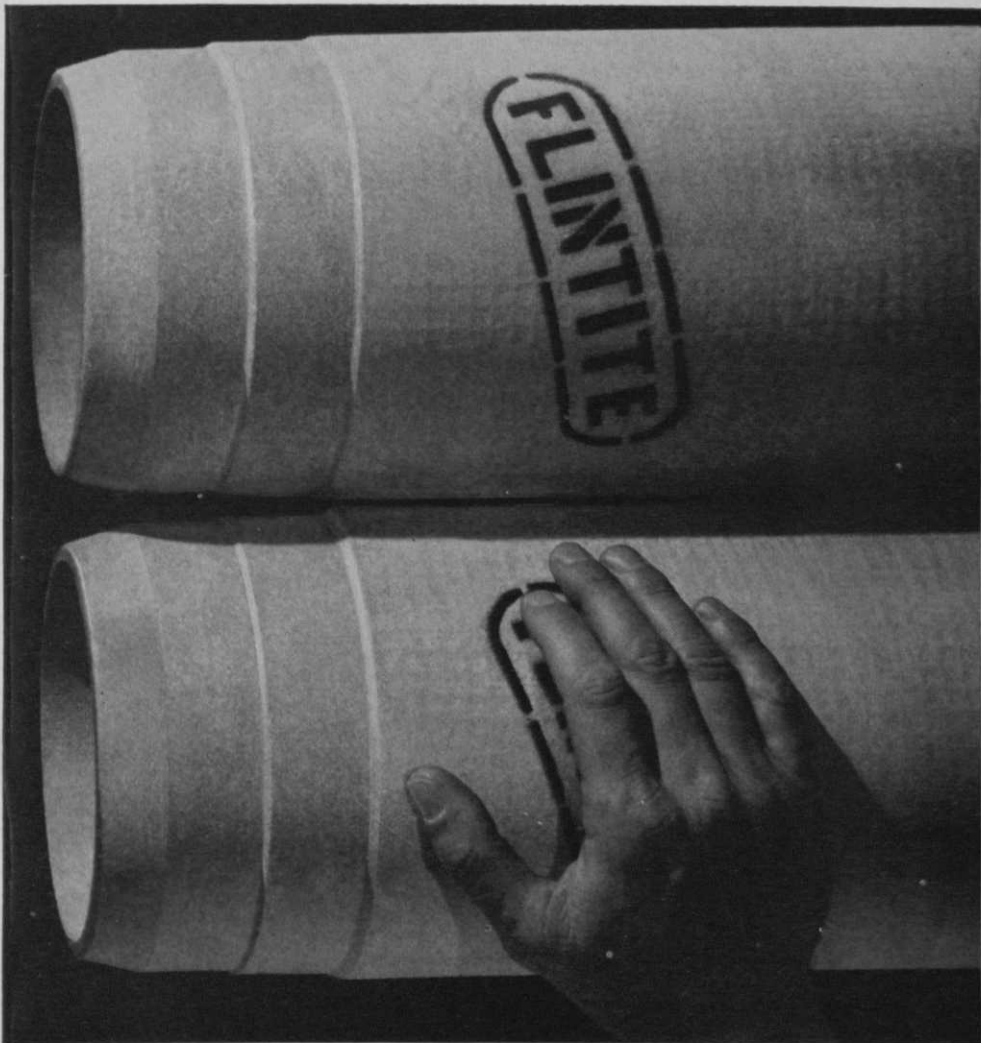
Why, you may ask, does Fred Grau

tell us all these things about crownvetch when our interest is in turf? In my travels I have sensed the interest of many supts. in livestock, farms, highway maintenance, beautification, erosion control, and soil building. Also, many are using this ground-cover on steep areas on golf courses that are out of the line of play. Some are using it to cover their soil beds for building topdressing material. Anyone interested in details of building soil with Penngift crownvetch on a half-acre soil bed may drop a post card to me at College Park, Md. A mimeograph will be prepared for mailing this winter in good time for early spring planting.

During mid-August our crew spent nearly two weeks gathering seed from the "Mother source" near Virgenville in Berks County, Pa., almost within a brassie shot of Harry Carlson's Moselem Springs GC. Harry plans to cover some of his rough steep areas with Penngift. As we worked we could gaze on Harry's beautiful green fairways of Merion bluegrass — a lovely sight. On a previous visit we were impressed by his tees of Penncross bent, which are as good as many putting greens. His Penncross greens were utter perfection.

As we reflected, we couldn't help but wonder when we will have a fairway grass that can approach the quality of well-managed Merion but which can come close to perfection on low- and medium-budget courses. Will it be another bluegrass or must we look to the tall





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fescues? We are thinking now of cool-season courses where Bermuda and zoysia will not perform well. Many years of effort tend to show that it will be possible to develop a tall fescue that will stand close mowing, that will be nearly ever-green and will be fine textured. Joe Duich at Penn State is well along in the development of a polycross tall fescue. We have been working for many years with a finer-leaved tall fescue that we call Traveler II. It is looking good in lawns. It still must be tested in fairway turf but it shows promise in that direction.

The need for a low-budget fairway grass that will stand up to disease, wilt, etc. is acute. Perhaps we need not limit this need to the low-budget course. Many courses are desperately seeking the "perfect" fairway grass to match the perfection attainable with Penncross on greens. It is our opinion that great effort should be devoted by turf experiment stations to developing the ideal fairway grass.

### Turf Schooling

**Q.** After three years of military service overseas my nephew will return. He has had 1½ years of college, is a good golfer and he wishes to prepare himself for a combination job of pro, supt. or manager of a small club. Are there short courses which specialize in turf management or must he take a 2 or 4 year course in agronomy? (Nebraska)

**A.** Your nephew may apply to two schools with which I'm well familiar, and offer short courses in turfgrass management: 1) Pennsylvania State University, University Park, Pennsylvania, Dr. Joe Duich. 2) University of Massachusetts, Amherst, Massachusetts, Prof. Joe Troll. Iowa State, Illinois, Ohio State and Purdue are other schools that have fine turf management courses.

### Compacted and Diseased

**Q.** Our greens of Midwest black soil are over 30 years old, compacted and diseased. We aerate 3-4 times a season, chopping the cores with a vertical mower, drag and overseed with Seaside bent, the original grass. We fertilize and spray for fungus alternate weeks.

- 1) How can we improve the existing soil to reduce or limit compaction?
- 2) Would spiking help?
- 3) Would overseeding with Penncross help? (Illinois)

**A.** Start changing the grass to Penncross by hydroseeding twice a year, spring and late summer, using ½ pound to 1,000 sq. ft. each time. Penncross is quite resistant to disease.

Improve soil texture by topdressing with a

## Turf Conferences

### SEPT.

- 9-VPI & Virginia Turfgrass Council, VPI, Blacksburg, Va.
  - 9-10-Cornell University, Ithaca
  - 10-11-Alabama-North Florida, Auburn University, Auburn, Ala.
  - 14-15-Midwest Field Days, Purdue University, Lafayette, Ind.
  - 16-17-Penn State Field Days, University Park, Pa.
  - 18-Illinois Field Day, University of Illinois, Urbana
  - 23-24-Lawn & Turf Conference, U. of Missouri, Columbia
  - 23-25-Northwest Turf Conference, Vancouver, B. C.
- ### OCT.
- 10-Rutgers Field Day, New Brunswick, N. J.
  - 21-22-Equipment & Materials Exposition, Brookside Park, Pasadena, Calif.
  - 21-23-Central Plains Conference, Kansas State University, Manhattan
  - 25-27-Sprinkler Irrigation Assn. Convention, Scottsdale, Ariz.

### NOV.

- 4-6-Oklahoma Turf Conference, Oklahoma State U., Stillwater
- 16-20-American Society of Agronomy, Kansas City, Mo.

50-50 mixture of medium sand and a good calcined clay. Keep up the aerating program to mix topdressing material with existing soil to prevent layering.

Spiking is only a partial answer, useful mainly in summer when heavy aerating is desirable.

Use every means possible to stimulate soil organisms which help significantly to improve soil texture. These methods include 1) sensible watering 2) using a good fertilizer as the source of nitrogen (the influence on bacteria is significant) 3) liming to keep soil pH values near 7.0. 4) keeping soil phosphorus low and using sulfate of potash each time nitrogen is applied.

### On Canada Cup Team

Arnold Palmer and Jack Nicklaus, who swept the Canada Cup matches for the U.S. in Paris last year, again will represent this country in the International Golf Association competitions which will be played at Maui, Hawaii, Dec. 3-6. Nicklaus won the 1963 individual title last year and paired with Palmer to take the team title. Spain was second, South Africa third and Canada fourth. U.S. has won six of 11 team titles, Australia two, and Japan, Ireland and Argentina, one each.