FVEAA NEWSLETTER

August 1994

NEXT MEETING - August 19 at 7:30 PM

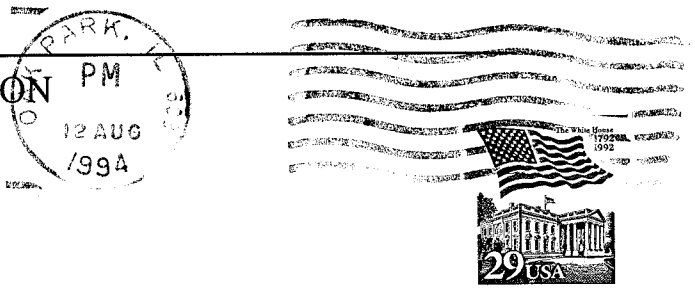
Will be in Room 1046 in the Student Resource Center at
the College of DuPage, southeast corner of 22nd Street & Lambert Road

DISCUSSION TOPICS - Conversion package parameters, and Kevin Taylor's (IDOT) presentation of Employee Trip Reduction Program.

MEMBERSHIP INFORMATION

Any person interested in electric cars is welcome to join the FVEAA. The cost for a full year's dues is $15 which will entitle the member to receive our monthly Newsletter which contains useful information about electric car components, construction, policies, and events. Dues for new members joining in September will be $ 2.50

NEWSLETTER
FOX VALLEY ELECTRIC AUTO ASSOCIATION
308 South East Avenue
Oak Park, Illinois 60302



First Class

John Emde
6542 Fairmount Avenue
Downers Grove IL 60516 -2919

ADDRESS CORRECTION REQUESTED

PRESSEZ

Ozone and Electric Vehicles. The immediate problem is the health destroying ozone that we breathe on hot days when hydrocarbons and other pollutants cook in the air. This Ozone is an invisible gas that causes shortness of breath, wheezing and coughing.

The Chicago Metropolitan Areas including the collar counties has been designated as a severe non-attainment area for ozone. Draconian measures to correct the ozone problem have been mandated by Law.

There is a simple solution that does not impinge on our freedom of choice or require another layer of bureaucrats to administer. Just "GO ELECTRIC" (And save money)

Our speaker for the next meeting will be Kevin Taylor from the Chicago Area Transportation Study to outline the Employer Trip Reduction Program and other programs to solve the Ozone problem.

Ken

MINUTES OF JULY 15 MEETING

The meeting was called to order by President Woods at 7:45 PM. Eighteen members attended. Minutes of the June meeting were approved as published.

Treasurer Corel report that $ 2106.62 in the savings account and $ 839.50 in the checking account was accepted. He also stated tonight he would give small 12-volt gelcell batteries to any member able to use one.

Member Sartain reported on Michigan's first Electrathon on June 11th, sponsored by the Jordan College Energy Center. The event was held at a Grand Rapids racetrack in the time preceding the usual stock car racing. This insured a large audience. Twenty three high schools and community colleges participated. The winner completed laps on a 1/2-mile track in the allowed 1 hour. It was suggested that President Woods discuss with Member Oviyach the possibility of the FVEAA initiating a similar event.

There was a discussion of the FVEAA test of the ECOSTAR. President Woods was authorized to write to GM and offer a similar program for their Impact. Member Shafer will prepare a draft letter and proposal.

Member Shafer led a discussion of conversion costs, including a proposed up-front financing program. At the next meeting a general discussion of a conversion package that includes a motor, controller and battery charger will be held. Member Corel reported a large PM motor and controller package may be available. Former member Richard Marsh's controller development should also be investigated.

Member Clark reported SAE books on the History of Electric Automobiles, and Electric & Hybrid Technology are available from public library systems

The meeting was adjourned at 10:05 PM.

Submitted by
Dale Aarvold
Secretary

PICKUP CONVERSION

New member Steve Marshall of Milwaukee reports that his conversion of a Dodge D-50 pickup truck is almost complete. Way to go Steve !

A NOTE ABOUT THESE NEXT TWO PAGES

EV owners who use their cars have accumulated an operating and cost experience that cannot be obtained in any other manner. Their cars are regularly driven in real-life situations. The Editor would appreciate FVEAA members use experiences and data for future Newsletters.

The first article was sent to us by Howard Alan, President of the Illinois Solar Energy Association. Noel Perrin, the author, published a book "SOLO" recounting his experiences driving the car around the US. The book was brought to the FVEAA attention by Member Clark. In the NY TIMES article, he mentions his urban driving use.

The second article was noted by Member Vana in a swimming magazine he reads.

The Truth About Electric Cars

NEW YORK TIMES AUG 2, 1994 OP-ED. SECTION

By Noel Perrin

THETFORD CENTER, Vt.

In 1998, New York State is to join California, Maine and Massachusetts in requiring auto makers to begin selling electric cars. Not many — just 2 percent of the cars a manufacturer sells in the state that year. But that's still too many for the oil companies, which don't want to lose any part of their gasoline market. In their campaign to prevent the New York regulations from going into effect, these companies have been running scare ads.

The ads focus on money. They could hardly focus on quality, because the quality of modern electric cars is too high. When Popular Science test-drove a General Motors Impact earlier this year, a prototype, it reported that the vehicle was "not so much a surprisingly good electric car, but possibly the best-handling and best-performing small car that G.M. has ever turned out."

A Mobil ad I saw in June quoted a study asserting that electric cars could cost at least $10,000 more to manufacture than comparable gas-powered cars, and maybe as much as $27,000 more. Who could pay that much? Almost no one. Therefore, the ad maintained, the auto companies will artificially reduce electric-car prices to the level of gasoline-powered cars — and lose money on every one. They'll then recoup their losses by raising prices on all other cars.

The Mobil ad predicted that if the new regulations go into effect, everyone in New York buying a gasoline car in 1998 could get zapped an extra $600. Forty-nine conventional-car buyers all handing over $600 to subsidize one environmental maniac who wants an electric car. Even the math is a little funny here. When I multiply $600 by 49 people, I get $29,400. I thought the maximum difference was $27,000, and the more probable difference around $10,000. If it's $10,000, the zap per gasoline-car buyer drops to $204.

But never mind the math. The whole premise is absurd.

Take my electric Audi, my beautiful, steel-gray commuter car. Last year I paid $10,250 for it. I can and do drive to work in it, zipping down the interstate at 60 miles an hour. True, I can't drive very far — about 45 miles before recharging overnight. But that gives me enough power for short trips around town, and the cost of recharging is negligible. No one has given me a subsidy. Granted, mine is an old Audi, built in 1983 and converted to electric in 1992 (not by me). But it's unlikely that I could find a 1983 gasoline Audi in perfect order for $250.

> Clean and cheap — ask the man who owns one (me).

Or take the current stock in trade of Green Motorworks, an electric-car dealer in southern California. Its cars start at $9,995.

But Mobil isn't talking about used electric cars nor about converted gasoline cars like my Audi, or like the Electric Leopard at Green Motorworks. It's talking about new electric cars, built from scratch in 1998. It's claiming they will cost from $10,000 to $27,000 more than comparable cars with combustion engines.

Can this really be true for a car that is simpler in design? That does not yet enjoy the economic advantages of mass production but will well before 1998? Compare a gasoline engine and an electric motor sometime and see which has more moving parts. Consider which vehicle needs a catalytic converter on the tailpipe — and which one needs a tailpipe at all, or a muffler, or a fan belt, or antifreeze, or motor oil.

Oh, I admit the oil companies are getting some support from Detroit. There's a man at Ford, and a very high-ranking one, who says that a decent electric car would cost $100,000 to build. Chrysler is selling a few electric vans right now. The price: $100,000 each. Scary.

But Detroit is not the only place where cars are built. There's France, for example, where automobiles got their start 100 years ago. Both Renault and Peugeot Citroën will begin production of electric cars next year. Peugeot Citroën plans an initial run of 10,000 cars.

Now listen to Jean-Yves Helmer, the head of Peugeot's car division. "The production cost of an electric car is lower than a standard car," he said in an interview in Automotive News this spring. Mr. Helmer expects to be selling electric Peugeots and Citroëns in France next year for $10,700. He thinks he could price them the same in the United States. What about the scare-figures thrown around by Mobil and Ford and Chrysler? "Their cost estimates seem to be highly inflated," he says politely.

And an electric Peugeot at $10,700 is still not going to be the cheapest electric vehicle in the world. There's a company in Taiwan that expects to be making and selling an electric car for just under $5,000. (I admit it's a smaller vehicle than I have any interest in owning — about the size of a golf cart.)

So whom do you believe? The oil companies with their somber predictions? Or Mr. Helmer, who will be ready to sell inexpensive electric cars next year?

Noel Perrin teaches environmental studies at Dartmouth College.

MEMBER VANA SAW THIS ARTICLE ABOUT ANOTHER FVEAA MEMBER IN MARION IA

EV REPLACES ICV for Brian Klosterman

Brian Klosterman pulled into the parking area at the Linn County REC Annual Meeting with a car that was emitting only a gentle, sewing-machine-like whir.

All of Brian's local trips are noiseless and pollution free, he has no oil changes or major repairs, he has an Electric Vehicle (EV) of his own making!

Brian converted a 1980 VW Rabbit, a conventional Internal Combustion Vehicle (ICV), to an EV in 1991. He has been driving it to work ever since, a 16 mile a day trip. Add in a few errands and most days that mileage will average 33 per day.

He was one of the first persons to arrive at the Annual Meeting. He wanted a first hand look at the EV (Ford Ranger pickup) that was on display. He had a keen interest in visiting with the people who had converted this vehicle.

Brian didn't say so but you could see his disappointment as the people showing the truck had not been involved in the conversion. They were unable to answer his technical questions. He saw little difference between the truck and his own EV. His car has both Amperage and Voltage gauges. Theirs had Battery Charge Gauge and Discharge Rate Gauges.

The truck has heavy duty suspension, Brian put heavier springs in the back of the Rabbit. This is necessary because of the added weight. The truck has 20 batteries and Brian has 18. Both vehicles use front and back space to house the battery power system. Of course both have built-in chargers and are plugged in like an appliance to an electric source to charge up the batteries. Brian plugs his personally designed charger in each night and it is ready to go the next day.

The heaters in the units run off the batteries that run the EV but a separate 12 volt battery system runs the windshield wipers and headlights.

Brian says, "Cruise speeds of 30-40 mph make the most efficient use of the batteries. I've had my EV run at 75 mph, but you need to remember, the faster you go the more you are taking from your stored energy and you will not go as far on a charge." The batteries are good for 25,000 miles before they need replacement. They are the only expensive item to keep the car on the road. It will cost approximately $950.00 to replace them. When the cost of replacing the batteries is amortized over the vehicle's lifetime the operating cost is comparable to the ICV.

(Photo omitted)

Brian Klosterman drives his Electric Powered vehicle (a converted VW Rabbit) to work every day. No pollution, no noise. A hair dryer keeps his windshield cleared in inclement weather.

(Photo omitted)

Brian says, "There's a lot of weight in these batteries. I had to put heavy duty springs in the back end." The car can carry two persons without exceeding its original recommended gross weight.

(Photo omitted)

About 75 percent of the private cars in this country are driven less than 50 miles a day, and this figure increases to 93 percent for second cars. There is a place in society for the EV. A need exists for a longer lasting and more efficient battery. To spur battery development, the US Department of Energy and industry have joined forces to fund research efforts on new battery technologies.

The August 20, 1993, issue of Science magazine reported that Stuart Licht and Dharmasena Peramunage, chemists at Clark University in Worcester, MA, have developed a sulfur-aluminum battery they claim puts out six times the power of the lead-acid batteries currently being used in test fleets of electric cars. The battery holds up to 200 watt-hours/kg. For consumers, more power translates into longer driving time between charges.

The sulfur-aluminum battery is also much lighter than lead-acid batteries. It is made from fairly inexpensive materials, and doesn't have the environmental problems that lead does. However, the researchers caution that the battery is in the early stages of development.

California has imposed a requirement that two percent of all vehicles sold there have zero emissions by 1998; and by 2003, 10 percent of annual car sales must be EVs.

Test fleets of Ford and GM electric vehicles are expected to hit the roadways later in 1994.

In 1910 Thomas Edison said, "In 15 years, more electricity will be sold for electric vehicles than for light." For two reasons this prediction did not come true. First, the invention of the electric starter eliminated the difficult and sometimes dangerous hand-cranking that had been required to start gasoline-powered automobiles of that time. Second, the discovery of oil in Texas made gasoline a cheap fuel. Gasoline-powered cars and trucks captured the market, and the development of the EV was halted before engineering refinements and mass production techniques could evolve.

Still, the EV was once a popular mode of transportation. Robert Anderson of Scotland invented the first EV in 1839. In 1896 an EV - a Riker Electric - won the first American automobile race. By the turn of the century, about 4,200 automobiles were being sold each year, and about 38 percent of them were EVs. In 1912 there were 34,000 registered electric cars, plus hundreds of electric trucks and other commercial vehicles, traveling our country's roadways. Battery-recharging stations were common throughout the Northeast; New York City alone had 41.

Our ICV's dump over 200,000 tons of pollution a year into the air we breathe. A switch to EVs might cut most air pollutants significantly, even though some pollution is caused by the power plants supplying electricity to recharge the EVs. However, the EVs can be charged during evening hours, when the demand for electricity is low. Utilities could save energy and lower costs through load leveling. Load leveling is a conservation strategy to create a more steady level of electricity output. It makes more efficient use of generating equipment than does the start-up-and-cut-back procedure necessary to meet varying demand. Another bonus is that widespread use of EVs would significantly reduce noise pollution, which affects our hearing and nervous systems.

Where will electric vehicles be in the year 2000? Maybe there will be one in your driveway and Brian Klosterman will not be the only one in the neighborhood driving around silently doing his bit to preserve our environment.

The 19 hp electric motor is powered by the 18 batteries that are connected in series to produce 108 volts.

RECENT EV ARTICLES

PROTOTYPE VEHICLES

Ford unplugs electric vans after 2 fires - Chicago Tribune (Bloomberg Business News)

Ford requested users of its ECOSTAR electric utility vans to park these vehicles outdoors after two users experienced fires. An EPRI test vehicle caught fire on May 2 during a recharge cycle. A second vehicle used by a Canadian unit of American Brown Boveri, the manufacturer of a sodium-sulfur battery used in the van, also caught fire. The suspension is a necessary precaution during the field testing of these experimental electric vehicles.

Electric cars hit the road - Chicago Tribune 7/3/94 (Page unknown)

The first of 80 General Motors test vehicles will be delivered to consumers in July. The users will drive the Impact for a 2-4 week period in the Los Angeles portion of the field-test program. A total of 1000 participants in 12 cities will evaluate the Impact over the next two years.

U.S. Electricar certifies its light pickup truck in crash testing (News Release from US Electricar)

In June, the company announced that its production electric pickup truck passed the Federal Lab Crash Simulated software test and is expected to receive FMVSS safety certification. Photos and a video of the process are available from Alex Campbell, US Elelctricar Corporate Communications (707) 525-3227.

From Canada, With Love - Autoweek 7/11/94

Rama Wheel Company of Ontario, Canada will import Czech-built Skoda electric cars to North America and will modify these to meet North American performance expectations.

PUBLIC POLICY

Marge. we're planting corn! - Autoweek 7/11/94

The EPA had decided to recommend ethanol as the fuel additive for reformulated gasoline, beginning in 1996. Ethanol addition will make fuel burn more cleanly, but may add $25 to the typical annual gasoline bill. Oxygenated fuel additives have been the subject of a fierce lobbying battle between farmers and distillers of ethanol and the oil companies who prefer methanol (a petroleum-derived additive). Environmentalists were supporting the oil companies on this issue, contending that methanol will be cheaper and that ethanol processing requires energy to turn corn into fuel that will add to greenhouse gas emissions.

Automakers say demand is key to electric cars. - Chicago Tribune (AP) Date unknown

The Big 3 were represented at a recent gathering to discuss alternative fuel vehicles. They agree that compressed natural gas is likely to be an early winner. EVs will be market-driven and consumers won't accept these until they can provide the same qualities they have become accustomed to in gasoline cars.

EVents

S/EV 94 October 3-5 - Providence RI (Solar & EV Symposium)

Sponsored by Northeast Sustainable Energy Association. Keynote speakers are Amory Lovins, David Freeman, and Robert Stempel. Workshops, Tutorials, and Paper sessions. Nancy Hazard, Northeast Sustainable Energy Association 23 Ames Street Greenfield MA 01310 (413) 774-6051

Central Electric Vehicle Symposium October 25-27- Oklahoma City

Sponsored by Oklahoma University, Electric Vehicle Research Institute, and Electric Power Research Institute (EPRI) Speakers, Paper sessions, and Exhibits. Oklahoma Gas & Electric, PO Box 321, M/C 902, Okla City OK 73101 (405) 3225-4721.

EVS-12 - Anaheim Convention Center (12th Biennial International Symposium)

SHO (Electric Power Research Institute) 167 South San Antonio Rd, # 10, Los Altos CA 94022 (415) 949-2050

FROM OTHER EV NEWSLETTERS

The Electric Grand Prix Corporation (Rochester NY) devotes 3 pages to a description of an electric vehicle development by students at the New England Institute of Technology. It was called "Solar Tech II" , built around a Classic Motor Carriages 359 Roadster kit. The issue also reports that Delco and US Electricar have signed purchase agreements to use the Kilovac contactor. Information on this device that carries 150 amps (small unit) or 350 amps (large unit) may be obtained from Kilovac, PO Box 4422, Santa Barbara CA 93410, (805) 684-4560. The issue also reviews a new conversion book, BUILD YOUR OWN ELECTRIC VEHICLE written by Bob Brandt. It is published by McGraw-Hill and may be ordered from your local bookstore. Price - $16.95 for a paperback; $27 for a hardcover. Car specifications prepared by the Swedish National Board, for purchase of EVs were: Weight - 2700 lbs, Top Speed 75mph, Acceleration 0-50 with standard motor 11 seconds (7.1 seconds with high power motor). Range with lead-acid batteries - 120 miles, Retail price $ 17,347.

The Aussies (AEVA) have a lot of EV information, as usual, in their latest newsletter. Particularly interesting was their summary of an April 94 article in the EPRI Journal describing the Horizon lead-acid battery. See article from the 3/7 issue of Design News in this Newsletter for a brief description of this development. Also included was a description of hub-drive technology which is reproduced in this issue.

Eastern Electric Vehicle Club (EEVC) describes their use of a workshop at the Boyertown Museum of Historic Vehicles. It is principally used by three or four members.

World Electric Transportation features a description of Mitsubishi's EV research projects that utilize NiCad batteries giving a 250 km range and 130 Km top speed and the ESR that is designed as a hybrid. An ad for a new transistor shunt motor control system from GE notes it has a 72-144 volts input, controlled field weakening, and regenerative braking. Info is available from Pro Electric Vehicles, 11852 Eddy Ranch Road, Penn Valley CA 95946, phone (916) 432-5244.

The Maine Sun featured an article on strawbale construction for homes.

COMPONENTS FOR A "STANDARD" CONVERSION PACKAGE

The FVEAA plans to discuss requirements for three major components of a so-called "Standard" conversion package, the motor, controller, and battery charger. This article will present basic car selection assumptions and calculations applying to the choice.

THE CAR

A wide selection of cars is available for recycling and conversion to electric power. Most have been based on a "compact" car that has an original curb weight of about 2500 pounds. This will be used as the reference vehicle. A 3200 pound gross vehicle weight (with driver & passenger) for a converted car is assumed.

BATTERY

Lead-acid, golf-cart type, 6-volt, deep-discharge batteries are assumed for a project because they are commercially available at a reasonable price. Each battery (called a module in this discussion) is rated by the number of minutes it will deliver 75 amps. Dimensions of a standard GC2 6-volt module are 264 mm length, 183mm width, and 270 mm height. Modules weigh between 55-70 pounds. Experience has shown that the battery in a converted car makes up 25-30% of the curb weight. A conversion may have 8-20 modules weighing 500-1400 pounds.

DRIVE SYSTEM VOLTAGE

Battery weight is a major limitation that influences drive system voltage. A 96-volt drive system that has 16 battery modules @ 6 volts each, with a total weight of 1000 pounds will be used.

MOTOR REQUIREMENTS

The first motor requirement is a rotation direction that matches the of the original engine. Most engines have a clockwise rotation, viewed from the front of the car (Honda is an exception). The second requirement to provide an acceptable top speed is motor rated rpm at rated voltage that matches the original engine. Most compact car engines are rated 5000-6000 rpm.

Motor power is the next parameter to consider. This is determined by the acceleration desired and vehicle weight. There are two acceleration ranges to consider: 0-30 that is needed for urban driving, and 0-60 for overall performance. A typical car can accelerate 0-30 in 3-4 seconds. (30MPH = 44 FEET/SECOND). Since the EV needs to keep up with traffic a 0-30 capability in 4 seconds is used. The average acceleration for this is 11 feet per sec-sec. Highway power requirements are considered later.

Newton's Laws of motion are used to calculate motor power (Acceleration = Force/Mass)
The 3200 pound gross vehicle weight must be first converted to mass by applying the acceleration of gravity which is 32 feet per sec-sec.

MOTOR REQUIREMENTS CALCULATIONS (CONTINUED)

Mass = Weight / 32 = 3200/32 = 100 pounds, sec-sec/foot

Force = (Mass)(Acceleration) = (100)(11 feet/sec-sec) = 1100 pounds

Power = (Force)(Distance) / Time = (1100)(88 feet) / 4sec = 24, 200 ft-lbs/sec

Horsepower = Power/550 = 24,200 / 550 = 44 Hp

Kilowatts = 0.746 (Hp) = (0.746)(44) = 33 Kw This gives the short-time rating for the motor.

With an assumed 96-volt system, 33 Kw requires 393 amps (Round up to 400 amps).

The next step is to calculate the power required to move the car at a steady speed to find the motor's continuous rating . The EV will probably be driven part time on an expressway at 65 mph and this will be used for highway power calculations. Losses become a factor.

Rolling resistance for a 3200 lb car is 0.5-2% of car weight or about 50 lbs (6 Kw)
Aerodynamic drag @ 65 mph for a typical car is about 200 pounds. (23 Kw)
@ 30 mph is about 30 pounds (4 Kw)

With an expressway-driven car, the continuous rating requires at least 30 Kw. For an urban-driven car about 10Kw is required drawing 104 amps from the battery.

Summarizing the above, the motor should have a 15-6000 rpm rating @ 100 volts, have a continuous power rating of 10-12 Kw, and a short-time (6-second) overload capability of 35 Kw.

THE CONTROLLER

The controller must be efficient and able to deliver 400 amps continuously @ 96 volts. Heat sinks or forced cooling will probably be required to dissipate the heat generated by this device.

THE CHARGER

Charging system voltage is the first consideration. A standard 120-volt, 15-amp AC circuit allows the car to be charged almost anywhere. The 120-volts is a root mean square (rms) figure. AC supply systems vary by utility and can be as low as 110 volts (rare) or as high as 125 volts (unusual). The charger must be efficient (at least 90%) and deliver a constantly-declining current as charge nears the full value of 2.2 volts/cell. It should also have a maintenance charge of about 0.25 amps or a time-pulsed full charge feature. A two-winding isolating transformer is preferred. Temperature compensation is a desirable feature.

DESIGNER'S CORNER

Useful technology for your idea file

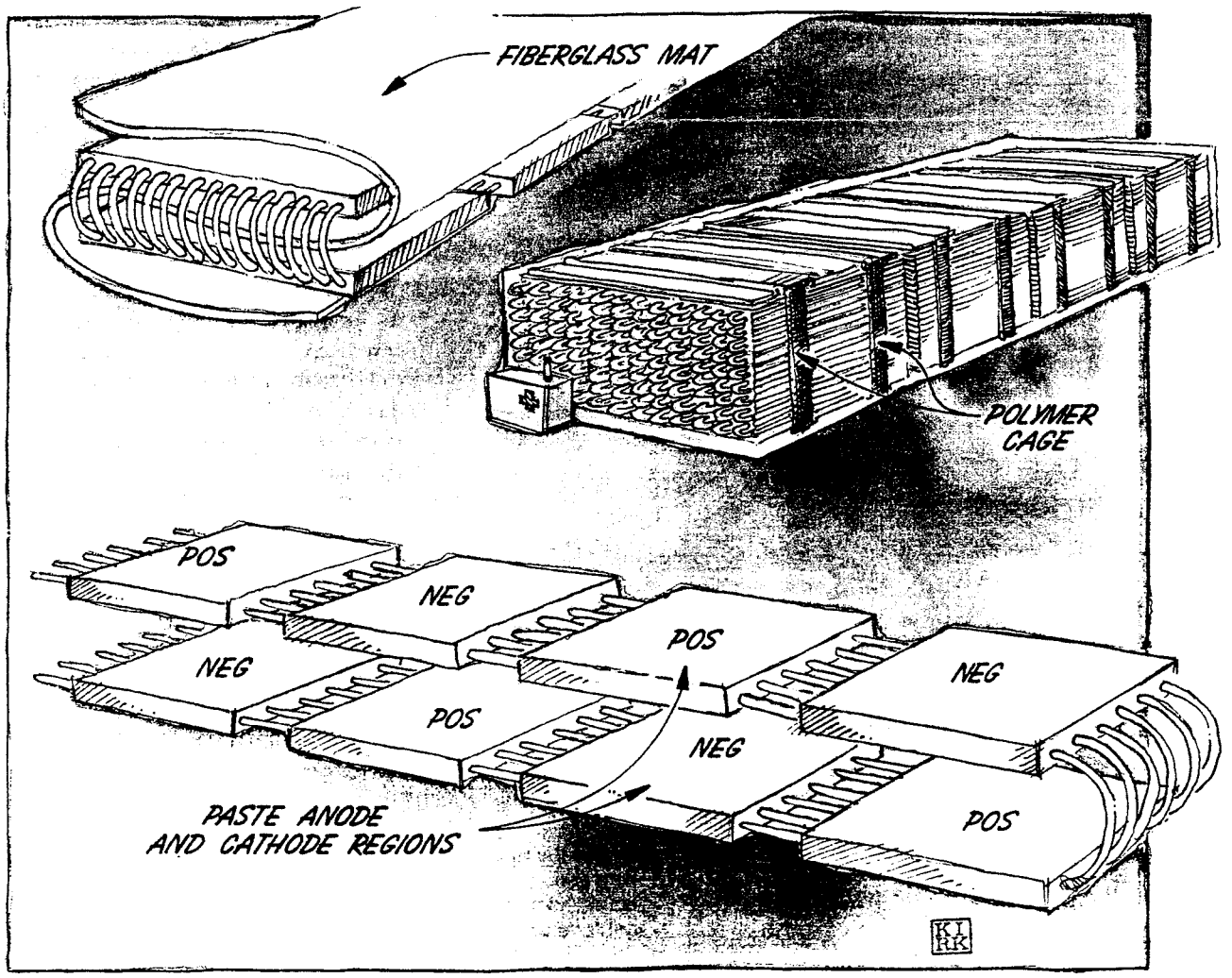
Pb-acid batteries, reborn

Instead of vertical lead and lead oxide plates, the Horizon® battery uses bipolar elements made from woven grids of coextruded fiberglass and lead-tin alloy alternately coated with anionic and cationic paste. Separated by fiberglass mats and compressed by a polymer cage, stacks of these elements form low-impedance galvanic cells upon addition of sulfuric acid electrolyte. Cells can be configured as needed to create a battery of desired voltage and energy.

The compressed mats offer more uniform distribution of reaction surface as well as better resistance to vibration and shock than suspended plates. Holding the sulfuric acid in absorptive material minimizes plate degradation from the concentration gradients which form in free electrolyte designs.

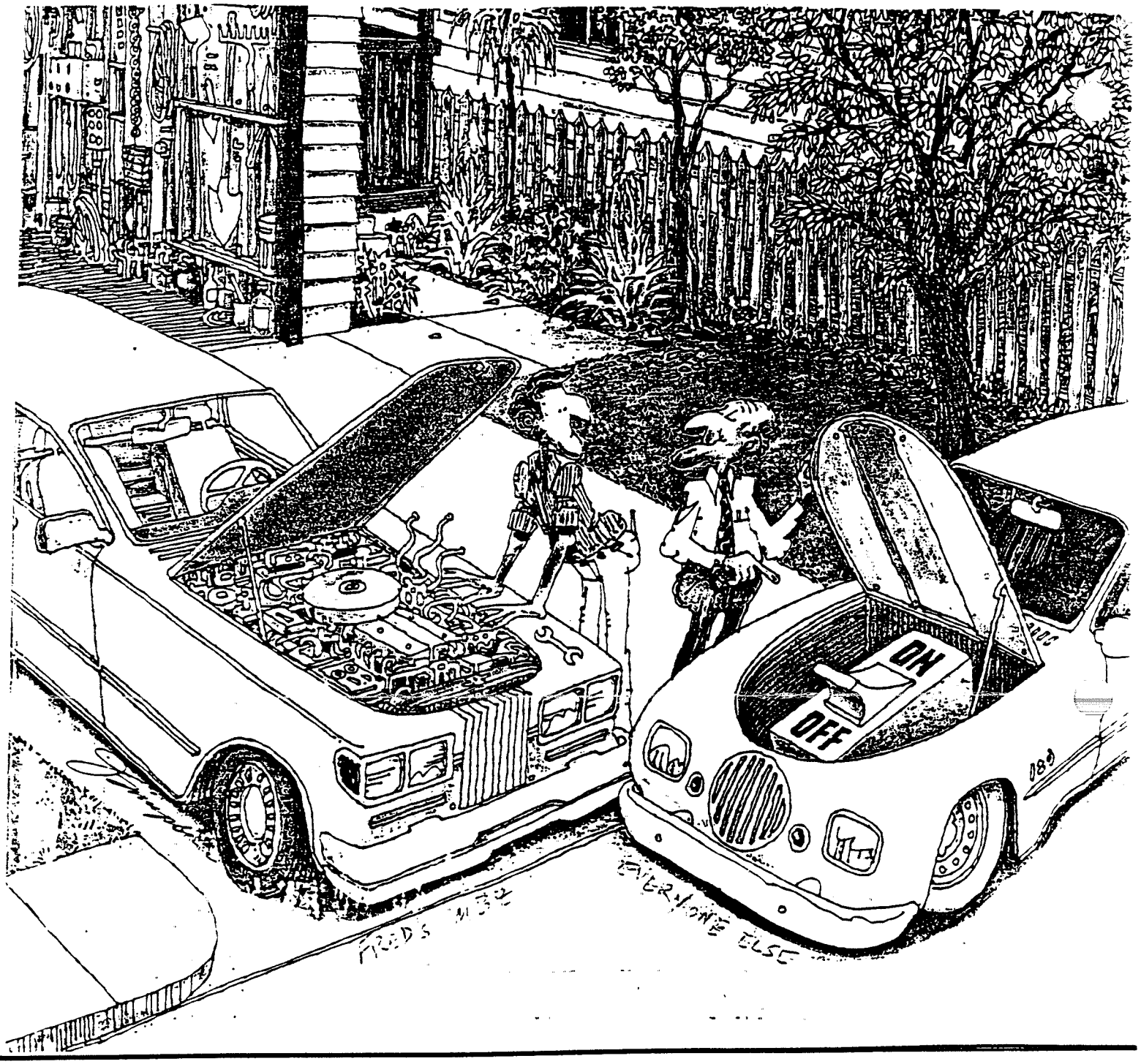
With a specific energy better than 45 W-hr/kg, the new design has taken more than 900 charge/discharge cycles at the C/2 rate. For an electric car, this may translate into 80,000 miles of operating life.

Carlos Coe, Horizon Battery Technologies, Inc., 2809 IH 35 South, Box 788, San Marcos, TX 78667, (512)753-6540.
For information, circle 509



Low impedance of Horizon battery results from short, parallel electron paths between bipolar cell elements. Design gives better peak power and quicker recharges than conventional lead-acid batteries.

From IEEE Computer Society publication in March, 1992



SPECIAL NOTICE

At the August meeting President Woods will announce a Saturday date for FVEAA members to assemble and help John Newton's widow, Juanita, dispose of his collection of electric vehicle parts. Included are motors, instruments - some dating back 50-60 years, a dynamometer, test sets and other items. Those of who respected John as a competent engineer, as well as CEO of PORTEC, know his basement is filled with a lot of stuff valuable to someone interested in EVs which will otherwise be junked. The FVEAA will be asked to approve a document verifying the value of his collection for Jaunita.