

LEAD INDUSTRIES ASSOCIATION, INC.

292 MADISON AVENUE

NEW YORK 17, N. Y.

February 19, 1963

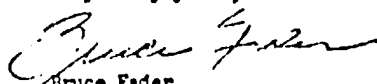
SUBJECT: BATTERY POWER

To Members of the Lead Industries Association, Inc.

Here is a copy of "Power With No Strings Attached," our newest brochure on battery power. It is our hope that this literature will receive wide distribution among people responsible for new product development. Its aim is to show the advantages of battery power for tools, appliances, and vehicles . . . and to point out the superiority of the lead-acid battery for these applications. We feel that the manufacturers of battery powered devices of all kinds have something to gain by distributing the brochure, too, and we hope to have reprint orders from many of them.

Additional copies of "Power With No Strings Attached" are now available in quantities up to 25 at no charge or in bulk at our cost for extra thousands, \$10.00 per hundred copies.

Very truly yours,

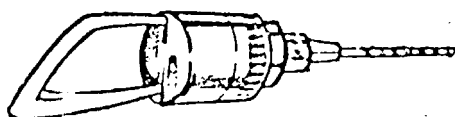
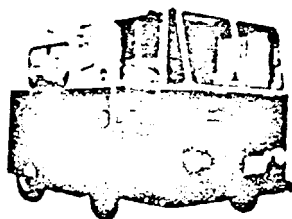
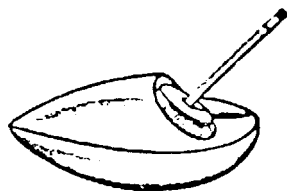
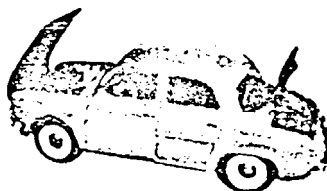

Bruce Fader
Manager, Technical Services

Look Ahead with Lead

LIA23618

POWER

WITH
NO
STRINGS
ATTACHED



A LOOK AT TODAY'S BATTERY POWERED VEHICLES AND TOOLS
AND A GLIMPSE OF WHAT MAY BE JUST AROUND THE CORNER

LEAD INDUSTRIES ASSOCIATION, INC.
292 Madison Avenue • New York 17, N.Y.



Look Ahead with Lead

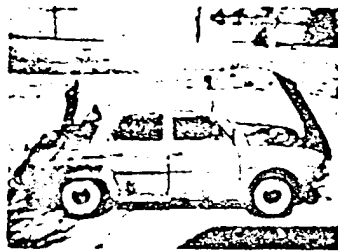
battery power

THEN



AND

NOW...

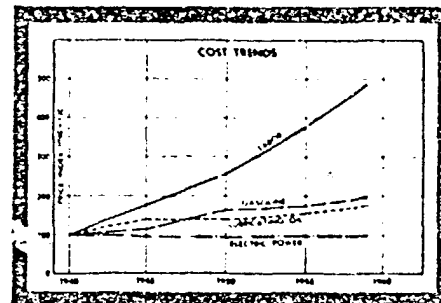


When it was called the horseless carriage, batteries and gasoline power vied for popular acceptance pretty evenly. Those were the days when 100 miles was a day's trip and chances were that the day included a little do-it-yourself repair work. Battery-powered cars were in vogue for town use by sweet little old ladies and usually had rosebud fenders as part of their inside trim . . . perhaps to match the general lines of the greenhouse which characterized their exterior styling.

Today, though the electric retains its well-deserved reputation for driving ease, it boasts trim styling and, more important, trim engineering and economy. It is still the perfect car for a busy mother or grandmother to use on shopping jaunts. It has a steering wheel and a single accelerator-brake pedal. It has about a dozen moving parts—four wheels, a steering wheel, and the brake system. It's silent. It's simple. It's ready to go on the coldest morning. It will do all the shopping, errands, and odd jobs of the average family car for about 2 or 3 cents a mile instead of 10 cents a mile.

How is it that battery power is again making such a strong bid for powering automobiles? There are many answers to this, but they all boil down to the changes which have been made, almost unnoticed, in the past several decades.

Basic costs have changed drastically in the area of motive power. The war years alone saw a tremendous inflation of gasoline and oil prices. Between 1940 and



1960, gasoline cost rose 100 per cent. Electric power, in the same period, remained unchanged.

Users of industrial vehicles, keeping close check of the total expenses, have found that maintenance of internal combustion engine vehicles has risen even more precipitously. The cost of a skilled mechanic has just about tripled since the start of the war. Since the host of moving parts in an internal combustion engine wear and are vulnerable to breakdown, maintenance costs for these vehicles have risen drastically. Battery powered industrial trucks, on the other hand, fare much better in maintenance since they have so few moving parts. This is why each year finds a greater proportion of battery powered trucks in industrial service.

Batteries, too, have changed. The heavy, bulky black box that powered Aunt Tillie's electric in 1912 was on a technical par with the wheezing engine of her neighbor's gas buggy. But throughout the past four decades, and especially since the end of World War II, battery research has led to whole new breeds of lead-acid batteries for motive power and compact little battery packages that pack a real wallop of power. Wartime research has brought about wider use of other battery systems, too, so that battery power for special requirements is now available.

As a specific example, consider what has happened inside the lead-acid industrial battery since 1912. In the first place, there are no more wooden separators between the plates. The job is done today with glass fabric or fibers in conjunction with plastic sheaths. In the second place, the old-fashioned hand pasting of the grids has been replaced with machine filling of the electrodes to match the new, rugged electrode design. The result has been that today's battery packs 145 ampere hours of work in the same space taken by a 100 ampere hour battery in 1950... and with less weight and better life.

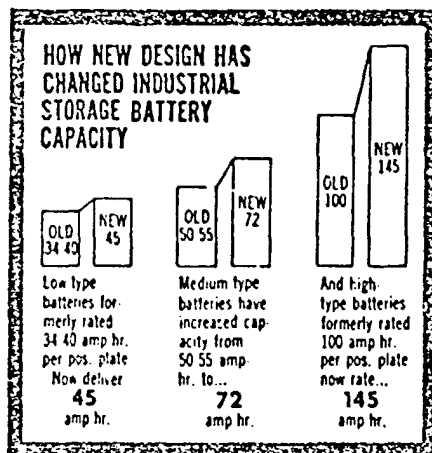
Speaking of battery life, it is interesting to note that batteries are less expensive today than they were before the war when useful life is considered. The average cost for lead-acid storage batteries has risen 20 per cent in this period. The average life for lead-acid batteries has risen 50 per cent in the same period.

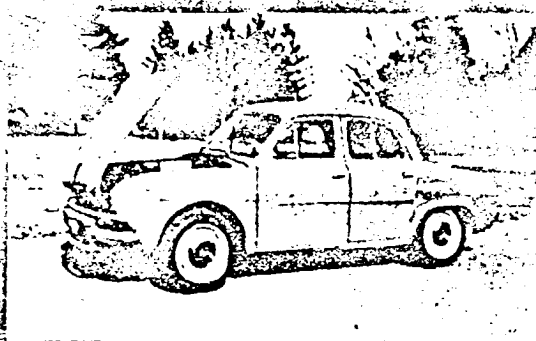
Technology pays off in other ways, too, in today's battery powered car, truck, or tool. The oft-quoted "complexity of modern life" has nothing to do with

battery-powered devices. If you want to go somewhere in a battery powered car or golf cart, you turn it on and go—it doesn't balk on cold mornings, you don't have to worry about anti-freeze (there's no place to put it), it can't have a flooded carburetor, and there's no shifting by you or an expensive-to-repair automatic transmission. The ride is simple, silent, and safe. Granted, electric cars aren't designed for turnpike cruising, but they'll do a comfortable 35 for all your shopping and city driving.

The same simplicity is evident in battery powered lawn mowers. There is no fooling around about starting, no choke to worry about, no gas-oil mixture to make up and store. And consider the freedom an electric hedge trimmer or battery powered drill offers you. You can use them anywhere with no extension cord, no bulky and noisy motor, no wasted motion.

When you look at the whole picture, you conclude that battery power is back—and this time to stay—because of lower costs, better batteries tailored to specific uses, and the sort of convenience, safety, and utility that people want in any product they buy.

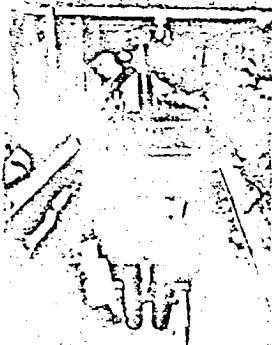
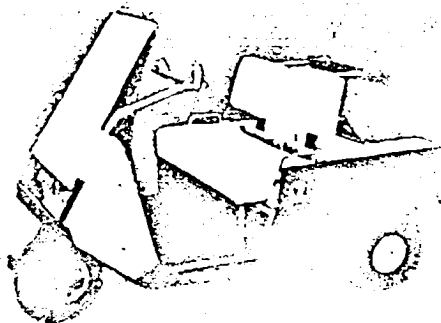




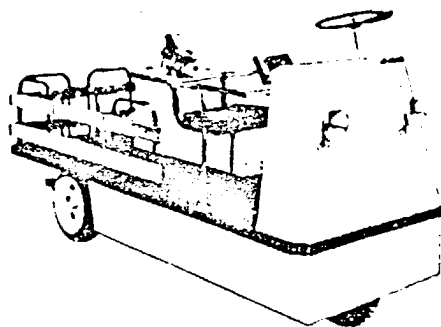
NATIONAL ELECTRIC COMPANY has developed a new type of battery-powered vehicle that can be used in all types of terrain. It is a four-wheeled vehicle with a steering wheel and a seat. The vehicle is designed to be used in all types of terrain, including rough, hilly, and mountainous areas. It is also designed to be used in all types of weather, including rain, snow, and ice.

let's look at vehicles...

EVERYONE KNOWS ABOUT GOLF CARTS. If you're a golfer, watch them take the grades on your course. This one is the Golf Cart manufactured by I. Z. Golf Car Division of Textron, Inc., Atlanta, Georgia.



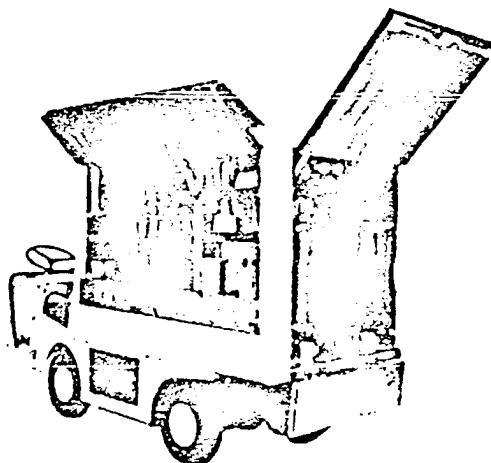
NO CONFUSION IN THIS HENHOUSE. The design of construction peculiar to battery-powered drives makes it possible to use this poultry tractor for all types of work. It can be used in large poultry farms without fear of damage to the birds. As the tractor is designed to be used in all types of terrain, the design is no problem. The tractor is designed to be used in all types of terrain, including rough, hilly, and mountainous areas. It is also designed to be used in all types of weather, including rain, snow, and ice.



PLANT MAINTENANCE, OF COURSE! It's no joke to have to lug 300 pounds of pipe and tools to the job site in a big industrial plant. It's no fun, either, to attempt maintenance car (Victor Comptometer Corporation Electri-Car Division's Model 7110) is one of a number of quiet, go-anywhere plant vehicles. Note the built-in workbench and vise. No smoke or fumes, or flying sparks—the battery powered maintenance vehicle is at home in a clean lab or in a hazard area. Arc-welder? Battery carts are bringing them to the job in many plants, too.



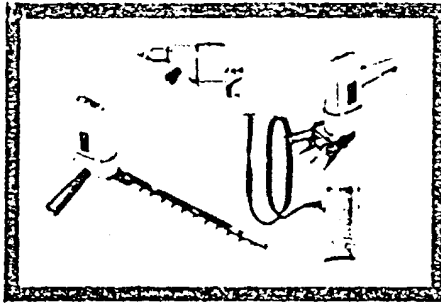
MUSCLE POWER—you bet! The 25 tons of steel on the bed of this Elwell-Parker transporter is just half its rated load. The truck is whisper quiet.



THEY HAVE TO RING A BELL at coffee-break time because this mobile canteen built by Marketeer of Redlands, California glides into the department so silently. One of a number of specialized battery powered vehicles by this company, the canteen wagon can be used indoors or out, in the foundry or the front office.



THIS CADDY NEVER WHISTLES while you line up a tricky putt. Battery motive power drives this precise little club-toting vehicle at a pace to match yours—whether you favor a brisk stride or a lazy meander. Controls in the handle not only steer the Toro Caddy Master, they provide a wide range of speed. Manufactured by Toro Manufacturing Company of Minneapolis 6, Minnesota.

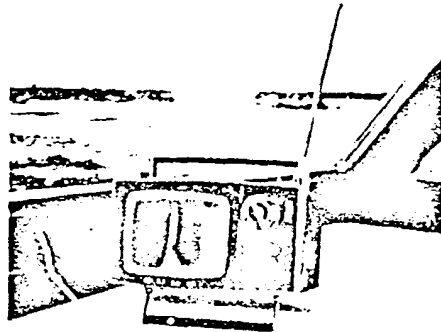


HERE'S THE HOMEOWNER'S SATURDAY MORNING TEAM. With the new Skil battery pack tools you can trim the hedge, polish the car, drill holes to put up a new clothes line. All these tools— $\frac{1}{2}$ " drill-polisher, hedge trimmer, grass shears—are powered by the same battery pack (or your car battery) and permit you to work anywhere without the inconvenience of long extension cords. Built by Skil Corporation of Chicago.

FORGET THE 100-FOOT EXTENSION CORD when you want to vacuum the car, and avoid the hazard of tripping over the cord when you carry the vacuum cleaner upstairs. The battery powered vacuum cleaner is not yet in production but it makes the sort of product design sense that demands product development.

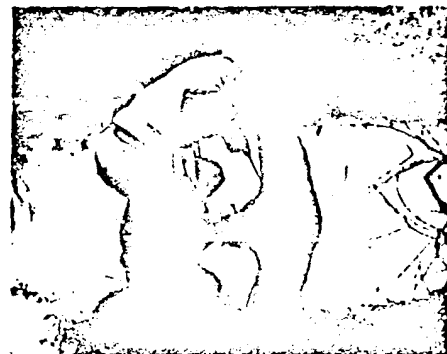


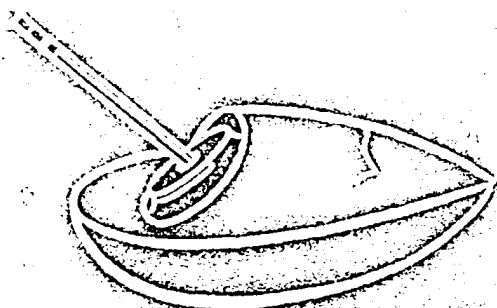
let's look at tools and appliances. ●



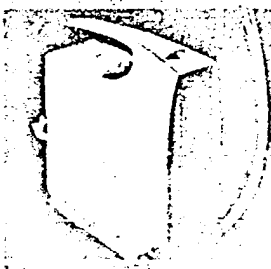
TV AFLOAT. Small enough to pack in a picnic basket, Sony's portable TV set gives three hours of reception anywhere from the four pound, $6\frac{1}{2}$ x 4 x 2" lead-acid power pack furnished as an accessory. The idea has been so successful that US manufacturers are also working on small battery-power units.

DON'T WORRY, he won't get shocked. The power supply to this drill is only 12 volts DC. The battery he carries on his belt is ample to put 15 or 20 $\frac{1}{2}$ " holes in the stump. If it's an all day job in this sort of rugged terrain, he can run an extension cord to the battery of his jeep or swamp buggy. The drill is one of the Porter-Cable "Big 10" battery powered models.

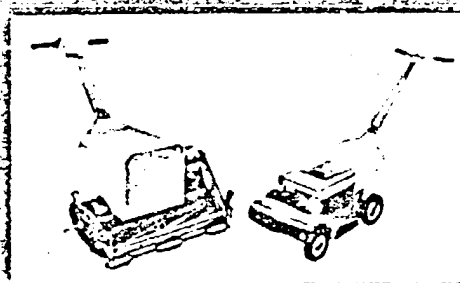




DR. JAMES DOUGLAS, THE BIG ROOM, 1900. Dr. Douglas, a prominent physician of the time, is shown in his office, which was a large, ornate room with high ceilings and decorative moldings. He is seated at a desk, looking towards the camera. The room is filled with books and medical equipment, reflecting the professional nature of the practice.

[illegible]

ers, campers, and hikers will find a lot of fun in the new book. The book is divided into two parts. The first part is a collection of 100 questions and answers about the outdoors. The second part is a collection of 100 recipes for outdoor cooking. The book is written in a simple, easy-to-read style. It is a great resource for anyone who loves the outdoors.



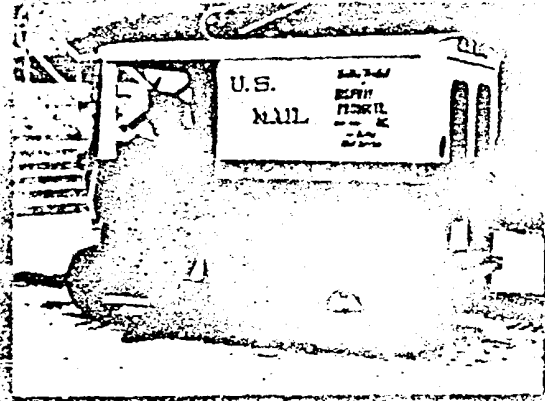
INCLUDE CUTTING THE GRASS & WEEDS. The grass and weeds are the most common pests in a garden. They can be removed by hand or with a lawnmower. If you use a lawnmower, be sure to cut the grass and weeds before they get too tall. This will help to prevent them from becoming a problem. If you use hand tools, be sure to wear gloves and use a sharp blade. This will help to prevent injury and make the work easier.

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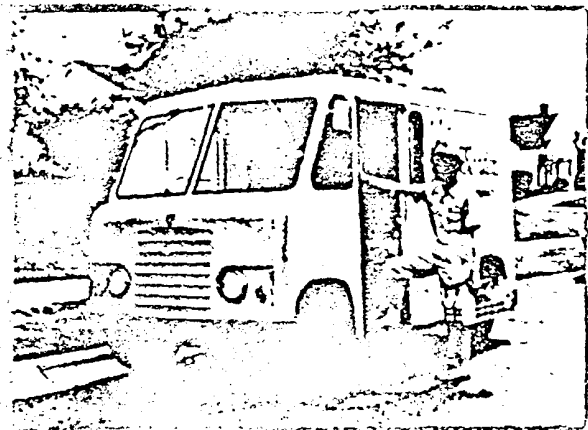
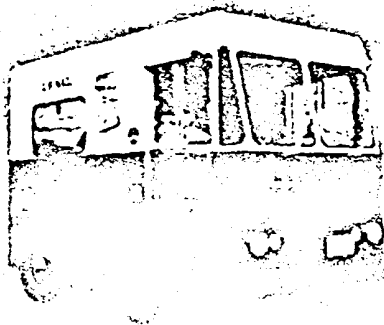
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COVER A 50 MILE DELIVERY ROUTE and make 100 more for less than a school. The Highway Products Hy-Cycle does it every day. With a maximum payload of 800 pounds (65 cu. ft.) it can handle a good many roundups. Every lot of handsome savings. The Post Office trucks do, too, and is testing 39 "Hy-Cycles" of elegant design also built by Highway Products, Inc. of Kent, Ohio.



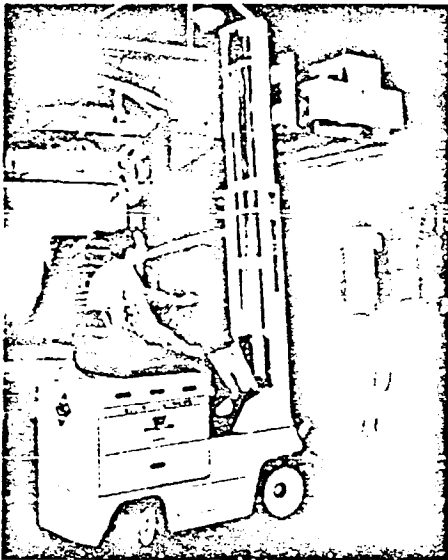
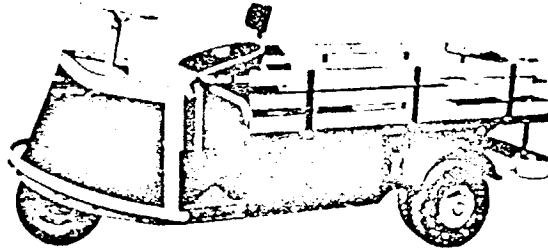
let's look at trucks...



BIG LOADS ARE NO STRAIN on the Chevrolet Model 1934 2-ton truck. It's built to handle the heaviest loads, and it's built to last. It's built to the same standards as the military trucks. It's built to the same standards as the military trucks. It's built to the same standards as the military trucks.

IN THE MAINTENANCE DEPARTMENT, there's no stop for either. The Chevrolet 2-ton truck is built to last. It's built to the same standards as the military trucks. It's built to the same standards as the military trucks. It's built to the same standards as the military trucks.

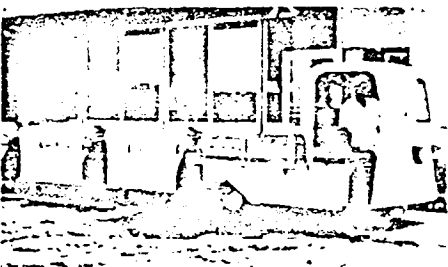
TALK ABOUT A GENERAL PURPOSE TRUCK, this dual rear wheel truck by Labor Spring and Electric Car Corp. hauls up to a ton and is widely used around factories, warehouses, airports, train and bus terminals, refineries, docks, nurseries and farms.



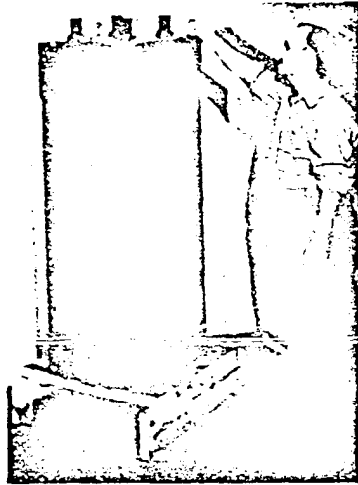
AN ILLUSTRATION of the sort of technical development behind the current resurgence of battery power is this Allis-Chalmers industrial lift truck. A-C had never before built electric trucks, but perfection of an electronic control system has led to this vehicle which cuts power consumption by as much as two-thirds compared with even conventional battery trucks.



BIG ORGANIZATIONS can't live without communication and Equitable Life Assurance Society generates lots of it. This office mail truck by The Automatic Division, Yale & Towne, assures rapid delivery of mail and inter-office paperwork. How else could the job be done so conveniently, speedily, and economically? Battery power and silent operation eliminate all nuisance value from the operation.



CUSHMAN TRUCKSTERS do so many interesting things that no one example does justice to their versatility: plant security police use them, parking lot patrols use them to get in and out of tight places and are so successful in silently sneaking up on wrong doers that mischief and thievery have dropped noticeably, bridge maintenance crews use them to thread through traffic jams . . . the list goes on and on. This chow train delivers hot meals from the central kitchen to cottages of a school for retarded children. Ample power and simple controls let the chef himself make the deliveries without spilling the soup.



Lead-acid batteries power submarines...

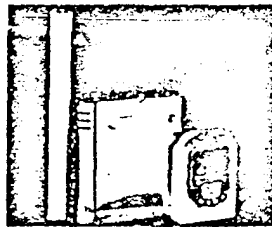
Whether you buy batteries for a pocket radio or specify them as a design engineer you know that there are many, many types. Lead-acid batteries alone range in size from cigaret lighter units to submarine propulsion cells bigger than a man.

Of all these various sizes and kinds of battery, which is best? There is no simple answer to that question. Each particular design situation has its own demands and peculiarities and some one battery system will probably meet them better than any other. The lead-acid system is nearly always a strong contender for any battery power job.

Suppose the question had been "Who is the greatest athlete in the world?" The answer to this would certainly not be the world's heavyweight boxing champion because he could never place at a track meet. A star miler, on the other hand, might last only one or two plays in a college football game. No, the greatest athlete in the world would probably be a decathlon champion—a man who can do a number of things exceedingly well.

If there is a "best type" of battery, the lead-acid storage battery bids strongly for the title. It can "place" in every event of the battery olympic and it carries off the

let's look at lead-acid batteries



... and cigaret lighters.

This combination cigaret lighter and flashlight is powered by the smallest commercially available lead-acid cell. A touch of the slide, and the top opens to show a hot resistance wire touching off the flame on the wick. It's a product of Magna-Lux, Long Island City, New York.

honors in more than a few of the categories. First, it stores a lot of power in a small, and not-too-heavy package. Tests show that a typical automobile battery stores 1.3 watt-hours per cubic inch, 15 per pound. Admittedly, this record is topped by batteries using silver electrodes. They pack two to two-and-a-half times as much power in the same space, five to seven times as much per pound. But they cost 20 to 25 times as much to buy and 45 to 95 times as much to use.

To picture just how much power a lead-acid battery can store, imagine that you had a perfectly efficient hoisting machine designed for battery power. A typical automobile battery—your battery—could hoist itself about 75 miles into the air on the energy it stores at full charge.

But batteries do not always start a job with a full charge. They are sometimes driven beyond their capacity or used at extremes of temperature they were not designed to cope with. How does the lead-acid battery stand up under such abuse? Just beautifully! Granted that you can destroy any battery by abuse if you set your mind to it, lead-acid batteries will take more punishment than any other kind except one, and lead-acid beats it roundly in every other test.

The most telling figures on battery performance are those dealing with cost: cost of buying, cost of using, and the cost of associated equipment. In this decisive area lead-acid batteries are tops. The cost per cycle of charging and discharging an industrial lead-acid battery is only 4.3 cents (12v, 100 amp-hr) while the next best battery comes in at 6.5 cents on the same basis. (These costs include energy and amortization.)

Automotive batteries, operating under conditions far from ideal from a battery standpoint, cost 13 cents per charge-discharge cycle. This is a conservative figure. More graphically, it is roughly equivalent to the cost per start if you only start your car two or three times a day during the life of the battery. Suppose you had to crank your car to start it. Would it be worth 13 cents to have it started for you? That cost applies to those cold mornings when the car is covered with snow, too. And the battery didn't spend the night in a warm bed or have a cup of hot coffee before you got into the car. If 13 cents is too much money for starting the car under these conditions, the battery will throw in lighting, radio, and heater operation, and it may even open and close your windows or adjust your seats.

If you are looking for a power source with no strings attached, get to know the lead-acid battery. He's a tough character, able to stand up to punishment. He's a hard worker with real muscle power. And he gets the job done without fuss or frills, without any special care or equipment, and nearly always for a lower cost than any other battery.

Comparison of common battery systems rated at 100 amp-hr, 12 volts

Type	Average voltage	Number of cells (12v)	Weight lb	Volume cu ft	Charging Time hrs	Energy kwh	Cost \$	Cost ¢/kwh
Lead-acid Industrial	1.9	6	12.1	1.15	5-10 (12v, 100 amp-hr) 10-15 (6v, 200 amp-hr)	1.15	2.00	1.73
Automotive	1.9	6	10.9	1.1	10-15 (12v, 100 amp-hr) 15-20 (6v, 200 amp-hr)	1.15	2.00	1.73
Nickel-cadmium portable	1.2	10	11.0	0.6	10-15 (12v, 100 amp-hr) 15-20 (6v, 200 amp-hr)	1.15	3.00	2.61
Nickel-cadmium stationary	1.2	10	11.1	0.75	10-15 (12v, 100 amp-hr) 15-20 (6v, 200 amp-hr)	1.15	3.00	2.61
Nickel-iron (stationary)	1.2	10	13.1	0.75	10-15 (12v, 100 amp-hr) 15-20 (6v, 200 amp-hr)	1.15	3.00	2.61
Aluminum hydroxide	1.35	5	11.1	0.75	10-15 (12v, 100 amp-hr) 15-20 (6v, 200 amp-hr)	1.15	3.00	2.61
Aluminum hydroxide	1.35	5	11.1	0.75	10-15 (12v, 100 amp-hr) 15-20 (6v, 200 amp-hr)	1.15	3.00	2.61
Aluminum hydroxide	1.35	5	11.1	0.75	10-15 (12v, 100 amp-hr) 15-20 (6v, 200 amp-hr)	1.15	3.00	2.61

manufacturers

BATTERY POWERED VEHICLES

Cleveland Electric Vehicle Company
The Electric Storage Battery Co.
221 Cherry Avenue
Chardon, Ohio

Cushman Motors
Lincoln 1, Nebraska

Electric Marketeer Mfg. Co.
2195 W. Hwy. 99
Redlands, California

Henney Motor Division
National Union Electric Corp.
Center & Buck Street
Canastota, New York

E-Z-Go Car Division
Textron, Inc.
P. O. Box 388
Augusta, Georgia

Highway Products, Inc.
Kent, Ohio

Lahey Spring & Electric Car Corp.
2615 Magnolia St.
Oakland, California

Lektro, Inc.
P. O. Box 813
Astoria, Oregon

Toro Mfg. Corp.
3016 Snelling Avenue
Minneapolis, Minnesota

Victor Comptometer Corp.
Electric Car Division
3900 N. Rockwell Street
Chicago, Illinois

BATTERY POWERED INDUSTRIAL TRUCKS

Allis Chalmers Mfg. Co.
Box 512
Milwaukee 1, Wisconsin

American Pulley Company
Division of Universal American Corp.
4200 Nissahuckon Avenue
Philadelphia, Pennsylvania

Baker Industrial Truck
A Division of Otis Elevator Co.
P.O. Box 5579
Cleveland 1, Ohio

Barrett-Cravens Co.
630 Dundee Road
Northbrook, Illinois

Clark Equipment Company
Industrial Truck Div.
Battle Creek, Michigan

The Colson Corporation
7 South Dearborn Street
Chicago 3, Illinois

Crown Controls Co.
40-44 South Washington St.
New Bremen, Ohio

Economy Engineering Co.
4511 W. Lake Street
Chicago 24, Illinois

The Elwell-Parker Electric Co.
4205 St. Clair Avenue
Cleveland 3, Ohio

Lewis-Shepard Products, Inc.
125 Walnut Street
Watertown 72, Mass.

Lift Trucks, Inc.
2425 Spring Grove Ave.
Cincinnati 14, Ohio

Mercury Manufacturing Co.
4700 W. Division Street
Chicago 51, Illinois

The Voto-Truc Company
12401 Talt Avenue
Cleveland 8, Ohio

The Raymond Corporation
Greene, New York

Revolver Company
North Bergen, New Jersey

Towmotor Corporation
16100 Euclid Avenue
Cleveland 12, Ohio

Automatic, a Division of
The Yale & Towne Mfg. Co.
101 West 87th Street
Chicago 20, Illinois

Yale & Towne Mfg. Co.
Yale Materials Handling Div.
11000 Roosevelt Blvd.
Philadelphia 15, Pa.

INDUSTRIAL BATTERIES

The Electric Storage Battery Company
Exide Industrial Marketing Div.
Rising Sun & Adams Avenue
Philadelphia 20, Pennsylvania

C & D Battery Div.
Electric Autolite Co.
Conshohocken, Pa.

Gould National Batteries, Inc.
E-1201 First National Bank Bldg.
St. Paul 1, Minnesota

K-W Battery Company, Inc.
3555 Howard St.
Skokie, Ill.

BATTERY POWERED TOOLS AND APPLIANCES

The Black & Decker Mfg. Co.
Towson 4, Maryland

Jacobsen Manufacturing Co.
1721 Packard Avenue
Racine, Wisconsin

Little Wonder, Inc.
Div. of Schiller-Pfeiffer, Inc.
1028 Street Road
Southampton, Pennsylvania

Magna Lux Corporation
29-28 41st Avenue
Long Island City 1, New York

Rockwell Manufacturing Co.
Pittsburgh 8, Pennsylvania

Russell-Harrington Cutlery Co.
River Street
Southbridge, Massachusetts

Skil Corporation
5033 Elston Avenue
Chicago 30, Illinois

Sony Corporation of America
514 Broadway
New York 12, New York

Winona Products Corporation
Winona Lake, Indiana

need technical help in choosing a power source?

Lead Industries Association's technical staff will be pleased to offer data or put you in contact with battery suppliers. Send the details of your problem to:

Battery Desk
Lead Industries Association, Inc.
292 Madison Ave.
New York 17, N.Y.