LEAD INDUSTRIES ASSOCIATION, INC.

292 MADISON AVENUE

NEW YORK 17, N. Y.

April 5, 1963

SUBJECT: PROMOTIONAL CAMPAIGN FOR MOTIVE POWER BATTERIES

To Members of the Lead Industries Association, Inc.:

A new advertising and promotional campaign to increase the use of battery power for industrial trucks, personnel carriers, and other vehicles is being launched this year by the L.I.A. The attached folder tells the complete story and we urge that you study it carefully. Many members may well be in a position to benefit from battery power where they are not using it now, and many might be in a position to help us get the message across through distribution of ad reprints and literature to their sales forces, distributors and customers.

The attached folder, with appropriate covering letters, is being sent to executives of electric utility companies, industrial truck manufacturers and industrial battery manufacturers to elicit their cooperation, too, because of their mutual interest in this market. In addition the Industrial Truck Association gave us the opportunity of presenting the program in person to their members at a recent meeting of that group. The Edison Electric Institute has tentatively indicated that they will give us a similar opportunity at an early date.

We believe that, with the cooperation of all interested parties including our own membership, this campaign can be a means toward considerably larger consumption of lead in the form of metal and oxides as used in storage batteries.

Won't you help and let us hear from you?

Very truly yours,

R. L. Zimmerman

Executive Vice President

RLZ:mk
Enc.

Look Ahead with Lead

LEAD INDUSTRIES ASSOCIATION, INC.
292 MADISON AVENUE
NEW YORK 17, N.Y.

CAMPAIGN FOR MOTIVE POWER BATTERIES

The purpose of this campaign, to be launched in April, 1963, is to increase the use of storage batteries as a source of electric power for industrial trucks, personnel carriers, other vehicles, appliances, tools and other equipment. While the funds for this program are being supplied by lead producers with the expectation of increasing the use of lead in storage batteries, it is hoped that cooperation in reaching the right people can be obtained from industries with a mutual interest such as electric utility companies, manufacturers of electric vehicles and equipment, and manufacturers of storage batteries. Here is the program and what you can do to help.

ADVERTISING

A space advertising program designed to convince top and middle management, operating and supervisory personnel, and material handling engineers - all those who have a voice in deciding on the type of equipment their company will employ - has been prepared. The schedule follows:

Magazine	Number and Size of Insertions	Circulation
Business Week	7 2/3 pages bleed	401,794
Factory	6 pages bleed	71,539
Material Handling Engineering	6 pages bleed	48,972

These ads will appear on the following dates:

Business Week	Apr. 20, May 11, June 15, Sept. 14 & 28, Oct. 12 & 26.
Factory	Apr., May, June, Aug., Sept., Oct.
Material Handling Engineering	Apr., May, June, Sept., Oct., Nov.

Preprints of the ads are enclosed and each will appear twice during the year in each publication.

Look Ahead with Lead

DIRECT MAIL

Two 12-page brochures have been prepared to be used in answer to advertising requests and to be circulated to prospects through direct mailings. You may already be acquainted with the first of these - "Industrial Trucks, What They Cost to Own, to Operate, to Maintain." This was published about two years ago and has met with phenomenal success. Through this Association and the cooperation of truck and battery manufacturers and utility companies about 100,000 copies have already been distributed. The second brochure is just off the press and tells of the variety of ways in which batteries may be used to supply motive and portable power. It is called "Power with No Strings Attached." It is intended to create interest among design engineers in the possibilities of electric power as well as among users of electric equipment. It will be offered through some of the foregoing advertising as well as in some of our ads in the design magazines and by direct mailings.

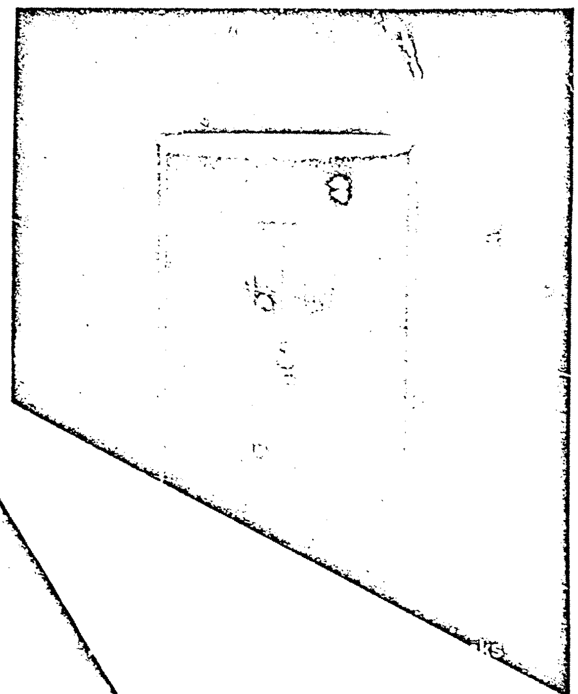
HOW YOU CAN HELP

We believe this campaign can be of greatest benefit to all concerned if utilities, truck and battery manufacturers help us get the most effective distribution of our message. Preprints of the ads and copies of the literature, with an explanation of the program, should be put in the hands of all your sales force and distributors and they should be encouraged to put these in the hands of prospects for this kind of power. You can make mailings of the ads and brochures to your own lists of people who would be interested. We are absorbing all the advertising cost and cost of preparation and initial printing of the brochures as well as giving wide distribution of this material ourselves. We can offer you this material for further effective distribution of your own at the following nominal prices:

Preprints of each ad	$ 3.00 per hundred
Industrial Truck brochure	7.00 per hundred
Power with No Strings Attached	10.00 per hundred

You can also keep us informed of new and interesting developments in battery power, cost studies, applications and other information that will be useful in the preparation of future advertising, brochures and publicity.

This advertisement is appearing in: Business Week—April 20 and September 14, 1963



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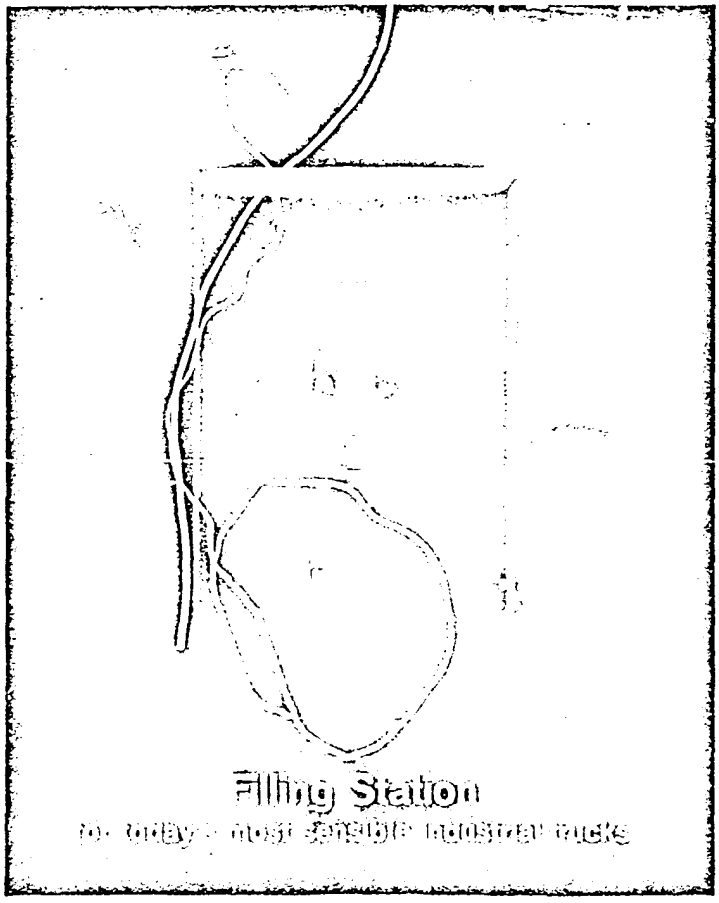
This advertisement is appearing in: Business Week – April 20 and September 14, 1963



Filling Station

for today's most sensible industrial trucks

When it comes to industrial trucks, "sensible" means *electric* for a battery of reasons. Electric trucks are much cheaper to run than combustion-engine trucks. No gas. No oil. No spark plugs. No a lot of things – all expensive. In dollars and cents, you can save an average of $1000 per truck every year by going electric.

Electric trucks are also safer. There are no combustibles to store or handle. And *they do not give off noise or heat.*

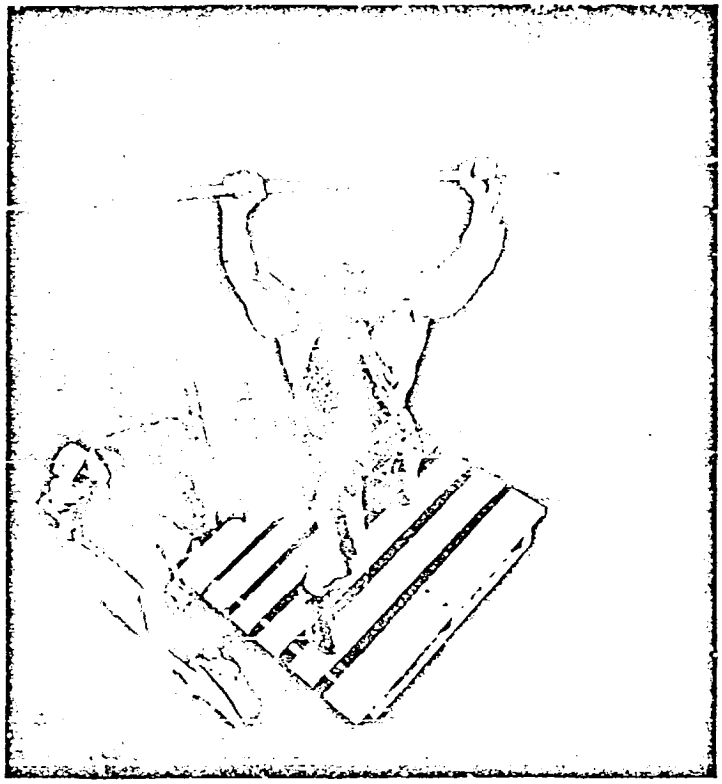
Another thing that will never fail to put an electric out in front of a similarly rated gas model is a drag race – electrics are faster on typical in-plant runs.

Speed, safety, economy – all factors which must be considered when making a buy decision on industrial trucks – point to electrics hands down. If your plant has wall sockets, you're half way there. Lead Industries Association, Inc., Dept. P-2, 292 Madison Ave., New York 17, N. Y.

Get all the facts, write for informative Industrial Truck Cost Calculator.

Look Ahead with Lead

This advertisement is appearing in Business Week - May 11



What's your lowest-cost weightlifter?

Samson here uses steaks for fuel. Very expensive. The battery powered truck is another story: high energy output at minimal cost. Electric trucks and personnel carriers, as compared with gasoline vehicles, offer savings of 25% in fuel alone.

Operational expenses are lower, too. Overall statistics prove average savings of approximately $1000 yearly per truck, compared to gas-powered trucks. There's far less maintenance. Electric trucks have hundreds fewer moving parts. Their service life averages twice as long, too.

Add these advantages for modern battery power: no combustible fuels to store or handle, cleaner and quieter operation. Electric trucks are also faster on typical in-plant runs, are easier to operate (no clutching, no shifting). Their ability to work in narrow aisle space means more plant area can be devoted to production or storage. Lead Industries Association, Inc., Dept. P-5, 292 Madison Avenue, New York 17, N. Y.

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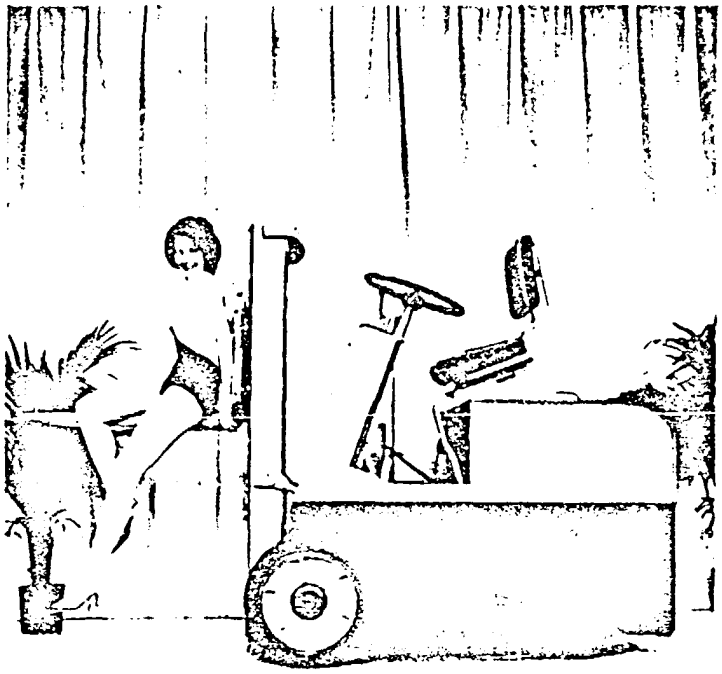
Get all the facts, write for informative Industrial Truck Cost Calculator.

Look Ahead with Lead

This advertisement is appearing in: Business Week September 28 and October 26, 1963



Seen the new industrial trucks for 1978?

The trucks you can still be using half a generation from today can be bought right now from your dealer . . . assuming that he sells *electric* trucks. In services that kill off other trucks in 7 to 8 years, electrics have kept going 15 years and longer.

You'd expect to pay more for twice-as-durable trucks, and you do. But overall electrics cost you less. *Far less* for maintenance . . . because there are hundreds fewer moving parts. *Far less* for fuel . . . because your electric outlet delivers about four times more energy per dollar than gasoline. And while gas costs have been rising 80%, utility rates have remained steady.

You'll save on insurance, too. There are no combustible fuels to store or handle. Electrics are safer and cleaner too.

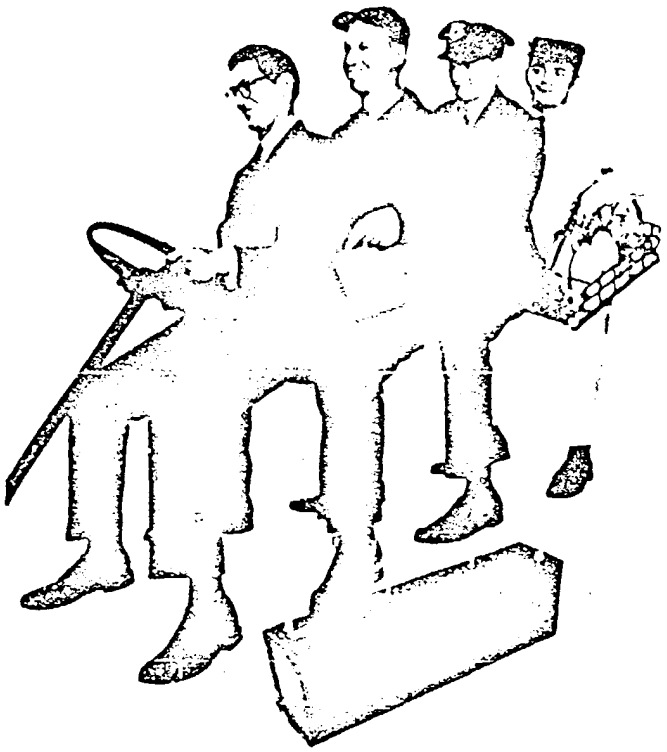
Statistics show all these savings can average $1000 yearly on every truck you use.

And don't forget: electric trucks are *faster* on typical in-plant runs than gasoline trucks of same rating. Quieter, too. Easier to operate indoors or out, on flat or grade. Lead Industries Association, Inc., Dept. P-9A, 292 Madison Avenue, New York 17, New York.

Look Ahead with Lead

When all the facts are in, you can't rule electrics out. Get all the facts today, write for informative Industrial Truck Cost Calculator.

This advertisement is appearing in: Business Week - June 15 and October 12, 1963



How to Add Mileage to Manpower

Putting a nation on wheels brought about an American economic revolution. Now on the industrial scene, versatile personnel carriers are cutting wasteful in-transit time and moving the men behind the machines to higher productive output. Plant guards silently cover their rounds in battery powered vehicles. Maintenance men and trouble shooters quickly move their repair gear from one plant area to another. And at significantly reduced cost. One major chemical producer with a fleet of three battery powered maintenance carts estimated savings of 375 hours of travel per year, or yearly savings "approximately equal to the purchase cost of the vehicles." And plant tours—whether for executive inspections or visiting dignitaries—run with unwonted smoothness in these comfortable carriers.

Giving wheels to your people is a step not to be neglected in plant automation. Choose from the various models of economical, battery powered carriers the one ideally adapted to your need. A good way to find out more about them is to write to Lead Industries Association, Inc., Dept. P 6, 292 Madison Avenue, New York 17, New York.

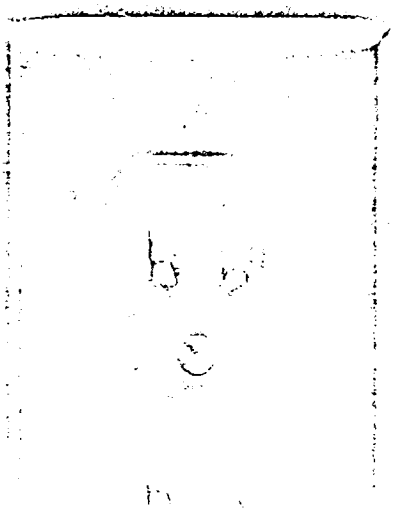
Battery powered industrial trucks and personnel carriers can help you run your plant better. "Power With No Strings," a new bulletin on this subject, is yours for the asking.

POWER

LEAD

Look Ahead with Lead

LIA23691



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Speed, safety, economy—all factors which must be considered when making a buy decision on industrial trucks—point to electrics hands down. If your plant has wall sockets, you're half way there. Lead Industries Association, Inc. Department G-4, 292 Madison Avenue, New York 17, New York.

Get all the facts, write for informative Industrial Truck Cost Calculator.

Lead Ahead with Lead

This advertisement is appearing in:
Factory—April and August, 1963
Material Handling Engineering—April and September, 1963

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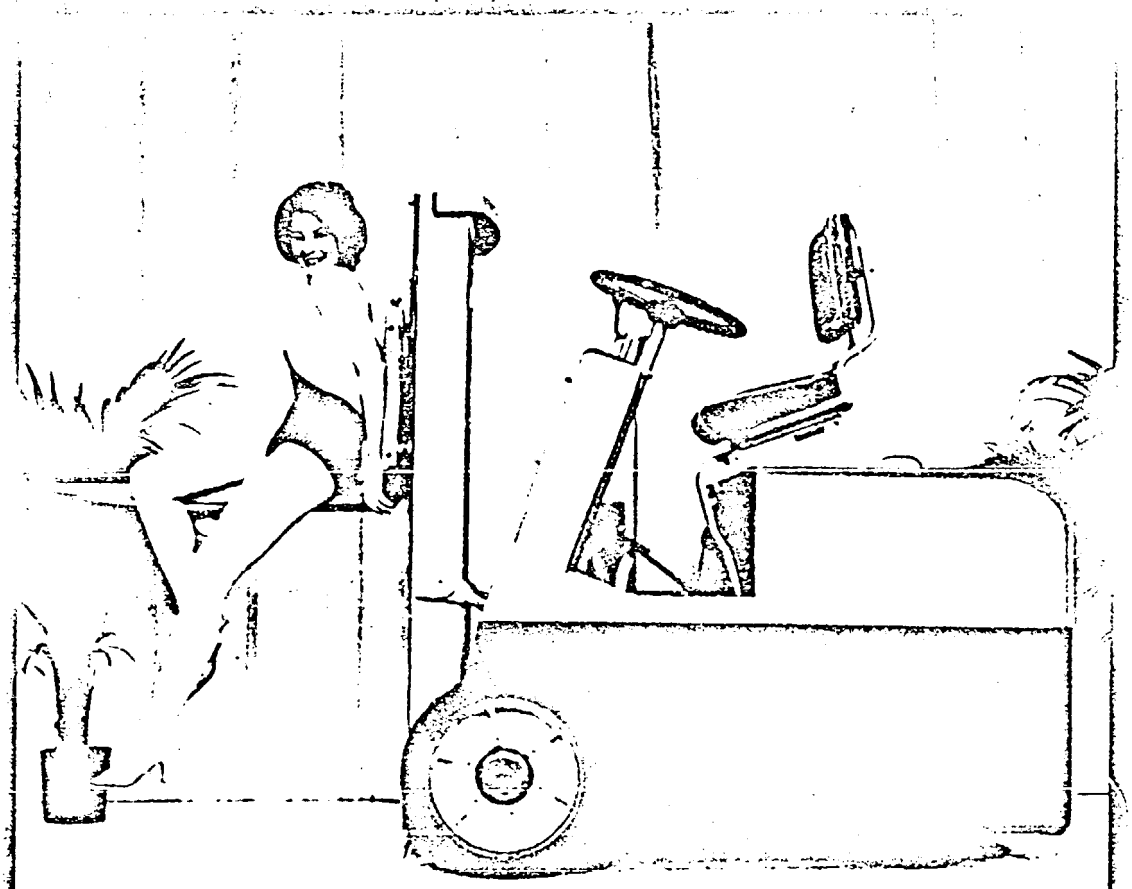

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You'd expect to pay more for twice-as durable trucks, and you do. But over all electrics cost you less. *Far less* for maintenance . . . because there are hundreds fewer moving parts. *Far less* for fuel . . . because your electric outlet delivers about four times more energy per dollar than gasoline. And while gas costs have been rising 8%, utility rates have remained steady.

You'll save on insurance, too. There are no combustible fuels to store or handle. Electrics are safer and cleaner for Statistics show all these savings can average $1000 yearly on every truck you use.

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Lead Ahead with Lead

When all the facts are in, you can't rule electrics out. Get all the facts today, write for informative Industrial Truck Cost Calculator.

This advertisement is appearing in
Factory – May and September, 1963
Material Handling Engineering – May and October, 1963

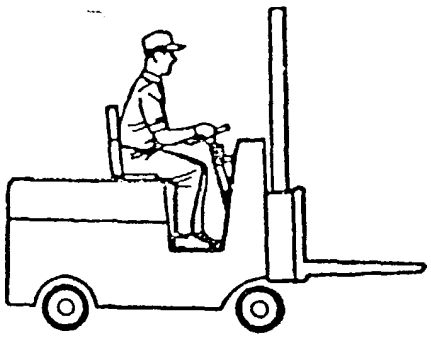
INDUSTRIAL TRUCKS:

What do they cost

—to own?

—to operate?

—to maintain?



With the aid of the handy calculator charts in these pages you can get the complete answers to these questions . . . accurately, and in a jiffy . . . these charts do the paper work that could mean substantial money savings in your operation.

LEAD INDUSTRIES ASSOCIATION
292 MADISON AVENUE, NEW YORK 17, NEW YORK

LOOK AHEAD with LEAD

A Cost Calculator

Studies of industrial methods have shown what a tremendous contribution to productivity industrial trucks can make. In many industries, a return to manual handling operations could erase the whole profit margin. And perhaps it is because these trucks are so profitable that their own economics are, to some extent, ignored.

Yet there are great differences in the cost of owning and operating trucks of the two main classes — battery powered and gasoline powered. In the calculator charts in this bulletin and the example shown, a battery powered truck is seen to cost less than 2/3 as much as a gasoline truck when all the factors are considered.

But the real purpose of the charts is not to prove a hypothetical example. They are designed to let you arrive at your own cost factors quickly and without any great burden of computation. If your operation is typical of the hundreds surveyed in the study[1] on which this method is based, you have only to locate nine points in the charts on the following pages to learn what your total cost picture is for gas or electric trucks.

If the potential savings of using battery power seem too good to be true, consider some of the changes of the past few years and how they have affected the cost of owning and operating industrial trucks. Obviously the cost of gasoline and lube oil have been rising while the cost of electric power has declined. This, of course, favors battery power. Surprisingly, though, the cost of the energy as it is used at the wheels and forks of the truck amounts to only about one fifth of the total cost for a gasoline powered truck and about one third of the total cost for a battery powered truck. While the changing cost of fuel or power is significant, the more important change has elsewhere.

Studying the cost trend chart (Figure 1) it can be seen that the most rapid of the changing factors has been the cost of labor. Since both gas and electric trucks need drivers of comparable skill there is no advantage or disadvantage for either in the changing labor rate on that point. But when it is realized that the largest single item of expense for either type of truck is maintenance, the effect of labor becomes apparent.

For gasoline trucks, the cost of maintenance today is higher than the sum of all other costs they incur in general, two thirds of the cost of owning and operating a gasoline powered truck is chargeable to maintenance. The greater part of this expense is in skilled labor where the trend is to advancing wages.

While the largest single item of expense in owning and operating an electric truck is also maintenance, it is far less (about one half the total cost, as opposed to two-thirds for gas trucks) since the number of moving and wearing parts in an electric truck is reduced to a minimum. In terms of actual dollars per year, the cost of maintaining an electric truck averages about 40 per cent of the cost of maintaining a comparable gasoline truck.

And there are still other factors to consider in comparing overall costs. Accessory equipment is needed with both types of truck, for example. But where standard tools, facilities, and the cost of repairs have risen, the cost of battery chargers, as a specific example, has fallen drastically over the past few years.

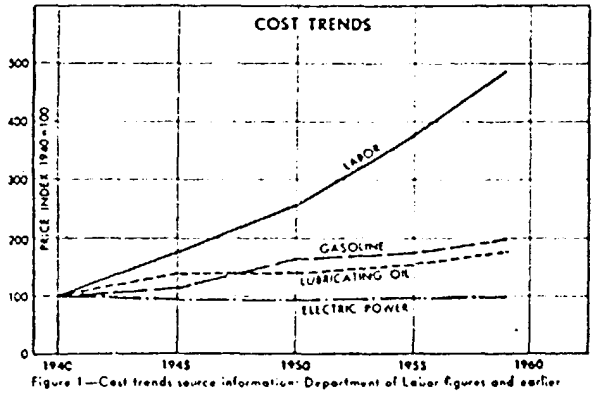


Figure 1—Cost trends source information: Department of Labor figures and earlier published information from several other federal agencies.

Batteries, Too, Have Changed

Just as there has been an enormous change in the economics of battery and gasoline-powered industrial vehicles, there has been a change in batteries themselves. Purchasing decisions based on battery performance of ten or even five years ago leads to costly errors.

In the first place, today's heavy-duty industrial battery is not even made in the same way that lead-acid batteries were made a decade ago. In place of simple lead grids with lead oxide paste deposited in them, today's battery makes use of glass fibers and tough plastic internal retaining walls. In some designs the battery is made up of hundreds of individual small tubes which cannot be jarred loose, or bent or broken. And at the same time much of the space formerly needed for separators is saved.

The second outstanding advantage of today's lead-acid battery stems from the space-saving design

[1] "Industrial Truck Costs," Exide Industrial Division The Electric Storage Battery Co. Philadelphia 20 Pa

for Industrial Trucks

mentioned above. In its more compact form, the modern battery can deliver more ampere-hours per cubic inch — or alternately, pack a given ampere hour capacity into a much smaller space than its ancestor of a decade ago. For two batteries of the same size, the one of new design delivers up to 45 per cent more ampere hours of work than the old. And, of course, for the same capacity, the new design is less costly (Fig. 2).

Service records for the new batteries show that they are far exceeding the older design in ruggedness. A greatly increased life is expected.

There is, too, another important factor which is stretching battery life for industrial users. A number of postwar technical developments have made the automatic battery charger as inexpensive as the old equipment had been.

Operating unattended, the automatic chargers in use today feed power to the battery at optimum rates, detecting the exact needs of the battery and tailoring the charge pattern to match them. They have taken the art out of battery charging . . . and with it the guess- and the hunch- and the cell-o-break. For it is a fact that charging technique is one of the most important factors in the life of lead acid batteries. Indeed, other basic battery systems have largely staked their case on their ability to withstand charging abuse and now they have lost this major point of contention.

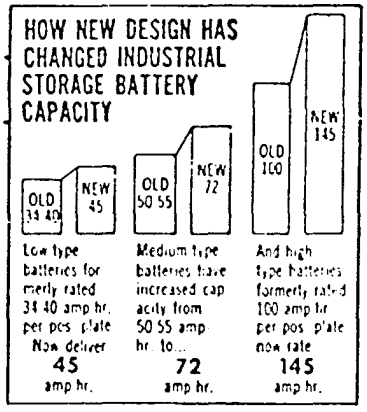


Figure 2

YES, BUT . . .

Like politics and baseball the question of which type of industrial truck to use is rarely subject to the sole test of logic. Hence we are all prone to ignore some of the figures or facts, lean on personal experience and say, "Yes, but . . ."

Here are some of the "yes buts" of the industrial truck question together with what may be a new insight:

"Yes, but gasoline-powered trucks are faster!" As your insurance company can tell you, this is almost invariably true. The internal combustion engine is characteristically able to develop high speed on the straightaway and tests by a manufacturer of both types of truck have shown that when the point to point travel is greater than 800 feet, a gasoline truck will generally get there before an electric.

If your problem is loading and unloading trucks, stacking pallets, etc., you may be interested to know that the same study shows the electric truck to be faster at this sort of work. There is a basically simple reason for this: Just as the internal combustion engine balks at low speeds, shows gear shifts and automatic transmissions and develops maximum power at high speeds, the series starting DC motor used in electric trucks develops its maximum torque at low speeds. (Fig. 3)

This is why an electric truck uses such a small and comparatively simple mechanism and why it wins the work race even though it loses on a race track.

"Yes, but electric trucks cost more than gasoline trucks!" Based on selling price, this is absolutely true. It is also true that an electric truck has at least twice the life expectancy of a gasoline powered truck and may last three or more times as long. No matter how you amortize an electric truck, its long life pays for the difference in first cost.

"Yes, but even though the truck may last twenty years, the batteries have to be replaced." Actually the life expectancy of a correctly rated set of batteries cycled once a day is several years greater than that of a

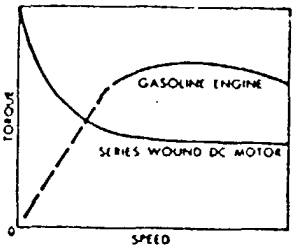


Figure 3—Comparison of characteristics of the internal combustion engine with a DC series motor used in electric trucks. Note the low speed characteristics particularly.

gasoline powered truck.

In order to avoid guesswork in the calculations in this bulletin, the method now used by many truck users has been followed: the batteries are rented, thus being a predictable expense. Normally, this expense can be reduced, of course, by purchasing the battery. Therefore, in our calculations, electric trucks have been deliberately penalized by the difference between battery rent and actual battery cost if purchased. The same was done with battery chargers.

One final word on battery replacement: In the past twenty years, while inflation has forced other industrial prices to double, batteries have risen about 20 per cent in cost . . . and about 50 per cent in life expectancy!

"Yes, but recharging batteries is expensive and troublesome." Electrical power is not expensive and has not increased in price in the inflationary movement generally. Battery chargers are not expensive — even the last fully automatic types cost only about $600. But to prove that point, electric trucks are penalized (see above) by renting rather than purchasing chargers in the calculator charts. Finally, the "trouble" of recharging batteries consists of disconnecting the running plug, inserting the charging plug, and starting the charger. Elapsed time, 30 seconds. When the discharged battery is hoisted out and replaced by a fresh one, changeover time is about two minutes.

HOW TO CALCULATE THE COST OF OWNING AND OPERATING INDUSTRIAL TRUCKS

On this and following pages are calculator charts permitting an accurate and extremely rapid comparison of costs between gasoline-powered and electric industrial trucks. The three charts, or nomographs, perform the complex calculations involved in finding:

The Cost of Owning a Truck

The chart to calculate depreciation of industrial trucks (opposite) takes into account the initial purchase price of the truck and its useful life. If these two factors are known and points corresponding to them on the left and center scales of the chart are connected by a straight line, that line will cross the right-hand scale at a point corresponding to the cost per year. The calculation is a simple division of first cost or apportioning of it over the useful years of truck life. This calculation does not take into account taxes, interest, sinking fund or any of the other common methods of amortization. It represents only the *cost of owning* the truck.

Where plant experience permits, it is best to use the actual life of trucks that have been tried. If this information is not available, use the indicated points on the center scale. These have been established by a survey of typical industrial operations which verify that an electric truck lasts at least twice as long as a gasoline-powered truck of the same rating.

If actual prices of the trucks you use are known, start with them on the scale at the left. If they are not known, Table I gives price ranges and averages of industrial trucks from truck manufacturers' price lists of January, 1959. Note that these are standard trucks (special attachments not included) and that the electric truck prices do not include the cost of the batteries.

TABLE I

PRICES OF STANDARD INDUSTRIAL TRUCKS — JANUARY, 1959

Truck Rating	Gasoline-powered			Electric		
	Minimum	Maximum	Average	Minimum	Maximum	Average
lb.	$	$	$	$	$	$
2000	3850	4400	4100	5050	6000	5550
3000	4630	5700	5100	6400	7200	6800
4000	5200	6100	5700	7000	7750	7350
5000	5900	6700	6300	7600	8300	7950
6000	6200	7350	6900	8250	8950	8600

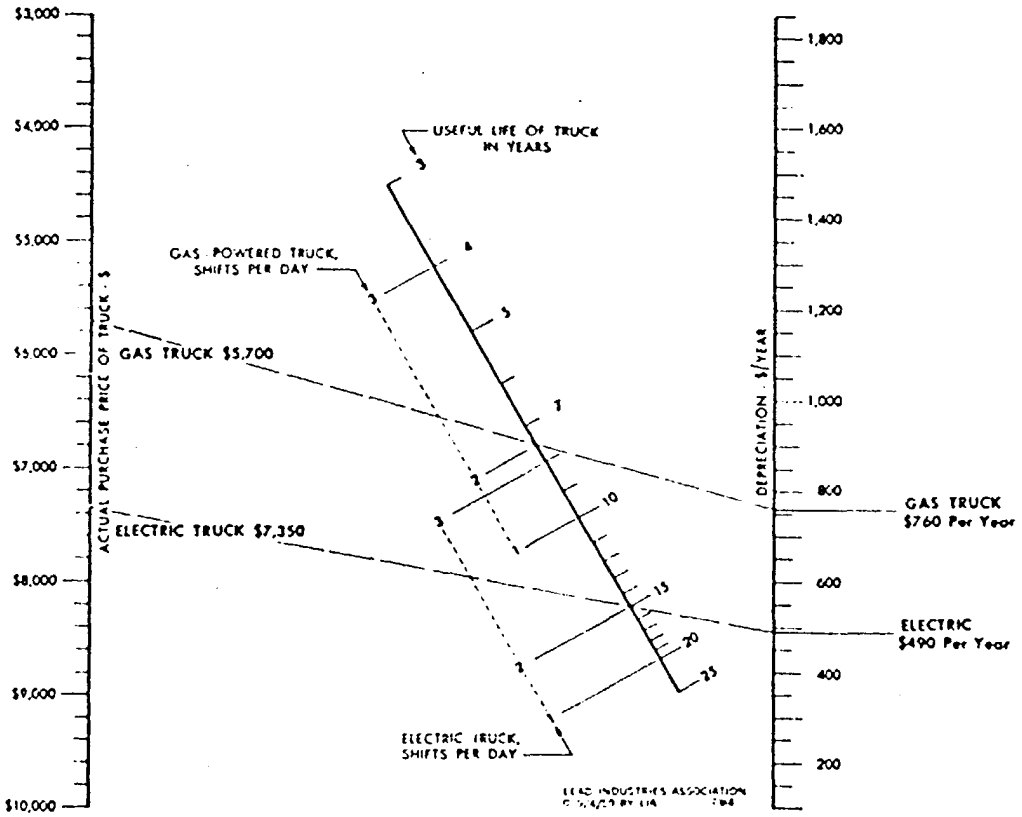
How to Find YOUR Depreciation Cost

A Typical Example

Suppose that an industrial operation working a two-shift day required a new truck rated at 4000 pounds. From Table I, the average price of a 4000-pound gasoline-powered truck is $5700, that of a 4000 pound electric is $7350.

Find $5700, the price of the gas truck, on the scale at left and place a straightedge through this point so that it falls at "Gas powered truck, 2 shifts per day" on the center scale. As indicated, its life expectancy is 7½ years. Note that the straightedge crosses the righthand scale at $760 per year.

In the same way, connecting $7350 with "Electric truck, 2 shifts per day" (note that life expectancy is taken as 15 years though it may well be far higher) leads to an annual cost of $490.



COST TO OWN A GAS TRUCK

$760 per year

COST TO OWN AN ELECTRIC TRUCK

$490 per year

The Cost of Operating a Truck

One significant factor is omitted in this calculation of operating costs; the hourly wage rate of the driver plus fringe benefits and overhead. Since, in any plant, the same personnel would drive electric or gas trucks, this cost is not subject to comparison. In studies of total cost, however, it should be added to the final results.

Operating costs for gasoline-powered trucks are defined as the cost of gasoline consumed and cost of oil consumed. (Oil changes are covered under maintenance.) Gasoline is charged at 27.6¢ per gallon, the accepted average industrial bulk cost, and oil is charged at 19.0¢ per quart. Oil and gas consumption figures are given in Table II. These are average figures obtained by surveys of industrial users.

Operating costs for electric trucks include the cost of furnishing batteries, battery charging equipment, and the cost of electric power consumed. Since both batteries and a charger are capital equipment, their cost per hour of operation is a function of their life. In order to eliminate any guesswork, the nomograph for operating costs is therefore based on rented batteries and chargers. The cost of renting these is significantly higher than the cost of owning them, thus indicating the most unfavorable cost performance for electric trucks. The actual rent figures are based on available leasing plans for batteries and chargers of the ratings recommended for the truck size in question. AC power is charged at the commonly accepted industrial average of 1.5¢ per kilowatt-hour.

Because the costs for the batteries and charger are based on a fixed monthly rent, the cost of using them becomes less as they are used more in any month. It is therefore necessary to set some basis of use. The operating cost nomograph is based on a plant operation of five days each week with six annual holidays.

Since it is easier to establish the cost of operating a gas truck, we enter the nomograph with this cost. If the figure is available for your operations and is based solely on gas and oil consumption, use it. If the figure is not available, an average cost figure, can be taken from the last column of Table II.

Locate this figure on the left scale, cost per hour to operate a gas truck, and lay a straightedge through that point so that it passes through the appropriate point in the center of the nomograph.

Note that the nomograph accommodates normal* one and two-shift operations. It also handles three shift operations where three separate sets of batteries are used, where two sets and spares (figured here as $2\frac{1}{2}$ sets), or two sets and no spares are used.

A straight line through the cost of operating a gas truck and the proper number of shifts will locate a point on the right scale corresponding to the cost of operating an electric truck of the same rating in the same service.

*One set of batteries per shift.

TABLE II

OPERATING COSTS OF GASOLINE-POWERED INDUSTRIAL TRUCKS

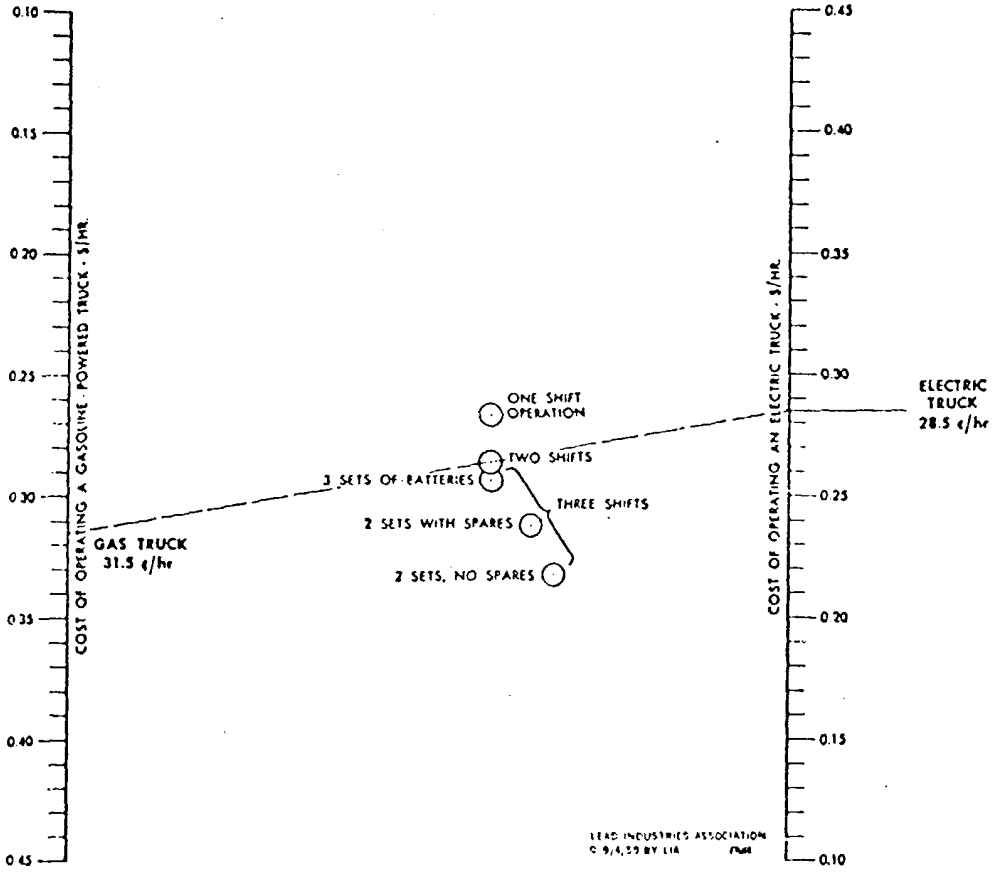
(Gasoline @ 27.6¢/gal, oil @ 19.0¢/qt)

Truck Rating	Average Gasoline Consumption		Average Oil Consumption		Operating Cost
lb.	gal./hr.	$/hr.	qt./hr.	$/hr.	$/hr.
2000	0.63	0.174	0.076	0.014	0.188
3000	0.85	0.234	0.096	0.018	0.252
4000	1.07	0.296	0.100	0.019	0.315
5000	1.20	0.332	0.117	0.022	0.354
6000	1.45	0.400	0.120	0.023	0.423

How to Find YOUR Operating Cost

A Typical Example

In the operation considered in the first example (cost of owning a truck) a 1000 pound truck was used for two shifts a day. If a gas truck were used under normal conditions, the cost per hour to operate it (from Table II) would be $0.315 per hour or 31.5¢ hour. Find this point on the left scale of the nomograph. Lay a straightedge through this point so that it falls on the center point "two shifts." The straightedge will cross the right scale at 0.285 $ hour of operation.



COST TO *OPERATE* A GAS TRUCK
0.315 $/hour

COST TO *OPERATE* AN ELECTRIC TRUCK
0.235 $/hour

And, in a year of operation,

8 hours/shift × 2 shifts/day × 255* days/year = 4080 hours/year

0.315 $/hour × 4080 hours/year = **$1285 per year**

0.285 $/hour × 4080 hours/year = **$1163 per year**

*For a five-day week, no overtime, holidays

The Costs of Maintaining a Truck

The cost of maintenance found by the third nomograph includes oil changes, replacement parts, the labor costs involved in diagnosing troubles and installing replacement parts, and the costs of charging batteries and maintaining them and their charger.

Both the hours of maintenance and the value of replacement parts attributable to an hour of operation are known for both gasoline-powered and electric trucks. These have been taken from the maintenance records of hundreds of industrial truck users. The values used as the basis of this calculator are average values reported in Table III.

The nomograph is quite simple to use. A known maintenance labor rate plus fringe benefits and overhead on the left scale aligned with the proper point in the center will indicate the *maintenance cost per hour of operation*. If the hourly rate for maintenance labor plus its overhead and fringe benefits is not known, it is common practice to double the hourly rate to allow for these.

Table III

MAINTENANCE TIME AND VALUE OF REPLACEMENT PARTS PER HOUR OF OPERATION

Maintenance Time hours/hour of operation			Parts $/hour of operation		
Minimum	Maximum	Average (Mean)	Minimum	Maximum	Average (Mean)
All Gasoline-powered Trucks:					
0.080	0.190	0.135	0.150	0.340	0.240
All Electric Trucks:					
0.020	0.081	0.055	0.050	0.130	0.090

How to find YOUR Maintenance Costs

A Typical Example

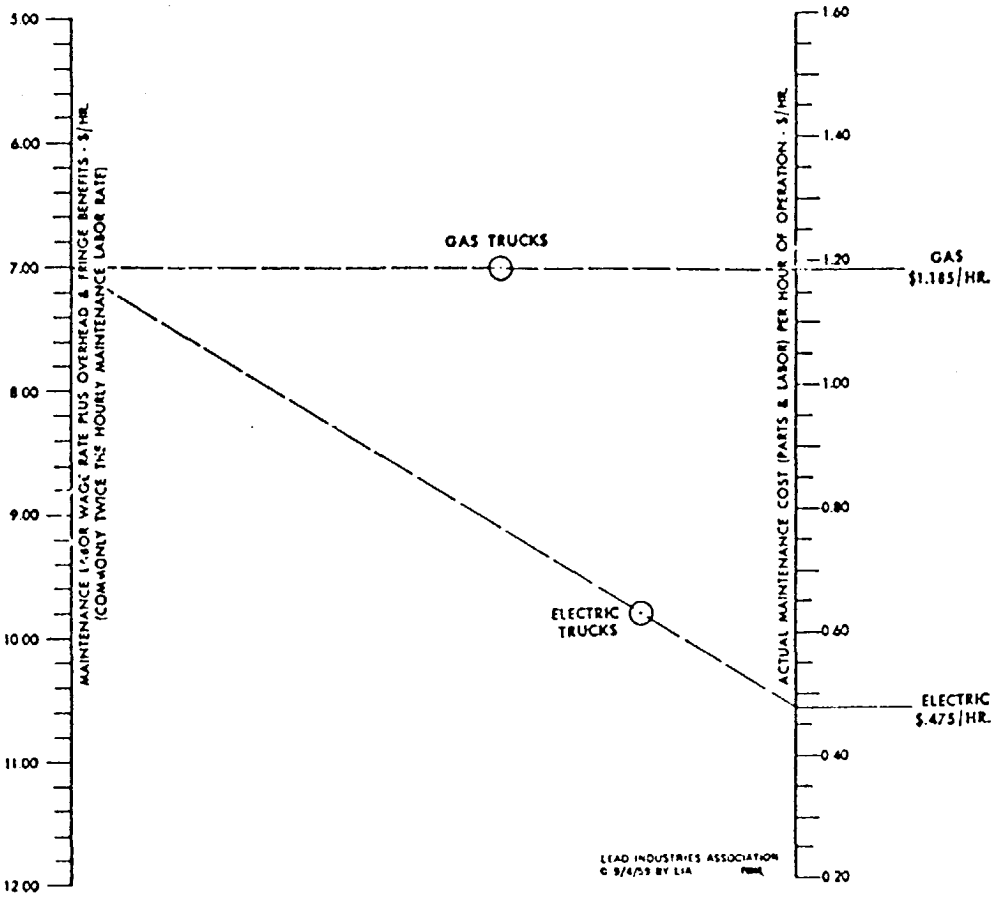
Continuing with the operation of the two earlier examples, suppose that the hourly wage rate for the mechanics at the plant in question is $3.50 per hour. Since the overhead and fringe benefit costs are not known, the wage rate is doubled and used to enter the left scale of the nomograph at $7.00 per hour. Aligning this with the proper points for gas and electric trucks, we find intersects with the righthand scale at $1.18½ per hour of operation for gas trucks and $0.47½ per hour of operation for electric trucks.

COST TO *MAINTAIN* A GAS TRUCK	COST TO *MAINTAIN* AN ELECTRIC TRUCK
$1.185 per hour of operation	$.475 per hour of operation

and for the same five-day week, 6 annual holiday year,

8 hours/shift × 2 shifts/day × 255 days/year = 4080 hours per year

1.185 $/hour × 4080 hours/year	.475 $/hour × 4080 hours/year
$4835 per year	$1938 per year



SO, TOTALING UP —

	Typical Example		YOUR PLANT	
	Gas	Electric	Gas	Electric
Cost to own, $/year	760	490	____	____
Cost to operate, $/year	1285	1163	____	____
Cost to maintain, $/year	4835	1938	____	____
TOTAL, $/year	6880	3591		
	3591			
SAVING, $/year	3289 in favor of electric truck			

WHAT OTHERS HAVE FOUND

While the cost comparison method described in this bulletin will let you estimate costs for gas or electric trucks in your operation, it is based on averages of costs and, tacitly, on average working conditions. What about the special working conditions and problems of your operation? How do they alter the cost picture?

If your particular operation involves one of the specific problems described in the following case histories, you may be interested in what these truck users have found.

CASE II — SAN FRANCISCO WAREHOUSE COMPANY

Operation: General warehousing of palletized grocery products.

Significant job factors: Typical of many palletized operations.

Description: In 1948 at the beginning of a study made by San Francisco Warehouse Company six electric and five gas trucks were operating in two warehouses. Operations encompassed receiving of palletized grocery products, stacking, making up shipments and loading delivery trucks. The study ran from 1948 to 1952.

Results: In the five years covered by the survey, the company found direct annual maintenance and repair costs to average $322.30 for gas trucks, $60.75 for electrics. Vice-president Lloyd Swayne, Jr. believes that these figures are still valid today. On the basis of the study, the company has turned to an increasing portion of electric trucks in its fleet. Today it uses 13 electric trucks, eight gas trucks, and one gas-electric truck. Mr. Swayne explains that "the low repair cost of battery powered trucks and their ability to keep operating without downtime are the reasons why we have been converting from gasoline to electric during the past ten years."

CASE IV — AUTOMOTIVE PLANTS

Operation: Varied—handling everything from heavy castings to containers of small parts and fasteners.

Significant job factors: Round-the-clock operation and the consequent need for reliability; large fleets; close cost control.

Description: Specific details of plant operation have not been divulged but it is known that cost studies have been made at Oldsmobile and Ford.

Results: As reported in *Iron Age**, "Oldsmobile Div. in the last few years has bought almost 400 electric units after a thorough, long term cost study. This started a trend at Fisher body. Sixty electrics were included early this year in plant expansions and equipment replacements. "Ford Motor has also bought about 150 electric trucks after finding a 4 to 1 ratio on maintenance costs."

*"Industrial Trucks. Price vs Upkeep," Dec. 20, 1956

CASE I — THE BOSTON AND MAINE RAILROAD

Operation: Baggage and mail handling at a railroad terminal.

Significant job factors: Heavy loads, fairly long runs including numerous ramps with grades up to 10 per cent.

Description: Previously, 34 gas tractors were used round the clock to load and unload baggage and mail. Though there were minor problems such as extreme heat for the drivers during the summer, gas fumes, and occasional fires, the change to electric trucks was spurred by a cold December morning on which 16 of the trucks would not start.
The 34 gas trucks were replaced by 24 battery powered trucks.

Results: At the end of a year of operations, the Boston and Maine was able to show a reduction of 50 per cent in fuel-power costs, 75 per cent in maintenance part costs, and 60 per cent in maintenance labor. Net out-of-pocket savings for that one year were $32,700.

CASE III — INDUSTRIAL MACHINERY MANUFACTURER

Operation: General handling in heavy machine manufacturing. Three trucks are used to receive, transfer between operations, load for shipping. Loads range from 1500 lb. parts to 6-7 lb. parts palletized.

Significant job factors: Typical of many plant operations where few trucks are involved.

Description: Switch from gasoline-powered to electric trucks was made in 1955. The three trucks are somewhat specialized: one is a high-lift model, one is specifically designed for loading over-the-road trucks, one is a general-duty lift truck.

Results: Management reports that *exclusive of major overhauls* the average monthly maintenance of the trucks has been reduced $26.28. After almost five years of service, the original batteries are still in service. Furthermore, though fumes and noise were accepted as normal with gasoline trucks, they are now noticed by their absence.

CASE V — A PAINT AND VARNISH PLANT

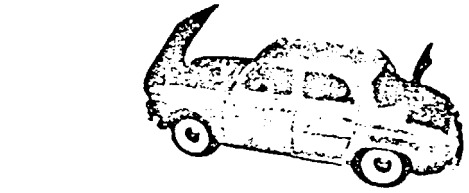
Operation: In-plant handling of paint raw materials, finished products.

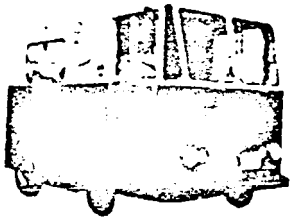
Significant job factors: General industrial use; fire and safety factors are important to management.

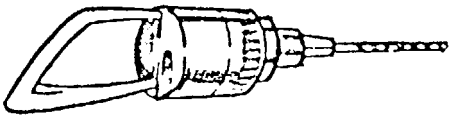
Description: Prominent paint maker has had experience with both gas and electric in-plant trucks. Trucks are used throughout the manufacturing operation—receiving, transporting materials for processing, handling finished paints, warehousing, shipping.

Results: Based on spot check comparisons, management finds that the use of electric trucks is at least 45 per cent cheaper than gas trucks. In commenting on such a comparison, the assistant superintendent pointed out that, "We have always felt that electric trucks are much better for inside operation and safer, too."

POWER WITH NO STRINGS ATTACHED







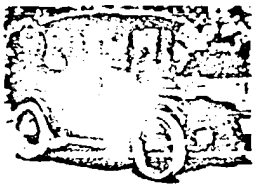
A LOOK AT TODAY'S BATTERY POWERED VEHICLES AND TOOLS
AND A GLIMPSE OF WHAT MAY BE JUST AROUND THE CORNER

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

Look Ahead with Lead

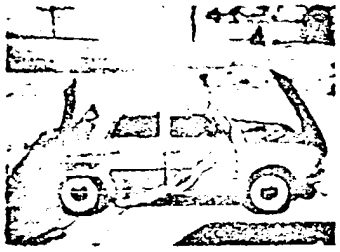
battery power

THEN



AND

NOW...

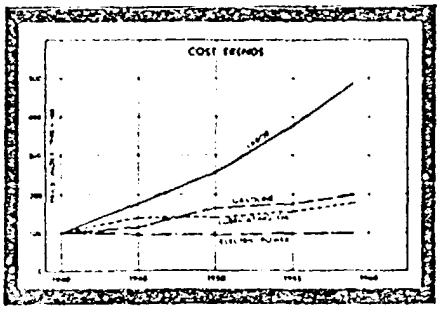


When it was called the horseless carriage, batteries and gasoline power vied for popular acceptance pretty evenly. Those were the days when 100 miles was a day's trip and chances were that the day included a little do-it-yourself repair work. Battery powered cars were in vogue for town use by sweet little old ladies and usually had rosebud vases 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.

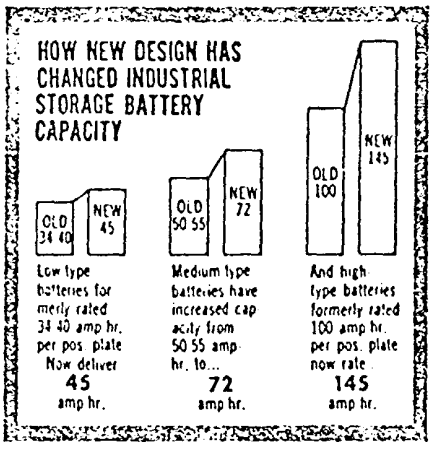
As a specific example, consider what has happened inside the lead-acid industrial battery since 1912. In the first place, there are no more wooden separators between the plates. The job is done today with glass fabric or fibers in conjunction with plastic sheaths. In the second place, the old-fashioned 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.

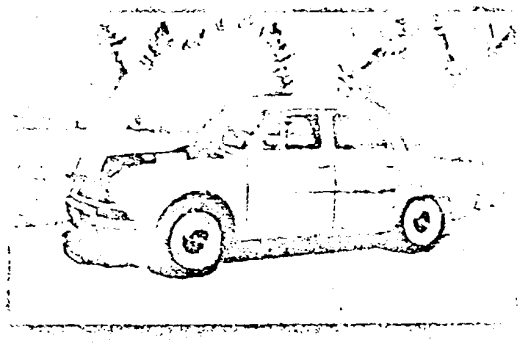
Speaking of battery life, it is interesting to note that batteries are less expensive today than they were before the war when useful life is considered. The average cost for lead-acid storage batteries has risen *20 per cent* in this period. The average *life* for lead-acid batteries has risen *50 per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

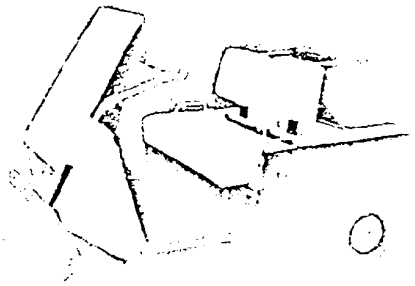
Technology pays off in other ways, too, in today's battery powered car, truck, or tool. The oft-quoted "complexity of modern life" has nothing to do with battery-powered devices. If you want to go somewhere in a battery powered car or golf cart, you turn it on and go—it doesn't balk on cold mornings, 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.

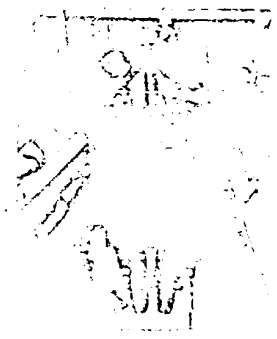
The same simplicity is evident in battery powered lawn mowers. There is no fooling around about starting, no choke to worry about, no gas-oil mixture to make up and store. And consider the freedom an electric hedge trimmer or battery powered drill offers you. You can use them anywhere with no extension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

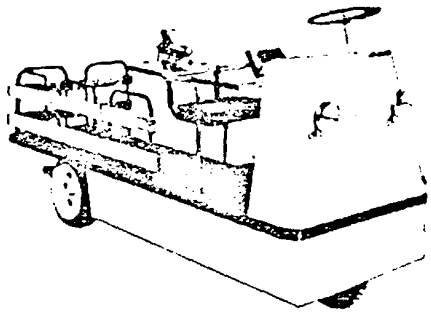
When you look at the whole picture, you conclude that battery power is back—and this time to stay—because of lower costs, better batteries tailored to specific uses, and the sort of convenience, safety, and utility that people want in any product they buy.



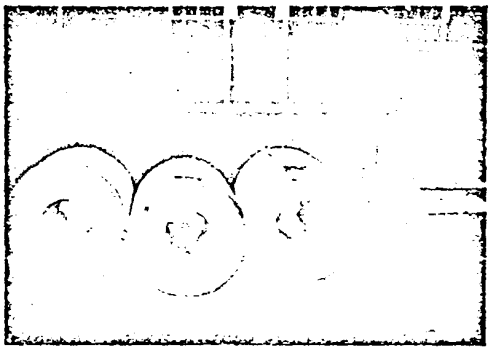




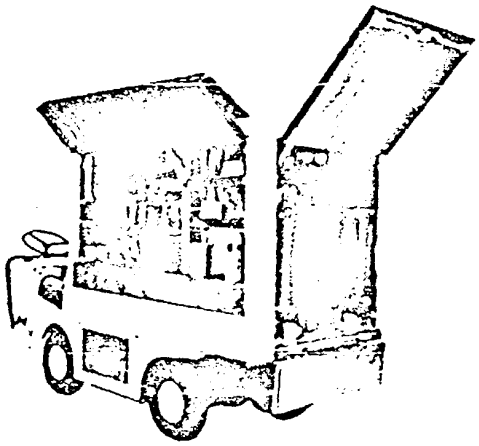




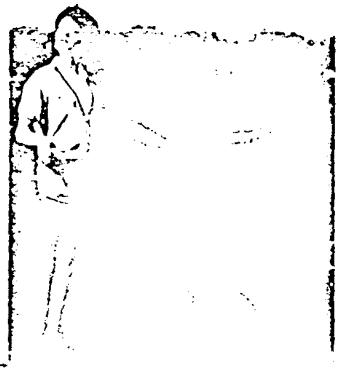
PLANT MAINTENANCE, OF COURSE! It's no joke to have to lug 300 pounds of pipe and tools to the job site in a big industrial plant. It's no fun, either, to attempt maintenance car (Victor Comptometer Corporation Electri-Car Division's Model 7110) is one of a number of quiet, go-anywhere plant vehicles. 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.



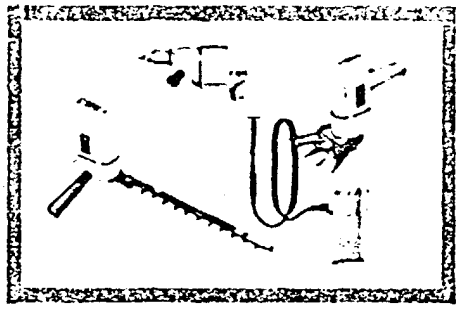
MUSCLE POWER—you bet! The 25 tons of steel on the bed of this Elwell-Parker transporter is just half its rated load. The truck is whisper quiet.



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.

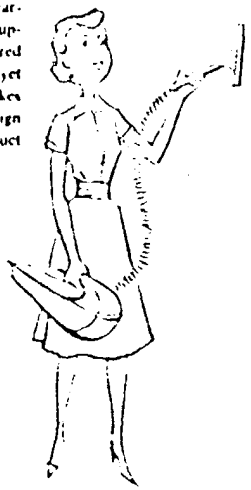


THIS CADDY NEVER WHISTLES while you line up a tricky putt. Battery motive power drives this precise little club-toting vehicle at a pace to match yours—whether you favor a brisk stride or a lazy meander. Controls in the handle not only steer the Toro Caddy Master, they provide a wide range of speed.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

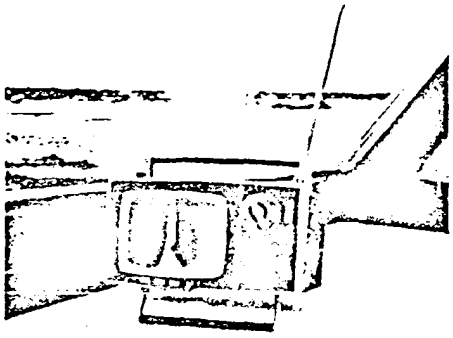


HERE'S THE HOMEOWNER'S SATURDAY MORNING TEAM. With the new Skil battery pack tools you can trim the hedge, polish the car, drill holes to put up a new clothes line. All these tools—⅜" drill-polisher, hedge trimmer, grass shears—are powered by the same battery pack (or your car battery) and permit you 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.

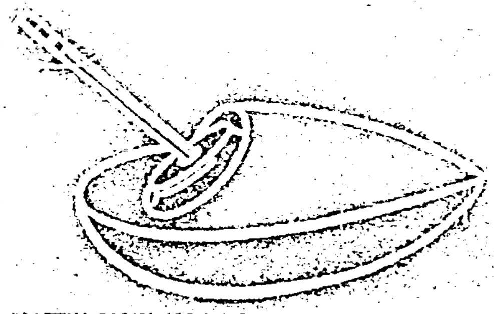


let's look at tools and appliances..

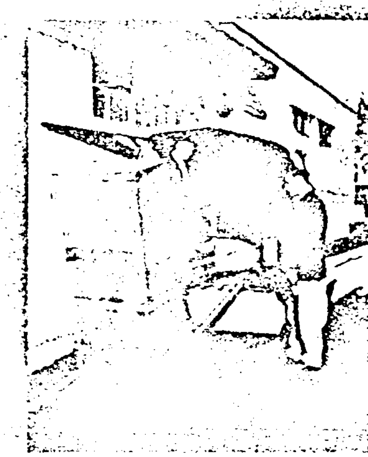


TV AFLOAT. Small enough to pack in a picnic basket, Sony's portable TV set gives three hours of reception anywhere from the four pound, 6½ x 4 x 2" lead-acid power pack furnished as an accessory. The idea has been so successful that US manufacturers are also working on small battery-power units.

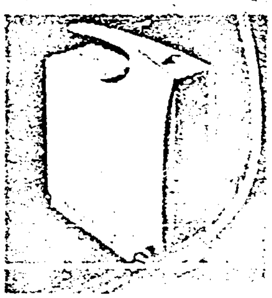
DON'T WORRY, he won't get shocked. The power supply to this drill is only 12 volts DC. The battery he carries on his belt is ample to put 15 or 20 ½" holes in the stump. If it's an all day job in this sort of rugged terrain, he can run an extension cord to the battery of his jeep or swamp buggy. The drill is one of the Porter-Cable "Big 10" battery powered models.



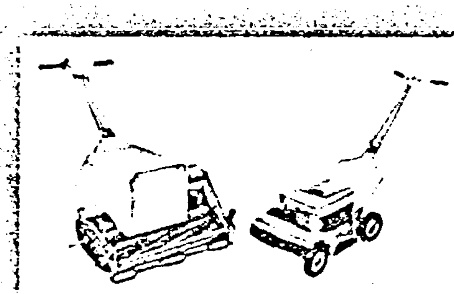
DRAFTING ROOMS ARE BIG ROOMS and draftsmen have lots of pencils to sharpen. It has not yet been put on the market, but a battery powered pencil sharpener makes good sense. It will be fairly small, easily [illegible], and have no strings attached. At five o'clock the [illegible] will be dumped and the sharpener put to charge with its [illegible] charger by plugging it into the electric line.



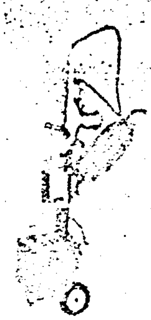
[illegible] automobile battery, together with [illegible] pocket winch pictured here, will pull a boat of two tons or more up onto a trailer with no more exertion than it takes to throw the switch. Built by [illegible] Products Corp. of [illegible] Lake, Indiana, the Autowinch is less than 15 inches high, weighs less than 40 pounds.



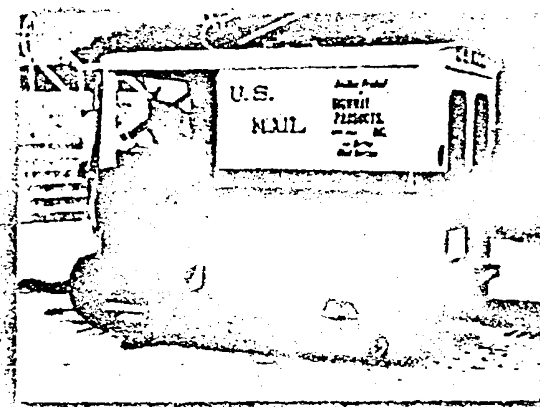
BATTERIES MAN THE PUMP! Boat owners, campers, and all others who have need of running water in unlikely places (including flooded basements) now have a pump of unrivaled convenience. Powered by two lead-acid cells, it moves three gallons a minute, will run for seven hours without recharging. The built-in charger plugs into a regular 110-volt outlet. Life expectancy for the batteries is four years according to the manufacturer, [illegible] Harrington Company of Southbridge, Mass.



INCLUDE CUTTING THE GRASS in your Saturday morning chores. You can do it early in the morning without spoiling the luxury of your neighbor's extra hour in bed if you use a battery powered lawnmower. The reel style mower above is used by golf courses for keeping greens in velvety condition without fraying the nerves of the golfers [illegible] to [illegible]. The rotary model [illegible] for homeowners and [illegible] quiet and [illegible]. Both are made by [illegible] Manufacturing Co. of Racine, [illegible].

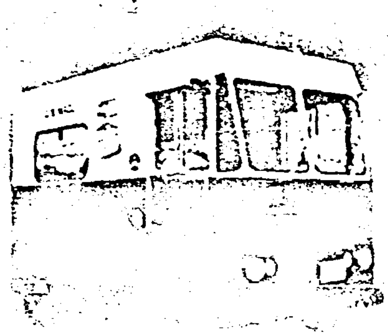


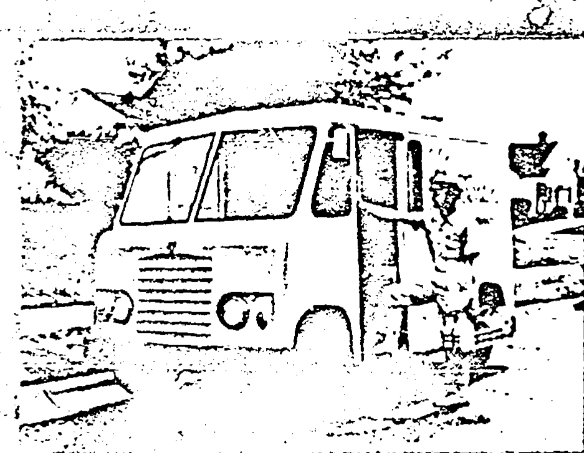
EDGETRIMMING WITHOUT STOOPING — the [illegible] handle adds the last touch of convenience to this 8" lawn edger-trimmer built by Little Wonder, Inc., and powered by lead-acid batteries. They also make a 15" and 20" [illegible] trimmer which operate from the same battery and [illegible] carried in a wheeled dolly, as shown.



COVER A [illegible] DELIVERY ROUTE and [illegible] for less than a dollar! The [illegible] Products [illegible] does it every day. With a maximum payload of 500 pounds [illegible] it can handle a good many [illegible] delivery jobs at [illegible] savings. The Post Office thinks so, too, and is testing 50 "[illegible]-Cycles" of earlier design also built by Highway Products, Inc., of Kent, Ohio.

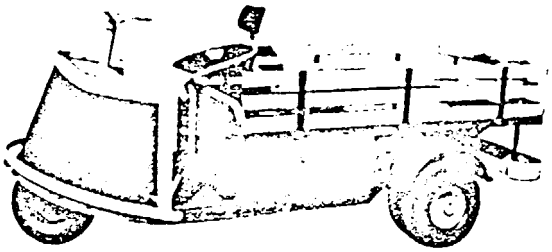
let's look at trucks...

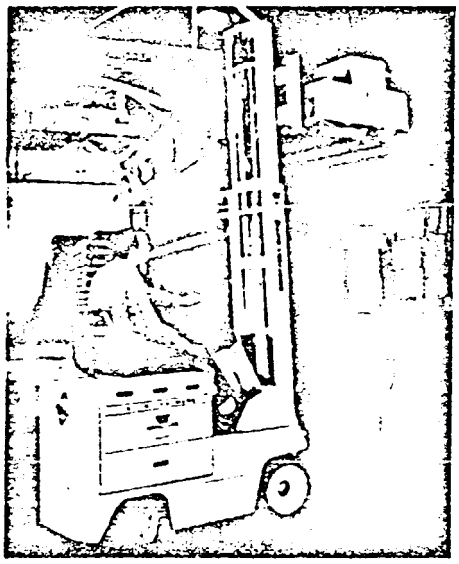




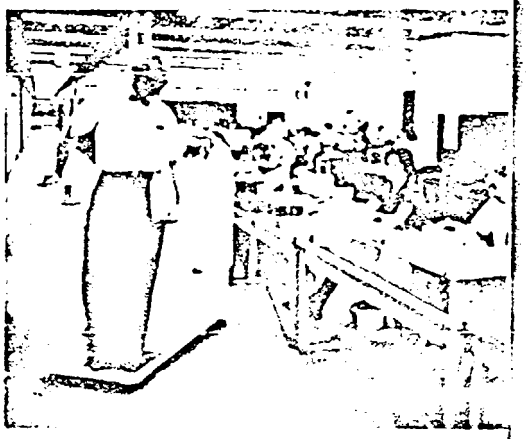
BIG LOADS ARE NO STRAIN for the [illegible] Model LA. [illegible] delivery run with [illegible] of mail, [illegible] to the [illegible] ahead of conventional [illegible] trucks on the [illegible]. Operating costs [illegible] a mile for [illegible] average of [illegible] [illegible]

TALK ABOUT A GENERAL PURPOSE TRUCK, this dual rear wheel truck by Taber 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.

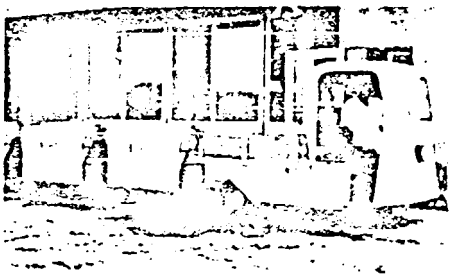




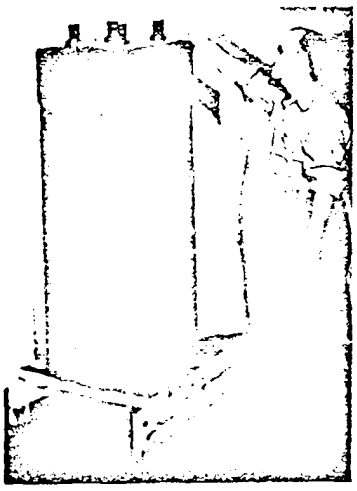
AN ILLUSTRATION of the sort of technical development behind the current resurgence of battery power is this Allis-Chalmers industrial lift truck. A-C had never before built electric trucks, but perfection of an electronic control system has led to this vehicle which cuts power consumption by as much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

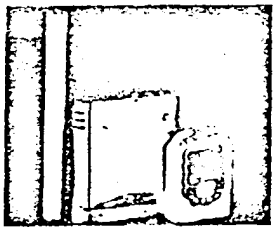
Whether you buy batteries for a pocket radio or specify them as a design engineer you know that there are many, many types. Lead-acid batteries alone range in size from cigaret lighter units to submarine propulsion cells bigger than a man.

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 decathalon 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



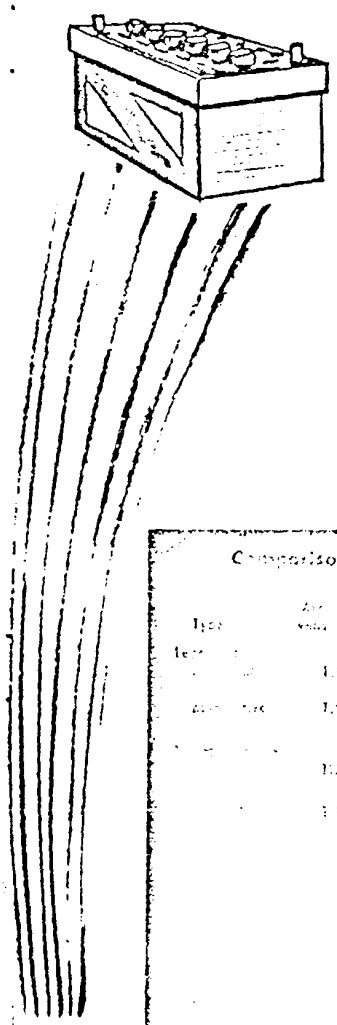
. . . and cigaret lighters.

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 75 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 — 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

Type								
[illegible]								
[illegible]	1.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	1.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	1.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	1.3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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. Highway 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

Laher 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 Wissahickon 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 Corp.
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 Moto-Truc Company
12401 Taft Avenue
Cleveland 8, Ohio

The Raymond Corporation
Greene, New York

Revolator 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

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

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