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Chicago’s Fifteenth Annual Automobile Show  
Manufacturer's Display to be Held at the Coliseum and Armory January 23 to 30

BY S. A. MILES*

It is truly remarkable the amount of interest there is in the annual National Automobile Shows in New York and Chicago. Fifteen years ago there was a need for an automobile show, and the same need exists today. In short, the national shows have done a great deal to sustain and develop the industry, in addition to being an exhibition which prospective buyers of cars may visit and see under one roof all that is newest and best in the automobile and automobile accessory line. The best proof that the automobile show fills a need is that the same leading makers year after year take advantage of it by exhibiting their products. Furthermore, nearly all of the exhibitors at the New York show are included in the Chicago exposition, which indicates that they realize that the New York show covers the eastern field and the Chicago display the western field.

When shows were first held, manufacturers of cars were striving for recognition and exhibited because they wanted the public to become acquainted with the names of their cars and see what they looked like. Today this is a condition found only to a small extent. There are a few makers of new cars who exhibit largely to let the public see their product and to connect with dealers and agents for distribution, but the majority of exhibitors have been in the show year in and year out, and these are the ones who, knowing that their product is well known, realize that they must continue to keep it before the public.

Designers and engineers as well as others connected with automobile companies have an opportunity to view at these shows all of the new ideas in the way of designs in construction and accessory equipment, and many of them become impressed with certain features of design and equipment which they incorporate into their own product within a few months. Inasmuch as these changes and alterations are usually for the better, the buyer of a car taking delivery in the spring benefits indirectly.

Between four and five hundred exhibitors means that their staffs in the aggregate number about 6,000 people. About 95 per cent of these journey from distant points to the show. In addition to these, about 3,000 automobile dealers from all parts of the country are numbered among the visitors. Many of these dealers meet at the shows or make appointments with prospective customers. Then, too, thousands of out-of-town automobile enthusiasts make a special trip to the automobile show, remaining in the city over night, so that a conservative estimate would say that the automobile shows bring at least 20,000 visitors from out-of-town places. The exhibitors and their attendants average seven days’ visit at the show; dealers average three days.

The annual show is an annual tonic. It takes place at the time of the year when the buyer is in a receptive mood—when he is beginning to make up his mind regarding the purchase of a new car. In many cases he or she is contemplating the purchase of a first car. The show is of great value because it begets enthusiasm, resulting in the prospect’s determination to buy. At the show the maker displays his car to upwards of a quarter of a million people. In newspaper, magazine or outdoor advertising he has described his product with printer’s ink or paint. At the show prospects see the real article. The exhibitor buys so much space for so much money, just as he does in any advertising medium, but in this particular medium there is no waste circulation. Everyone who has seen the maker’s published advertisement is interested in seeing the product itself. Furthermore, the motor car which is displayed to the buyer in the most favorable light, for the buyer is naturally enthused by the number of interested people around him, who are also intent on purchasing cars.


These manufacturers will also have their products on display during the Chicago show, which will be held as in former years in the Coliseum and Armory, January 23-30.

There is every indication that the 1915 Chicago show will be more interesting than any ever held in the past. The entire Armory floor will be devoted to electric vehicle displays. Manufacturers are preparing very exquisite exhibits and it is expected that extra sales forces and floor representatives will be in demand to demonstrate and explain the various principles of the electric to the vast throng of automobile “fans” who are fast recognizing the value which the electric offers in its economy, reliability and elegance.

*Manager National Show.
ELECTRIC VEHICLES

STORIES IN PICTURES OF ELECTRIC VEHICLE PROGRESS AND DEVELOPMENT.
A portion of the Edison plant taken the morning after the fire, December 9. A reconstruction gang was at work in the Edison plant within a few hours after the last fireman departed from the scene. The fire was witnessed by a vast throng of sight-seers, estimated at nearly fifteen thousand. The fire started at 5:30 p.m. and reached its height at 10 p.m. The Edison fire department was promptly on the scene, but because of inadequate water supply it took considerable time to check the flames.

The small picture in the upper left-hand corner shows the method of loading gold ore. From this point the truck makes an ascent of two hundred and fifty feet on a road having a six per cent grade to the mill. The road bed shown in this picture is constructed of ore running eight dollars to the ton. The upper right-hand picture shows the trestle roadway leading to the mill. After dumping the load, the truck leaves the mill by a trestle roadway built on a thirty per cent grade. The mill of the Colorado Gold Mining & Development Co. is located at Altman, Colo., at the summit of Bull Hill, shown in the upper center of the photograph, and this point is 11,729 feet above sea level. This is an excellent example of the reliability of the electric truck even under conditions usually considered adverse to the battery propelled vehicle. The mine officers state that this truck has never been found inadequate to any service demanded in their haulage problems.

“Commercial” Pole Truck Equipped for Passenger Service

The Electrics Negotiated Many Inclines Over Poor Road Courses.

STORIES IN PICTURES OF ELECTRIC VEHICLE PROGRESS AND DEVELOPMENT.
Passenger Electric Vehicle Models for 1915

A Brief Review of Each Manufacturer’s Models and Their Specifications

AUTHENTIC dates establish the year 1891 as the birth of the electric battery propelled vehicle. The year 1915 then, represents the twenty-fourth anniversary of this type automobile; and since its inception it has indeed developed into an important industry.

The very first electrics were built purely as experiments, promoted by storage battery manufacturers in search of a new field for their product.

As the vehicles developed, early models were used as public cabs. The public soon became interested in the electric and as a result requested manufacturers to furnish them with private cars. Many enterprises sprang up. Good and bad vehicles were put on the market. From that time, engineers seeing a profitable field for a practical vehicle, began at once to study the principles of the working factors with the result that to-day we find a vehicle of mechanical perfection embodying the latest and artistic ideas in carriage building.

Probably the greatest development in reaching the present day perfection was secured since 1908. During this period the entire vehicle was subjected to a complete change in design, not only in general lines and construction but also in its mechanical factors and their working principles.

A very noticeable weakness in the automobile industry has always been evident on the part of manufacturers to imitate new features promising advantage. This policy has extended so definitely to all parts not protected by patents that practically all models of all makes resemble each other beyond discrimination.

Consequently the product as a whole has developed as a unit. The best features and the most successful principles together with the similarity in design adopted by practically all manufacturers, places nearly all individual types on an equality. Probably the only differences of major importance exist in various types of controllers, motors and tire equipment.

In the models announced for 1915 special emphasis is laid on the reduction in gross weight. Many of the new models are known as “the light electric, nearly a thousand pounds less in weight, etc.” This radical departure results after years of insistence by engineers that the electric would be more successful if its weight and size were reduced thereby giving a greater mileage more economically.

Body design has undergone a few changes. A number of manufacturers have reduced the height of their vehicles and extended the length of the body to allow for more seating space. Included in the latest improvements are patented window lifts, hand-hammered oval fenders, wire wheel equipment, etc.

A short review of each manufacturer’s models is presented showing the latest developments in construction and design.

AMERICAN ELECTRIC CAR COMPANY, Saginaw, Mich., manufacturers of Argo, Borland and Broc electric announces Models 50, 52 and 60 in the Borland type; model 50 a five-passenger forward or rear drive; model 52, a roadster; model 60, a seven-passenger limousine.

Argo announces models A, B and C; model A, a four-passenger brougham; model B, four-passenger roadster; model C, fore drive, five-passenger.

General Specifications: Renault type coupé, all aluminum seating four passengers. Depth of body 73 inches glass to glass. Rear seat 46 inches wide and 22 inches deep. Front seat 45 inches wide and 22 inches deep. Distance between seats 23 inches. Width of door 23 inches. Running board 14 inches above ground. All windows drop with exception of front, which is clear vision, adjustable for all weather conditions.

Standard colors: Blue, Brewster green and purple, suitably striped.

All metal parts are sterling silver plated.

Upholstering: Best quality of imported Bedford cloth with animal hair trimming of metal or hand-buffed leather and special broadcloths furnished when desired.

Wheel base 108½ inches, carrying the load between the axles. Tread: Standard 56 inches.

Frame is of 5-inch deep pressed channel steel. Front springs semi-elliptic, 38-inch sweep; rear, full elliptic scroll, 38-inch sweep.

Front axle, nickel steel drop forged “I” beam. Ball thrust bearing at top of steering pivot. Rear axle, full floating bevel gear type equipped throughout with Hess-Bright ball bearings.

Drive-shafts 3½ per cent nickel steel, heat-treated. Double internal expanding brakes on rear hubs, each set 14 inches in diameter. 1½ inches wide, with Raybestos facing. Brake shoes adjustable from outside of axle. Hubs provided with grease shieders, absolutely preventing grease from filling brake drums.

Artillery type wheels, 38x4 inches. Motz high efficiency, 38x4 inches; pneumatic tires optional.

Standard equipment, 40 cells of 11 plate M. V. Exide Hycap. Patented interlocking foot control, operated with right foot pedal. One movement throws off the power and applies the brakes.

Five speeds forward and five reverse, ranging from 4 to 25 miles per hour.

Westinghouse four-pole series wound, of unusual overload capacity, with corresponding high efficiency at overloads.

Imported annular bearings, silent type.

Power transmitted from motor to rear axle by means of Herringbone gear, cased to form unit power plant with a complete elimination of universal joints or slip couplings. Wheel steer, absolutely irreversible.

Complete weight with batteries and complete equipment 3,400 lbs.

Borland General Specifications: Model 50 coupe—rear seat 50 inches wide, 22 inches deep. One collapsible front seat. Optional side driving floor. Rear or front drive control.


Wheel base—models 50 and 52—96 inches; model 60—121 inches.

Steering—Left side steering on all models. Lever steering on model 50; wheel steer on models 52 and 60.

Controller—Non-arcing General Electric control; six forward speeds, three reverse speeds.

Motor—Series wound General Electric with 300 per cent overload capacity; three point suspension.

Batteries—Optional 11-plat Exide for maximum mileage, per charge of 8 MV Exide for maximum life of batteries. Iron-Clad Exide batteries special equipment at additional cost.

Axles—Full-floating type rear axles; shaft drive.
ELECTRIC VEHICLES

Five speeds are at your use, ranging as follows: 5, 8, 13, 17 and 20 miles per hour. Mileage per charge conservatively ranges from 50 to 85 miles.

Equipment consists of headlights, body lamps, two sun-burst interior lights, tall lamp, inspection lamp, fans. Whiton patent on rain-vision front window, cut-glass flower vase, toilet set, smoking set and complete equipment of tools.

Baker Motor Vehicle Company, Cleveland, Ohio, announces an interesting line of novelties for 1915: models OA, lever steer; model DB, wheel steer; model BBD, a double drive brougham; model BBF, a front drive wheel steer brougham; model VAE, a bevel gear coupe and model WA roadster, wheel steer.

General Specifications: Wheel base, 88 to 100 inches; tread, standard; rear axle, worm gear; two separate control and steering levers and two separate sets of brakes; one control points from left rear seat; the other from left front seat. A specially designed interlocking device prevents operation from both front and rear seats at the same time. Horizontal controller lever type; six speeds forward, three reverse. One controller operated by two independent controller levers. Semi-elliptic springs, front; cantilever, rear. Tires — 34x¾ special electric pneumatic; 34x¾ front; 39x¾ rear. Cushion, floor, roof, and body design. Aluminum panels, full limousine back; full skirted patent leather fenders. Body—black; panels—blue, green or maroon; or body and panels, Baker green, with white wheels. Instrument panel, new with a combination of all lights; ventilator; volt ammeter; automatic circuit breaker.

Buffalo Electric Vehicle Company, Buffalo, N. Y., announces a new five-passenger model with many new features.

General Specifications: In this new model the old style of control lever has been changed, the rear pivot column being directly in the center of the car, giving the driver a clear view. The control lever is connected with an exclusively designed controller of the drum type, enclosed in a housing at the base of the steering column.

This controller has no fixed speed positions as the circuit remains unbroken from the lowest to the highest point, making arcing and sparking positively impossible from careless or improper manipulation.

The chassis frame is of pressed channel section steel of the double-drop type, reinforced at angles, semi-elliptic front and cantilever rear springs. All springs are of nickel steel and are pointed with 11 feet long. Hickeys are mounted on Timken roller bearings. Timken Detroit front and rear axles, the latter being the full floating helicicle bevel gear, with two sets of brakes, internal expanding and external contracting, operated by foot pedals, and a small assist for drive. Cammer steering gear is used, with tilting column located in the center of the car and an 18-inch steering wheel hinged to permit folding down parallel with the steering column, providing an unobstructed passage for entering and leaving the car. A specially designed motor is enclosed in a dust, oil and water proof housing integral with the rear axle, mounted on three-point motor suspension for the forward support being of the ball and socket type, to compensate for uneven road conditions and relieve torsional strains.

The drive is direct from motor shaft to rear axle, all working parts running in oil, eliminating universal joints, sprockets, chains and all exposed and unnecessary wearing parts. Goodrich Silvertown Cord tires, 34x¾, constitute standard equipment.

The body is full streamline forming a continuous blend of harmonious curves from front of hood to extreme rear of the body. Front and rear crown fenders, long, sweeping and graceful, with all bolts and rivets concealed. The rear body sides are connected by an artistically-designed running board. The doors are suspended on concealed hinges provided with a safety lock, specially designed bumper and spring dowel. Sashless doors may be raised or lowered by turning a small handle designed and provided for that purpose.

Chicago Electrics, now being built by the Walker Vehicle Company, Chicago, Ill., will continue the manufacture of three standard models with many new improvements.
**General Specifications:** The body design of all models will remain a pure limousine type. The arched roof design will be continued. Models 151 and 153 are the four-passenger, five-limousine drive electric limousines. Model 153 differs only from model 151 in that it is equipped with a comfortable revolving chair seat for the fourth passenger. This body measures seventy inches from glass rim to glass rim, giving a most luxuriously roomy roof car.

The wheel base of this car is ninety-six inches. Horizontal control is used which includes five speeds and a substantial mechanical brake operated by hand. In addition the car is equipped with powerful foot brakes.

Model 152 is a front-seat drive, five-passenger limousine. The rear seat of this car is exceptionally wide, giving ample room for seating three passengers comfortably. The operating radius is increased by an extended rear seat, placed on the left side and in line with the center of the door. A fifth seat on the right side of the operator's chair is arranged to fold entirely out of the way when not in use.

The wheel base of this model is one hundred and four inches and has an interior body length of seventy-eight inches.

The motor is a slow-speed, series-wound, built by the Westinghouse Company. Efficiency and minimum weight of motor construction has been reached in this design.

The controller is a Westinghouse-Chicago special, continuous-torque with magnetic blow-out. Large carrying capacity and extending usage. The controller is wired directly against the motor, materially reducing the length of wiring. All being readily accessible through door in floor of car. No resistance is used, all speeds being running speeds.

The control of the car consists of five forward and reverse speeds with brake operated by horizontal control lever Yale locked. One ratchet lever operating brake and emergency electric operated by the operator's foot pedal. One foot brake lever operating without ratchet or in conjunction with ratchet pedal above mentioned.

The front axle is I-beam section, heat-treated Timken. Knuckle pin and pinion are heat-treated, nickel-chrome steel.

The battery consists of forty cells 11 MV Exide, high-riddled jars and flexible copper connectors. Battery weight is equally distributed—twenty cells rear; twenty cells forward. No batteries are carried directly over the axles. It is evident that batteries placed directly over the axles are subjected to severe shock which means hard riding and great battery wear.

The braking system consists of 142½ internal expanding brakes on rear hubs operated by foot pedal, and a ten-inch contracting hand brake on propeller shaft, operated by the controller lever.

The steering equipment consists of Firestone notch dual tread cushion tires, differing only in that larger size tires will be used. Wire wheels with Goodrich Silvertowne cord pneumatic tires are furnished on demand.

FLEANDERS ELECTRICO, (Inc.), Detroit, Mich., announces its Colonial Electric with many new improvements.

**General Specifications:** Motor is a high-efficiency type, 3-horsepower, incorporated in the rear axle, armature being wound on sleeve and mounted on the worm shaft direct.

Batteries are Flanders special thirty cells, 153 amper hour capacity, eliminating washing.

Controller is of the latest improved non-arcing drum type of continuous torque, giving six forward and six reverse speeds operated by the operator's lever.

Rear axle is of unit construction, comprising motor, differential gear and all driving mechanisms.

Drive is by Flanders high-efficiency worm gear. Driving gears are mounted with the armature shaft and mounted below bronze gear.

Bearings are all imported and annular ball bearings, with the exception of front wheels, which are cup and cone on account of the high speed thrust.

Emergency brake is equipped with locking device, interconnected with control so that the application of the emergency brake automatically cuts off all driving current and remains applied until controlled foot again in neutral position, regardless of the position of the controller when emergency brake is engaged.

All moving running parts are enclosed in automatically fed bath oil.

Body—Flanders colonial coupe of pure colonial design, seating five passengers comfortably.

Fenders are all full skirited, patent leather, curved fenders.

Steering is lever type, with adjustable ball joints throughout.

Front Axle—Most improved type canted pivot.

Wheel Base—One hundred inches.

Ssr Jord 56 inch, 33 by 4-inch special electric pneumatic tires recommended unqualifiedly.

Fenders cradle spring suspension.

Two internal expanding brakes.

Painting in Napoleon blue panels, with black uprights and chassis.

Speeds at two to twenty-four miles an hour, with mileage charge ranging from seventy-five to one hundred miles, according to speed and condition of roads, and skill of driver.

Weight at 2,500 pounds.

MILBURN WAGON COMPANY, Toledo, Ohio, announces models 15 and 151; model 15, a four-passenger, stream line coupe with cantilever springs; 100-inch wheel base; worm drive. Model 151, a four-limousine roadster, light weight; one man top; 100-inch wheel base; cantilever springs; worm drive.

Ohio Electric Car Company, Toledo, Ohio, announces models 41, 51 and 21; model 41 and 51, five-passenger broughams; model 21, a touring roadster.

**General Specifications:** Chainless, direct shaft drive without universal joints.

Motor—The Ohio Electric motor, specially designed. The torsion tube is supported between the motor and the rear axle at a point very near to the center of inertia. This puts the weight of the springs above the frame of the car above the springs.

Brakes—Double external, non-freezing type, in addition to magnetic brake.

Cushion—The drop frame of cold-rolled, pressed steel in channelled sections.

Front Axle—One-piece, heavy drop-forged I-beam.

Rear Axle—Floating type; the weight of the car being carried by the springs.

Spring Suspension—Semi-elliptic front, three-quarter elliptic scroll in rear.

Side, tail and double headlights; also two reading lights and volt-ammeter light. The volt-ammeter is above the front window, an adjustable traffic-mirror, Warner autometer, 8-day clock, special disappearing toilet case and smoking set, cut-glass flower vase, charging plug.

RATCHET AND LANG CARRIAGE CO., Cleveland, Ohio, is presenting seven models consisting of Model R5, a roadster; Model CR5, a club roadster; Model B5, a brougham; Model BX5, a brougham; Model JS5, a coach model; Model TC5, a town car; Model TXC5, a town car.

**General Specifications:** Upholstery—Blue, green or maroon, imported broadcloth as well as exclusive fancy fabrics and leather. Wheel Base—102 inches. Drive—Worm, standard. Steering—side lever. Tires—33x4½ inch special electric pneumatic. 30x4½ inch special electric cushion. Battery—12 cells, 11 N. Y. Hy-Cap Exide standard equipment, Ironclad-Exide or Edison at extra cost. Equipment—This model is provided with two revolving seats, two side lamps, two head lamps lamp, tail lamp, dome lamp operated by opening of door, two corner lamps, concealed ventilator lever operated, adjustable full car width, windscreen, electric mechanical window lifts, frameless windows, auxiliary rain vision shield, Warner Auto Meter, flower vase, Waltham 8-day time-piece, separate case containing mirror and memorandum book, Klahon horn, kit of tools.

**Standard Electric Car Company, Jackson, Mich.** will continue in the manufacture of its standard type car. This company builds but one car which has been developed to such an extent that in consideration of its price and splendid construction, it serves as a splendid product in the electric vehicle industry.

WARD MOTOR VEHICLE COMPANY, New York announces five-passenger coupe which attracted considerable attention at the New York show.

**General Specifications:** Capacity, five passengers; wheel base, 96 inches; body length, glass to glass, 74 inches;
battery: Ward 40-cell, 15-plate; radius, 60 to 100 miles; speed, 17 to 20 miles—five speeds forward, two reverse; body, selected poplar; colors, blue: upholstery, eight inches deep, blue broadcloth to match exterior finish; curtains, dark blue silk to match the upholstery; transmission, single change of speed, geared road, steel (rust-preventing, lead-coated); frame, heat-treated pressed steel; springs, long coach type (64 inches); axles, Timken roller bearing; rear axle full-floating; wheels, wood, artillery type; tires, 34x4½ pneumatic with puncture-proof inner tubes; weight, 3,400 pounds.

Waverley Company, Indiana, models for 1915 show many improvements especially in body design. The eight new models include the latest developments in roadster, limousine, coupe and brougham designs.

Specifications (Four-Coach Brougham): Body—Length car over all 149 inches; width car over all 66 inches; length body over all 131 inches; width body over all 61 inches; wheel base 106 inches; interior length, glass to glass, 65 inches; two rear seats 18½x20 inches, one rear seat 20x20 inches; front seat 18½x15 inches; space between seats 12 inches and 24 inches; width door opening 23 inches; height seat to ceiling, front 42 inches, rear 44 inches; ground to step 14 inches; step to sill 6 inches; height floor to cushion 16 inches; tread 36 inches.

Color—Black with majestic blue panels, or painted to order with any standard or selected colors.

Upholstery: Special importations of plain and mohair fabrics or special limousine leather.

Wheels—Wood, fitted with pneumatic 34x4½ inches front and 34x4¼ inches rear. Cushion tires 34 inches front and rear.

Springs—Full elliptic front and rear.

Motor—One 80-volt Waverley especially adapted to hill climbing; speed 5 to 20 miles per hour; motor suspended to body.

Gearing—Waverley noiseless enclosed high-efficiency shaft drive.


Steering: Side lever, semi-irreversible. Fenders: Steel.

Battery—Forty-two cells or 13 plate any standard make lead battery.

Woods Motor Vehicle Company, Chicago, offers 4 new models: models 1501, 1503, 1504 and 1522. Model 1501 is a five-passenger, dual control brougham; model 1503, a five-passenger front control brougham; model 1504, a five-passenger rear control brougham; model 1522, a four-passenger rear drive brougham.

General: The entire body is covered with aluminum. The window openings are stamped out of large sheets of this material.

Doors are high and wide, with arched top. The sashless body is raised, lowered and automatically locked at any height by means of the perfection window lifter. Double door catches prevent doors from swinging open when not entirely closed.

Windows are all glass, which lowers, drops almost to the body line. Every window and door corner is rounded, which adds to the symmetry of the body design.

Speeds range from five forward and five reverse—to four miles per hour; mileage depends upon hills, speed and road conditions; some owners are getting one hundred miles per charge.

Wheel Base—One hundred and ten inches. Construction of chassis frame allows car to turn in very short radius.

Worm Gear Drive: Mounting under body, the gear affords a permanent bath of oil and assures the necessary lubrication reaching the worm constantly. The Woods worm gear is type worm gear always has three teeth in mesh. This reduces the tooth pressure to one-third of that of the gear having only one tooth in mesh.

Woods special battery never requires washing or cleaning; the battery carries a liberal guarantee.

Springs are full elliptic, both front and rear. Mounting of rear springs on radius rod diminishes by one-third the shock the rear springs are to absorb.

Tires are Woods special electric cushion tires with dual read. Size, 34x4½ inches front, 38x4½ inches rear, Clutch rim.

Ratchet foot pedal brake, operated from both front and rear seat, acts on brake drums on rear wheels. An auxiliary controller brake operated through the power controller handle with the same movement of the hand which shuts off the power. All brakes are automatically released when controller is moved to first speed from either front or rear control.

Electric Vehicles on Mileage Run

A popular fallacy in regard to the electric automobile is that it is slow of motion and of such limited mileage that it is impracticable for general use. To correct this mistaken idea an example is given of the actual running power of the electric in the significant test run made by fourteen electric passenger cars on December 5 from Los Angeles to a neighboring town and return, a distance of almost a hundred miles on a single charge, during which not so much as a wrench had to be applied to a single car. An electric service truck carrying a 1500-lb. load accompanied the cars and made the trip without a hitch and with power to spare. This run was made by owners of Beardsleys, the Beardsley company offering a silver medal to any owner who made ninety miles on one charge and a gold medal to any who reached a hundred miles, and it is remarkable to note that no one won the silver medal because everyone qualified for the gold. The speedometers were sealed at the start and were not opened until the batteries were exhausted which was at about six o'clock the same evening when it was found that the cars averaged 100.1 miles each, first place being taken by a car which made 112.1 miles and was driven by a young lady. Several of the drivers were elderly people and some were new to the part as was one young woman who was unfamiliar with the car but who after a fifteen minute practice joined the party and made a score of 100.1 miles. Some of the records ranged as follows: 106.5; 105.8; 104.1; 103.9; 101; 100.3, which are some of the best ever scored by electric vehicles, but which might have been even better under favorable conditions, for the tour lay through hilly country, over country roads with several heavy grades and the return was made through the city in a hard rain over pavements which were exceedingly slippery. It is to be noted that all these cars, which besides the truck, included broughams, roadsters and victorias, carried from two to three passengers, and were stock models not driven by experts but by the owners themselves.

Flanders Electric Assumes Control

As the result of plans that have been in preparation for some time a new corporation, known as the Flanders Electric Company, has succeeded to the business of the Flanders Manufacturing Company, of Pontiac, Mich., the new corporation having M. Rothschild as its president, Don C. Mc Cord as vice-president and general manager, and B. F. Es gar as secretary and treasurer. The company is incorporated with a capitalization of $100,000, and will have its office headquarters in Detroit.

The Flanders Electric Company will continue the manufacture of the Flanders Electric car at Pontiac as in the past, and a greatly enlarged scale of production is planned. What are styled the 1915 models are already coming through, and are available for distribution among the dealers.
A Study in Electric Vehicle Garaging

BY F. E. McCall

The Importance and Value of Choosing a Proper Location and Site

In the United States there are approximately 37,000 electric; 25,000 passenger and 12,000 commercial vehicles. Although the electric vehicle production is but a small percentage of the automobile output, still it is sufficient to represent a worthy industry both in vehicle manufacturing and garaging.

Electric vehicle garaging is an important industry, comparatively undeveloped, except in a few of our larger electric vehicle centers, and open to many improvements and opportunities.

In order to supply a constant demand for data on the subject of garaging, Electric Vehicles will publish beginning in this issue, the first of a series of six articles which will practically cover the situation, namely, (1) Location and Site; (2) General Construction, Plans and Materials; (3) Electrical Equipment, Charging and Lighting; (4) Service, Repair, “Hiker,” Inspection; (5) Accounting, Collections, Advertising and Proper Records; (6) Selling Electrics in Conjunction with Garaging.

These subjects will be treated in detail. Accurate figures, new suggestions and improvements selected from the better principles of operating garages, gas and electric, will be offered with interesting illustrations presenting a clear conception of those elements which go to make up the model electric garage.

Location and Site

Probably the very first and most important factor to be considered, is choosing a proper location and site. Whereas this element would be of much less importance in the location of a gas car garage, in building the electric vehicle station it is absolutely essential. As a rule gas cars are found in great numbers in most any locality. Electrics, especially in larger cities, are restricted to limited communities. Consequently it is most natural that under these peculiar conditions the garage catering to electrics exclusively, must have its location either in an electric neighborhood or at least within close proximity. Although in electric vehicle using centers there are usually many well established garages, (as clearly indicated by the accompanying map), nevertheless the model electric garage in these pioneering days has little to fear even from established competition.

In considering general location, as a rule it is judicious to investigate the better apartment districts, exclusive communities fronting on boulevards, and suburbs within a reasonable distance of central localities directly connected by paved roads. It is a good suggestion also to secure the co-operation of vehicle manufacturers in selecting a location. Manufacturers are invariably well posted on the garage situation. Because it is almost an impossibility to sell electrics in a locality which has no garage properly equipped, the manufacturer is exceedingly anxious to advise on locations offering opportunity for garages. In this, however, it is essential that such advice received from vehicle manufacturers be thoroughly investigated, especially in order to avoid a location which is not within the close proximity of an electric vehicle using center but merely in a prospective appearing community where few electrics exist but which is being campaigned for sales. In many cases garagemen have taken manufacturers' “tips” as bona-fide and established garages which luckily assisted manufacturers in making enough sales to put the garage on a profitable basis. However, this is rarely good business policy especially in contemplation of establishing an exclusively electric garage. Many gas-electric garages have started in this manner and ultimately evolved into the more refined and profitable garaging of electrics, the gas car revenue assisting them during the pioneering period.

The local central station company is also a valuable source of information in selecting locations. Current producing companies are being solicited constantly for garage information. Often the question is asked, “Where is the nearest garage in my vicinity?” In many cases the central station finds it necessary to plead with gas car garages inducing them to install equipment capable of taking care of such cases. And each such instance means an opportunity, a prospective field for the electric garage.

Site

General location being decided upon, the next problem is choosing a site.

Many disadvantages of location and site present themselves to the garage owner after the first six months of operation. As a rule the building has been previously erected, or binding leases signed and consequently the garageman must make the best of his proposition. In order to avoid choosing a site which might develop such faults, special attention should be given to the adjacent environs and conditions. Street car routes, public schools, fire stations, elevated entrances, principal boulevards, especially where the garage entrance extends to the street curb, are advisable to avoid. The site should be entirely free from regular congestion, both vehicle and pedestrian.

The particular site should be just adjacent to the prospective field, easily accessible from the main thoroughfares and still not in a congested enough district to necessitate more than reasonable care in entering and leaving the garage.

Probably the best possible location is a corner site on a side street just off an important thoroughfare. The corner location offers many advantages, all of which will be treated in detail in the monthly articles to follow. Two entrances may be erected allowing an easy entrance and exit, a vitally important feature in the electric garage.

In selecting the side street site it is essential that such main entrance be on a paved street. Many owners refuse to drive over unimproved or neglected roadways. The particular site also should be within a reasonable distance of either main thoroughfare, boulevard or street car route in order to secure all possible advertising.

In whatever location, it is vitally important that the question of current supply be fully solved. It is quite evident that the central station should be consulted on this matter in order that proper lines and cables be installed to supply the necessary energy.

Ample time should be devoted in selection of both location and site. All of the various suggestions offered herein should be seriously considered because experience has proved their redeeming features and also their faults.

[The second article of this series will appear in the February issue, entitled, “General Construction, Plans and Materials.”]
“Revivo” Storage Batteries for Electrics

A New Process in the Manufacture of a Semi-Dry Storage Battery

BY N. FALLEK

Does an electrolyte in a pulp condition or state give the efficiency that a wet one does? Without a doubt it absolutely does, and what is more, it has certain advantages that even the skeptical have to realize. We have been so accustomed to the old type that it seems to be a foregone conclusion on the part of those who are skeptical—does this proposition come up to the wet type? The experienced battery man says, “Well, I have never had any experience with your unit. All that I have known has been a liquid proposition.” The layman, of course, does as he is told.

We have to have a certain amount of plate surface to equalize the amount of electrolyte that is placed within a unit. You will note on this unit, which is a vehicle type, that it is filled in a dry state. The elements are just the same as the wet, with the exception that this preparation of pulp is composed of asbestos as its main issue. There are nine ingredients placed within that pulp.

This pulp is not what would be termed “absolutely dry.” It is semi-dry, but as dry as we can get it, permitting the battery to be turned upside down and losing no electrolyte. There is one advantage. There have been claims made, and no doubt they are true, that in some of our batteries a jar breaks and there is a liquid that oozes out. That’s true for the simple reason that at certain times the battery is flushed with distilled water, but if you were to take a gravity percentage of that liquid, you would find it very, very low.

What other advantages have we over the wet? The second is this. By some peculiarity or other, the acid or electrolyte is retained in this pulp. With this proposition, the asbestos pulp acts as a separator. It is in the center so that it absolutely protects the active material in the grid. Stopping the precipitation which comes from the shedding eliminates cleaning the battery.

Also when the ordinary battery becomes sulfated, you have to charge and re-charge in order to work off the sulphation. This is unnecessary with the dry type. The sponge matter is not a gelatine. Gelatine has been proven inefficient for the simple reason it will turn to water. For fifteen years I have experimented on this and I have gone through the process from one end to the other with sawdust and mica of every description and have come to the point that asbestos is the only method of producing restrictive electrolyte pulp.

Another advantage is the enormous amount of recuperation. A quicker and more intensified recuperation is obtained simply because the oxygen is not embodied in one side of the electrolyte. With the wet, the oxygen is passed off and you have to keep adding to the strength of your acid as it goes down, but with this type battery it appears from tests and experiments you have practically the same amount of your electrolyte from one end of the pulp to the other.

This pulp is placed in the unit in the factory in its original state and it is sent out. We have units which have been used for over two years in the service of the Denver & Larimer R. R., and they have never had a particle of anything added to the unit but a little distilled water.

The pulp is always moist. It isn’t affected by the heat or the cold.

The main advantage of the proposition is you have a unit you can handle in any manner. You cannot get away from the fact that we can eliminate the amount of stopping or spilling that is such a drawback to the ordinary battery.

In order to make a success of the vehicle type of battery the public ought to be educated as to the handling of their own batteries. The taking care of storage batteries should not be confined to the expert. Take, for instance, a man buying a gasoline car. The first thing he does is to ascertain from the dealer if he has a certain carburetor and certain things that are the best which can be bought. They don’t do that with an electric vehicle and there should be a system whereby they ought to be educated.

The first test we made was with a Frichtle 1910 car which weighs approximately 2100 pounds, and we took it out on its initial test with a battery which had made two discharges. We made 87 miles on one charge. We got within about two miles of the factory and waited just 22 minutes and we returned to the factory on full voltage. On the next test we made 96 miles.

In demonstrating one of the advantages of our battery, we propose to take a car, install our battery in it, turn the car upside down and run it, and you will notice that the bottom of the car is not burned up with acid.

One peculiarity about the pulp that holds the electrolyte—the gravity does not diminish to the extent it does with the wet type.

We have found that we do not get as good success with this unit when it is charged at a high rate.

In order to determine the performance obtainable from this battery, we are installing a complete battery in one of the Denver Gas & Electric Light Company’s trucks with instructions that it be accorded the same service and treatment that occur to other lead batteries in their trucks; that it be boosted if necessary at the same boosting rates used with other types of lead batteries, and as time elapses, we will ascertain the comparative performance on the part of our battery.

U. S. to Test Electrics

The eyes of the United States government experts are on the three electric trucks now being tested by federal authorities in regard to the efficiency and economy in the delivery of parcel post packages in Indianapolis.

If the test is up to standard, several of these trucks of 1,200 pounds capacity will be put into service in the various big cities, for the delivery end of the parcel post is considered one of the important elements in the service.
Walker Company to Manufacture Chicago Electrics

Announcement of the New Management and Specifications of 1915 Models

The Walker Vehicle Company, Chicago, has purchased the factory and business of the Chicago Electric Motor Car Company and will continue the manufacture and sale of the well-known Chicago electrics.

Manufacturing will be continued in the Walker plant in Chicago, where up-to-date and complete facilities will give every advantage to production.

The sales office, display rooms and service departments will be located at 2700 Michigan avenue.

The Walker Vehicle Company has been successfully engaged, for the past six years, in the manufacture of electric commercial vehicles. The interests owning the company are such that its reliability and responsibility are unquestionable. William A. Fox, vice-president of the Commonwealth Edison Company, has been elected president of the Walker Vehicle Company; G. A. Freeman, identified with the Commonwealth Edison Company interests, is vice-president.

Practically the complete organization of the Chicago Electric Motor Car Company, including the factory and service men, will continue with the Walker Vehicle Company handling the sales and service departments. Gail Reed, formerly secretary and sales manager of the Chicago Electric Motor Car Company, has been appointed general sales manager.

The "Chicago electric" first entered the market in 1912, the company being organized by Frederick J. Newman, one of the oldest and best known electric vehicle engineers in the country, who first designed and built solid tire electric cars. The construction, based on 14 years' experience, met with instant approval and success and established a reputation for sound worth and efficiency.

The 1915 line will consist of three models.

The body design of all models will remain a pure limousine type. The arched door design will be continued. The body construction throughout has been highly refined and a great many decided improvements made, for it has been found that more strength than ordinary carriage building affords, is necessary in the electric motor car constructed for the use of solid tires.

Models 151 and 153 are the four passenger, rear seat drive electric vehicles. They insure absolute comfort to four passengers, leaving the driver's vision entirely unobstructed.

The driver and two passengers can occupy the rear seat and still have perfect freedom to operate the car. A fourth person can be seated on the right front seat. A fifth person can be carried with ample room in an emergency seat located on the left front side of both models.

Model 153 differs only from model 151 in that it is equipped with a comfortable revolving chair seat for the four passenger. This body measures seventy inches from glass to glass giving a most luxuriously roomy car.

The wheel base of this car is ninety-six inches, giving all the comfort in riding qualities and body length, at the same time speed and a substantial mechanical brake operated by hand. In addition, the car is equipped with powerful foot brakes.

Model 152 is a front seat drive, five passenger limousine. The rear seat of this car is exceptionally wide, giving ample room for seating three passengers comfortably. The operator facing forward is seated on the left side and in line with the center of the door. A fifth seat on the right side of the operator's chair is arranged to fold entirely out of the way when not in use. Particular care has been taken to build these front seats to afford the greatest comfort. Deeper and more comfortable cushions will be used throughout.

In this model, entrance and exit can be made from either door, the seating arrangement being such that there is no blocking of the doorways.

The wheelbase of this model, which is one hundred and four inches, and an interior body length of seventy-eight inches, gives a most luxurious comfort and unusual riding ease. While unusual body length is found in this model, which is essential to comfort and luxury, this car can be turned completely in thirty-eight feet. It will be noted how well adapted this extreme

Interior View of the Walker Vehicle Plant.

Chicago Electric Chassis.
short turning radius will prove, particularly for city driving.

Chassis:—It should be realized to begin with that the construction of this car is based on solid tire use. The selection of steel used throughout has been given the most careful study by engineers, who through a period of fourteen years, have designed and built electric cars for solid tires.

The chassis construction is the same on both models with the exception of the wheel base. The frame is of pressed steel, side members being very deep and exceptionally wide. These side members are reinforced by eight heavy cross members integrally gusseted. Every engineering feature that gives the greatest ruggedness in strength has been built into this chassis.

The motor is a slow speed, series wound, built by the Westinghouse Company. Efficiency and minimum weight of motor construction has been reached in this design. The advantages of reduced wear on bearings, brushes and commutator being self-evident. In addition to the direct motor advantages, a decided reduction in drive parts is attained. This motor is direct connected in a straight line drive shaft through double universal joints to rear axle, no gear or chain reduction being necessary between motor and rear axle, making a direct shaft drive on all speeds.

For hill climbing the slow speed motor has decided advantages, because of the reduction in heating tendency, and the fact that its power is not gained by an excessively high speed.

The controller is a Westinghouse-Chicago special, continuous torque with magnetic blow-out. Large carrying surface and heavy wiring used. The controller is located directly against the motor, materially reducing the length of wiring. All being readily accessible through door in floor of car. No resistance is used, all speeds being running speeds.

The control of the car consists of five forward and reverse speeds with brake operated by horizontal control lever Yale locked. One ratchet lever operating brake and emergency electric cut off. One foot brake lever operating without ratchet or in conjunction with ratchet pedal above mentioned. In the control of this car every chance for mistakes or trouble in operating has been safeguarded. The reverse cannot be operated until the brakes are applied.

Rear Axle:—The recent improvements made in the rear axle assure absolute silence, the greatest efficiency and longest known wearing qualities. The rear system will remain practically the same in every respect with the exception of the gear unit. The gear unit is an improved worm bevel which type of gear assures a practically continuous mesh, eliminates all back lash, and gives absolute silence. It has been found that this gear, through most extensive tests, does not effect the present high efficiency, strength and durability. The great dependability of these gears is a factor of utmost importance. No untird features enter into the construction of this rear axle and under the most severe road usage they have given unflagging satisfaction. Careful attention has been given to the matter of lubrication and numerous improvements have been made in this respect.

Front Axle:—The front axle is I beam section heat treated Timkon. Knuckles and lever are heat treated, nickel chrome steel.

Battery:—The battery consists of forty cells 11 MV Exide, high ribbed tabs and flexible copper connectors. Battery weight is equally distributed, twenty cells rear, twenty cells forward. No batteries are carried directly over the axles. It is evident that batteries placed directly over the axles are subjected to severe shock which means hard riding and great battery wear.

This position of the batteries permits the use of more flexible springs as well as preventing pounding of axles when the car encounters poor pavements. Another point is the fact that the batteries can be carried at an average of fourteen inches or more lower than found ordinarily. This gives low center of gravity, eliminates top-heaviness, prevents undesirable swaying and insures excellent riding qualities. Proper distribution of the battery weight is the first big step in the proper balance of an electric car.

Braking System:—The braking system consists of 14x2½ internal expanding brakes on rear hubs operated by foot pedal, and a ten-inch contracting hand brake on propeller shaft, operated by the controller lever.

Steering is the improved vibrationless lever operating on SKF self-aligning ball bearings. Speeds give a range of 5, 8, 15, 18 and 22 miles per hour. Tread is standard fifty-six inches.

Tires:—Tire equipment consists of Firestone notched dual tread cushion tires, differing only in that larger size tires will be used. Wire wheels with Goodrich Silvertown cord pneumatic tires are furnished on demand.

The Edison Plant Fire Swept

Wednesday, December 9, 1914, will pass into the annals of Edison history as the day of the Great Edison fire.

The fire originated in a comparatively small structure, located in the center of the plant, about 5:30 p.m. on that day. The Edison fire department was promptly on the scene, but because of inadequate water pressure were unable to check the flames, which soon gained tremendous headway. Assistance was summoned from the neighboring municipalities of Newark, Orange, East Orange and Montclair, but the same lack of water pressure handicapped them also. Only when the mains of West Orange were connected with those of South Orange did the engines begin to do effective work.

At the start no one for a moment thought the fire would spread, especially to the concrete buildings, so that much that could have been saved was not removed in time. This was particularly true of the Administration Building, which was not thought to be in the path of the fire. However, several departments located in this building saved many valuable records, and the vaults, located in the building on every floor, also protected a great deal that was necessary to the resumption of business.

The fire was witnessed by a vast throng of sightseers, probably ten to fifteen thousand people. Starting at 5:30 p.m., it reached its height at 10 p.m., and at that time its progress was checked, or at least confined to the buildings already on fire. Yet at 7 a.m. the next morning the firemen were still at work.

The fire did not in any way affect the Edison Storage Battery Company. One end of the large concrete buildings of the battery works is across the street from Mr. Edison's private laboratory which was saved and this as well as the rest of the plant escaped unscorched.

The Edison officials state that the vehicle battery business will not be interrupted to any great extent. Orders will be taken care of as usual.
Equipping the Electric with Wire Wheels

Early Development and Tested Reliability of the Rudge-Whitworth Suspension Wheel

Wire wheels recently adopted for passenger electrics were first used about half a century ago. The wire wheel characteristic is that a road shock to a wire wheel is accompanied by a great decrease in tension on the few spokes nearest the road, and a very small increase in the tension on the many spokes away from the road. With the wood wheel the characteristic is exactly opposite. The few spokes of a wood wheel get a great increase in the strain, and the many a very slight decrease.

In certain classes of vehicles wire wheels were very successful and became thoroughly established, but their manufacture was always the work of specialists, and became the work of artists rather than scientists. Quite naturally wire wheels were adopted for passenger motor cars. But the artists engaged were quite unable to perceive the differences in design demanded by the differing conditions, with the result that unsuitable wheels were marketed and the excellent idea of the suspension or wire wheel was discredited, not only in this country, but in Europe generally.

One of the greatest troubles to overcome in the wire wheel was the loosening of the spokes. This allowed them to "work" at the rim as well as at the hub, a common defect in all double-spoked wire wheels.

The Rudge-Whitworth patent triple spoke entirely eliminated the trouble and produced a wire wheel scientifically braced from every point. Seventy spokes in tension, throwing the wheel into compression, made it perfectly circular; while with wood wheels, the compression was on twelve spokes only.

Another important trouble to overcome was rusting; this was accomplished after much careful experimenting, and a patent process soon eliminated all traces of rust, even after years of use.

As is invariably the case, the few good wheels were condemned with the many bad, and ten years ago it was futile to try to sell a car with wire wheels.

It is universally recognized that the wire wheel is the best, strongest, most reliable, and by reason of its beneficial effect on tires, and decrease in consumption of the batteries, it is the cheapest and most efficient wheel to run. Likewise the resiliency afforded by the suspension type eliminated vibration from the steering handle.

 Destruction tests have shown that the wire wheel is practically indestructible. A pendulum blow that completely demolished a wooden wheel simply deflected the wire wheel 1¾ inches. One front wood wheel 36x4 inches and one back wood wheel 36x4½ inches were tested complete with tires inflated to 80 pounds per square inch, against the same sizes of wire wheels and under the same conditions. These wire wheels were so built as to weigh 149 pounds as against 179 pounds for the wood wheels, both including inner hubs. The weight of the pendulum bob was 450 pounds, arranged to strike the rim itself and not the tire only. The pendulum bob was pulled back by rope and tackle and released from different distances up to 6 feet. Wire wheels bend but never break; thereby averting the accidents resulting so disastrously to the occupants of the car. A car may be disabled through the breaking of a wheel, requiring the use of a truck and team to remove it. This never occurs with wire wheels.

America was slow to adopt the wire wheel by reason of the great progress made with demountable and quick detachable rims; England clung to the clincher rim because of the many early failures of the quick detachable and demountable rim; therefore, America, by reason of its almost universal use of quick detachable and demountable rims, did not favor the wire wheel, as used in England with clincher rims. The perfection of a suitable quick detachable rim that would not interfere with the sterling qualities of the wire wheel, when used in combination with the Rudge-Whitworth wire wheel, offers the American motorist a wheel equipment of the highest efficiency.

An important feature of any wheel is the device which holds it on the car.

It must be constructed in such a manner as to tighten itself up if for any reason it is loose. The manufacturers of the Rudge-Whitworth wheel have used many complicated ratchet devices, all of which depended upon a light spring.

In 1912 they conceived the idea that they are now using. It consists of a ring which screws on the hub in the opposite direction in which the wheel turns when the car goes forward. The feature is the method that is used in making the ring lag or go slower than the wheel when it is not screwed tight so that it will become tight. This is accomplished by making the outer shell of the hub (that part of the hub to which the spokes are fastened) rest on a ridge cut in the edge of this ring. This ridge is beveled in such a manner that the outer hub will fit against it where the hub is beveled. When the ring is not screwed all the way up the bevel does not exactly fit. The result is that the circumference of the outer hub at the point
of its contact on the beveled part of the ring is smaller than the circumference of the ring at that point.

As the wheel rotates, the hub rolls on the ring. The difference in their circumferences is the amount of tightening that results at each revolution.

This amount decreases as the ring gets more nearly on. When the ring is in place the tendency to tighten has disappeared. This means that the ring will never get too tight to be easily removed. It takes several miles in travel to make the ring turn one revolution.

The running of a car generates heat in the tires. It is a well known fact that rubber is far weaker and more liable to be cut at high temperatures than at low. Rubber is a bad conductor of heat and in consequence the greater part of the heat generated has to get away through the rim.

Comparing the sections of the wire wheel and the wood wheel we find that a very large proportion of the rim of the latter is covered up by the wooden felloe, and wood is, of course, an excellent non-conductor, moreover, this wood felloe is placed so as to block or blanket the one place where the heat would otherwise have the best way out, that is, between the two beads of the cover where the air tube actually touches the rim. The air inside a tire is always in circulation and the effect of this air in keeping the temperature down by the cooling because of the contact of the air tube with this exposed piece of rim is very great indeed.

Further than this, not only is there no part of the wire wheel rim covered up so that it cannot act as a cooling medium, but there are 70 spokes and nipples fitted into it, and each of these forms important additional radiating surface, thereby keeping the tires much cooler (wood is a non-conductor of heat and therefore does not allow the heat from the tires to escape); secondly, the wire wheel is 50 per cent lighter at the rim than a similar wood wheel with demountable and quick detachable rims. The lighter a wheel is at the rim the less gyroscopic action when the wheel is rotating rapidly. Gyroscopic action tends to make a wheel travel in a straight line so that when a bump is met, over which the wheel must rise, the tire not only has to sustain the shock at the bump due to the weight of the car, but also due to the tendency of the wheel to travel in a straight line through and not over the bump.

It is impossible to take a census of all the individual experiences, and each by itself fails to convince because of the relatively few tires and miles employed.

Many letters from users show that tire bills have been reduced from 25 to 50 per cent by the use of wire wheels.

A long series of tests, extending over a quarter of a million miles, has been made by the Daimler Company. No less than 100 tires were used, 50 on cars with wood wheels, and another 50 on the same cars, but with wire wheels. In both cases \( \frac{36}{32} \times \frac{3}{2} \) inch tires were used. The results were as follows:

- Fifty tires on wood wheels, 102,524 miles; average per tire, 2,050 miles.
- Fifty tires on Dudge-Whitworth wheels, 172,731 miles; average per tire, 3,434 miles.

This shows that tires on wire wheels give an increase of mileage of over 70 per cent, or what is the same thing a reduction of the tire bill by over 40 per cent.

Wire wheels are 30 per cent lighter than wood wheels of equal size, thereby saving the weight of from one to two passengers per car. This in the course of a year's travel would not only lessen the cost of tires, as is shown by the Daimler tests, but it will materially lessen the charging expense, an item which must be seriously taken into consideration as the number of automobiles increase.

1915 Model Ohio

The latest model developed by the Ohio Electric Car Company, Toledo, Ohio, has a body of aluminum throughout and the window frames are made of solid aluminum castings. The doors are hung on steel hinges and a safety catch provided on each door preventing it from flying open when not fully closed.

Chainless direct-shaft drive is used with this car, the motor is suspended by a ball-and-socket joint. The motor propeller shaft and rear axle form one rigid unit. The shaft is directly connected to the motor without reduction gears. The torsion tube, in which

the shaft is held concentric by a double row of ball bearings, is connected to the rear axle and to the motor, thereby keeping the shaft in alignment. Either helical bevel driving gear or worm driving gear may be used with this car, as desired. A small disk is used for controlling purposes. By turning the disk in one direction four forward speeds are obtained; an accelerator button which is near the foot adds an extra speed. By turning the disk in the other direction three reversing speeds are obtained. The disk cannot be reversed without pressing a guard button, which prevents the possibility of turning it in the wrong way in an emergency. By pushing a controller-lock button the controller disk is locked and cannot be moved until unlocked by means of a key. The magnetic brake is operated by another button.

Trucks to Have Fenders

An ordinance requiring all owners of auto-trucks to equip their machines with fenders and mud guards has been presented to the City Council of Portland, Oregon. The measure has received the unanimous approval of the public safety commission.

It is said the absence of fenders and mud guards on the trucks is responsible for many accidents. The guards, it is said, would greatly lessen the danger of accidents.
THOUGH most of the world continues to revel in calamity, and for the coming year no relief promises, we are concerning ourselves less about it. The selfish attitude is the only one compatible with our own welfare and prosperity. It is reported that our country, or perhaps we should say our administration of government, is criticized by the warring powers because we do not interfere in their civilized warfare, but only protest when our commerce is affected. We are therefore a nation of money-grubbers. There is no civilized warfare. The warring nations are entitled to no consideration of ours whatsoever. Commerce is the only thing we are called upon to protect because commerce only is constructive and progressive.

Because we had built up a substantial foreign trade we have lost, perhaps, one customer out of one hundred. We do not need that customer. We are sufficient until ourselves. If all the rest of the world were wiped out we would still be sufficient, still have prosperity.

For months we have heard much of the problem of the unemployed. We always have an unemployed problem, whether we hear much about it or not. The poor we have always with us; and as every action has its reaction and every condition its opposite, so we have the rich, too, always. The fittest survive and the mightiest get what they desire.

Sales of automobiles have not fallen off during the alleged business depression of recent days. They have, in fact, increased. If this be depression, it has no sting for us. People may not buy bread or clothing or furniture; so that they buy automobiles we have no fear for their condition, or our own.

There are nearly a hundred and fifty makers of gas cars, and they expect to sell nearly a million cars this year. There are about twenty makers of electrics; how many cars do they expect to sell? Pro rata, the figure should be over a hundred thousand. Actually it will not be anything like that. Possibly it will reach ten per cent of it—one per cent of all the cars sold—if the sales forces work harder than ever before. That is not by any means an adequate amount, and of course we hope to see the proportion increased. But as it stands, merely as a proportionate and not a specific figure, it represents a job of work to be done. Failure to sell the proper, or rather let us say the usual, ratio of electrics to the gas cars sold cannot be laid to “hard times”; the gas car people are proving right along that there is no such thing.

Some have tried to reason that there is no relation between gas cars and electrics. That is foolish argument. The competition is as real as that between gas lighting and electric lighting for our homes and offices; between gas power and electric power for our factories; between gas heat and electric heat for our wives’ flat irons. And in all these things electricity has made better progress than it has in driving vehicles. Is that the fault of the batteries, or the charging facilities, or the sales propaganda? There is some reason for it. If a hundred people buy gas cars every time one buys an electric are all of that hundred foolish? Are any of them foolish? Or is the gas car a hundred times better or more convenient or more adaptable, and in that case does the buyer of the electric get stung unmercifully?

For every thousand gas cars sold there must be just so many electrics sold. The ratio is bound to be
constant with equal sales effort, be the times good or bad. If the gas car people sell this year twenty-live per cent more cars than last year, then the electric car people, without trying any harder, will logically sell twenty-five per cent more cars than last year. The prosperity of the electric car makers during 1915 depends primarily on the total number of people—eight hundred thousand or a million and a quarter—who make up their minds to buy some kind of a car. But the progress of the electric car makers depends upon their own ability to increase the proportion of that total which comes to them.

Nineteen-fifteen will be a better year for electrics than the trade has ever seen, though the activity may be a little late in starting. There will be more central stations interested, and those which are interested will do more. Cheaper cars will make enough headway to arouse a new competitive spirit, and a fair start will be made toward a more complete and country-wide distribution of charging and service stations. There will be a greater effort to familiarize the whole of the public with the unquestionable advantages of the electric, which will lay a foundation for future business increase.

The electric manufacturers will get their share of business in 1915, if by share we mean their usual and customary proportion of the total vehicle business. They will find it hard to increase that share from a merely nominal to a really equitable figure unless they show a more progressive spirit, more readiness to co-operate with agencies which are willing to work for their good, and a broader-minded view of their own industry.

Among these requisites we do not hesitate to include a recognition of legitimate trade journalism. For while ignoring that established feature of industry does not make for failure, or even necessarily for loss, it is one of the indications of mental and commercial caliber which in itself determines progress or stagnation.

EXCHANGING PROSPECTS.

During a recent meeting of the Electric Vehicle Association of America, considerable discussion ensued after the suggestion that prospects should be exchanged between various electric truck representatives, in order that practically every electric truck company could send representatives to such a prospect, thereby creating the impression that the electric truck was important enough to have a great many manufacturers in the field. The trouble at present seems to lie in the fact that a company wishing to purchase a motor truck is called upon by from fifty to a hundred gas car salesmen representing various firms and usually by one or two electric vehicle salesmen.

Few prospects have any reason to believe that there are more electric truck manufacturers in the field than those who call upon him, though as a matter of fact there are many firms who fail to learn of his existence until the sale has been closed. The prospect, being induced by the greater representation, usually purchases a gas car. The question is then, would it be judicious to exchange the prospect among all the electric vehicle manufacturing firms, each attempting to make a sale on the merits of his car and his personal ability as a salesman. In practically every large city electric truck manufacturers have representatives. Each prospect could be visited by at least ten manufacturers, if one salesman representing each of these manufacturers had knowledge of the prospect. Without a doubt it would have a wonderful influence in putting another electric truck in service. Although the question deserves consideration it offers certain impossible phases. Competition in many instances would not allow truck manufacturers to endorse such a policy. It is hardly fair to believe that companies retaining high salaried sales forces, and spending thousands of dollars in advertising annually, should be obliged to turn over their prospects to smaller companies unable or unwilling to employ similar tactics in finding their own prospects. There is a remedy, however, which presents itself in a co-operative scheme made possible by the Electric Vehicle Association through its various local sections.

This success could be attained by the industry at large and consequently to each individual manufacturer if they could get together, bury the weapons of competition and promote a co-operative advertising campaign which would boost the use of electrics in general, avoiding specific type arguments. An equal investment of money on the part of each manufacturer placed properly in publicity and advertising would have a wonderful effect on the general public. The prospect after seeing some of the engineering and building features of the electric battery propelled vehicle would receive that impression of the excellence of the type which is necessary before he can be expected to decide on any particular make of truck. Although this would not be strictly exchanging prospects it would have a similar effect, in that the equal investment in publicity and advertising would have the same effect on the prospect as if representatives from each company making electric trucks had called upon him in an effort to make a sale.

A NEW DEPARTMENT.

Since the inception of Electric Vehicles, the editors have had occasion to answer a great many important questions relating to various elements of electric vehicle practice pertaining to both passenger and commercial types.

Believing that many will be benefited by seeing published not only their own but also solutions of those difficulties offered by others, this department has been established and offers its unlimited service through these columns.

In answering inquiries, the solutions of which might reflect on the reliability of any specific type in discussion, the editors reserve the right to submit suggestions to such questions by private correspondence.

The questions in this issue are every day problems. Some have been previously analyzed. The solutions of many present valuable information. In order to publish as many as possible, each inquiry is discussed briefly, reference to previously published articles in Electric Vehicles indicated wherever possible.

All questions asked pertaining directly to the advisability of purchasing particular brands of vehicles or accessories will be treated confidentially. Whatever advice given will be based purely on our personal knowledge and experience, recommending the three best types which have proven the most successful in operation.

Electric Vehicles will be glad to answer all questions pertaining to electrics. This department is closely allied to practical and technical interests and subscribers are offered this service gratis.
Operation of Edison Storage Batteries

By JAMES F. ROGAN

A storage battery is commonly looked upon as a receptacle in which to store electricity. Electricity is not a concrete matter. (In fact nobody knows just what it is.) Therefore, in the general comprehension of the term, it is not stored. Electricity simply causes a chemical change to be effected in certain substances, when it is caused to flow through them. These substances, in endeavoring to return to their original state, produce electricity.

Suppose we place two pieces of very thin bright steel out of doors for a few weeks. They become “rusted.” The action of the oxygen on the outer layer of the metal has formed it into an oxide commonly known as “rust.”

Now, let us place these two pieces of steel into a solution composed of potash and water, and connect them by wires to a small dynamo. The electricity, in flowing from the dynamo through the solution, from one of the plates to the other, and back to the dynamo, changes the rust to metallic iron on one of the plates, but causes the other plate to become “rusted” twice as much as before.

Now, let us disconnect the plates from the dynamo and connect them, by means of wires, to an ammeter. Instantly, the excess oxygen in the rust on the one plate commences to pass back to the bright plate and, by so doing, causes electricity to be generated. Why? Nobody really knows.

We have now charged and discharged a primitive storage battery.

Instead of two thin rusted steel plates, let us mount, say, one hundred such plates, equidistantly spaced, on one rod, and one hundred more on another rod. Now suppose we interpose the two groups so the plates of the two groups will not touch each other, and then connect them to our dynamo. The electricity will flow from one group, through the solution, to the other group, converting the oxide of one group to metallic iron, and increasing the amount of oxide on the other group. We will be able to get much more electricity from the battery thus formed, because of the greater plate surface exposed.

We have thus determined that large surface is necessary.

Let us next place a lot of fine particles of iron rust into two perforated flat steel pockets and, after putting these pockets into potash solution, pass electricity from one to the other, through the solution, as before. All the iron rust in one pocket will be changed to metallic iron, because the oxygen will have passed over to the iron rust in the other pocket, causing this material to possess twice as much oxygen as before. The super-oxidized pocket tends to swell to a cylindrical shape.

Now, when you connect the two pockets to your ammeter, you will find that much more electricity is flowing than before, although the two pockets take up much less space than the two hundred steel plates. The reason of this is, the small particles present a very great combined surface to the solution.

Suppose, after having a great number of experiments, you find that if you put some iron rust—iron oxide—into perforated steel pockets, and mount a lot of these pockets on a steel grid or support to form one plate, and place nickel hydrate (a green powder) into perforated steel tubes, and mount these tubes on another steel grid to form the other plate, you will have arrived at the point Mr. Edison reached when he discovered the Edison storage battery.

The electricity, in flowing through the solution from the “tube” or positive plate to the “pocket” or negative plate, causes the oxygen in the iron oxide of the pockets to come over to the green nickel hydrate. This oxidizes the hydrate and forms a new kind of nickel oxide, heretofore unknown chemically. This oxidizing of the hydrate tends to cause the tubes to swell. But they are already round—cylindrical—and are furthermore reinforced by a number of seamless steel rings placed around them. It is therefore apparent that they cannot swell.

We continue to pass the current through until the iron oxide in the pockets has been converted into metallic iron, and the green nickel hydrate, in the tubes, becomes black nickel oxide. Then when we connect these two plates to our ammeter, the increased capacity will be apparent.

At this point we still find, however, there is room for improvement, just as Mr. Edison found.

Some substances permit more light to pass through than do other substances. Likewise, some substances present greater resistance to the passage of electricity through them than do other substances. This nickel oxide in the positive plates has high electric resistance. So it becomes necessary to divide it up into very thin layers, and to conduct the electricity to these layers by intervening layers of metal.

I will explain to you later how this was accomplished. It was exceedingly difficult to achieve, and cost Mr. Edison much money and effort.

The loading of the tubes is accomplished by an automatic machine operating as follows:

After the perforated steel tubes have been made, they are placed vertically into iron clamps directly under a row of fixed tubes, through which metal rods pass. After a little metal cap has been inserted into each of the tubes, the machine is put into operation, and a very small quantity of green nickel hydrate—the green powder—is allowed to fall into the tubes.

On top of this falls, in an evenly distributed layer, some very finely divided metallic nickel scales. The metal rods descend, and under a pressure of about two thousand pounds to the square inch, forces this thin layer of nickel scales into very intimate contact with the thin layer of nickel hydrate. The rods are

*Presented at Los Angeles before the A. I. E. E.
caused and the performance repeated, until a total of seven hundred alternate layers of nickel hydrate and flake nickel have been tamped together. Besides making intimate contact with the successive layers of nickel oxide, the layers of nickel flake make like contact with the sides of the tubes, so that when the tube is placed into a solution of potash and water, the charging current passes to these layers of flake nickel, and through the thin layers of nickel hydrate for the purpose explained.

After the tubes have been filled, they are removed from the iron clamps, another metal cap is inserted in the top of each, and the two ends are mashed flat. The tube is then placed into a machine which forces the seamless steel rings over it, equidistantly spacing them. Thirty of the tubes are then mounted on grids and firmly clamped thereto by means of retaining ears forming part of the grid.

The negative pockets are formed into two halves, open at the top. These pockets are clamped in a device, and loaded with iron oxide by machines similar to the tube-loading machines, although it is not necessary to interpose layers of metallic nickel flake, be-

cause iron oxide has lower resistance than the nickel oxide in the positive tube. The conductivity of the iron oxide is increased by mixing with it a little mercury, which is all sufficient.

Twenty-four of these pockets are placed into interstices of a steel grid and subjected to hydraulic pressure, which firmly clamps them to the grid. It also corrugates the sides of the pockets, imparting to the said sides sufficient elasticity to cause them to always adhere tightly to the iron oxide mass within.

We now come to the assembly of these positive plates and negative plates, to form a battery.

For convenience, we will mount four of our positive plates on a steel rod, the plates being equidistantly spaced by means of steel washers fitting over the rods and between the plates.

We similarly mount five negative plates on such a rod. Two nuts at the ends of each of these rods, when tightened, firmly clamp the plates.

We now sandwich the four positives and five negatives together, so that, between the negative plates, positive plates are interposed.

It becomes necessary to keep these plates from touching. We therefore place a number of hard rubber rods between them, the crevice formed between adjoined tubes of the positive plates providing a channel to hold the little rods in position.

We then fit the hard rubber ladder pieces to the edges of the plates. The cross members of these ladders have little grooves, so that the edges of the positive and negative plates fit into them, as a drawer fits into a table. This keeps the edges apart.

There must be a receptacle into which to place this combination of plates so nested together. The can, as this container is called, is made up of sheet steel, all seams of which are welded by means of the oxygen-acetylene blow pipe. The sides of the can are corrugated, to provide mechanical strength and radiating surface.

The hard rubber bottom support is placed into this steel can; the nested plates are slipped in with their hard rubber ladders in place; two thin sheets of hard rubber are slipped in between the sides of the can and the outside negative plates, and the entire unit is ready for the top.

After two hard rubber washers have been placed over the vertical pole pieces the top is put in position and likewise welded to the can. Please note that the
hydrogen gas fed thereto. The retorts are placed in a furnace and brought up to the proper heat, at which the nickel becomes firmly welded to the surface of the steel. This forms an impervious preserving coating of nickel for the exterior of the cell, and provides excellent electrical contact of all the parts. This process is one of the many that had to be invented and perfected for the manufacture of the Edison battery.

The cells are mounted in wooden trays with hard rubber pockets in the side slats which receive buttons on the sides of the cells and secure the cells firmly in place.

The electrical connections between cells are then completed, the positive pole of one being connected to the negative pole of the next, and so on. These connections fit over the tapered poles or terminals of the cells, and are brought into intimate contact therewith by the nuts on the ends of the poles. Therefore, to remove a cell from a tray, or to disconnect one cell from the other, it is only necessary to remove the nuts and, by means of a little jack, pull the connection off the pole. There is no sawing through connectors when disconnecting, nor lead burning necessary when setting up a battery.

As already mentioned in this paper, it will probably be of interest to look further into the electro-chemical action, as follows:

Starting with oxide of iron in the negative, green nickel hydrate in the positive and potassium hydrate in the solution the first charging of a cell reduces the iron oxide, to metallic iron while converting the nickel hydrate to a very high oxide of nickel, black in color. On discharge, the metallic iron goes back to iron oxide and the high nickel oxide goes to a lower oxide, but not to its original form of green nickel hydrate, and every cycle thereafter the positive charges to a high nickel oxide. Current passing in either direction (charge or discharge) decomposes the potassium hydrate of the electrolyte and the oxidation and the reduction at the electrodes are brought about by the action of its elements. An amount of potassium hydrate equal to that decomposed is always reform at one of the electrodes by a secondary chemical reaction and consequently there is none of it lost and its density remains constant.

The eventual result of charging therefore is a transference of oxygen from the iron to the nickel electrode and that of discharging is a transference back again. This is why the Edison battery is sometimes called an “oxygen-lift” cell.

When both electrodes become fully charged the elements of the decomposed potassium hydrate can no longer act on them, and instead they react to produce hydrogen and oxygen, the elements of water which are given off as gas.

Nickel flakes in the positive and mercury in the negative do not take part in the chemical reaction, but are used solely to bring the particles of active material into good electrical contact with the conducting support.

The electrical efficiency of an Edison battery will all run about the same per cent and we will use the A-Four Type 150 ampere hour battery for illustration, and I will give you the complete data on this cell.

The weight of the cell is 13.5 lb. The ampere hour capacity is, as I have stated, 150 ampere hours when the cell is first put into use, and the normal actual output from a seven-hour charge is 168 ampere hours. The maximum output on overcharge from this cell is 190 amperes. Cells are charged under normal charging conditions 7 hours at 30 ampere hours, and the normal discharge rate is figured five hours.

The watt hour capacity of this cell is 180. The normal actual output from a seven hour charge is 202 watts, and the maximum output from overcharge is 228 watts.

The rated capacity per pound in watt hours is 13.3; the normal output per pound from the 7 hour charge is 15.0. The maximum output per pound is 16.9.

The discharge rates of this type cell is 30 amperes. The maximum rate for intermittent discharge is 180 amperes. The watt equivalent of normal rate is 36. The watt equivalent of maximum ampere rate is 133.

The average voltage, discharging at the 5 hour rate, is 1.20. Discharging at 1/5 normal rate, the voltage rises to 1.28. While discharging at five times the normal rate, which is one hour, the voltage is lowered to .84.

The internal resistance of the Edison battery has long been the bone of contention among electrical engineers. The mean effective internal resistance of the A-Four Type is .003.

The normal ampere hour efficiency of all of the A-type cells is 80 per cent. The normal watt hour efficiency is 60 per cent.

In reference to installation of Edison batteries in vehicle service in Southern California, the Southern California Edison Company has 21 electric vehicles, all equipped with Edison batteries, some of them having been in use nearly four years, and all of them giving the best of continuous service.

Another installation is a set of 60 cells of A-6 225 amperes, which were shipped to Los Angeles, about six years ago, and were used in a one ton Lansden hotel bus owned by the King Edward Hotel. This bus ran continuously for over five years, and was in service approximately 18 hours per day. The batteries recently were removed and put in another chassis owned by Walter E. Smith Company and are now used in grocery deliveries. As this is the oldest set that we have any record of here in California, it only goes to show the long life the batteries will stand up to with any reasonable care and attention.

The Edison Storage Battery can be put on charge for five times its normal rate for a period of five minutes; four times its normal rate for fifteen minutes, three times its normal rate for thirty minutes and twice its normal rate for one hour. It can also be discharged at five times its normal rate or the cell or series of cells can be short-circuited without any injury to the battery.

Electric Trucks Unload Steamer

The unloading of the steamship Mexico was finished Friday before noon by the use of the electric trucks of the Dock Board, and the Mexico crossed the river to enter the Algers dry docks for necessary repairs. There does not seem to be any question whatever of the adaptability of the trucks to the work for which they were designed. The stevedore in charge of the unloading, declared himself surprised and delighted with the work of the trucks.
There has been considerable criticism on the part of the shippers and teamsters in Boston of the freight terminal facilities in that city, and of the methods employed by the railroads in sending out notices and in delivering freight, particularly L. C. L. shipments. To determine whether such criticism was justified, the electrical engineering department of the department of the Massachusetts Institute of Technology, in connection with the investigation, it was making of the use of motor trucks for freight delivery, had several students in the spring of 1912 make a number of observations on the movements of all kinds of vehicles at the Boston freight terminals. A summary of their observations and conclusions was drawn up and was shown to the operating vice-presidents of the three railroads entering Boston.

Two of the roads were sufficiently interested to contribute to the Institute a sum of $2,000 jointly, to be used to extend this investigation. In the fall of 1912 a research association was appointed to carry out this investigation, and during the past year it has devoted its entire time to this study, under supervision of the research division of the electrical engineering department of the Institute. A discussion of the methods and results of this investigation are given herewith. The discussion naturally falls into two parts, viz., Part I, Analysis of Time Spent by Wagons in the Freight Yards; Part II, Analysis of Time between the Arrival of the Train in the Railroad Yard and the Delivery of Freight. The conclusions derived from the two studies are given at the ends of Part I and Part II respectively.

**PART I.**

**Description of the Boston Freight Terminals:**—In Fig. 1 is shown a map of the business district of Boston on which the houses in the freight terminals are indicated by black blocks. In general each of these blocks represents several houses arranged side by side as indicated by the numerals alongside the block. The five blocks in the lower right hand corner represent the 11 freight houses and 2 piers of the N. Y., N. H. & H. Railroad. The two small blocks to the west of the South Station (Boston Terminal) represents the 4 freight houses of the Boston & Albany Railroad. The string of blocks of the upper part of the map to the north and west of the North Station (Union Station) represent the 35 freight houses of the Boston & Maine Railroad.

This last group is divided into three sections handling respectively the freight to and from the Southern, the Fitchburg, and the Portland divisions. The houses of Minot street handle the freight for the Southern division, those in the vicinity of Warren Bridge the freight for the Fitchburg division, and those in the vicinity of Rutherford avenue the freight for the Portland division of the Boston & Maine.

From the map it will be seen that the N. Y., N. H. & H. Terminal, the Boston & Albany Terminal, and the Southern and Fitchburg divisions of the Boston & Maine Terminal are each within approximately one mile from the center of the business district. The most distant house of the Portland division is approximately 13 miles from the center of the business district. The wholesale district lies chiefly between the harbor and a line drawn from the North to the South Stations.

In addition to the terminals described above, the freight for reshipment to trans-Atlantic and coast-wise points is handled at the Mystic Docks, the Hoo-sac Tunnel Docks, the East Boston Docks, and the docks along Atlantic avenue. The study, however, has been confined to the handling of less-than-car-load freight passing through the houses described in the preceding paragraph.

**Methods of Delivering and Receiving Freight:**—Inward and outward bound shipments are in most instances handled through separate houses. In the New Haven Terminal, 6 of the houses and one-half of each of the 2 piers are used for L. C. L. inward freight and 5 houses for L. C. L. outward freight. In the Boston & Maine Terminal there are 12 houses used for inward, 7 for outward, and 3 for both inward and outward L. C. L. freight. Of the 4 Boston & Albany houses, 2 are used for inward and 2 for outward L. C. L. freight. At the inward freight houses the teamster must himself locate and load his freight. He first receives at the cashier's office a delivery check which designates the house and usually the door at which the freight will be found. After arriving at the door he must enter the freight house, pick out his freight and load it upon his wagon. In case the teamster finds freight in the house for which the delivery check is not available, he may load it upon obtaining a "memorandum" check from the cashier's office.

At the outward houses the teamster must distribute his freight at one or more doors according to its route and destination. He unloads the freight from his wagon at the proper doors and then departs upon obtaining the road's receipt of delivery of goods. The N. Y., N. H. & H. Railroad and the Boston & Maine Railroad have issued loading books which state the house and door at which the freight will be received for any destination whatever.

*By H. Pender, H. F. Thomson and C. P. Eldred.*
Definite house and door number is given for each destination, but the teamsters in general are allowed to unload at any door in the immediate vicinity of the one designated. This tends to avoid congestion and also to make it unnecessary for a teamster to move his wagon from door to door in case he has freight for several points normally unloaded at different doors near one another.

Delivery Checks and Memorandum Checks:—The regular delivery check for each consignment is made out in the freight agent's office from the waybill, the latter either coming with the consignment or coming by mail. This delivery check is sent to the cashier's office at the proper portion of the freight yard and a clerk there makes a proper copy of it. Soon as this information is received, the delivery clerk in the freight house receives the check and makes a copy for the teamster. The method of making out the delivery checks is described more fully in Part II.

The system of memorandum checks referred to above and several times in the following discussion, is used to enable consignees who expect freight to obtain it as soon as it is placed in the freight house, without waiting for the regular delivery check to be completed and "racked." A teamster is permitted to enter the freight house, look for such freight, knowing approximately where it is likely to be located. After finding the freight he may then go to the cashier's office and obtain a check called a memorandum check, and the freight will be surrendered by the delivery clerk upon presentation of this check. This system, although it requires the driver to spend more time at the freight house, is of considerable advantage to consignees in cases of error on the delivery check or of delay in the arrival of the waybill causing the agent's office delay in making out the delivery check.

Time Spent by Wagons in Freight Yards:—It was desired first to find the percentage of the day spent in the freight yards by the average teamster of large trucking concerns handling miscellaneous freight. Observations made for twenty-one days on the one- and two-horse trucks of two of the largest master teamsters in the city showed that these wagons spent approximately one-third of the working day in the freight yards.

Figs. 2 and 3 show graphically the results from these observations. As seen by these plots the teamsters spent approximately one-third of the working day in the railroad yards. The conditions at the freight terminals, therefore, largely influence the amount of work that can be done by teams doing this class of hauling.

These observations also showed that the delay per day experienced at the warehouses, or stores, was actually greater than the delay due to congestion in the railroad yards. By delay as used throughout this paper is meant lost or idle time on the part of the wagon driver. The delay in the case of freight being delivered to the warehouse usually arises from the necessity of waiting for platform space or for the use of an elevator. The delay at the warehouse in the case of freight being loaded is due chiefly to the fact that the goods are not ready for shipment at the time that the teamster calls.

The conclusion that the average delay at the warehouses was greater than the average delay at the railroad yards was substantiated by additional data upon wagons hauling the outputs of two large factories. In one case, observations upon more than 700 loads, some of which were delivered to warehouses about the city, and the remainder to the railroads, showed that the unloading time at warehouses was 38 minutes as compared with 29 minutes at railroad yards. These were two-horse wagons and the loads, composed chiefly of goods packed in barrels, averaged a trifle over four tons each.

In another case observations upon two- and three-horse wagons which took 179 loads away from the factory showed that on the average 51 minutes elapsed between the arrival of the wagon and its departure with load. Of this time only 16 minutes were spent actually loading. The remaining 35 minutes were consumed in waiting for a turn at the loading platform. This delay was chiefly because of poor assignment of the wagons, more wagons being used by the master teamster in doing the trucking than could advantageously operate under the conditions.

Relative Times Spent by Different Classes of Vehicles:—In connection with our studies of motor trucking, a number of observations were made to determine the relative times spent by different types of vehicles in visiting a given freight house or group of houses. Fig. 4 is a typical plot made from one set of such observations in two inward houses facing each other. This particular plot gives the division of time from the instant the vehicle entered the roadway between the two houses until it passed out again past the same entrance.

Load Curves:—The number of vehicles calling at the outward and inward freight houses throughout typical days was also observed. Fig. 5 shows typical load curves...
at an inward and at an outward house. The relative volume of inward traffic during any hour is approximately proportional at the area under the inward curve for that hour; similarly, the relative volume of outward traffic during any hour is approximately proportional to the area under the outward curve for that hour. These curves show that about 30 per cent of the total inward traffic is between 7 and 9:30 A.M., and that about 35 per cent of the outward traffic is between 4 and 5:30 P.M. In this connection it should be noted that the entrance gates open at 7 in the morning and close at 5 in the afternoon. These curves show clearly that one of the greatest difficulties encountered by the railroads in the handling of L. C. L. freight is the necessity of providing facilities which are utilized to their maximum capacity during only one or two hours of the day. This condition is analogous to a power plant operating at a very low load factor.

Photographs of Yards During the Rush Hours—In connection with the load curves shown in Fig. 5 numerous photographs of the yards were taken, of which Figs. 6 to 9 are typical. The load curves can best be interpreted when considered in connection with these photographs.

Fig. 6 is a view of the roadway between two of the New Haven inward houses taken about 8:00 A.M. on April 18, 1913. This photograph shows approximately 25 teams in the yard. The maximum point on the inward curve in Fig. 5 corresponds to 49 teams in the yard; hence at the hour of maximum traffic the congestion would be twice as great as that shown in the photograph.

Fig. 7 is a photograph taken of the roadway alongside a New Haven outward house at about 5 o'clock in the afternoon of April 17, 1913. The congestion here shown is somewhat greater than that of the corresponding maximum point of the outward curve shown in Fig. 5, as the traffic on this particular day was exceptionally heavy.

Fig. 8 shows the conditions at a similar house taken earlier in the afternoon (4 P.M.) and is representative of the conditions during the greater part of the day.

Fig. 9 is a photograph, taken at about 5 P.M., of the roadway between two Boston & Maine houses in the Rutherford avenue group. This view also shows in the study of the conditions at the freight houses was next undertaken to determine if possible what proportion of the time spent by the teamster at the freight terminal might be eliminated. The first item in the lost time is waiting for turn at the freight house doors.

Observations were made on 475 vehicles making 590 door calls at two of the New Haven outward houses, 231 vehicles making 262 door calls at three of the Boston & Maine outward houses, and 139 vehicles making 216 door calls at two Boston & Albany outward houses, or 1068 door calls in all. The average wait per door was found to be 1.1 minutes, with a maximum wait of 35 minutes and a minimum of no wait at all. These observations were all taken in the afternoon and therefore represent the more congested portion of the day. It was found (see Figs. 2 and 3) that on the average, taking into account all the observations made, each vehicle made about 3.5 door calls per trip to the outward houses of any one road; hence the total average wait per trip was 3.5 x 1.1 = 4 minutes. This aggregate figure compares favorably with observations reported by David Beecroft in a paper presented at the November, 1912, Convention of the National Association of Automobile Manufacturers, on the delays at the outward railroad freight terminals in Chicago and Detroit, and at the docks in New York City, in all of which terminals the single dump system is employed. Mr. Beecroft gives an average wait of 62 minutes at the Santa Fe Terminal in Chicago, 11.7 minutes at the Illinois Central Terminal in Chicago, 30 minutes at the Coopers St. Terminal in Detroit, and 12.5 minutes at the Jersey Central Dock in New York City.

Similar observations were made at the inward freight houses during a number of forenoons. The total number of door calls covered by these observations was 878. The average wait per door was 0.6 minutes, the maximum wait was 41 minutes, and the minimum wait was none at all. It was found (see Figs. 2 and 3) that on the average each vehicle made 2.5 door calls per trip to the inward houses of any one road; hence the total average wait per trip was 0.6 x 2.5 = 1.5 minutes.

Other Lost Time—The time spent in waiting for turn at the freight house doors is the only lost time at the outward houses chargeable to the railroad. At the inward houses, however, there may be in addition to delay in waiting for turn at the freight house door additional lost time due to the following causes: (1) Inquiries at cashier's office; (2) Loading of driver at the cashier's office.

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Fig. 4. Typical Plot of Time Spent per Vehicle at Inward Freight Houses.

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Fig. 3. Typical "Load Curves."
and in the freight house; (3) Searching for freight by driver.

Data regarding the first two of these items, namely, the time consumed in inquiries and in loafing were obtained by two sets of observations, one made at the New Haven Terminal (December, 1912) and the other at the Boston & Maine Terminal (March and April, 1913.) The results of these observations are recorded in Table I. At the same time data on item (3) were also obtained, which, however, were supplemented by more extended observations at other times.

TABLE I.
ANALYSIS OF TOTAL TIME SPENT BY WAGONS* AT INWARD FREIGHT HOUSES.

<table>
<thead>
<tr>
<th>Item</th>
<th>Avg. time per wagon in freight yard</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minutes</td>
</tr>
<tr>
<td>CASHIER’S OFFICE:</td>
<td></td>
</tr>
<tr>
<td>Checks</td>
<td>3.8</td>
</tr>
<tr>
<td>Inquiry</td>
<td>2.8</td>
</tr>
<tr>
<td>Loading</td>
<td>1.9</td>
</tr>
<tr>
<td></td>
<td>8.5</td>
</tr>
<tr>
<td>FREIGHT HOUSE DOOR:</td>
<td></td>
</tr>
<tr>
<td>Giving receipt and making inquiries of</td>
<td></td>
</tr>
<tr>
<td>Delivery Clerk</td>
<td>2.2</td>
</tr>
<tr>
<td>Searching (including calls without loading)</td>
<td>4.1</td>
</tr>
<tr>
<td>Loading</td>
<td>16.2</td>
</tr>
<tr>
<td>Delay at door</td>
<td>0.8</td>
</tr>
<tr>
<td>Helping other drivers</td>
<td>1.0</td>
</tr>
<tr>
<td>Roping, etc.</td>
<td>2.3</td>
</tr>
<tr>
<td>Loaing</td>
<td>1.6</td>
</tr>
<tr>
<td>Moving in Freight Yard</td>
<td>27.9</td>
</tr>
<tr>
<td></td>
<td>10.3</td>
</tr>
<tr>
<td>Total</td>
<td>46.7</td>
</tr>
</tbody>
</table>

*These wagons on the average carried somewhat lighter loads than those on which the data given in Figs. 2 and 3 were obtained.

The general plan of making observations recorded in Table I was to pick out wagons at random as they called at the cashier’s office for their delivery checks and follow them during the time the wagons were in the freight yard. The period of time observed was from the stopping of the vehicle at the cashier’s office until the passing of the last freight house on leaving the yard. The wagons on which these observations were taken were all owned by small teamsters, and all stopped at the cashier’s office before going to a freight house. Some of the master teamsters, such as those owning the wagons on which the data in Figs. 2 and 3 were taken, maintain foremen or “lumpers” at the different yards; in such a case the lumper gets the delivery checks for his company at the cashier’s office and distributes them among the drivers of his company, thus eliminating the necessity of each driver visiting the cashier’s office. As a class, the wagons of the smaller teamsters, or those of companies which do not make a business of freight hauling, do not handle as large loads per trip as do the wagons of large trucking companies, so that the total time of loading and the number of door visits per trip as given in Table I are smaller than the typical values for the master teamsters shown on Figs. 2 and 3.

Inquiries at Cashier’s Office.—These observations showed that 6 per cent of the total time in the freight yard was consumed in making inquiries at the cashier’s office. These inquiries at the cashier’s office are because chiefly of two causes: (1) obtaining memorandum checks for shipments whose delivery checks were not as yet available to the teamster; (2) correcting errors on delivery checks as discovered by the driver. As a large proportion of the calls at the inquiry windows were for memorandum checks, any improvement in the system of handling the regular delivery checks whereby the number of memorandum checks could be reduced would greatly aid the teamster.

Loaing of Drivers.—The time spent by the driver in loafing at the cashier’s office was found to be an appreciable item, particularly on cold days. This source of lost time is, of course, in no way chargeable to the railroad. The average loafing time at the cashier’s office at the time of the observations recorded in Table I (December, March and April) was 7 per cent of the total time in the yard. In this connection it may be remarked that the driver is the prime factor in the freight terminal situation, as his complete co-operation is necessary for the success of any freight house system.

Searching for Freight:—From the observations re-
corded in Table I, the average time spent by the driver in searching for freight in the freight house was 9 per cent of the total time in the yard, or 15 per cent of the time at the freight house door. An earlier set of observations made in November, 1912, on 159 door visits at four other freight houses of the New Haven and the Boston & Maine showed an average delay on account of searching of 21 per cent of the time at the freight house door. The average searching time for all these observations (318 door calls in all) was 18 per cent of the time at the freight house or approximately 11 per cent of the total time in the yard.

In some instances the time charged to searching was time spent by the driver in locating freight for which the delivery check was not available and which he wished to remove on a memorandum check. A part of the searching time was also due to the crowded conditions of the houses, but the chief causes were scattered consignments and neglect to place the pieces of freight so that the identification marks could be read easily. In some cases searching was due indirectly to the poor manner in which the goods had been packed and marked by the shipper; in the rehandling packages had become so battered that the addresses were almost unrecognizable.

It frequently occurs that a consignment of goods billed in a certain car will actually arrive in several cars and will, therefore, be scattered in the freight house when unloaded. The remedy, for this lies at the point of loading rather than at the destination. Since these observations were taken, considerable improvement has been made in the conditions in the freight houses. One road has put on "sorting gangs" whose duty it is to keep the freight properly sorted and to move forward each night all uncalled for consignments.

Door Calls Without Loading:—In making the various observations referred to above it was found that a wagon frequently called at a door and then left without loading any freight. To determine the extent of this practice and the causes thereof, two sets of observations were made in October, 1912, one covering a total of 267 door calls by typical New Haven houses and one covering a total of 221 door calls of typical Boston & Maine houses. It was found that of these 488 door calls, 107 calls, or 22 per cent of the total calls, were ineffective as far as the actual loading of freight was concerned. The maximum time occupied for such a call was 69.5 minutes, the minimum 0.2 minutes and the average for the 107 calls was 6.8 minutes. To this should be added the time spent by the wagon in going from the wrong door to the right one, which on the average is probably not over 1 minute. The average time lost per door on

this account including all calls (486) was 1.4 minutes at the door itself, or allowing for moving to the right door, the average delay would be 1.7 minutes.

These extra door visits were found to be due to (1) omission of door locations on the delivery checks, (2) errors on the delivery checks, and (3) errors by the drivers. In certain cases the omission of door locations arose from the fact that the railroad's office work was ahead of the yard work, and the drivers preferred to obtain the delivery checks without locations designated and to search for the freight, rather than wait for the office to receive the location. The errors on the delivery checks were found to be due to carelessness in making out the checks, to illegibility of the waybills from which the checks are made, or to the shifting of a car before it was unloaded to a position other than that reported to the cashier's office.

The above facts in regard to the extra door visits were called to the attention of the railroad officials, who demanded greater care by the clerks in marking the door locations on the checks. A subsequent (March, 1913) series of observations made at the New Haven houses showed that the percentage of these extra door calls had been reduced from 22 per cent to 12.5 per cent, the latter figure being an average for 390 door calls. The corresponding average time wasted per door call, including all calls (390), was reduced from 1.4 to 1.0 minutes.

Possible Improvements:—In order to summarize the above observations and to indicate how much time might be saved to the teamster by possible improvements in the methods of delivering and receiving freight at the freight houses, the following table (11) has been drawn up, based on all the observations recorded above. The table refers to the average conditions as they existed in the freight houses at the conclusion of our observations (October, 1913) and to two-horse wagons regularly employed in trucking miscellaneous freight.

In the columns headed "Possible Reduction by Rail-
road," are given the reductions in time which, in our opinion, would result from improvements which might reasonably be carried out by the railroads. No additional houses
and no radical change in the general system of receiving and delivering freight are contemplated, but only such changes as might be made to improve the present system. It should be borne in mind that improvements cost money; it is beyond the scope of this paper either to estimate the cost of the suggested changes or to discuss the question of what proportion of this additional expense should be borne by the railroads without additional compensation.

Obtaining Checks:—This item includes the time spent by the teamster at the cashier’s office in obtaining delivery checks and settling bills. The time of 4 minutes could not be reduced appreciably.

Receipts and Inquiries:—This item includes the time spent by driver in making inquiries at the cashier’s information desk, in telephoning about lost shipments, and in giving receipt to delivery clerk and in making inquiries in freight house. This time of 5 minutes could be reduced materially by the exercise of greater care in making out the delivery checks. As noted above, errors in the delivery checks are frequently due to errors or illegibility of the waybills (made out by the railroad) which are used in making out the delivery checks; errors in the waybills are in turn frequently due to errors or illegibility in the bills-of-lading (made out by the shipper). The possibility of errors in the delivery checks would be reduced if the railroad used billing machines for making out the waybills, for the name and address of the consignee and the description of the goods could then be entered on the delivery check as a duplicate of the entry on the waybill. Errors in both delivery checks and waybills would also be materially reduced if shippers adopted the practice of making out bills-of-lading by typewriter instead of by hand, as is now common even with large houses.

The time taken by the driver in obtaining the railroad’s receipt for outward bound freight is included under unloading time for wagons delivering freight.

Waiting for Turn at Door:—Contrary to statements made frequently by drivers that they lose large amounts of time due to waiting for their turn at the freight houses, this item was found to be surprisingly small, viz., an average delay of 1.5 minutes for inward and 4 minutes for outward freight. The delays observed were chiefly during the rush periods in the morning at the inward houses and in the afternoon at the outward houses, and even at these times the length of delays was not excessive (see page 11). The number of available doors in the freight houses is more than adequate for traffic except during these brief morning and evening rush periods.

It is doubtful whether the average delay of 1.5 minutes per yard trip to the inward houses could be materially reduced, although greater care in locating the freight in the freight houses and in making out the delivery checks, as discussed in the next paragraph, would cut down the number of door visits per trip, which in turn might relieve the rush hour congestion somewhat. It is impossible to estimate how much of a reduction might thus be effected, since it frequently happens that this delay is due to a driver waiting for a particular door, even though other doors in the same house are not occupied.

Searching for Freight and Calls Without Loading:—The action of one road in putting “sorting gangs” in the freight house has proved beneficial to both the teamster and the railroad, giving more space for the unloading of the cars and keeping consignments from being covered up by freight arriving subsequently. Were this improvement carried out in all freight houses the average searching time could be reduced materially. By avoiding the errors in the delivery checks as noted above, the unnecessary calls at doors without finding the freight would be partly eliminated. By having the regular delivery checks made out ready to receive the door locations as soon as the freight is unloaded, these checks could be handed at the cashier’s office almost simultaneously with the placing of the freight in the houses, and thereby reduce the number of memorandum checks and the time spent by drivers in hunting for freight which may or may not be in the house.

A certain amount of time must inevitably be required for the driver to locate his freight, but with more efficient methods of handling the freight in the freight house and in making out the delivery checks the average searching time per trip could, in our opinion, be reduced from 8 minutes to about 3 minutes.

Loading or Unloading:—This is the portion of the time at the freight house spent by the teamster in handling freight. The time at present consumed could be materially reduced by a closer co-operation between the employees of the railroads and the teamsters. The employment of more truckmen in the freight house to assist the drivers in handling the bulky loads would improve the service by further reducing this time, though the labor expense to the railroad would be increased. A reduction of the present times for loading and unloading by about 15 per cent could, in our opinion, be expected from a reasonable improvement in co-operation and increase in the number of truckmen.

**TABLE II.**

**Estimated Distribution of Total Time in Yard for Average Two-Horse Wagon**

(Wagon receiving freight calls on the average at 1.5 houses and at 1.5 doors per house. Wagon delivering freight calls on the average at 2 houses and at 1.75 doors per house.)

<table>
<thead>
<tr>
<th>Distribution of time</th>
<th>Time in yard for wagon to obtain load, minutes</th>
<th>Time in yard for wagon to deliver load, minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Present Possible reduction by railroad Net time after reduction</td>
<td>Present Possible reduction by railroad Net time after reduction</td>
</tr>
<tr>
<td>Obtaining checks</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Receipts and Inquiries</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Waiting for door</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Loading or unloading</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Loading</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>Moving in freight yard</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>67</td>
<td>54</td>
</tr>
</tbody>
</table>
In none of the above discussion have the methods of handling freight known as the "single dump" and the "sill delivery" been considered. It is an open question if the saving in the time of the drivers which might result from the institution of these methods would justify the necessary increase in the labor cost of the freight houses.

**Loading:**—The time spent by the drivers in loading while at the cashier's office and in the freight yard is not chargeable to the railroad and, therefore, would not be affected by any readjustment of the methods of operating the freight houses. Loading time depends on the season of the year, being greater in extremely hot or cold weather than when the temperature is normal.

**Moving in Freight Yard:**—This item represents the time that the wagon is moving while in the freight yard; that is, between the passing of the first and the last freight buildings in the given terminal. This time is relatively large at the Charlestown yards on account of the scattered locations of the houses. The moving time in these yards could be reduced somewhat by using for L. C. L. freight those buildings which are nearest the business center of Boston, and which are now used for car-load freight. Several times as many wagons call per day at one of the L. C. L. houses as call at one of the car-load houses. The moving times of the wagons would also be reduced if the street paving alongside the houses was kept in better condition. The paving on some of the private ways in the yards is filled with ruts which collect ice and water during bad weather. On some of the public streets, there are curbstones which make it inconvenient to back wagons to the freight house doors. Even were improvements in these respects carried out it is doubtful if the average moving time could be reduced by more than 10 per cent. or say one minute; although at some of the houses a much greater saving could be expected.

**Total Reduction of Time of Yard Visit:**—The total possible saving of the teamster's time as represented in the above table is, in round figures, 18 per cent, or between 1/6 and 1/5 of the time now spent by him in the freight yards. The changes in the operation of the yards as pointed out above might be expected to result in a considerable increase in the capacity of the railroad's present terminal facilities for handling L. C. L. freight. This saving in time is not as important to the teamster when considered in connection with the total working of the wagon of course as it first appears. As the wagons at present spend only 1/3 of the day in the freight yard, a reduction of this yard time by as much as 1/5 would mean a saving of not more than 7 per cent of the total working day. In other words, the study has shown that reasonable changes which the railroads might make in their present system of receiving and delivering miscellaneous freight, would effect a saving for the operators of the teams of a maximum of 7 per cent of the working day. As already pointed out, the cost of making these changes has not been considered in this connection, but merely the possibility of the railroads' rendering improved service with their present house equipment. It is pointed out above that the average delay of wagons was greater at the warehouses than in the railroad yards; the shippers themselves can therefore influence the lost time of wagons to a greater extent than can the railroads.

**Underloading of Wagons:**—The study has also furnished information which suggests a lack of efficiency in the present system of moving miscellaneous freight between warehouse and freight house. Data obtained on loads taken from the inward houses of the Fitchburg Division of the Boston & Maine terminal by 63 one- and two-horse wagons, (included in the observations given in Table 1) showed that these loads averaged slightly less than 3,000 lbs. This is approximately one-half of the normal capacity of these wagons for the Boston conditions of grade, pavement and distance. Any system of trucking whereby an increase in this average load could be affected would cause a corresponding decrease in the number of teams required to handle the same traffic. The "store-door" delivery by the railroads might provide a means of reducing this lack of efficiency.

*(To be Continued.)*

**The Fritchle Milestat**

The lack of a device to determine the condition of charge or discharge of a storage battery has been the great drawback to the use of electric automobiles for country touring. The ordinary meter will indicate amperes and volts, but does not indicate the condition of the charge of the battery at all times. The amperemeter indicates the amount of current used, but does not always indicate the full discharge. Furthermore, the amperemeter does not indicate any internal loss of current, because of short circuits in the cells, etc. The amperemeter records only the loss that passes out through the terminals of the battery. About seven years ago road tests were made by Mr. Fritchle to determine the relation between specific gravity and miles. At first it was supposed the specific gravity readings would show the amount of current, but this is not true. Most batteries are charged at a maximum gravity of 1280, and a discharged Fritchle battery is 1080 or 200 points of acid. The first 100 points, from 1280 to 1180, do not represent half of the discharge. They represent practically two-thirds of the discharge. From 1180 to 1080 is about one-third of the charge of the battery.

Percentage of sulphuric acid conforms very closely to the percentage curve of sulphuric acid. From 100 per cent to 80 per cent represents about 35 points specific gravity, and from 20 per cent to zero shows 55 points of gravity. This is not true. Most batteries do not have a specific gravity of 2180 once. As the wagens at first appear... As the wagens at present spend only 1/3 of the day in the freight yard, a reduction of this yard time by as much as 1/5 would mean a saving of not more than 7 per cent of the total working day. In other words, the study has shown that reasonable changes which the railroads might make in their present system of receiving and delivering miscellaneous freight, would effect a saving for the operators of the teams of a maximum of 7 per cent of the working day. As already pointed out, the cost of making these changes has not been considered in this connection, but merely the possibility of the railroads' rendering improved service with their present house equipment. It is pointed out above that the average delay of wagons was greater at the warehouses than in the railroad yards; the shippers themselves can therefore influence the lost time of wagons to a greater extent than can the railroads.

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This device has worked out very satisfactorily. It was used in Mr. Fritchle's trip from Lincoln, Nebraska, to New York, five years ago this month, 2180 miles, and if it had been accurate for this milestat, he probably would have been stuck more than once. It was also used to great advantage in the recent Colorado Derby a few months ago. You can tell exactly at all times how much current you have left. It is just as valuable to an electric car as a method of measuring the gasoline in the gasoline tank.

This device reads in percentages—from 0, 20, 40, 60, 80 and 100.

W. J. McDowell, chairman of the Chicago section of the Electric Vehicle Association of America, reported recently that there are in service in Chicago today 801 electric commercial vehicles, which is an increase of thirty over the total in service on March 1, 1914.
Questions and Answers
Problems and Their Solutions Which Arise in Everyday Operation

Passenger Electrics.

Very often I leave my electric standing on the street for three and four hours. Has the cold weather any effect on my batteries? Does cold weather reduce my battery mileage?

Cold weather has detrimental effect on the operation of an electric. Batteries work most efficiently in warm weather. Mileage is much lower in cold weather, especially if the battery is exposed long enough to become chilled. Lubrication in the various working parts of the car becomes stiff and fails to perform its proper function, consequently it takes more current to propel the vehicle. This reduces the mileage materially. As a rule the batteries are built in a weather proof box which protects them from serious effects of low temperatures; however, it is not good policy to submit the vehicle to freezing temperatures for long periods.

What is the average life of lead storage batteries and how do they compare with the Edison nickel-iron type?

The Electric Vehicle Association has published data on this subject which places the average life of lead storage batteries at 2 1/4 years; Edison batteries at 4 years.

Does frequent washing take the new appearance from a car? If so can you recommend a polish or solution which will restore the original lustre?

Too frequent washing will cause the varnish to become dull. The lustre cannot be restored unless repainted. The market offers many excellent polishes; however, the principal consideration lies in the use of high grade soaps. It is poor policy to have your car washed too frequently.

To what extent do skid chains increase the demand for current on the batteries?

On this subject there is little available information. The chains act as a continuous series of small pebbles each demanding a certain extra effort. Without a doubt skid chains reduce mileage from 7 to 19 per cent. It is advisable, however, to use chains wherever necessary. Skidding often results in expensive accidents and chains are the only known device which make it possible to ride in safety.

My instruction book emphasizes the use of cold water for washing my car. I wash my own car and wonder if warm water would have any effect on the varnish.

Instructions issued by the vehicle manufacturer are in nearly all cases the results of careful tests. Sudden changes in temperature causes varnish to crack and peel. It is not advisable to use warm water, first, because it removes the lustre and leaves the varnish dull in color. Secondly, if your vehicle has been exposed to low temperature, the sudden change resulting from the use of warm water will cause the varnish to shrink and blister.

Recently I spilt a can of lubricator on one of my fenders. How can I remove the stain?

What kind of a fender is it, leather or aluminum? If it is a leather fender, alcohol and gasoline applied once a day will soon remove the spot. If the fender is aluminum saturate a cloth with gasoline and sponge stain until it becomes soluble.

On public boulevards do vehicles have the right of way over those attempting to cross on intersecting side streets?

It is generally understood that those vehicles passing on the boulevards have the right of way. In every instance vehicles attempting to cross at intersecting side streets should slow down and not attempt to cross without first ascertaining the approach of vehicles on the boulevards.

Is it a fact that batteries run over when mounting inclines? Tests have proven that no danger arises from this source.

I have read much about the economy of coasting. Is there really a saving or does the renewed starting use up enough extra current to equalize the amount saved while coasting?

Whenever possible it pays to coast. However, there is a difference between coasting and "proper" coasting. For instance, it is judicious to coast down an incline turning the current on just before reaching the bottom rather than after beginning to mount the next rise. Proper coasting increases mileage considerably.

Can you suggest a method to prevent skidding?

Skid chains on both front and rear tires. It pays to run slow enough to stop gradually at any time without necessitating a quick setting of the brakes with consequent liability of skidding.

After leaving my electric car in the garage over night I notice a pool of liquid on the floor under my car. Is my battery worn out, over-charged or what?

If you are unacquainted with the inspection of your batteries, call in a garageman or a representative from your battery maker. Without a doubt one of your battery jars is broken and should be replaced. Also there might be a possibility of using too much water in flushing. At any rate you should consult an expert.

What is the best kind of a charging apparatus for home use?

The market has many rectifiers, good and bad. If you will tell us the kind of battery you are using, the number of cells, average mileage, etc., we will supply you with the names of three reliable manufacturers of charging equipment most suitable to your present needs.

To whom does "Central Station" refer?

Central stations are those companies which manufacture electricity such as the Cleveland Electric Light and Power Company of your own city.

Is it safe to buy a second-hand electric from the used car department of a gas car manufacturer?

Reliable houses sell under a guarantee. It is good policy, however, to pay an expert to examine and find the true value before purchasing.

How can I prevent my springs from squeaking? I have oiled them very frequently.

Moisture between the spring leaves causes squeaking. To avoid squeaking your springs should be lubricated. Mere oiling fails to find the proper points of trouble. Refer to your instruction book and without a doubt you will find that the body of the car should be jacked up on both sides in order to take the weight
from the springs. It is then an easy matter to insert grease between the spring leaves.

Has Cleveland an agency or garage which rents electrics to experienced drivers for personal use?
We have no record of such an agency.

In turning corners I notice a peculiar growl which seems to come from the rear part of my car. Is this a case of more lubrication or what?

From your question we judge you need an expert to examine your rear axle and differential. Any strain, for instance, an accident or a sudden lunge into the curb will cause the differential gears to be thrown out of alignment. This is a serious condition and should be corrected as soon as possible before the differential gears begin to wear.

Is the Columbus Buggy Company still in existence?
Columbus Buggy Company is still building electrics in Columbus, Ohio.
Do wire wheels show a saving in tire equipment and charging expense?
Tests are claimed to show an economy of 70 per cent saving on tires and about 20 per cent on the batteries.

What is the highest speed possible from an electric?
Depends on type and battery; 20 to 25 miles per hour is quoted as the best speed attainable with the latest models.

In starting my car it seems to start forward with a jerk. It has been doing this just recently. Why?
Your controller is out of order. Call in an expert or a representative from the manufacturer.

What is the best speed to use to secure the greatest mileage?
This depends upon the type, model and battery. Consult the manufacturer on this.

**ELECTRIC TRUCKS.**

What are the names of electric truck manufacturers in Chicago?
A complete list will be sent to you giving name, address and models in weights, capacities and prices.

What is the usual charge for storing, washing and charging a 2-ton electric?
Rarely taken on a flat rate basis. Storing usually costs $22.50; washing $20.00, and charging approximately $25.00. (This varies considerably.)

Does running on street car tracks injure solid truck tires?
Yes. However it is often the case that the saving in current demand shows an economy over tire damage due to running in the rails.

Is there a school for truck drivers and garagemen in Chicago?
Armour Institute has an excellent course on these subjects.

What is the depreciation on a 2-ton electric for the first and second years?
Depends upon the type and service in which it is operating. The truck builder will furnish you with these figures.

What would be the approximate cost of equipping a commercial electric garage with a capacity of twenty-five trucks?
This is a rather broad question depending upon many conditions. However, the question will be considered and an answer published in the February number.

A. McC.—Your problem and complaint will be referred to the Chicago Garage Owners’ Association, a body to regulate such matters.
PROPER selection and care of tires are essential. Selection:—It is acknowledged that solid tires last longer and give greater mileage when used on electrically driven vehicles than they do under gasoline vehicles. However, more care must be exercised in their selection.

In the first place, if the tire operating expense is to be maintained at the minimum, some compliance is necessary in selecting the correct size of tire equipment adequate to the load. The manufacturers equip their vehicles with tires of sufficient size to take care of the average operating conditions, but cannot and do not make allowances for abnormal conditions which may be encountered in any single installation, hence, in some places larger tires are necessary.

Tires should be soft and sufficiently resilient to act as a cushion for the vehicle, as a really hard tire shakes up the battery to its disadvantage and also tends to jar the vehicle to pieces.

Some tires are very inefficient as to current consumption and materially cut down the mileage from a single charge of the battery. Care should be taken that the tires are of a low current consumption type.

Care:—A clean garage materially helps the tires, as oil and dirt are natural enemies of rubber.

Overloading a truck is one of the common abuses of tires and is sure to cause trouble and expense and should never be allowed.

Reversing the vehicle at excessive speed when coasting down hill has practically the same effect as overloading and should be forbidden.

All non-skid devices are bad and detrimental to tire life. If they must be used, care should be taken in their selection, with instructions given and insisted upon that they be removed just as soon as conditions will allow. These also make the tire vulnerable.

Careful driving is an absolutely necessary factor in the economic operation of electric vehicles and tires.

In starting do not throw the controller to high speed at once, but allow it to step successively, allowing each one to gain its full acceleration before going to the next.

When stopping, throw off the power and coast up to the point at which it is desired to stop, applying the brake gradually instead of bringing it to full speed and jamming down the brake and so bringing the machine up hard.

Avoid all the chuck holes and bad pavements possible, and when impossible take them at a slow speed.

Drivers should have strict instructions not to run in ear tracks, as this causes rapid cutting away and wear on the tires and makes the tire manufacturers’ guarantee null and void.

THE CHASSIS.

In electric vehicle practice the word chassis is used to designate the body of the vehicle other than the battery and motor. These consist of the frame, springs and wheels, as well as the controller, motor, axles, gearing and steering apparatus. The motor and controller are pieces of electrical equipment, treated elsewhere.

Frame:—The body with load is supported on a strong but somewhat flexible frame, which rests upon springs attached to the front and rear axles, thereby carrying as much of the weight upon the springs as possible, cushioning shocks and reducing the vibration. The frame is made of two side members and several cross members riveted into a unit of sufficient strength for the load and spaced to maintain proper distance between the sections of the driving gears. The members are generally used on account of combining strength and light weight. The outriders and spring stubs for the spring attachment are usually of forged steel riveted to the side members. The latter may be entirely in one horizontal plane, raised at front, rear or center, according as the requirements of the service demand, such as for pleasure, commercial or special use.

The storage battery is assembled either in a single tray or in several trays as required. The latter are placed under the floor or carried on top of the frame. It may also be divided and carried at front and rear in order to better distribute its weight for easy riding qualities.

Springs:—In order to cushion the shocks and absorb the jars while traveling over uneven surfaces, springs of careful design and of specially treated steels are used. They rest upon the axles and support the frame by means of bushed connections at the extreme end in the semi-elliptical form or spring seats attached to the frame in full elliptical type.

The axles should be long enough to support their share of the load but first receive the shocks due to holes and ruts in the road. In order to combine the strength and light weight necessary, specially forged steels, heat treated, are employed. Front axles are usually of I-beam section with bell flowers or yoked. The axle ends are yoked to carry a knuckle with spindle for the wheel and steering arm, each mounted in anti-friction bearings. This permits free rolling of the wheels and steering with powerful leverage. The projected arms of the steering knuckles at each end of the front axle are connected by a cross rod so that the motion imparted by the steering wheel or lever may be transmitted to both wheels evenly. The connection between the cross rod and the steering arm is made either by means of a rod known as a drag link, or a yoke and pin arrangement. The bearings in each case are suitably enclosed to be well lubricated with grease.

Commercial vehicles for heavy duty are usually provided with a rear axle and transmission assembly. In this arrangement the motor drives to a differential gear in the counter shaft which in turns transmits the torque to the sprockets bolted to the rear wheels by open or enclosed chains. In pleasure vehicles and lighter commercial vehicles a live rear axle construction is generally used. The motor then drives to a differential gear enclosed in the rear axle housing, which in turn transmits the torque through the live axles in the house to the wheels. A second and popular arrangement consists of the motor driving first through the enclosed silent chain to a secondary shaft which conveys the rotation to the differential gear in the live axle housing. The rear gear in the rear axle housing may be either of the bevel, worm or herring-bone type.

When the motor drives directly to the rear axle without intermediate gear reduction it is known as a "shift drive" form of construction and is still employed on the heavier vehicles in axle housing driving the wheels through gear contained in the latter. The mounting of a motor upon the rear axle so that a spur gear on its shaft drives a geared rack attached to the rim of the wheel was used in the earlier types and is still employed on the heavier vehicles in order that great traction may be secured. This is especially effective in very heavy service when a motor is mounted for each of the four wheels. These transmissions are known as two- or four-motor drives.

CONTROLLER.

The current supplied to the motor from the storage battery is regulated in amount and direction by the controller. When the cells of the battery are arranged in series, then the current is increased by increasing the number in series, and the armature of the motor and by progressing through changes of field strength. Modern controllers are designed to operate with continuous torque throughout the speed range, avoiding jerks and without interruption of the traction. Reversing the direction of motion of the vehicle is accomplished by reversing the direction of current through the motor, causing it to rotate in the opposite direction.

There are several types of controllers, each designed, however, with the object of giving safe, reliable, yet simple, operation. The majority are operated manually with negligible effort on the part of the operator. Some are designed to be operated by a foot pedal. A third type is of electro-magnetic design actuated by a small disc conveniently placed for the driver.

The most common type is the drum controller which consists of a cylinder, or section or one, rotated by a handle. The drum is provided with copper segments on its surface upon which rest copper contact fingers under slight pressure. The leads from the battery, motor and resistance are connected to the fingers so that as the drum is rotated in one direction electrical resistance and strength and decreasing resistance may be effected. Each combination of "speed" is given by the position of the drum. The star-wheel attached to the axis of the drum registers with a pawl in the roller end of the drum, and the drum forces the end of the latter to roll into the slots of the star-wheel with a sudden movement which is felt distinctly by the operator and may also be distinguished by clicking sounds. The variable speed steps so obtained are therefore distinct. In the "off" position, no current passes from the battery to the motor.
Four, five or six speeds are usually provided and the last gives the greatest speed and pulling power. In some cases the first two or three steps are operated with the gear box divided into two or three parts of parallel arrangement. This combination is efficient for high speeds, as it reduces the resistance loss. The desire to operate with a minimum of current is a general practice, and the third, fourth, and fifth steps are usually provided with the third and fourth steps being a parallel arrangement of fields with resistance, and the fifth with the resistance cut out. If a greater number of speed steps are desired, the motor can be divided into two or more steps, but it will be interposed, permitting the resistance to be reduced by a smaller amount. It is important to remember in the operation of electric vehicles that the amount of power used and supplied by the battery increases with the speed as well as with the load, hill climbing and the like. The mileage under such conditions depends upon the battery capacity. If the latter is, say 150 ampere hours, and a current of 100 amperes be drawn continuously, then the vehicle could be operated approximately 1 1/2 hours, while if but 20 amperes were demanded by speed and load conditions, then about 7 1/2 hours of steady running might be obtained. Although the motor speed may be more, the engine is designed to operate under very high current draw, it is evident that such adverse conditions should be avoided, as abuse will cause injury in time. When switching from one speed to another, the position of the valve should be placed in the "off" position when the vehicle is brought to rest or allowed to stand unattended. Accidental starting is thus avoided, and the addition of a Yale lock on the controller prevents unauthorized use of the vehicle.

The impetus of the car is sometimes used for retarding the motion by adding a notch to the controller, which provides for short-circuiting the armature through resistance, the motor field being excited from the battery. The motor is then acting as a generator and absorbing the energy of the moving vehicle, transmitted through the gears to the motor shaft. This action is known as "electric braking," and sometimes is further combined with springs that leverage from the controller handle to a brake drum on an extension of the motor shaft.

Naturally each type of controller is wired to the battery, motor and resistance, so that the designed speed changes will be effected. This wiring may be traced out and a diagram drawn, or the manufacturers of the make of apparatus in question will furnish blue prints, giving the wiring diagram and developed connections.

**Care of the Controller.**

The passage of the controller from the speed, point to point, described above, is indicated distinctly and the drum should not be permitted to remain between points so that there may be arcing between the fingers and the segments or the arcing leaves a tendency to stick. If the latter be poor, however, touching only at a few points, or the fingers slowly draw from the segments, then there will be an arc, causing blistered surfaces. To avoid this, contacts should be faced well with sandpaper and proper pressure applied to the spring of the pawl, so that the drum will stop exactly in the notch. It is well to disconnect the battery leads when working on the controller in order to avoid burns or short circuits.

Lubrication should be frequent, regular and moderate. Once a week when in daily service, inspection should be made, the fingers adjusted to an even, moderate tension, run parallel with the drum and faced with sandpaper for good contact. Badly burned fingers should be replaced and fitted into position. The drum segments should be cleaned and wiped with a linen rag with an oiling solution applied to them. The drum should be sandpapered. In facing fingers to the drum, sandpapering should be done upon the fingers instead of upon the drum segment, because the former are more easily replaced.

**Care of Mechanical Parts.**

Although it is frequently stated that the electric vehicle is simple and requires little care or attention, it must be understood that it is a piece of apparatus, and though the number of moving parts is small, and neither delicate nor complicated, yet attention is necessary. Lubrication and adjustment are the important requirements. When parts are properly adjusted, a competent mechanic they should remain so, excepting for accident or necessary wear and tear.

Lubrication requires the most attention, and it is safe to err on the side of too much rather than too little. Add in small amounts often rather than large amounts seldom. Vehicles of all types are provided with means for lubrication, depending upon the character of the contact surfaces. Among these may be mentioned oil cups, grease cups, grease boles, oil bearings and grease packed bearings. Wheel bearings are packed with grease, while the treatment for the controller consists in wiping the copper contacts with a clean rag and a small quantity of vaseline. The brush should be greased and cleaned from time to time with acid and grit. If dirt works into any of the bearing they should be washed out thoroughly in gasoline or kerosene, the old lubrication removed and uncontaminated used for repacking.

Adjustments are required from time to time, such as tightening nuts, screws, chains, brakes, etc., and may readily be made by inspection of the assembly with the aid of the instructions furnished. Periodic inspection and adjustments are generally sufficient, except for the yearly overhauling, which should be done by a competent mechanic. The object of the yearly overhauling is for the renewal of such parts as may be necessary, such as chains, sprockets, gears, bearings, etc., and for the rigid inspection of parts which may be badly worn, so that they may be replaced, reducing the possibility of breakdown to a negligible quantity.

Attention should be paid to the braking mechanism, so that danger of failure at a critical moment may be avoided. The care in this regard is simple and consists in seeing that a moderate pressure on the brake pedal produces a firm and sufficient retarding action. This simple inspection should be gone through daily before removing the car from the garage. Turning up on the turn buckle or cam springs will effect the necessary pressure. Sometimes when sufficient pressure is exerted there is still slip between the shoe and brake drum. This may be due to a leather lining that is worn out or to grit on the drum surfaces. In such cases it should be washed out thoroughly with gasoline.

It is very important that the brakes do not bind or drag. They should take hold gradually and bring the car to an easy stop, as sudden locking of the brakes may cause stripped tires, skidding, or other damage. The pressure upon the brake drums should be as nearly uniform as possible, so that the tendency to skid will be reduced to a minimum. Dragging brakes not only cause unnecessary wear of the brake lining, but use up power or battery capacity, thus reducing mileage. The shoes should wear down about one-eight inch free of the drum when the pedal is on the "off" position. **Charging Apparatus.**

Storage batteries must be charged from a source of direct current. When alternating current only is available or when the vehicle is to be used on high voltage direct current, some apparatus to convert the alternating current to direct current or to reduce the direct current voltage, must be employed. The simplest case is where the direct current voltage is near to the maximum required for the charge. In this case the only apparatus necessary is a rheostat regulating resistance placed in series with the battery, and a voltmeter.

When direct current is available, but at a voltage far above or below that required for charging, a motor generator set is employed. The motor is driven from the available service, and the voltage of the generator is reduced to the required number of volts for battery charging. A rheostat may be employed in the battery circuit or the same result attained by varying the voltage of the generator through field regulation.

If the only source available is one of alternating current, apparatus must be employed to convert this to direct current. The three principal means of accomplishing this end are as follows: Mercury arc rectifier; synchronous or rotary converter; motor and generator set.

The mercury arc rectifier may be employed for direct current loads up to 50 amperes. As usually employed the rectifier is connected to a single phase alternating current supply. The efficiency of the rectifier is 80 to 85 per cent.

The synchronous converter has no limitation as to direct current output, but we find that the voltage on the direct current side bears a fixed relation to the alternating voltage side. It therefore follows that to vary the direct current voltage, some
**Detroit Evening News, Detroit, Mich.**

Number and capacity of vehicles—one ½-ton, five 1-ton, five 2-ton. Make, type and size of batteries—½-ton, Edison, A4, 60-cell; 1-ton, Edison, A6, 60-cell; 2-ton, Edison, A6, 60-cell. Total kilowatt hours required per day per charge—384. Approximate maximum demand—513 kilowatts. Average monthly kilowatt hour consumption—198.44. Average annual kilowatt hour consumption—119,908.

**Type of business—department store.** Name and address of user—C. Caswell & Co., Oakland, Calif. Number and capacity of vehicles—six ½-ton, ten 1-ton, five 2-ton, Edison, A5, 60-cell. Total kilowatt hours required per day per charge—144. Approximate maximum demand—242 kilowatts. Average annual kilowatt hour consumption—3,744. Average annual kilowatt hour consumption—4,928.

**Baker Motor Vehicle Equipment.**

Type of business—express. Name and address of user—American Express Co. Number and capacity of vehicles—two ½-ton, two 1-ton, ten 2-ton. Make, type and size of batteries—½-ton, Edison 60, A4; 2-ton, Edison 60. A8. Total kilowatt hours required per day per charge—290. Approximate maximum demand—43 kilowatts. Average monthly kilowatt hour consumption—6,700. Average annual kilowatt hour consumption—80,400.


**Type of business—truck rental and package delivery.** Name and address of user—Halle Bros. Co., Cleveland, Ohio. Number and capacity of vehicles—ten ½-ton, five 1-ton, Edison, A4, 60-cell; ten 2-ton, Edison, A6, 60-cell. Make and size of batteries—3½-ton, Edison 60, A6, 60-cell. Total kilowatt hours required per day per charge—250. Approximate maximum demand—33 kilowatts. Average monthly kilowatt hour consumption—6,500. Average annual kilowatt hour consumption—78,000.

**Type of business—department store.** Name and address of user—Halle Bros. Co., Cleveland, Ohio. Number and capacity of vehicles—ten ½-ton, five 1-ton, Edison, A4, 60-cell; ten 2-ton, Edison, A6, 60-cell. Make and size of batteries—Exide-Ironclad, 42-9. M. V. Total kilowatt hours required per day per charge—90. Approximate maximum demand—12.5 kilowatts. Average monthly kilowatt hour consumption—2,940. Average annual kilowatt hour consumption—28,080.

**Type of business—department store.** Name and address of user—Halle Bros. Co., Newark, N. J. Number and capacity of vehicles—six ½-ton, Make, type and size of batteries—½-ton, Exide-Ironclad, 42-9. M. V. Total kilowatt hours required per day per charge—35. Approximate maximum demand—8.5 kilowatts. Average monthly kilowatt hour consumption—1,430. Average annual kilowatt hour consumption—17,160.

**Type of business—books and printed matter.** Name and address of user—Board of Education, St. Louis, Mo. Number and capacity of vehicles—three 1-ton, one 2-ton. Make, type, and size of batteries—1-ton, Exide-Ironclad, 42-11 M. V.; 2-ton, Exide-Ironclad, 42-13 M. V. Total kilowatt hours required per day per charge—50. Approximate maximum demand—7 kilowatts. Average monthly kilowatt hour consumption—1,300. Average annual kilowatt hour consumption—15,600.

**Commercial Truck Company Equipment.**


**Type of business—department store.** Name and address of user—Palais Royal (A. Leiner's), Washington, D. C. Number and capacity of vehicles—five ½-ton, four 1-ton, one 2-ton. Make, type and size of batteries—½-ton, Edison, A4, 60-cell; 1-ton, Edison, A6, 60-cell. Total kilowatt hours required per day per charge—300. Approximate maximum demand—412 kilowatts. Average annual kilowatt hour consumption—7,900. Average annual kilowatt hour consumption—95,600.

**Type of business—newspaper.** Name and address of user—E. D. Mead (C. S. Pfister & Co.), New York. Number and capacity of vehicles—seven ½-ton, five 1-ton, three 2-ton. Make, type and size of batteries—½-ton, Edison, A4, 60-cell; 1-ton, Edison, A6, 60-cell. Total kilowatt hours required per day per charge—300. Approximate maximum demand—412 kilowatts. Average annual kilowatt hour consumption—7,900. Average annual kilowatt hour consumption—95,600.

monthly kilowatt hour consumption—3,484. Average annual kilowatt hour consumption—


Type of business—bakers. Name and address of user—Wilmington Steamboat Co., Wilmington, Del. Number and capacity of vehicles—five 2-ton. Make, type and size of batteries—2-ton, 15 M. V. Ironclad-Exide, 42-cell. Total kilowatt hours required per day per charge—155. Approximate maximum demand—22 kilowatts. Average monthly kilowatt hour consumption—1,450. Average annual kilowatt hour consumption—18,600.

Type of business—railroad. Name and address of user—Pennsylvania Railroad. Number and capacity of vehicles—two ½-ton, two 1-ton, one 5-ton. Make, type and size of batteries—50-ton, C. C. Edison, 60-cell, 1-ton, A6 Edison, 60-cell, 5-ton, 25 medium lead, 42-cell. Total kilowatt hours required per day per charge—58. Approximate maximum demand—8 kilowatts. Average monthly kilowatt hour consumption—1,598. Average annual kilowatt hour consumption—17,990.

General Vehicle Company Equipments.

Type of business—bakers of bread and French pastry. Name and address of user—Zampieri Bros., 17 Cornelia street, New York City. Number and capacity of vehicles—two 750-lb., one 1,000-lb., Make, type and size of batteries—750-lb., 2-ton, 14-cell, 44-cell and 42-cell. Ironclad-Exide, 44-cell and 42-cell. Total kilowatt hours required per day per charge—12.5 for each 750-lb., 16.8 for each 1,000-lb. (approximate total, 58). Approximate maximum demand—6.5 kilowatts. Average monthly kilowatt hour consumption—1,450 (approximate on all four wagons). Average annual kilowatt hour consumption—96,600 (approximate on all four wagons).

Type of business—department stores. Name and address of user—R. H. Macy & Co., Broadway at 34th street, New York City. Number and capacity of vehicles—fourteen 1-ton. Make, type and size of batteries—1-ton, Gould and Exide batteries. Total kilowatt hours required per day per charge—23 for each vehicle (average, 322). Approximate maximum demand—48 kilowatts. Average monthly kilowatt hour consumption—6,050 (approximate on all 14 trucks). Average annual kilowatt hour consumption—96,600 (approximate on all 14 trucks).


Type of business—bakers. Name and address of user—S. Cushman’s Sons, 517 West 95th street, New York City. Number and capacity of vehicles—eight ½-ton. Make, type and size of batteries—½-ton, 42-cell 9 WTX Phila. Total kilowatt hours required per day per charge—95. Approximate maximum demand—63 kilowatts. Average monthly kilowatt hour consumption—11,570. Average annual kilowatt hour consumption—138,840.

Type of business—mail service (United States). Name and address of user—Commercial Truck & Mail Service Co., St. Louis, Mo. Number and capacity of vehicles—nine 1-ton.
Solid Tire Equipment

In selecting the best tire equipment for a given service the manufacturer has to choose from among several desirable qualities which may be obtained in tires of various types. He can easily obtain a tire which excels in any one of the several desirable qualities of resiliency, resistance to punctures, durability, etc., but such qualities if emphasized are invariably secured at the expense of other equally desirable ones. For instance, the pneumatic tire can be made to give wonderful resiliency and with perfect riding qualities, but it of necessity will be deficient in durability and puncture resisting qualities.

On the other hand, a tire made to resist punctures and to stand the wear of hard use will be deficient in resiliency, and consequently in easy riding qualities, which also effect the speed and mileage of the car, especially an electric. In a more restricted sense the same principles apply to a solid tire.

Made to give maximum resiliency, easy riding and a minimum of resistance to inequalities of the road it will be found to be deficient in wearing quality. If on the other hand the solid tire is made to give a very great amount of wear it is found to be less satisfactory in its riding qualities.

The ideal tire is one which combines all of the desirable qualities in proper proportion. We do not want to sacrifice wearing qualities to secure extreme resiliency, nor do we want to overdo the matter of durability at too great an expense of the riding qualities.

The exact nature of the service demanded of tires naturally has an important bearing on the question of what constitutes proper tire equipment. The Woods Motor Vehicle Company have, during their eighteen years’ experience in the manufacture of electric pleasure cars, found that the solid rubber cushion tire, designed according to proper specifications and tested formula, best meets the demands of the service required on an electric machine. The high speeds and frequent use over rough roads which are required of most gasoline cars is not expected of an electric. The maximum speed of a trifle over 20 miles per hour, and that usually on well paved city streets, naturally does not call for the same resiliency of tires as would be necessary under more strenuous service conditions. In addition, the simplicity of the electric, the absence of all mechanical complications, makes the necessity for extreme resiliency less urgent as far as the car itself is concerned. The very fact, however, that the electric car is simple and very unlikely to require repairs or even adjustments on the road, makes stability of tires an essential feature. The great dependability of the electric is nullified to a great extent if it be equipped with tires which are liable to be punctured, thus rendering it at the mercy of any one of its four wheels. When equipped with solid rubber cushion tires the electric car is the dependable service vehicle which it is designed to be.

By adopting for the electric the solid tire of absolute dependability in service, we naturally lose some of the desirable qualities of resiliency. This deficiency in resiliency is not as important as it might seem to the person familiar only with the requirements of gasoline car service, as stated before on account of the comparatively low speed and favorable conditions under which the electric is usually operated.
Electric Vehicle Association Developments

Sectional Development Work, Reports of Committees, and New Announcements

The following is an abstract of the activities of the Electric Vehicle Association of America since the last report of the council meeting of November 16, as prepared by A. Jackson Marshall, secretary.

Since the last report of the sections' activities there has not been a meeting of the council, and, therefore, the membership stands as last reported, namely, 942 members, and divided as follows:

- Active (C. S. 102, manufacturers 33), 135; associate, 765; auxiliary, 12; press, 30; total, 942.
- There are awaiting in the general office of the association 33 membership applications, divided as follows:
  - Active (C. S. 103, manufacturers 33), 136; associate, 769; auxiliary, 12; press, 30; total, 977.

Section: Cost of Operating an Electric Passenger Car

Discussion was participated in by Messrs. Bennett, Davis, Parker, Fowler, Klingselsmith, Freeman and McCall. While it was impossible to settle upon the definite cost on account of so many conditions to be taken into account, yet many interesting facts were disclosed. Among the most important being the favorable comparison with gas car costs, both on a garage kept basis. And in addition, free delivery service goes with the service to the electric car.

Harry Fowler spoke on the plan of the Chicago Garage Owners' Association to work out a more binding garage general service contract, so that accounts could be more easily collectable, also that the E. V. A. co-operate by furnishing a committee to assist them in this work.

It was suggested by Fred B. Schafer that this was an opportune time to have a committee look into the matter of garage, electric and gasoline, automobile maintenance costs, and ascertain, if possible, the equivalent cost for a gasoline car as compared with the electric on the present basis of $40 per month.

The chairman said that these two committees would be appointed and announced later.

Meeting adjourned at 2 P. M.

The executive committee meeting of the Chicago section was held December 4 at 1 P. M., in the Men's Grill, Marshall Field's Annex, Chairman W. J. McDowell presiding.

After the minutes of the previous meeting were read and approved, Secretary McCall reported two new applications for associate membership, namely, Howard Monroe Raymond, dean of Armour Institute, and W. F. Bauer, Edison Storage Battery Company's Chicago manager.

D. M. Simpson, chairman papers and program committee, reported plans that were being utilized in further stimulating attendance at the weekly meetings of the section.

Secretary McCall laid stress on the matter of interesting the garage people, and as a means to such end, agreed to present a paper in the near future entitled, "Rates and Service as Particularly Concerning Electric Garages."

Harry Salvat, chairman of the garage committee, spoke of his activities as an officer of the Chicago Garage Owners' Association in endeavoring to settle the question of commission on tires and batteries. The scheme is to have a common price to the user, at either the garage where the car is kept, at the vehicle agency whose car is concerned, or at the battery company. This would eliminate the present prevalent shopping around feature and prevent price cutting to the user, which tends to expose the garage man whose price must be maintained to make any profit, with the result that he loses the sale and corresponding commission. This arrangement would carry with it the following rules: The battery man gets a certain wholesale price, while the difference between this price and user's price would be split 50-50 between the vehicle manufacturer and the garage man.

F. E. McCall, chairman of the attendance committee, reported that the members of this committee have apportioned the names of the members as well as some of the interested non-members amongst themselves, and have been calling such persons by phone the morning ahead of the section meeting. Particular effort will be made before each regular monthly meeting, although the plan will be worked on to some extent each week. The results have been good and the committee feels the efforts are fully repaid.

D. C. Arlington, chairman of the traffic regulations committee, read a letter from Captain C. C. Healey, commanding traffic division, in answer to Mr. Arlington's letter offering to co-operate with the rules and regulations of the city concerning electric car traffic in any manner that would relieve the congested conditions of the loop or road conditions on the boulevards. Captain Healey's letter was full of the co-operation spirit. He called attention to the parking space in Grant Park, which was now necessary because of the enforcing of the 60-minute ordinance which allows unattended cars to stand at curb only one hour in the loop district. He also called attention to the enforcing of the so-called 10-foot ordinance which is in strict accordance with safety first ideas, and requires that all automobiles shall not approach within ten feet of a car discharging or taking on passengers.

Mr. Arlington suggested much good would come from an E. V. A. booklet on "dons" of the road, which could be printed under the auspices of the E. V. A. and distributed to the car user. This idea met with the approval of those present, and the chairman instructed Mr. Arlington to get subject matter for this at once, and turn over to the secretary for printing.

The chairman told of results of asking for city records on the amount of accidents in which electric automobiles were concerned. He was told that no distinction was made between gas or electric, and of course could not get the desired information. He will write a letter asking that a separation be made between the two.

Chairman W. J. McDowell announced that he had appointed a committee to co-operate with the Chicago Garage Owners' Association in the construction of a more binding service contract, as follows: G. H. Adkin (Chairman), Harry Fowler, C. S. Ross, W. C. Hately, J. A. Pierce.

The chairman also announced the following as a
committee to find the equivalent cost of a garage-kept gasoline car as compared to the service furnished the electric passenger car: Fred B. Schafer, H. W. Howard, G. K. Cole.

The meeting was opened at 1:10 p.m. at the Railroad Club, 910 South Michigan avenue, Chicago, W. J. McDowell, chairman, presiding.

The chairman took the floor in starting the discussion on the subject: "Best Ways and Means for Promoting the Commercial Electric Vehicle in Chicago," offering the following suggestions or topics under which the general discussion could be advantageously promoted:

(1) An advertising campaign, featuring electric trucks, similar to the one recently put on by the Commonwealth Edison Company with several of the leading pleasure car manufacturers.

(2) An occasional moving picture film which could be released to theatrical houses scattered throughout the city.

(3) That the Commonwealth Edison Company give a year's supply of electricity to each purchaser of a new electric truck.

(4) That the Secretary's office be made a clearing house for prospects so that all commercial car salesmen will be called in on each and every job, to better combat the idea that everything is gasoline, which opinion is so often formed from the greater preponderance of gasoline salesmen over the electric.

C. A. Street asked how much such a campaign as mentioned would cost. Mr. Swain, advertising department representative of the Commonwealth Edison Company, replied that if he could recall correctly, that these advertisements cost at about the rate of 28 cents per line, which made the total cost somewhere between $1.30 to $1.60 per insertion.

G. A. Freeman suggested that Mr. Swain take this matter up and see what the central station company would be willing to do on such a campaign in connection with commercial car manufacturers in order to be able to report at our next meeting.

G. H. Jones advocated that the advertising fields differ greatly between pleasure and commercial types of electric cars and that the field best adapted for pleasure car advertising would not be as good for commercial cars. He suggested that a better plan would be to have a special campaign in which a sort of magazine would be gotten out jointly with manufacturers, and distributed to those interested or likely to be actual prospects. He also brought out the point that trucks, up to this time, have been most successfully operated in fleets, and that there might be some danger in selling single trucks which would prove unsatisfactory from improper garaging facilities. He said that he did not think that as a rule the existing garages cared very much for taking in commercial cars.

Several others thought that this was not the case, and Mr. Hately, of the Royal Electric Garage, was asked as to his attitude in the matter. He replied by stating that he would take all the electric trucks he could get and that if his garage was not large enough, he would get another building, and that he was sure there was quite a number of other public garages which looked upon the matter in the same way as he did.

Mr. Jones then suggested that we ask the Chicago Garage Owners' Association to what extent their men who were in the electric garage business would be willing to do as regards taking in electric trucks. Mr. Hately volunteered to take this matter up at the next meeting of the Chicago Garage Owners' Association and to report back as soon as possible.

T. W. Barnes of the General Vehicle Company preferred not to be quoted without authority from headquarters on the "prospect" question, but thought it might be feasible. He felt that their company had had very poor results from their commercial car advertising.

Phil Schafer, president of the Manhattan Brewing Company, a user of commercial electric trucks, made a few remarks, in which he stated, "Treat your customers right and they will be boosters; that is why I am here." He thought that the salesman was often prone to knock the other man's goods, and he gained this idea from actual experience. He thought the electric truck salesmen should get onto the job in greater numbers, as he said that previous to a recent purchase by their company, 19 gasoline truck salesmen called to one for the electric.

D. C. Arlington also made a few remarks, in which he said there was a great need for more electric truck salesmen so that the preponderance of evidence would not be so greatly in favor of gasoline on account of superior numbers.

Fred B. Schafer remarked on the difficulty in obtaining valuable data on electric trucks as the data varied so greatly between large and small fleets that indiscriminate averages would really mean nothing. He suggested that in compiling such figures they would be more useful if separated into three distinct classes, in which averages might be taken if desired.

(1) Single home-garage kept commercial cars.

(2) Small installations kept in public garages.

(3) Isolated fleets in private garages.

Mr. Macrae remarked on the need for more definite data, stating the present available figures were general averages, which in most every case, proved practically worthless for comparison. He thought that the various costs entering into operation and maintenance costs should be items, either as total cost per truck or per mile.

George B. Foster thought that the common prospect idea was a very good one and hoped to see it put into practice. He also emphasized the need for data, and suggested that it all be gotten up and itemized into its component parts and expressed on the mileage basis.

Mr. Jones called the attention of those present to the fact that the magazine called Data was strongly considering the publication of data on electric vehicles, and that he had suggested to them that they change the size of their sheets to fit the standard hand-book recently adopted by the N. E. L. A. and various manufacturers so that these sheets could be put into same with various other hand-books, without any work on the part of the individual.

Mr. Street emphasized the fact that any data that might be obtained would still be needed to be taken up by itself and investigated, as it might be that many elements in it might differ from all other semi-similar data.

Mr. Harry Salvat, who could not be present, called up the Secretary and reported that the electric division of the C. C. O. A. was thinking of introducing an ordinance into the city council which would prohibit the speed of gasoline trucks to 10 miles per hour. He
thought it was a safety first measure and that it would be one of the greatest possible benefits in improving road conditions, and in the matter of the electric competing on a speed basis.

Owing to the lateness of the hour, and as most of the matters were practically just started, and not at all in a settled condition, it was decided to bring this subject up at our next meeting.

Meeting adjourned at 2:15 P. M.

Philadelphia Section—The Philadelphia Section meeting of November 11 was held in the hall of the Electric Philadelphia Company, Chairman R. L. Lloyd presiding. Maxwell R. Berry of the Electric Products Company of Cleveland presented a paper entitled "Charging Apparatus."

Minutes of previous meeting read and approved.

Committee reports included: membership, eight new members; garage, progress in listing charging stations in vicinity of Philadelphia; parcels post complete data has been submitted Parcels Post Committee in Washington, and while having been favorably received, yet it would appear that lack of funds would prevent purchase of new apparatus at the present time; new business, whereas many electric cars can make the run to Atlantic City with comfort, there is always a doubt existing in the minds of electric vehicle owners as to whether some abnormal condition, such as bad roads, battery not fully charged, dragging brakes, etc., may prevent the vehicle being driven through.

And, there being no available charging stations between Camden and Atlantic City.

And, believing that a charging station of ample capacity, located at a convenient point, would relieve the fears of electric vehicle owners, and would permit the greater use of both pleasure and commercial cars between these points, it was, on motion,

Resolved, that a committee of five be appointed to investigate the conditions of the Hammon ton Electric Light Company's plant, and endeavor to secure co-operation of that company,

And to secure contributions from vehicle manufacturers and agents, storage battery manufacturers, and others whose commercial interests would be benefited thereby for the purchase of a hundred ampere charging outfit, with suitable charging plugs, rheostats, etc., and loan the same to the Hammon ton Electric Light Company, this apparatus to remain the joint property of the contributors to the pool; the Hammon ton Electric Light Company to furnish service at any hour of the day or night at a reasonable charge to any electric vehicle.

W. H. Metcalf stated that reports published in various automobile trade journals showed 14,000 electric trucks in the United States and that 10,000 were registered in Pennsylvania. He thought that there must be considerable error in both statements, and would like to receive authentic data concerning the matter from the association.

Secretary stated that the association was engaged in co-operating with the various automobile registration departments of each state in an endeavor to secure the listing of gasoline pleasure and commercial cars and electric pleasure and commercial cars. He also stated that a letter had been received from the department at Harrisburg stating that in 1915 reports would be kept in this manner in so far as was possible.

A rising vote of thanks was tendered the speaker of the evening and the meeting adjourned at 10 p. m.

The Philadelphia section's executive committee met at noon November 24, at the Automobile Trades Association, Broad and Callowhill streets, Chairman R. L. Lloyd presiding.

Resignation was received from Carroll A. Haines as chairman of traffic committee, which was, on motion, accepted, with regret.

Various plans were presented to make the association of greater value to the users of electric vehicles, and after discussion, it was determined to hold the meeting of December 9 at noon, preceded by a luncheon, and the Secretary was instructed to make arrangements for such meeting.

Chairman Lloyd announced the committee appointments for 1915 as follows: Membership committee, J. C. Bartlett, chairman; Sidney D. Gridley, R. L. Heberling, A. W. Young.


Papers committee—A. W. Young, chairman; E. S. Foljambe, Fred B. Neely, Dr. C. H. Reed, Frederick B. Fink.

Adjourned, 2:30 P. M.


Parcels post committee—Frederick B. Neely.


The Philadelphia section meeting of December 9 was held at the Colonnade Hotel, Chairman R. L. Lloyd presiding. The speaker of the meeting was G. O. Simpson, on "The Development of the Pneumatic Tire and Its Highest Type, the 'Cord Tire.'"

Minutes of previous meeting read and approved, after which the chairman announced the appointment of the chairmen of committees for 1915.

Reports of committees:

Membership committee announced that there are now five active members, one auxiliary member, one press member and sixty-one associate members enrolled in the Philadelphia section.

Papers committee reported that several interesting papers were promised and that they expected to have an especially good one at the January meeting.

Traffic committee reported progress on co-operation with the city officials in traffic arrangements.

The Edison Diamond Disc Phonograph Company furnished a large instrument and selected records to provide entertainment during luncheon, which was followed by a talk explaining the wonderful advance made by the real inventor of the phonograph, Thomas A. Edison, in the development of his original phonograph to the wonderful state of perfection whereby the tones of the human voice were most perfectly reproduced.

Meeting adjourned at 2 p. m.

Washington Section.—The Washington section meeting of November 12, held in the office of the Potomac Electric Power Company, 14th and C streets, N. W., was called to order at 8:17 by the chairman of the section, E. S. Marlow.

After the meeting was called to order the secretary read the minutes of the July, October and November meetings of the executive committee.
When the minutes had been read and approved the chairman called upon R. B. Emerson, as chairman of a special committee on section activities, to submit his report. Mr. Emerson not being present at the time, it was decided to hold the report awaiting his arrival. The chairman then announced Frank T. Kalas, of the Electric Storage Battery Company, who gave a description of the trip that he, together with Mr. Bartram and Mr. Marsh, made to the Philadelphia convention of the E. V. A., stating the running time from point to point on the trip, where speeds were obtained, and the average speed that was made between these points. His talk was accompanied with several lantern slides showing the kind of roads encountered on the trip.

The chairman then spoke of his trip to Philadelphia and the reception accorded to his presentation of the letter from President Wilson to the Association. He then called upon William Ulman, editor of Motor V.ews, for further description. Mr. Ulman declined.

T. D. Brewster of the B. F. Goodrich Company was then introduced and read a paper on cord tires. Following the reading of the paper a general discussion was invited by the chairman and called upon various members to express their views in regard to the new tire.

In reply to questions asked by those present, Mr. Brewster stated that the tire could be repaired and put in original condition, but stated that specialized machinery was required for the work and so far they had not facilities in all cities to do this work—the nearest repair shop to Washington being New York. The guaranteed mileage on these tires is 3,500 miles as a basis of adjustment.

Mr. Gundaker of the Union Transfer Company made the statement that they had made 25,000 miles with a solid tire on one of their trucks in this city.

It seemed to be the consensus of opinion that the solid tire had its advantages over the pneumatic in its high efficiency and safety from punctures—which made it particularly attractive for cars driven by ladies—although it was agreed that at the present time there were very few genuine punctures. The pneumatic tire, it was generally agreed upon, had a great advantage over the solid when it came to running over country roads.

Referring to the run from Washington to Philadelphia and return, Mr. Marsh stated that over very smooth roads the solid tire seemed to have a slight advantage over the pneumatic—but when traveling over country roads the pneumatic was very noticeably the most efficient and easiest riding tire.

There being no further business before the section the meeting was declared adjourned at 9:30 to meet again on Thursday, December 10, at 8:15 p.m.

The Washington section meeting of December 10 was held at the commercial offices of Potomac Electric Power Company, Chairman E. S. Marlow presiding. One paper and one address was given, the paper being by A. L. Broomal, electric vehicle motor designer of the Westinghouse Electric and Manufacturing Company, entitled "Electric Vehicle Motor Characteristics."

M. O. Eldridge, assistant in Road Economics, Office of Public Roads, U. S. Department of Agriculture, talked on road building and repairing.

Meeting was called to order by the chairman at 8:25 p.m.

The secretary read the minutes of the last meeting of the executive committee of the Washington section. They were passed as read. Following the reading of the minutes the chairman made a few brief remarks about the coming convention of the Electric Vehicle Association of America, and urged all those present to do all they could in order to obtain the next convention of the association for this city, and pointed out the advantages to be obtained by coming to Washington, the seat of Government of the United States.

After the report of the program committee, J. J. Haas of the Firestone Tire and Rubber Company announced that his company had just placed on the market a new fabric pneumatic tire which seemed to meet the requirements of an electric vehicle. He stated that one of the large manufacturers of electric pleasure cars had tried out the tire and found that it came up fully to their expectations. He exhibited a section of the tire and said that it could be easily repaired at any first-class tire shop.

The chairman announced the next meeting of the Washington section would be held on January 14, 1915, and stated that the place of meeting had not yet been decided upon. The speaker for that evening was Mr. Heacock, superintendent of Mails in Washington. The subject of Mr. Heacock's talk was "Vehicle Requirements in the Mail Service."

The chairman then announced the first speaker of the evening, A. L. Broomal, of the Westinghouse Electric and Manufacturing Company. Mr. Broomal gave quite an interesting and instructive talk upon the subject of "Electric Vehicle Motor Characteristics," illustrated with lantern slides showing in charts, diagrams and pictures the points to be desired to bring out.

At the conclusion of Mr. Broomal's talk, Mr. Haas moved that a vote of thanks be extended to him. This was seconded and unanimously passed.

M. O. Eldridge, assistant in road economics, Office of Public Roads, U. S. Department of Agriculture, was then introduced and presented a lecture on road building in the United States. This lecture was illustrated with lantern slides and moving pictures, the latter taken for the Panama-Pacific Exposition, and dealt with the economic, administrative and practical features of road building. Mr. Eldridge showed slides of good and bad roads in various parts of the United States and described in connection with these illustrations the best methods employed in the construction of the standard types of roads, such as gravel, macadam, bituminous macadam, brick and concrete. The moving pictures illustrated the construction of the post roads constructed by the United States Government and the state of Maine, jointly, from Portland to Brunswick, twenty-one miles. This road is built of the bituminous macadam type, penetration method, and cost $245,000, of which the Government pays $85,000, plus part of the engineering cost. Mr. Eldridge also showed a moving picture illustrating the construction of the Maryland Post Road, which extends from Rockville to Potomac, a distance of 6.4 miles. This road cost $45,000, of which the Government pays $14,700.

Amongst other things Mr. Eldridge stated that more than half a century has been required in familiarizing the public with the advantages and best methods of constructing water-bound macadam roads, but that it has taken less than ten years for the public to realize that plain water-bound macadam is not a satisfactory surface for carrying a great volume of fast automobile traffic. The automobile, he stated, has revolutionized the science of road building, and more new types of construction have been developed since the introduction of the automobile than in the past two centuries. Mr. Eldridge described and illustrated the construction of many of these new types of road building. He stated that it cannot be said that the electric vehicle does more damage to a plain macadam or gravel road than ironshod drawn vehicles,
for the speed of the electric vehicle rarely exceeds from twenty to twenty-five miles per hour, and it has been found that it is the high speed cars which cause the greatest damage, a speed exceeding twenty or twenty-five miles per hour.

We are now spending, stated Mr. Eldridge, over two hundred million dollars a year on public road improvements, which is two hundred and fifty per cent more than we were spending ten years ago. He attributed a large share of this activity to the automobile, from which about $11,000,000 revenues will be derived in 1914. Most of these revenues will be spent on the road building or maintenance.

Mr. Eldridge stated that while we have made tremendous strides in the United States toward better roads, there are still many parts of the country which have failed to obtain a dollar’s worth of road for each dollar expended. This he attributes largely to inefficient management and incompetent supervision. This is particularly true of the local systems in use in many parts of the United States.

After Mr. Eldridge had completed his talk he was extended a unanimous vote of thanks by the members present.

The chairman then announced that Mr. Bartram, chairman of the program committee, had on hand tickets for the Christmas entertainment and that anyone who desired to purchase tickets for this event could do so.

There being no further business before the meeting, it was declared adjourned at 10:30 a.m., to meet again on Thursday, January 14, 1915, at a place to be decided upon later.

St. Louis Section.—Meeting of November 25 was held in Cicardis’s cafe, Vice-Chairman F. E. Stevens presiding.

The first order of business was to consider the resignation of C. E. Michel, as chairman of local section. His resignation was accepted and the next order of business was to elect a new chairman in his place. M. B. Strauss was nominated and elected by unanimous vote for this position.

No committees have as yet been appointed and Mr. Strauss stated he would make these appointments by mail within a few days. There was considerable discussion regarding the scope of the local section and the work which this section could best accomplish. It was agreed that there was a good deal of work which could probably be done and this can best be done through committees to handle these various topics.

The question of the membership of the executive committee came up for discussion and it was decided that on account of the comparatively small membership it would probably be advisable for the time at least, to have this consist of the chairman, vice-chairman and secretary.

The meeting was then adjourned.

Electric Trucks Handle Xmas Rush

During the Christmas mail delivery period the three electric trucks in service of the parcel post department of the Indianapolis post office were given a most strenuous workout. And that the people of Indianapolis were able to get their Christmas presents on time was largely the result of the work of the electric trucks.

As service on electric vehicles of any kind is most important, much has depended upon the work of the Electric Vehicle Service Company, whose men have had in charge the watching of the work of the trucks so as to keep them in the best possible shape.

The trucks used are made by the Connersville Buggy Company. They were being tried out by government experts to test the economy and efficiency of electric trucks in the parcel post service. They were given an official fifteen days’ test. This test being over, they were continued in service to handle the Christmas deliveries. All sorts of economy and efficiency figures were gathered by the government observers, which were turned over to Postmaster Springsteen, who is soon to make his report on the work to the post office department at Washington.

Selling on Merits

Don’t knock the other fellow’s car. You may be selling it some day. Anyway you’re only inviting him to get out and tell people what’s the matter with the car you’re selling. This was the advice given the members of the Kansas City Motor Car Dealers’ Association at the Hotel Baltimore last night by A. R. Chalfont of Chicago, secretary of the National Association of Electric Car Manufacturers.

Don’t sell on the other fellow’s demerits; sell on your own merits, he continued. If you can’t keep busy telling your own good points you don’t know enough about your line. The other man has a good car; you have a better one. You haven’t time to fight him; you’re merely looking out for yourself.

Another serious abuse of the business, according to Mr. Chalfont, is that of making too much of an allowance for used cars, which are turned in as part of the purchase price of new ones. This, he believes, grew out of anxiety to make a sale at any cost, a tendency which he thinks should be discouraged.

Chicago Tests Fenders

All trucks in Chicago must be equipped with fenders after March 1. First tests were held in East Ontario street near the outer drive under the supervision of the city engineer.

About ten companies have designed life saving fenders to be used under the terms of the ordinance. Trials are made so that the city may O. K. fenders which live up to requirements. New York, Philadelphia, Omaha and other cities are awaiting the result of Chicago’s test to enact similar ordinances. Detroit conducted tests a year ago, but they were not satisfactory. Chicago is the first city in the country to make a serious effort to get a fender that actually will protect the lives of those who are struck by trucks.

Many automobile dealers have watched the experiments. They are generally hostile to the fender ordinance, their contention being that no fender has yet been devised which is at once practical and efficient.

London Uses American Made Electrics

The Anderson Electric Car Company, manufacturers of Detroit electric commercial vehicles and buses, has received orders from its London representative to ship additional buses of the same type as fast as they can be manufactured.

An electric has ample power and hill climbing ability to go anywhere. A good modern electric runs with absolute silence. It is safer to drive and easier to handle in congested traffic than any other type. The new models can make 25 miles an hour.
Regeneration or Electro-Dynamic Braking

According to an English electrical journal, few features of the electric have attracted more attention on the part of inventors than that which, under certain conditions, makes it possible to store up some of the kinetic energy otherwise wasted in heating up brake-linings during retardation. Again and again this somewhat fanciful refinement has come to life, first on a pleasure car, then on a heavy truck, and the sponsor of such a machine will often claim quite remarkable savings in consequence of the employment of dynamo braking. Very little consideration will indicate that the limitations of such a refinement are very definite as regards any resultant increase in mileage capacity. The fact that a shunt motor must be employed therewith—thus losing the very high starting torque and automatic speed adjustment of the series type—must not be forgotten. A typical imaginary case of the retardation of a moving electric vehicle will make matters very clear on this point. Consider a machine having the following characteristics and working under conditions as stated condition:

- Gross weight of vehicle: 2 tons
- Speed on level: 12 m.p.h.
- Average retardation during electro-dynamic braking period: 3 ft. per sec.
- Assumed dynamo efficiency of motor when generating: 70 per cent.
- Assumed transmission losses from all sources expressed as a proportion of motor torque: 18 per cent.
- Assumed charging efficiency of accumulator for short boosts as now presumed: 65 per cent.
- Average road resistance per ton: 30 lbs.

The kinetic energy of the moving car will be absorbed during retardation partly as energy supplied to the now generating motor and partly in overcoming the average road resistance encountered during the distance covered while stopping. The measure of the gross kinetic energy available at the instant of beginning to retard will be

$$\frac{1}{2} MV^2 = \left(\frac{1}{2} \times 2 \times \frac{2240}{32} \times (12 \times 1.46)^2\right)$$

which gives a total of 21,700 ft. lbs. to dispose of. Now we have assumed that in every second the vehicle is losing in velocity by 3 ft., hence it will—assuming uniform retardation—come completely to rest in

$$\frac{17.6}{3} = 5.9 \text{ seconds.}$$

The work done by a 2-tonner in rolling against a road resistance of 50 lbs. per ton at an average speed of 17.6 ft. per second for 5.9 seconds will be 

$$2 \times 50 \times \frac{17.6}{2} \times 5.9,$$

which gives a value of

$$5,200 \text{ ft. lbs.}$$

Clearly, then, we have left only (21,700 - 5,200), or 16,500 ft. lbs. for braking by recuperation. The amount of energy involved per second will be

$$16,500 \div 5.9 = 2,800 \text{ ft. lbs.}$$

But we must diminish the quantity actually restored in the accumulator not only by the loss in mechanical transmission, and by dynamo efficiency, but also by the losses which take place in the accumulator itself. The net available energy per second stored in the accumulator, therefore, becomes (2,800 ft. lbs.) \times (mechanical efficiency of transmission) \times (average electrical efficiency of dynamo) \times (average storage efficiency of accumulator). Applying the figures presupposed at the beginning of this paragraph, the result now becomes:

$$- \left(2,800 \times \frac{82}{100} \times \frac{70}{100} \times \frac{65}{100} \text{ ft. lbs.}\right),$$

which equals 1,015 ft. lbs. per second out of the average dissipation of 3,670 ft. lbs. per second that must have occurred during the period of coming to rest. The efficiency of the procedure would be under the above conditions somewhere in the neighborhood of 28 per cent, a figure which probably represents the outside limits of the attainable. Suggestions have been made lately for employing a small auxiliary accumulator in order to energise with maximum intensity the field of the motor during the regeneration cycle. Considering that such a battery would represent quite an additional 8 or 10 per cent of accumulator weight and initial expense—not to mention upkeep—and remembering the relative fewness of absolute stops on most services, the improvement seems at best problematical. Perhaps on rounds where the ratio of stops to clear running is exceedingly high there may be advantages to be gained therewith, but not so much on account of the conservation of energy effected as in reduced wear and tear that the system offers. Hence for public service accumulator vehicles electro-dynamic braking may have a future, but as an auxiliary to the mechanical brakes so dear to the engineer’s heart.

### Efficiency Run

It is an axiom among many electric car salesmen that there are just three principal points that sell electric cars, that is the outside appearance, the inside of the car, roominess, upholstery, etc., and the price. The fact that this axiom has gained wide circulation in selling circles is evidence that there is some basis of truth for the statement. Shrewd buyers, however, are not content with mere external features, shiny paint, and trimmings. Usually the better informed the purchaser is the more he is apt to insist on knowing about the construction of his car and its efficiency under all normal conditions of service. When the prospect is a technical man, an engineer who understands mechanical features in their relation to service, it is almost a certainty he will require some concrete evidence of the car’s ability to operate at a maximum efficiency before he will purchase.

The above is the substance of a statement made by H. D. Goodwin, sales director of the Woods Motor Vehicle Company, in discussing a remarkable run made recently by a Woods electric roadster.

The start of this trip was made from Michigan avenue and Van Buren street, Chicago, at 1:10 p.m. Monday afternoon, November 9, 1914. The route was along the boulevards through Lincoln Park, through Evanston on Railroad avenue, and then generally along Sheridan road to Highland Park, returning by generally the same route. A number of severe grades were encountered and at one point there was some delay waiting for a gasoline car to back down for a new start.

The car carried two passengers, including, besides the driver, a mechanical engineer in the employ of a prospective purchaser. The engineer’s report to his employer is summed up in the following record:

- Total distance traveled: 54.10 miles
- Total time running: 3 hrs. 21 min.
- Average speed, miles per hour: 16.13
- Total amperes discharged: 1,127
- Average amperes discharge per minute: 2.07

The engineer’s report includes the statement that the trip was conducted under unfavorable weather conditions, particularly on account of heavy winds.
Motor Exports Increase

Motor vehicle exports from the United States for October last were 1,404 vehicles, valued at $2,965,351, as compared with 1,776, valued at $1,793,222, in October, 1913. This is an increase of $1,172,129. The increase was due entirely to motor trucks, of which 622 worth $2,286,964, were exported in October, 1914, as against 79, worth $129,506, in the same month last year. Exports of passenger cars fell from 1,097, valued at $1,603,716, in October, 1913, to 732, worth $678,987, in the corresponding month this year.

Effects of the war on American automobile exports are reflected by large increases to European countries and decreases to other countries that previously were buying liberally.

During October we exported to the United Kingdom motor vehicles to the value of $829,982, as against $250,923 in the same month last year, but the exports to Canada amounted to only $143,916 last October, as compared with $423,016 the year before. France took $171,049 worth, as against $35,759 in October, 1913, while we sent to South America only $33,212 worth, as against $181,230 in October a year ago.

Germany has taken no motor vehicles from America in the last three months, but during the fiscal year ended June 30 her imports amounted to $1,059,249, as compared with $768,418 for the previous fiscal year. Italy took only two motor vehicles in October this year, worth $1,450, as compared with 18 a year ago, worth $19,172.

Other European countries besides those mentioned largely increased their purchases, which aggregated $1,461,191 for the month, whereas in October, 1913, they bought only to the value of $91,421.

Beardsley Makes Record Tours

A new record is reported in California as a result of the Beardsley electric owners' tour to Orange county and return. Fourteen Beardsley electric pleasure cars and one Beardsley electric truck participated.

The run was over the new boulevard to Santa Anna and Orange and return, which is hilly, and is not an easy trip for an electric car to make. The distance covered on the day's trip was 83 miles. The party returned to Los Angeles about 6 o'clock in the evening, and were tendered a banquet as guests of the company at the Log Cabin Inn on West Adams street, Los Angeles.

After dinner and the program the owners resumed the day's run to compete for the highest mileage scores. A silver medal was offered for all cars reaching 90 miles, and the remarkable part of the day's run was the fact that every car participating exceeded 90 miles.

It was necessary to complete the day's run in a pouring rain and over slippery streets. However, the cars did most remarkable work, and the highest score of the day was captured by Miss Lilian Wayland, 171 South Grand avenue, Pasadena, with her Beardsley electric brougham, which is one of the first models built by the company, the car having been in use about one year. This car made the remarkable score of 112.1 miles; a close second completed 106.5 miles; third, 105.8 miles.

A committee of three disinterested men acted as judges. All speedometers were sealed in the start in the morning and the seals were not broken until the batteries were exhausted.

The average mileage of all cars participating on this day's tour was 100 1-10 miles, which for a single charge and over country roads is the most wonderful performance ever accomplished with electric cars. It establishes a mileage record.

E. V. A. Co-operative Garage

The often talked of plan of a co-operative garage for electric pleasure vehicles has become a reality with the signing of a lease by the New York Electric Vehicle Association for a building on the southwest corner of Central Park West and 62nd street. A number of the leading manufacturers of electric pleasure vehicles are co-operating with the New York Electric Vehicle Association in this undertaking and all concerned are sparing no efforts to make it a big success. The Rauch and Lang, Detroit and Baker companies will have showrooms in the building, making it their headquarters. Various other manufacturers will have their showrooms in the building and these are being rapidly fitted up for occupancy, while the garage itself is being equipped so as to make it in every way an ideal garage for electric cars. The garage will start in with accommodations for one hundred and fifty cars, of which more than one hundred have already been secured. It is planned that there will be a fixed charge of $45.00 a month which will include battery charging, care of the car and taking the car to and from the owner's residence to the garage. The object of the plan is to provide a large, centrally located garage where electric pleasure cars will have a home of their own and receive special care and attention.

G. M. C. Establishes Coast Branch

The General Motors Truck Company has established a factory branch in San Francisco, succeeding the Pioneer Motor Truck Corporation which firm has acted as Northern California distributors for the line during the past two years.

It is the intention of the big corporation to make San Francisco the central distributing point for its business on the coast, and W. H. Barnes, who has been in charge of the company's branch in the Northwest territory, has been placed in charge of the newly established headquarters in this city. Barnes is at present in Seattle closing up his personal affairs, and expects to return by the end of the month and begin an active campaign in this territory. In addition to carrying a full line of parts for the forty-four different types of gasoline and electric trucks that the company now builds, there will also be on hand and ready for delivery the various types of commercial vehicles turned out at the factory. Agents are to be appointed in the different trade centers throughout the Coast, and the company is going to make an active fight for business.

Statistics prove 98 per cent of all motor car trips do not exceed 60 miles at an average of 20 to 25 miles an hour, and for this 98 per cent of trips the electric is considerably less expensive to run than any other type automobile.

The simplicity of the electric and the fact that it can be driven with safety by every member of the family have become established facts.
"The Electric Vehicle Hand-Book"

By H. C. Cushing, Jr.
Fellow of the American Institute Electrical Engineers
362 Pages, Pocket Size, Leather Cover, Price $2.00

Frank W. Smith
President Electric Vehicle Association of America
Sent post paid to any address on receipt of Price.

The Electric Vehicle Hand Book is the only complete and practical book on the operation, care and maintenance of all classes of electric vehicles, their storage batteries, motors, controllers and accessories.

Chapters

II.—Lead Storage Batteries; Descriptive Lead Batteries; Charge and Discharge Rates; Care of Storage Batteries.
III.—Care of Lead Storage Batteries; Assembling and Putting New Batteries into Condition; Charging; Charging Overnight; Emergency Charging; Inspection; Electrolyte; Cadmium Readings; Lead Burning.
IV.—Commercial Types of Lead Storage Batteries.
V.—Alkaline Storage Batteries; Description and Care.
VI.—Charging Apparatus and Charging Stations; Alternating Current Apparatus; Isolated Plants.
VII.—Measuring Instruments, Electrical and Mechanical.
VIII.—Wheels, Rims and Tires; Their Care.
IX.—The Motor, Construction and Care.
X.—The Controller, Construction and Care.
XI.—The Chassis, Its Components, Their Upkeep.
XII.—Associations and Publications Indentified with the Development of the Electric Vehicle.
XIII.—Comparative Cost Data.

We will propay all charges on a copy of this book to your address and include a full year's subscription to ELECTRIC VEHICLES, upon receipt of your order and three dollars.

Electricity Magazine Corporation
Monadnock Building Chicago, Ill.

"Certainly, you can specify Westinghouse Electric Vehicle Motors

for your delivery wagons and trucks, and get them.

"The Westinghouse Company makes a very extensive line and can supply exactly the right motor for any type or size of car and for any battery.

"I have electric delivery wagons and trucks for my business and a brougham for my own use.

"There are Westinghouse motors on all of them, and every one gives me the best possible service."

Westinghouse Electric & Mfg. Co.
East Pittsburgh, Pa.
Sales Offices in all large American Cities.
THE WALKER VEHICLE COMPANY

has purchased the factory and business of the Chicago Electric Motor Car Company and will continue the manufacture and sale of

CHICAGO ELECTRICS

This transaction was completed too late to obtain desirable space in the Annual National Automobile Show to be given in Chicago January 23rd to 30th, 1915. For that reason we will exhibit

The complete line of 1915 Chicago Electric models and the latest model Walker Electric trucks, at our general sales rooms, 2700 Michigan Ave., Chicago

This exhibit will continue throughout the Automobile Show week. This complete line of electric cars, passenger and commercial, represents the highest standards of electric car construction. This line offers without question the most desirable opportunities to wide-awake-live dealers. We cordially invite you to visit our exhibit where much of interest awaits you. Allotment of dealer's territories will be made at this time for the coming year.

WALKER VEHICLE COMPANY

Sales Rooms
2700 Michigan Avenue

Factory
531-545 West 39th Street

INVESTIGATE THE ELECTRIC

TWO-THIRDS of the motor trucks in service today will be replaced by electrics; this is the statement of a transportation expert.

The man who half investigates and buys gasoline trucks will be forced by economy or competition to change to electrics. This is expensive and unnecessary, especially in view of the record made by electrics as to economy, reliability and durability.

One large Chicago firm of fourteen years experience with motor trucks, has in the last eighteen months increased their fleet of electrics from 60 to 203. This addition was made only because of the record electrics had made when compared with their other methods of transportation.

Whether you own one horse and wagon or a fleet of gasoline trucks — you should investigate the electric.

Our Vehicle Engineers are at the service of Chicago firms.

Commonwealth Edison Company

120 West Adams Street

Chicago
CHICAGO ELECTRICS AT THE LAKE SHORE COUNTRY CLUB
Exhibitors and Their Exhibits

A Brief Review of the Manufacturers’ Displays as They Appeared at the Chicago Show

THE fifteenth annual National Automobile Show held in Chicago, January 23 to 30, was without a doubt the greatest exhibit of motor vehicles ever held in that city. This was the one show that really proved the public interest in the electric passenger car. This was probably because of a big advertising campaign carried on jointly by the larger electric vehicle manufacturers and the Commonwealth Edison Company of Chicago.

The booths were filled constantly with spectators. Manufacturers state that this year’s show brought many visitors who had never previously attempted to investigate about the electric. Many manufacturers sold all the cars they had in stock and in a few instances it was stated that a number of manufacturers were asked to sell the cars on the floor.

The models displayed differed but slightly from those of 1914. The principal improvements are in a decrease in the weight and an increase in the speed. More luxurious appointments, a richer upholstery and a maximum seating capacity arrangement are included in the new features. Wire wheel equipment was practically universal; in fact, but one type had wood wheels and it was stated that this type would be so equipped on the cars now under construction.

The roadster type, with a speed of 10 to 24 miles per hour, built particularly to appeal to men, caused quite a sensation during the show. This type model is surely a “seller” and it will have a gigantic influence in converting men to what was once considered purely as a woman’s car.

Electric vehicle manufacturers and their exhibits at the display were as follows:

Anderson Electric Car Company, Detroit, Mich., showed three models; model 54, a rear-seat brougham, equipped with wire wheels; a model 50, Cabriolet; and model 53, a front-drive brougham.


Baker Motor Vehicle Company, Cleveland, exhibited three models of its four-passenger style DA coupe.

Milburn Wagon Company, Toledo, O., exhibited model 151, an open roadster; model 15, a four-passenger coupe in two styles. The former is equipped with wire wheels.

Ohio Electric Car Company, Toledo, O., displayed its model 61, five-passenger brougham, equipped for double drive; a four passenger single-drive brougham; and a five-passenger single-drive brougham.

Rauch & Lang Carriage Company, Cleveland, O., exhibited its special J-5 coach with double control and capacity for five passengers; the same model equipped for front control; and the same model equipped for rear control.

Waverley Company, Indianapolis, Ind., exhibited its new No. 109 chair four-passenger brougham; a five-passenger limousine, and a dual-drive coupe.

Woods Motor Vehicle Company, Chicago, Ill., showed a five-passenger dual control brougham and other models.

Many electrical accessory manufacturers were found among the accessory exhibits, including the Edison Storage Battery Company, West Orange, N. J.; the Electric Storage Battery Company, Philadelphia; the Gould Storage Battery Company, New York; the Philadelphia Storage Battery Company, Philadelphia; the Vesta Accumulator Company, Chicago; and the Willard Storage Bat-
tery Company, Cleveland, O., all exhibiting vehicle batteries and specimen plates.

The Standard Roller Bearing Company, whose booth was in the armory, exhibited the Rudge-Whitworth wire wheel. The booth was in charge of Messrs. Machen, Germaine, Goodfellow, Winn and Dunbar.

Other important electrical manufacturers of charging apparatus, etc., were the Benjamin Electric Manufacturing Company, Chicago; Cutler-Hammer Manufacturing Company, Milwaukee, Wis.; Electric Products Company, Cleveland; Lincoln Electric Company; Cleveland; and the Westinghouse Electric and Manufacturing Company, Pittsburgh.

Chicago Electric, which was taken over by the Walker Vehicle Company, was unable to exhibit because the Chicago Company was taken over too late to secure display space. A complete line of Chicago electric was placed on exhibition in the company's show rooms at 2700 Michigan avenue.

Although this year's show introduced a new vehicle manufacturer which promises to become important in the industry, still the record of exhibitors was small compared with what it should have been. There are many local manufacturers who exhibit only in their own city and this local showing only has a tendency to lead the public to believe that the industry is not financially strong enough to keep up the pace of gasoline car manufacturers.

This theory is incorrect and it is hoped that in the coming years every electric vehicle manufacturer will exhibit in "full display" in order to establish the magnitude of the industry which really exists.

The American public are quick believers in "front" and weigh the value of their particular brand by the popularity which it possesses. The national shows are excellent mediums to secure such publicity, which has been instrumental in stamping the gas car on the minds of the American people.

Predicts Big Exhibit for Boston

Boston hasn't built a building large enough to house all of the motor car and accessory manufacturers that have applied for space to display their products at the automobile show which opens in Mechanics Building on the evening of March 6 and concludes one week later. For a month past every inch of available space has been taken and since that time Manager Chester I. Campbell has received almost a hundred applicants from pleasure car, truck and accessory manufacturers.

The abnormal demand no doubt is due to the fact that this year it will be a combination of truck and pleasure cars. The truck makers closed contracts for space early and as a result many pleasure car makers have been forced out. Last year when Mechanics Building was given over to the trucks exclusively there were only 31 makes on exhibition while the list for the 1915 show has 29 different exhibitors already contracting for space.

Another interesting phase of the Boston show is the great number of accessory manufacturers new to the New England trade that will exhibit. Last year most of the accessories were displayed by local agents and jobbers. This year the manufacturers are making the display and the great majority of them are there for the first time.

Rebuilding the Edison Laboratories

In the reconstruction of the laboratories of Thomas A. Edison at West Orange, which were recently destroyed by fire, there are two very important factors in the form of a couple of five ton electric trucks. These trucks are doing heavy hauling in connection with the rebuilding, and are transporting hundreds of tons of machinery a day.

The excellent work which they are doing recalls an interesting history extending over a period of twelve years, and brings to mind a remarkable feat accomplished by them ten years ago. They are numbers 701 and 705 of the electric vehicle fleet of the New York Edison Company, and are merely loaned to Mr. Edison on account of their huge capacity. It was in 1904 that these trucks hauled the biggest block of stone ever brought into New York City, with the exception of Cleopatra's Needle. The great stone was quarried and dressed on Hurricane Island, in Penobscot Bay, Maine. It took three years to do the work and the cut stone was valued at $10,000. At the bulkhead between piers 3 and 4, East River, it was placed on a special truck and hauled to the site of the Custom House. Since then these trucks have been continually in the service of the transportation department of the New York Edison Company and during the past year, owing to the use of roller bearings which supplanted the bronze type, it was possible to cut four cells from each battery, thereby reducing the number of cells per battery from 48 to 44. Each of these trucks is equipped with an electric windlass for hoisting and cable pulling purposes. All manufacturers of electric vehicles may point with pride to these two remarkable examples of electric truck endurance and service.

New Storms Light Weight Electric

Recent indications point to the immediate production of several low priced electric cars which will all be marketed in the United States at a price under $1,000. The latest of these cars is announced from Detroit and will be known as the "Storms." Only one standard chassis will be constructed which will be used for three different types of bodies, a coupe, roadster and delivery van. The wheel base of the new type of car will be 90 inches and the tread 44 inches. Special type batteries are used capable of giving 50 miles on one charge.
S. A. E. Electric Vehicle Division Report

Speed and Mileage Ratings, Motor Voltage, Motor Name-Plates, Battery Equipment

BY A. J. SLADE

Inclined at an angle. In order to obtain reliable and uniform results the tire must be well supported under its base. When mounted on a wheel in the usual manner the tire should rest on the ground or a solid floor. When making tests before mounting the tire on the wheel, tires that are not of the solid-base type should be mounted in a channel or on a rim or otherwise well supported under the base. All tires should be mounted on a heavy solid support of sufficient weight and rigidity to receive the blow of the hammer without giving away appreciably.

As the efficiency of the tire varies considerably with the temperature, it is important that a definite temperature be adopted and all tests be made at this temperature. Seventy degrees Fahrenheit is recommended, and unless otherwise definitely specified it is to be understood that all specifications and tests are based on this temperature. Care should be taken that the temperature of the tire is obtained and not that of the surrounding air. If there is apt to be considerable variation between the two, unless the tire has been standing some time in a room of uniform temperature. It also takes some time for the temperature of the tire to become uniform throughout its depth.

As it may be difficult at times to bring the tire to exactly the correct temperature, an allowance can be made for temperatures above and below 70 degrees, but as the allowance to be made varies with different compounds, definite figures cannot be specified that will apply in all cases, but by making a series of tests on various tires at various temperatures, curves may be plotted that will give in a general way the amount of allowance to be made in efficiency due to temperature.

It will be noticed when several readings are taken at the same position on the tire the last reading will be higher than the first. As giving results more nearly in accordance with service conditions, it is recommended that the hammer be allowed to drop several times and then the highest reading taken. The tire should be tested at several points and the average of the several readings recorded as representing the efficiency of the tire.

Standard Battery Equipment:—It is recommended that the number of cells in lead acid type batteries be 42, and the number of cells in the nickel iron alkaline type 60.

International Standardization:—The question of the society making recommendations for adoption as international standards by the U. S. National Committee of the International Electro-technical Commission was given consideration by the division, and the suggestion is offered that it might be desirable to take some procedure in this direction by offering to this committee the recommended practices which our society has accepted covering electric vehicle charging plugs and receptacles, and which also have become standard practice of the Electric Vehicle Association of America and the Incorporated Municipal Electric Association of England. It is the opinion of this division that other recommended practices of the society might be advanced for international adoption.

* Chairman, Electric Vehicle Committee.
Electric Vehicle Charging Stations

Charging and Garaging Within a One Hundred Mile Radius of New York City

The following list of charging stations in New York city was compiled by the New York Section, Electric Vehicle Association. The asterisk denotes the emergency charging station. Regular charging or garaging is not undertaken at these stations. Other stations are prepared to do both charging and garaging.

CHARGING STATIONS OUTSIDE OF NEW YORK CITY. DISTANCE RECKONED FROM COLUMBUS CIRCLE.

Asbury Park, N. J., 53 miles, Zacharias Garage, Sewall avenue and Main street.
*Chesapeake and Ventnor Garage, 6-10 North Barton Rouge avenue.
Bantam, Conn., 96 miles, the Bantam Anti-Friction Company.
*Bridgeport, Conn., 56 miles, General Motors Service & Truck Company, 534 Fairfield avenue.
*Catskill, N. Y., 120 miles, Upper Hudson Electric & Railroad Company.
*Chestnut Hill, Pa., 97 miles, Chestnut Hill Motor Co., Chestnut Hill avenue and Bethlehem Pike.

MANHATTAN

*The New York Edison Company, 100 Water street.
*The New York Edison Company, 546 Pearl street.
*North Moore Street Garage, 56-62 North Moore street.
*The New York Edison Company, 152 Clinton street.
*Motor Delivery Company, 42 Downing street.
*The New York Edison Company, 32 Horatio street.
*Ferri Contracting Company, 422 West 15th street.
*The New York Edison Company, 27 West 16th street.
Monahan Express Company’s Garage, 216-18 West 18th street.
Exide Battery Depots, Inc., West Side Garage, 527-41 West 23rd street.
*The United Electric Light & Power Co., 520 West 24th street.
*Exide Battery Depots, Inc., East Side Garage, 141 East 25th street.
*Storage Battery Supply Company, 259 East 27th street.
*The New York Edison Company, 452 West 27th street.
*Acme Electric Garage, 410 East 32d street.
*Lexington Auto Garage, 150 East 39th street.
*The New York Edison Company, 314 East 41st street.
*The New York Edison Company, 41st street and 1st avenue.
W. L. Thompson, 651-55 West 43d street.
W. F. Goodrich, 79 East 52d street.
*The New York Edison Company, 118 West 53d street.
T. 1. Proud Electric Company, 114 West 54th street.
M. J. Buckley, 150 West 56th street.
*The New York Edison Company, 155 East 60th street.
U. S. Lighting & Heating Company, 10 West 61st street.
The New York Electric Vehicle Association, Central Park West and 62d street.
The New York Edison Company, 170 West 64th street.
*Acme Electric Storage Battery Company, 206 West 70th street.
*Dakota Stable Company, 350 West 77th street.
*Sterling Garage & Stable Co., 309 East 90th street.
*The New York Edison Company, 123 East 83d street.
*Yorkville Auto & Garage Company, 327 East 84th street.
*The New York Edison Company, 211 West 84th street.
*Niagara Livery & Motor Car Company, 69 East 89th street.

Turin Garage & Supply Company, 53 West 93d street.
*Harlem Electric Company, 6 East 116th street.
*The New York Edison Company, 259 West 123d street.
*The United Electric Light & Power Company, 514 West 147th street.
Audubon Storage Warehouse, 1926 Amsterdam avenue.
*The United Electric Light & Power Company, 201st street and Harlem River.

BRONX

*The New York Edison Company, Rider avenue and 140th street.
*The New York Edison Company, 360 East 149th street.
*The New York Edison Company, Park avenue and 189th street.

WESTCHESTER


BROOKLYN

Clinton Garage, 8-14 Clinton street.
*Edison Electric Illuminating Company of Brooklyn, 95 Jay street.
*Edison Electric Illuminating Company of Brooklyn, 360 Pearl street.
*Edison Electric Illuminating Company of Brooklyn, 26 Lexington avenue.
*Edison Electric Illuminating Company of Brooklyn, 1171 Myrtle avenue.
*Edison Electric Illuminating Company of Brooklyn, 884 Broadway.
*Edison Electric Illuminating Company of Brooklyn, 1205 Atlantic avenue.
*Edison Electric Illuminating Company of Brooklyn, 208 Carroll street.
*Edison Electric Illuminating Company of Brooklyn, 360 Sumpter street.
*Edison Electric Illuminating Company of Brooklyn, foot of 66th street.
*Edison Electric Illuminating Company of Brooklyn, Rodney and Ainslie streets.
McIntosh Bros., 811 Union street.
Paste’s Auto Garage, Ocean Parkway and Sherman street.
Brooklyn Electric Garage, 342 Flatbush avenue.
Brooklyn Terminal Garage & Machine Co., 403 Third avenue.
The Barber Auto Service Company, Willoughby and Navy streets.
D. W. Kaatz, 23 Ten Eyck street.
*Flatbush Gas Company, 273 Clarkson street.

CONEY ISLAND

*Edison Electric Illuminating Company of Brooklyn, West 12th street and Railroad avenue.
*Edison Electric Illuminating Company of Brooklyn, Surf avenue, near West 14th street.

The above listed charging stations are indicated in the map on the opposite page by large black circles. It can readily be seen that the stations are quite numerous and located at convenient distances on principal highways thus making it possible for the tourist to get a boost at most any time. Central stations in the East are progressive and realize the advantages of increasing their profits from charging. The New York section of the Electric Vehicle Association has been very active in canvassing proper manufacturing companies and as a result this splendid system of charging stations has been established.
The New York section of the Electric Vehicle Association of America has issued a route map showing charging stations in New York city and environs within a radius of one hundred miles.

In New York the electric vehicle is an important method of motor transportation. Many passenger electrics and large fleets of commercial electric vehicles handle a large portion of New York's people and business.

The association section has done much to assist owners in the knowledge of just where to get a "boost" when needed. The association list shows a total of sixty-three stations, many garages and some merely emergency stations.

The accompanying map clearly illustrates the excellent location of the stations (indicated by the large circles). The great number of stations and their particular locations make it possible to get a charge in most any locality. For the benefit of those desiring to take long trips, that is to distant points such as Philadelphia, Atlantic City or Poughkeepsie, the map shows the proper roads to traverse, the numbers on the map referring to corresponding route-numbers in the "Metropolitan Automobile Guide."

It is the desire of the association section to acquaint owners with the locations of charging facilities in order that they may make cross country tours without constantly worrying about getting "stuck without juice."
Denver Promotes an Electric Vehicle Salon

Manufacturers of Electric Vehicles and Accessories Exhibit Products in Central Station Show Rooms

A NOOTHER central station innovation was inaugurated by the Denver Gas & Electric Light Company from an idea conceived by C. N. Stannard, secretary and commercial manager of that company. Mr. Stannard believed that much benefit could be derived by the company and its consumers who are interested in the electric vehicle, battery, charging apparatus and accessory industries if an electric vehicle exhibit could be held in the show room of the Denver Gas & Electric Light Company's building.

Accordingly, he requested the chairman of the Denver section of the Electric Vehicle Association of America to announce his offer of the show room for such a purpose, and his invitation to exhibit.

The Denver section voted to accept the opportunity to advance their interests and selected the week of January 4-11 as a desirable time to hold the salon. As a result of this idea, eleven 1915 model cars were exhibited in the central station company's salesrooms, and the end of the week found ten cars sold—eight passenger and two commercial. The Detroit electric vehicle being exhibited to the extent of five cars.

This vehicle salon developed many beneficial results other than sales. It developed a co-operative feeling among the various dealers that will do much to advance the interests of the electric in Denver. It also had the effect of tempering any ill feeling that existed among them.

The exhibitors of charging apparatus were successful in placing five rectifiers in private garages and some additional apparatus such as spark battery rectifiers and electric tire vulcanizers.

It is generally believed that the interest created by this vehicle salon will be favorably felt by the dealers for some time to come, as they secured many prospects which they anticipate will develop into customers in the near future.

At the conclusion of the salon, the exhibitors were very profuse in their expression of appreciation for the opportunity given them by the central station company, and requested that it be made an annual event, promising that the number of cars in the next exhibition would be more than double.

The Denver Gas & Electric Light Company, following its usual custom, used every effort to bring this vehicle exhibit before the people who should be interested in the electric.

Full page advertisements were placed in the New Year's editions of the Denver dailies, and the succeeding days found additional advertisements and news item write-ups. A thousand engraved invitations to visit the exhibit were mailed out to the desirable prospects.

Nearly every one in attendance at the salon wondered how the cars were placed in the show room. It was necessary to remove a large plate glass window on a Sunday morning, and runways were built from the street to the window sill and from the window sill to the inside floor. The cars were driven over the runway through the opening. This operation had to
be repeated when the cars were taken out of the building. It required the services of four glass men and three carpenters for these preparations which were provided by the central station. To sum it up, it was a grand success. The central station company is one of those progressive companies which have really co-operated with vehicle manufacturers. Because of this voluntary assistance Denver has become a real electric vehicle center and without a doubt will in the near future be considered as the city of electrics.

Chicago Ideal for Electrics

Chicago stands first as the world's foremost patron of the electric passenger vehicle. On its fifty miles of boulevards and hundreds of miles of level, well-paved streets more electrics are used than in any other great metropolitan district.

In Chicago the pioneers of electric road traction have experimented and labored. It was here that practically every important stage in the development of the car received its first tests and first gained the public's indorsement, and nowdays the Chicago woman is as much distinguished for the smart electric which she drives on shopping tours and social calls as the Kentucky woman for her fine stable of horses.

The first use of solid tires in the history of automobiles was on the streets of Chicago, and the first men to start the construction for the use of such tires were the engineers who designed the Chicago electric.

This electric car represents the sum total of experience dating from the pioneer days to the present on electric cars constructed for solid tires, and for that reason the name "Chicago Electric" was applied to the car, which, authorities pronounce, has the foremost popular hold in the most critical electric car buying region in the country.

Due to the fact that the electric cars have been used in Chicago and its contiguous territory extensively for a longer time than in any other locality, the buying public are far better versed in electric construction, for that reason more critical, than will be found in any other one locality. For that reason the electric car which holds the most prominent position in Chicago must have back of it the most substantial construction and values.

The builder of an entire car must protect his developments at a large expense, the specialist manufacturer in building to specification gives the trade the advantages of his patents without further cost. In the electric vehicle there are many parts; each part is a prominent factor in the successful future of the car.

The manufacturer who builds according to specifications has the opportunity to choose the principles which are recognized as the most efficient, representing thousands of dollars and years of study in the perfection of various factors.

In view of constructing a car at the lowest possible cost of manufacture, yet with the highest grade of material, and at a resulting lower price to the public, the Walker Vehicle Company of Chicago, manufacturer of Chicago electrics, is a thorough believer in the electric vehicle built with parts made by the specialist manufacturer according to individual specifications. Since the origin of the company its greatest effort was to create a faultless car, containing those principles involved in the manufacture of parts which have been recognized by the most successful experts in the country, and as a result this company claims the creation of a vehicle of specialized parts, built according to its own original designs, obtained from the highest type of producers.
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Constant Potential Charging

BY H. P. DODGE

that there being no gassing, the light liquid at the top does not diffuse with the liquid between and below the plates so that there is a difference of at least ten and possibly twenty-five points all the time. This can be demonstrated by allowing the battery to stand for three or four hours and the gravity will rise eight or ten degrees, but we did not pour off the liquid to ascertain the actual average gravity throughout the cell.

The dotted curve shows our estimate of what the true gravity curve should have been, could we have read it.

The temperature curve on this particular example was typical of practically all the temperature curves we took. Starting at 64, it rose during the first hour to 73; next hour to 76; next hour to 78; and remained at that temperature throughout the charge. The reason this particular car did not start in at a higher rate than 130 amperes was due to the fact, we discovered, that the wire leading from the switches to the rheostat were not quite large enough and warmed perceptibly, causing a drop of nearly one volt at the high rate of current at the start. Our experience at St. Louis showed us that we could count on a point somewhere between 140 and 150 amperes for the first two or three minutes, with 13 Hycap batteries.

One very peculiar feature we have noticed in practically all of the tests we have made is a hump in the current curve which shows up in the last half of the first hour. We have not been able to explain this ourselves, nor have we had any explanation volunteered, but the hump has been present, with one or two exceptions, in every test we have made. Curve No. 2 shows the calculated Electric Storage Battery curve for similar conditions. It resembles our curve very closely except for the hump.

I realize that the constant potential system is of interest to the automobile salesman largely as a matter of curiosity, but to the owner of a garage,
a number of apparently serious obstacles appear to oppose the adoption of this system. This was particularly illustrated to me last December in a letter written by Walter E. Holland, Research Engineer of the Anderson Electric Car Company, in a reply to a letter from me urging Mr. Critzer, secretary of the company, to adopt the constant potential system in the new garage being built in New York City for the joint use of several of the leading vehicle manufacturers. This letter was so much to the point that I am going to read it, together with my reply, as it covers as fully as I can imagine the most serious of the objections which immediately appear to those familiar with the ordinary garage equipment. I will take up Mr. Holland's letter in four sections, with my reply to each section, so that none of the points brought up by him will be overlooked.

Our Mr. Critzer has referred your letter of December 19 to me, and says that he investigations to determine if a constant potential charging systems fully. I fully realize the advantage of the system, but there are a number of perplexing problems in connection with its practical application in the ordinary garage.

First: We find in the average garage various lead battery equipments requiring four or five different voltages as well as Edison battery equipments requiring perhaps two different voltages. If we assume that the garage is housed with all of these equipments in it, there are a number of cars with all these equipments coming in as they do at irregular hours during the afternoon or evening. With a number of cars in the garage the problem of keeping the garage charged night and with perhaps somewhat excessive capacity in the charging sets, no doubt it is possible to work the problem out, but I think it would be extremely difficult.

Each number of batteries to contend with in the average garage, but the majority will consist of 40 cells. Each garage should have at least two units, and if a large garage, there should be three. The generator is subject to constant wear and tear, and will take care of the early stages of a 42- or 44-cell car. With two units, you could easily take care of four different battery equipments, and with three units of say 35 K.W., each there should be no difficulty at all in charging 90 per cent of the cars by this system. If it is found impossible to keep the proper voltage for all of the cars, it is only necessary to insert a little resistance in the circuits restricting some of the constant potential charging systems.

Second: Is the problem of maintaining the voltage at a constant proper point. I understand you did this in your St. Louis garage by means of the T. D. regulators. This should be satisfactory but it is a question whether the expense of such regulators is warranted. Probably when Mr. Leggett comes and gives us some cost figures on this apparatus, we can judge better on this point.

Answer: "I cannot find words to express my opinion of the T. D. regulator for use in maintaining the voltage in a charging station at a constant point. It is as nearly perfect an instrument that can be made: it will maintain this point between 72 and 120 volts; will maintain this point between no load and 100 per cent overload, without the slightest fluctuation of the needle; and is extremely simple in its operation. The cost is low and it can be adjusted to any shunt wound motor generator set, and the expense is really very small. Our T. D. regulators at St. Louis cost about $250. The amount of work put up by them is very small, and this work is done by eliminating the rheostats would pay for the regulators."

Third: Personally I am a strong advocate of the no-gassing method of charging as I know from experience that this method will very greatly extend the life of the lead battery. If the constant potential system of charging can be worked out in a practical manner so that it will not exceed the expense for the equipment and for the expert superintendent required is not too great, it is certainly the ideal method of charging as it will automatically give the no-gassing charge.

Answer: "This is all answered in No. 1 and 2, except your reference to the expert superintendents. That is the very point in which the constant potential system excels. A man need not know anything particularly about electricity, and if necessary he can sleep two or three hours between midnight and 6:00 in the morning without any damage whatever resulting to the batteries. In a general way, you cannot hurt a lead battery by this system. Of course there are some worn out batteries or short circuited batteries which will get hot with any method of charging, but if the battery is in good shape, it cannot be injured, except by gross carelessness. An intelligent, careful man will get much better results from this system than from any other."

Fourth: At one time we used in our various garages double voltage motor generators: a low voltage for 24-cell and 40-cell Edison batteries and a high voltage for 38- and 42-cell batteries. We have now discontinued the use of these double voltage systems and have put in constant 125 volt systems to take care of all batteries. We had to do this simply because we found the other system not flexible enough to meet the varying conditions and therefore impractical. It seems to me that the constant potential system in garages where there are many different battery voltages would be still more impractical than the double voltage system.

Answer: Regarding double voltage motor generators, we used to have a little experience with one of these, with very similar results to your own. That proposition is not the same as the one with which we are dealing, because there you are limited to two voltages, while with the constant potential system, by merely turning the rheostat handle, you can get any voltage you desire. In a moment's time, the rheostat loss on the 125 volt line you now have amounts to considerable when charging 30-cell cars.

We quote a letter from E. T. Root, Jr., of the Edison Storage Battery Company, W. S. Legett under date of December 10, with reference to the use of the constant potential system for charging Edison batteries.

"We are advocates of the no-gassing method of charging by means of a fixed resistance. This system of charging is working out very nicely in service. As a rule we figure on maintaining 1.7 volts per cell. Where a fixed resistance is used, usually it is a small wire wound rheostat that will be supplied on the resistance, so that current can be regulated after the installation is installed. This takes care of line variation or difference in charging current due to variation in gravity or temperature."

I have not learned whether or not my arguments induced Mr. Holland to recommend this system for the New York garage, but I feel if they install another system of charging they will be making a mistake. My interest is in the general welfare. If the no-gassing method of charging is due almost entirely to a desire to see anything that is new and that has merit come to the front with the least possible delay. I believe that the life of storage batteries will be greatly prolonged when this system is in general use.

I felt that it would be very much to the point to have a few of the acknowledged experts on storage batteries in the country come out flat-footed with the statement that constant potential system would double the life of their plates. How poorly I succeeded in giving a statement of this kind from any of them is illustrated in the following letters, which I will read. In my letter requesting these opinions, I asked
each gentleman for as strong a statement as he could see his way clear to give me as to what effect the constant potential system would have on the life of storage batteries in general. I also stated that quite a number of owners objected to beginning their charge at 150 amperes when the label on the outside of the battery specified 24 amperes as the starting rate.

A few more points of interest to the garage owner can be briefly stated as follows:

1. What size motor generator set is needed for charging 25 cars per night?

In my opinion it takes considerable less wattage to charge a car by the constant potential system than by rheostat method or even by rectifier. It is evident that the rheostat loss is saved and when a rectifier is used toward the end of the charge, it is necessary to keep the voltage around 2.6 volts D.C. and you cannot satisfactorily get much less than 10 amperes, so on a 30-cell car, 750 watts would be consumed as against 276 by constant potential system, assuming 2.3 volts per cell and a flow of about 4 amperes, which is all you can efficiently pass through a battery which is nearly charged. If we assume it is necessary to put 200 amperes hours into a 13 Hycap battery, it would take on a 40-cell car about 18 kw. hours by the constant potential system, and we have 20 hours at night in which to charge the cars. I would say that a 35 R.W. machine would easily charge 25 cars as far as the constant potential system is supposed to charge them ordinarily. This is borne out by the statement of the Louisville Company that they are charging from 20 to 22 cars each night. Our efficiency curve at Louisville shows that we put six cars on charge the first hour; then waited an hour and put two more on during the third hour, and could have put two more during the fourth hour. This corresponds almost identically with our experience in St. Louis. Inasmuch as most of the cars will not be completely discharged, I would consider it perfectly safe to figure 25 cars on charge each night for 35 R.W. outfit.

2. Is one large unit desirable, or two small ones, and what is the minimum limit or size?

I think a 35 kw. generator is small enough. There is not much difference between the cost of the 25 and 35 kw. unit, and the efficiency is good down to 100 amperes, and if a little ingenuity is used by the attendant when the load gets below 100 amperes, he can put some other cars on and give them their gassing charge at that time and keep the generator working at a good efficiency.

If we can get this equipment started as a standard size and all garages which equip with the constant potential system use this type of generator, it will have a certain advantage that would not exist if each unit was of a different size and had to be handled in a different manner.

How many rheostats are needed?

The size of the garage would have some bearing on the number of rheostats required. With two units, I believe one rheostat for every panel of six circuits would be sufficient, but with one unit believe that two rheostats would be necessary for each six lines. It will all depend on the number of different types of cars to be charged.

In conclusion we wish to state that we are getting stronger for the constant potential system right along. All of the battery people agree that it is good and the garage owner cannot but help but like it. It takes the responsibility from the night man and places it upon the owner of the equipment. There must be a saving in cost and longer life to the batteries.

As against this array of advantages, we have yet to hear one good argument against the use of this system in properly equipped garages.

**English Engineers Discuss Edison Battery**

At the last meeting of the English Association of Engineers a paper was read by R. J. Mitchell defining the ideal accumulator as one having the following characteristics: (1) Light weight, (2) great energy capacity, (3) small volume, (4) great mechanical strength and long life, (5) ability to charge or discharge at high rates, (6) simplicity of upkeep, (7) cheapness of operation, (8) uniform voltage on discharge, (9) immunity from open circuit deterioration or loss of charge.

While there is no present indication that it will be possible to store a kwh. say, for a weight of 5 lbs., advances have been made from Faure's day, when a battery giving an output of 1-h.p. hour weighed 230 lbs., contrasting this with modern traction cells, which weigh only 48 to 50 lbs., for this duty.

Good as modern lead cells undoubtedly are, as compared with what they were, yet it is unlikely that they represent the traction battery of the future, if only for mechanical reasons, and this fact was realized in quite early days. Many attempts were made to eliminate lead from the storage battery, and it was twenty-seven years after the coming of the Faure cell that Edison placed his now well-known iron-nickel-oxide alkaline accumulator on the market. It is possible with one make of battery to count fairly safely on a mileage life of 15,000, as compared with 2000 or 3,000 miles in the early days.

At the five-hour, or normal rate, the average voltage on discharge with the Edison battery is 1.2 volts per cell, while on charge at the same and constant current rate the voltage will rise to 1.85. The specific output per pound of complete battery varies from 13 to 18 watt hours, a figure of 15 watt hours per pound representing a fair average. The watt-hour efficiency is 59 per cent, the ampere-hour efficiency being 82.5 per cent. If the battery be overcharged it will give an increased output on discharge of about 13 per cent, but at the expense of efficiency, though sometimes this property is very useful, as it allows an electric truck in emergency to be run a longer mileage without any risk of battery trouble. Conversely, if the charging period be only five and a half hours, a watt-hour efficiency of 65.5 per cent is realized and an ampere-hour efficiency of 91 per cent. An Edison accumulator measuring a cubic foot would weigh, with crates, 90 lbs. and would give out 0.4 h.p. for four hours.

The author dealt fairly fully with the various systems for charging batteries, touching upon mercury arc rectifiers for charging from a.c. supplies, rotary converters, and so forth. Upkeep and maintenance of the Edison and of lead batteries were considered in detail, and the paper concluded with a description of the Sangamo ampere-hour meter, which is specially suitable for gauging the working condition of the battery.

Secretary of State W. J. Bryan is the latest to join the ranks of electric car users in the National Capital, and is to be seen these days driving a Detroit electric forward-drive brougham of the clear vision type.
IN describing to you the use of automobiles in the postal service, it is not my intention to compare the merits of different types of machines, but to explain briefly the character of work of the postal service requiring the use of automobiles or motor vehicles. They are used in the postal service in several ways, namely: For "screen" wagon service; parcel post delivery service; for delivery and collection service in cities; and for rural delivery service.

Screen wagon service is that used in hauling mails between railroad stations and post offices, and between post office and post office stations. This service receives its name by reason of the type of wagons used, they being always screened with heavy wire to protect the mails while in transit, and, as a rule, involves heavy hauling and the use of strongly built wagons or motor, vehicles, with a carrying capacity of from 1500 to 6000 pounds. The requirements are for heavy tonnage and mileage, rather than speed, and as there are usually but few stops and starts involved, motor vehicles can be used very advantageously, and are gradually becoming more generally utilized. Up until the present time, screen wagon service has always been obtained by the department under contract, the vehicles being owned and furnished by the contractors. There is now at the Washington office, strictly speaking, no screen wagon service, the mails being transported between the Union Station and the post office over a bridge which connects the two buildings, and between the main office and its stations by government-owned automobiles, constructed along the lines of the screen wagons. The use of the bridge connecting the railway station and the post office does not, however, preclude the use of motor vehicles, as great quantities of the mails are transported to and from the trains by small electric trucks belonging to the Washington Terminal Company. The use of these trucks assists very materially in effecting a speedy dispatch of mails between the two points, the mails from trains frequently being received in the post office in from five to seven minutes after the arrival of the trains. This is one of the advantages of the new location of the post office building. When the building was located at 12th street and Pennsylvania avenue, N. W., it required about one hour to transport the mails from the trains to the post office.

The parcel post service consists in the delivery of parcel post packages to residences and places of business, and does not differ very greatly from the delivery service of department stores or that of transportation companies engaged in a parcel delivery business. This service is performed either by wagons or automobiles, with a driver or chauffeur, accompanied by a carrier, who makes deliveries, the automobiles generally having a capacity of about 1000 to 1500 pounds. Automobiles are, perhaps, being used more extensively in this service than any other branch of the postal service, and yet, if not properly handled, this service is more costly than any other, due to the fact that it is generally necessary to keep the engine in motion while the machine is standing still and the carrier is making his deliveries. For this reason, the parcel post delivery service can usually be performed cheaper by wagons than automobiles, as the wagons are not near so costly when not in motion. This is particularly true of delivery in the business sections, when the stops are close together and the machines do not have an opportunity to speed up between stops. This difficulty is not experienced, however, when deliveries are made in the residence sections remote from the post office, as considerable time is gained by the automobiles in going between the office and the delivery points. Experiments and investigations at the Washington post office have indicated that in this service about 50 per cent of the time of the automobile is consumed in standing still, and the remainder of the time while in motion.

At the Washington office, they are delivering parcel post matter in three ways, namely, by wagon, by automobiles under contract, and by government-owned automobiles. Up until this time, it has been found that it costs less per package to deliver by wagon, but through the use of government-owned machines we are gradually reducing the cost of delivery by automobiles. During the month of December, the average cost per package for delivery by automobiles under contract was six cents; by government-owned automobiles, three cents; and by wagons two and a half cents. In this connection, however, it should be stated that the wagons are used almost exclusively in the business districts, where a larger number of parcels is delivered to a single patron than in the residence sections, and where the distance between the offices and delivery points are shorter.

I have said that the delivery of parcel post packages by wagons was cheaper than by automobiles, but I have not said that it is at all times nearly as satisfactory.

On December 24, twenty wagons and several automobiles left our office at 8 A. M., loaded with Christmas packages for delivery, each vehicle being accompanied by several carriers. About ten o'clock it began to snow, and, as all of the horses were smooth-sledded, very few of them returned for a second trip, while all the automobiles returned for an additional trip. Old "Dobbin" certainly put our delivery service on the "blink" that day, and you can safely bet that the next day we had more automobiles and less horses in service.

The delivery of ordinary mail in cities by vehicles is generally confined to the deliveries in the suburban districts, where the residences are sufficiently separated from one another, and the territory so remote from the post office, as to justify the use of a team by the carrier. The mounts used by carriers in suburban districts are usually furnished by the carriers themselves, the Department making a monthly allowance to the carrier for that purpose. These allowances are generally made for the maintenance of a horse and wagon, and as they are insufficient to permit the carriers furnishing automobiles, very few machines are being used by them in the delivery of ordinary mail matter.

*By W. H. Heycock.*
Occasionally, however, we find an enterprising carrier who prefers a machine to a horse, and who is willing to assume the extra expense for his own convenience. The same difficulty is experienced in this service as that in the parcel post service to which I called attention, that is, that so much of the time of the machine is consumed in standing still while carriers are making deliveries at the houses, and it is impracticable to stop and start the engine with every delivery made by the carrier.

What I have said with reference to suburban delivery, applies pretty generally to delivery by rural carriers, except that the time consumed in actually making the deliveries is not so great, as the rural carriers are not required to leave their vehicles, but, while in them, place the mail in boxes erected alongside the road. A few of the rural carriers, where the routes are located in districts with good roads, are using motor vehicles, as they can complete their deliveries more quickly and return to the office carrier, and use for their own purposes the time thus saved. Undoubtedly, a good stout little machine that can be easily operated and maintained at a minimum expense could be used to advantage in the delivery of mail in the suburban and rural districts.

The collection service in cities consists of the collection of mail by letter carriers from street letter and package boxes, and mail chutes in large buildings. Automobiles are used in this service in two ways—by carriers as they make their collections from the individual boxes, and while bringing the mail to the post office each trip, and by what might be termed trunk routes, which involves the sending of automobiles to collect mails from stations and from boxes in which collections have been placed by foot collectors, who deposit the mail in the stations or boxes instead of bringing it to the post office each trip. Up to this time, the Department has not experienced much success through the use of automobiles in making collections from individual letter boxes, owing to the fact that as the stops are so close together and so numerous, it results in great wear and tear on the machines, and very few machines have been found able to stand the strain that such service subjects them to. I can, perhaps, best illustrate to you the difficulties involved in the collection service by explaining to you briefly the experience of the Washington office in the use of automobiles in the collection service:

In 1908, it was decided to experiment with automobiles in making collections from individual boxes. A contract was let for one year, requiring the use of small gasoline machines, of a capacity of about 750 pounds, that were supposed to be adaptable for the purpose. When these machines were placed in service, each of them was assigned to what was formerly three-foot routes, or approximately 100 letter boxes, collection being made every two hours during a period of sixteen hours, or eight trips daily, the machines traveling approximately 80 miles a day and making 800 stops. This service cost somewhat more than the cost of the same service when performed by carriers on foot, and was not near so satisfactory as the latter, as the machines were constantly breaking down from one cause or another, thus delaying the collection service and making it necessary to send out relief machines to repair them. At the end of the contract period, the machines were ready for the junk heap, and the contractor refused to renew the contract except at a very greatly increased rate.

We then entered into a contract for machines of the steamer type for the performance of the same service, it being represented that the numerous stops and starts did not seriously affect the machinery of a steamer. This service was performed for one year, and, while it was much more satisfactory than that of the gasoline type, it still was not altogether satisfactory.

We renewed the contract except at a much higher rate of pay. Even this service was not as satisfactory as that performed by carriers on foot.

We then resumed collections by carriers on foot, but later entered into another contract for larger machines, which also provided for the transporting of carriers to their routes during the intervals between collection trips. These were the "van-like" machines you undoubtedly saw on the streets a few years ago. While they were much more satisfactory than the smaller ones, it was soon demonstrated that they were too large and heavy for that character of service, and after about eighteen months of service we began to experience the same difficulty as with the smaller machines, namely, that when a collector started from the door of the post office to make a collection, it was impossible to tell when he would return. This contract was later discontinued, and collection resumed through the use of foot carriers and horse-drawn vehicles at two-thirds the cost of the automobile service, and the service is still being performed in this manner much more satisfactorily than through the use of any machines yet tried for the purpose.

A large part of the expense involved in collection service from individual boxes by automobiles is due to the fact that it is necessary for a chauffeur to operate the machine, and for a carrier to make the collections, requiring the services of two men. I am not prepared to say that this character of service cannot be performed satisfactorily by automobiles, but up to this time it has not been demonstrated that it can be done in this city. It may be that there is a wide field in this particular kind of service for the use of electric vehicles. If you gentlemen present, who are interested in electric motor vehicles, can devise a light machine, easy of operation and durable, which can make stops and starts quickly, and be operated by our carriers, thereby eliminating the expense of chauffeurs, you will have helped solve the problem for the Department, and there is hardly any doubt but that such machines would be placed in general use throughout the postal service. If machines of the electric type can be built with sufficient speed and hill-climbing qualities to meet the requirements of the collection service, they would undoubtedly be found to be particularly desirable as government-owned machines, as every large post office has its electric plant where the charging of the batteries could be done at a very limited cost. The fact that electric machines are so much more simple of operation, and can be easily driven by carriers, without the extra cost of chauffeurs, it is a decided advantage in their favor.

Automobiles are being very successfully used in the collection service for bringing to the post offices mails collected and deposited by carriers in stations or deposit boxes located remote from the office, thereby saving the time of carriers and mounts that would be consumed in traveling to the office and back to the routes. We have a splendid service of this character in operation in this city. Collections made in Georgetown are deposited at Station A; those made in Mount Pleasant are deposited at Station F; and those made
in the business districts are deposited at Stations C and G. Automobiles are so scheduled as to reach these places just after the arrival of the carriers, and transport the mail immediately to the post office, where direct connections are made with outgoing and local deliveries. In the business districts eighteen collection are made daily, they being one hour and twenty minutes apart between 7 and 11 a.m.; forty minutes apart between 11 a.m. and 8 p.m., and one hour and twenty minutes apart between 8 p.m. and midnight. Through the use of automobiles, the mails are brought to the main office much more quickly than could be done by the collectors, and the time of 108 trips by carriers between the post office and the business districts is saved daily. Thirty-six such trips are saved between the main office and station F, and fourteen between the main office and station A.

Until 1912, all wagon or automobile service of the Post Office Department was performed under contract, the Department not owning a single vehicle of those used in its service. During 1913, the Department prevailed upon Congress to make an appropriation for the purchase of automobiles for use in the postal service, and fifty-two machines have been purchased and placed in the service under government control and operation, the majority of them being used in the parcel post delivery service. This has made it possible for the postal service to obtain automobile service cheaper than by contract.

Until this year, the vehicles performing the screen wagon service, and those on the city delivery service, were obtained under an entirely different or separate appropriation, and it was impossible to interchange or use the vehicles provided for under appropriation for the work incident to another appropriation. The fact that vehicle service was obtained under different appropriations and was not interchangeable added greatly to the expense therefrom, as it was generally performed by different contractors, making it impossible to use the lapsed or unused time under one contract for the performance of service under another. In other words, while the vehicle furnished by the contractor for the screen wagon service might be standing idle at the post office platform waiting for mail for dispatch, it was impossible to use it for the delivery of parcel post matter or for the collection service, although the lapsed time was necessarily charged for by the contractor in submitting his bid, as it was impossible for him to utilize it for other purposes. During the last Congress, however, an appropriation was made for an experiment of the combined screen wagon, parcel post, delivery, and collection services, and Washington is the first city to use automobiles in that manner. On October 19, the screen wagon service at this office was discontinued, and we were furnished with six gasoline machines—one of a ton and a half capacity, and five of three-quarters of a ton capacity. In the combined screen wagon and delivery service, the expense for lapsed or lost time is eliminated, and the machines now at the Washington office are used for nearly every moment of their time, they being utilized for collection service, parcel post service, transporting mails to post office stations, to the electric railway station and the steamboat wharves, and for conveying letter carriers to routes. In order to show you how closely the schedules are drawn, the small amount of lost time and the variety of service performed, I will read to you a schedule under which one of our machines works.

During the month of December, these machines traveled about 11,506 miles, with only 620 miles of dead mileage. They have been in operation since October 19, and not a single scheduled trip has been missed that can be charged to an irregularity or defect on the part of the machines.

The use of this combined service has greatly reduced the expense for vehicle service at the Washington office. The screen wagon service, which was formerly costing at the rate of 37½ cents a mile, is now costing but 13½ cents a mile, and the parcel post service performed under contract, which will soon be discontinued, is costing 6 cents per package, whereas it is costing but 3 cents per package when delivered by government-owned automobiles. This is made possible by combining the services and utilizing all of the time of the machines.

The use of motor vehicles in the postal service is still in its infancy, there being today 1700 vehicles used in the screen wagon service, less than 5 per cent of them being motor vehicles; 2485 vehicles used in the parcel post delivery service, less than 1 per cent of them being motor vehicles; and 43,814 vehicles used in the rural delivery service, about 10 per cent of them being motor vehicles. In order that you may know whether there is to be a field in the postal service for the use of motor vehicles, I can tell you that only recently a high official of the Post Office Department stated that he hoped to see the day shortly when every horse in the postal service would be eliminated, and the entire work now performed by horse-drawn vehicles performed by motor vehicles.

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<td>7. Brookland, 5:25 A.M.</td>
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<td>650 Carriers to Routes; Stephenson's Wharf, 7:30 A.M.</td>
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<td>82 Amux Equip., 8:00 A.M.</td>
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<td>767 12th &amp; W (V.V.), 8:32 A.M.</td>
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<td>742 Sta. A, 10:30; 30th &amp; M, 10:40 A.M.</td>
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<td>758 Sta. A, 12:40; 30th &amp; M, 1:00 P.M.</td>
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<td>618 Sta. A, 2:05</td>
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<td>284 Sta. C, 5:45; Sta. G, 5:55</td>
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<td>284 Sta. C, 6:25; Sta. G, 6:35</td>
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<td>206 Woodward &amp; Lotrop (bulk mail) 7:00 A.M.</td>
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**ELECTRIC VEHICLES**

**AUTO ROUTE "B"**

**Electric Trucks Save 40 Percent**

Marshall Field & Company, Chicago, operate a fleet of more than 200 electric trucks and delivery wagons. After experience with both gasoline and electric trucks for haulage and delivery work, Stanley Field, first vice-president of the company, recently made the comment that with electric trucks operated at an expense of $8 per day Marshall Field & Company are able to perform delivery service which cost $13 per day with gasoline trucks.
Electric Taxicab Successful in Detroit

The electric taxicab has arrived and has been proved a success. And, very appropriately, it is Detroit which is the first to get the benefit of this improvement.

Almost as great a change as that which substituted the taxicab for the old horse-drawn "hack" is that by which the electric taxicab is to supplant the ordinary gasoline vehicle. It took centuries for the carriage-maker's skill to produce a fairly comfortable horse-drawn cab; it has taken but a few years to provide the maximum of luxury in travel in the electric taxi.

The success of the electric taxicab is a new thing. True, there have been electric motor-cars in service for hire in eastern cities in the past few years. But they were not a success. Therefore, when the Detroit Taxi-cab & Transfer Company perfected its first new model early in 1914, it did not make any announcement, but waited for the test of actual usage and the verdict of the public to determine the success or failure of the experiment.

That verdict has been given. And it is success with emphasis.

What many automobile engineers did not believe practicable has been accomplished. An electric vehicle has been designed which has all the advantages of the gasoline taxi and none of its disadvantages and which has many triumphs of its own.

As a result, this company is completing ten more electric taxis of the same model and, before the year is ended, will have replaced its present equipment of gasoline cars with the new kind. Only a few gasoline cars for very long runs will be retained. Just how big a thing this change is may be understood when it is stated that the taxicab companies of every city in the eastern portion of the United States are inquiring about the new taxi and that there is the probability of a new branch of the automobile manufacturing industry here as a result of this demonstration. Within a year or so there is every reason to believe that the electric taxicab will be the accepted first-class means of transportation for hire in every large city.

To know just how big a step forward the Detroit Taxi-cab & Transfer Co. has made, one must balance the advantages of the new electric car with those of the old-style gasoline car. The latter is, after its first few months of hard service, almost always noisy. It is apt to be greasy and there is the odor of gasoline about it. Furthermore, its speed is what the temper of the driver elects to make it. Nervous people dread the rash haste of the reckless chauffeur. It is needless to say that repairs and accidents are incidentals to be considered as well.

The new electric taxis are larger and more comfortable. They are upholstered in handsome whipcord and there is a roominess to them unknown in the older cabs. There is practically no noise, for the tiny hum of the motor is all that can be heard at any time and that is indistinguishable in the roar of city traffic. Their speed is enough, but never too much, for the maximum possible is not more than 25 miles an hour and they are so much easier to control that there is hardly a possibility of accident.

But they have one other merit that will appeal to every woman. They are absolutely clean. There is no smudge, no grease, no danger of stain to mar costly garments. Every day each of these luxuriously upholstered cars is given a thorough treatment by the vacuum cleaner to remove any dust which may have lodged in it. The other dirt, almost inseparable from a gasoline car, is never there.

There is the greatest of ease in travel in one of these also. There is no jerk at starting, no lurches and abrupt halts. Quickly, silently, the motor turns and the taxicab starts, as silently and as quietly it stops. Low-hung on perfect springs, there is an absence of jars and vibrations which is restful. It would be difficult to conceive of a more convenient and pleasant way of traveling.

This efficient and comfortable electric taxi costs no more to ride in—and a bit less to operate—than the common gasoline taxi.

A Remarkable Showing

We have received a statement from the Cambridge (Mass.) Electric Light Co., covering the cost of operation of their two GMC electric trucks for one year, says "GMC Talk."

The company has two model 10 trucks which are used principally in hauling coal from the company docks to the electric light plant, a distance of two miles. The company's statement was issued to show the cost per ton of its coal delivered to its storage bins and included first cost and labor not chargeable to truck operation.

The amount of coal hauled during the year was 15,125 tons, the amount hauled per day by the two trucks was 70 tons.

From the company's statement we make the following deductions to show the "truck cost" of hauling the coal.

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two drivers at $2.50 per day each—70 tons</td>
<td>$70.00</td>
</tr>
<tr>
<td>Interest—one year at 5 per cent on $9,600</td>
<td>$480.00</td>
</tr>
<tr>
<td>Depreciation—Batteries</td>
<td>$192.00</td>
</tr>
<tr>
<td>Chasses</td>
<td>$600.00</td>
</tr>
<tr>
<td>Insurance</td>
<td>$240.00</td>
</tr>
<tr>
<td>Taxes on $9,600</td>
<td>$276.00</td>
</tr>
<tr>
<td>Repairs—Chasses</td>
<td>$276.00</td>
</tr>
<tr>
<td>Tires</td>
<td>$263.00</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>$180.00</td>
</tr>
<tr>
<td>Attention of battery man 12 months at $20.88 per month</td>
<td>$250.36</td>
</tr>
<tr>
<td>Electricity, 44832 KWH at $.01</td>
<td>$448.32</td>
</tr>
<tr>
<td>Total</td>
<td>$3,222.88</td>
</tr>
</tbody>
</table>

This remarkable showing is partially accounted for because of the extremely low price for current of 1 cent per kwh. But even at 4 cents, which is an average cost, the showing would be excellent.

Physicians’ Use of the Electric Vehicle

The Electric Vehicle Association is in receipt of a letter from a physician in Kansas City—one of the hilliest cities in the country—extolling the virtues of the electric vehicle as used in his practice in the place of five horses for the past six years. He further states that he obtained 12,000 miles from his first set of batteries and the same mileage from his first set of tires. He also advises that the average cost of charging, which he does at home, is $7.50 a month, and that the repairs and upkeep averaged less than $5 a month for the six years he has had the vehicle, which is still running with entire satisfaction.

This doctor's experience is that of a large number of physicians all over the country, for the electric appeals especially to them for its low operating cost, its dependability and noiselessness, and particularly for its complete cleanliness, which is a most important factor to men of this profession.
Lack of efficient garaging facilities for electric commercial vehicles has caused many owners using probably a single truck, or at least not enough to require a private garage to board their trucks in passenger electric garages. As a rule, passenger electric garage men will take on this new business when they have a little spare room. The question at once arises, is this a good policy considered from the viewpoints of truck owners, garage men, and those owners of passenger cars boarded in the garage?

The truck owner is glad to accept the accommodation. The garage man readily accepts the increase in revenue. The most important element of his patronage, the passenger car owner, in many cases a woman, frowns and feels ill at ease when obliged to stand her well-kept coupe alongside of a huge truck covered with the dust of a day’s trip, laden with advertisements and as a whole presenting rather a sordid appearance. In many instances that same owner seeks other garage service, and the garage man loses a regular customer.

The principle itself is incorrect, just as is garaging gas cars and electrics under the same roof. In either case one service will not properly apply to both types of vehicles; that is, cases are very rare in which there are facilities and experienced employees for both types. It is readily understood that one type or the other is purely a side issue, and as a side issue is often neglected. Charging facilities for passenger cars are inefficient for charging trucks; repairing apparatus inefficient for the massive truck parts. Guaranteed service to passenger car owners keep inspectors, battery experts, washers, chargers, etc., busy constantly; and the truck consequently is entirely neglected.

The truck needs truck garage service. Although its mechanical principles are identical with those of the passenger car, there are numerous phases of service necessary to trucks which are unknown to the average passenger car garage man. In the United States there are approximately 12,000 commercial electrics, and passenger car garage men should refrain from splitting this business up, by so doing offering unsatisfactory service to both, thereby keeping exclusive electric garages for both types from establishing stations where proper service and facilities could be had on demand.

Garaging on the European Plan.

The average electric garage offers service at a flat rate price, in many cities standard at forty dollars a month. This flat rate price includes storing, washing and polishing daily, unlimited charging and ordinary care of batteries, including cars delivered and called for at the owner’s residence by reliable operators. To the man who uses his car constantly and who can afford to have every detail of his car taken care of by the garage man such service is quite reasonable. To many other owners, however, a charge of forty dollars per month is excessive, in that such owners use their cars only one-third as much as the first type and consequently need only one-third of the charging, washing, greasing, etc. Whereas the first owner secures a maximum benefit from the forty dollars a month investment, the second owner is obliged to pay for something that he does not really desire, the charge merely granting him unlimited service if he should desire it. The case is then similar to our popular hotel scheme of American and Euro-

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pean plans. The occupant of an American plan hotel must pay for three meals a day even though he is in the habit of eating but two, while the occupant of the European plan hotel pays for just what he eats and when he eats it.

Although the flat rate plan equalizes itself to a certain extent, in that on one customer the garage man loses money and on the other customer makes money which ultimately brings him a proper net earning, to those owners who do not require excessive service there is a serious dissatisfaction which is instrumental in persuading them to get rid of the electric and purchase a gas car, which offers much cheaper garage service due to its different garaging necessities. The garage man can find a remedy for the dissatisfied customer if he would introduce a European plan. The garaging charge then would cover full garage service yet with a right to not only any one phase of the service, but all phases when desired. For instance, storage space board per car per month could be billed at $9, delivery of car at garage door per month $2, washing and polishing as required $7, oil, greasing, care of batteries and adjustment per month $2, delivered and called for car at owner's door per month $5, electricity per month $10, insuring (risk) per month $5. This unit cost would total at $40 and would furnish equivalent service to the full rate charge of $40. However, the unit cost service, that is the European plan, is especially advantageous to many owners in that some cars used once or twice a week for short trips during nice weather would not need washing, delivery, charging or inspection. In other words, this particular owner would be rendered a bill purely for storage space. Probably in the succeeding month the same owner might find it necessary to use his car every day for long trips, necessitating washing and polishing and the rest of the unit costs, which would bring his bill up to the maximum charge. By this method, the owner pays for what he gets, dissatisfaction is eliminated and the electric is a valuable possession rather than a dissatisfying expense account.

SELLING ELECTRICS.

The success of any meritorious product to be sold directly to the public depends purely on salesmanship. The salesman who is continually in the field, first establishing the utility of his product and then defeating the competition of his neighbor dealer, finds his vocation exceedingly interesting in that he is comforted by many obstacles which draw on every atom of diplomacy which he is able to invoke in order to obtain his prospect's final decision to purchase.

Selling electric cars demands many qualities that are rarely necessary in selling the average merchandise. Not even in selling the allied product, the gas car, do these essential qualities have as much weight. The gas car with its world-wide publicity, its universal acceptance as a necessity to every man's social and personal happiness and success, often sells itself to the public. The electric, on the contrary, with its greater purchase price, its limited mileage, its preceding years of inapposite publicity, is sold in ninety-nine cases out of a hundred only after diplomatic procedures have been taken.

The successful electric car salesman is a diplomat in the true sense of the word. The more diplomacy he possesses the greater is his success in closing sales. His prospects number among the most fastidious people, who demand that every factor of their purchase from the shape of the steering control handle to the weight of the vehicle be in accordance with their own ideas of personal taste and satisfaction.

Appearance, bearing, courtesy and patience, weighty consideration of every detail, minor or major, are the principal channels which lead to successful selling of the electric. The absolute knowledge of the proper moment to advance or retard, sales arguments, personal acquaintance with the prospect's weaknesses, habits and hobbies, social connections and financial standing, and absolute knowledge of every inch of the vehicle and its operation are all necessary to success in selling electrics.

In years past the successful electric vehicle salesman had even a greater task. The utility of this type automobile was a doubtful consideration. The question of service was also a subject for consideration. In this late day, when our streets are dotted with the battery propelled car, the public has learned to take for granted that the type as a mode of travel is satisfactory. The question of buying then depends on those other elements of price, design and trimming, which diplomacy alone can favorably influence.

EXHIBITING AT SHOWS.

Manufacturers of electric vehicles as a class appear to regard automobile shows and trade paper advertising in a negative light. Without discussing the trade paper end of it just now, it must be admitted that all too few electric vehicle makers were represented at the recent national automobile shows. Those who were there were doing the best they could, of course; but those who were not there unwittingly injured not only themselves but everybody in the business.

Everybody who is even slightly interested goes to the auto show. There is no more effective way of reaching the people of any community. And they spend their time there, and afterward, making comparison—a common human trait. They tell all their friends that the Jones' car is prettier than the Smith's, that they like the Brown best for its price, and that there were no electrics there—well, hardly any; just a few. The electric can't amount to much, because there were a hundred times as many gas cars exhibited. That is the impression they gather.

Numerically the electric at best cannot make much of a showing alongside the gas car. That is all the more reason for making all the showing possible. People never know what they do not see; and if they only see six makes of electric car they conclude that that is the whole business. They learn that every Tom, Dick and Harry who resembles a gas car, little or big, has a model at the show.

If the small makers of electrics cannot afford to exhibit at shows they cannot hope to grow any bigger. They should anticipate the expense as a part of their regular running cost and get in the game once a year just to make it look like a business.

CITIES ASK FEES OF ELECTRICS.

A bill will be introduced in the Illinois legislature soon to amend the motor car license law so that all money received from electric cars will be turned over to the city in which the cars operate and not to the state. As is well known, electric cars are largely for city use and it is rare that they are used for trips to the country districts.
Electric Vehicle Association Developments

**Sectional Development Work, Reports of Committees, and New Announcements**

THE following is a review of some of the activities of the Electric Vehicle Association of America, since the last report of the council meeting of November 16, in which is included some account of the council meeting of January 15, as prepared by the association secretary.


The secretary reported on the general activities of the association, including a brief report of section activities, excerpts of which follow.

**New England Section:** The last meeting of the New England section was held in conjunction with the Boston Motor Car Club on December 9, 1914 at the Hotel Thordike. John N. Cole, who was to speak on transportation subjects, was prevented on account of illness, and Edwin S. Sibley furnished entertainment for the evening.

D. C. Tiffany of the committee to take action in regard to the retirement of Mr. Baker, president of the Electric Motor Car Club, read resolutions acknowledging Mr. Baker's faithful services by standing vote.

It was resolved to send a copy to Mr. Baker and spread the same upon the records. Mr. Baker expressed his appreciation of the resolutions.

**Chicago Section:** Because of the automobile show held in Chicago, the Chicago section, on January 20, met at the Hotel Metropole. A large delegation of visitors was present.

Talks were made by Messrs. Chalfant, Pancoast and Dodge. Mr. Chalfant spoke of the good the association is doing in bringing the manufacturers and central stations in closer harmony. Mr. Pancoast spoke on the need for educating the public concerning the merits of the electric. He suggested the slogan "Drive an Electric" for those interested in the development of the battery vehicle.

Mr. Dodge presented a paper dealing with the constant-potential system of battery charging. A specific installation in a St. Louis garage employing two 35-kilowatt shunt-wound generators was described and the advantages of the system pointed out. This paper appears elsewhere in this issue.

**Philadelphia Section:** The January 13 meeting was held in the Colonnade Hotel, with Chairman R. L. Lloyd presiding. The subject of the evening was "Automobile Illumination" by Frank B. Ruoff of the General Electric Company, showing the electric lamp from its inception by Mr. Edison, through its various stages, to the latest nitrogen-filled automobile lamp. He showed views of the mining of the tungsten rock, and of the processes through which the lamps passed to form the complete lamp.

The papers committee, as chairman by A. W. Young, reported that they had under consideration several very good papers for the ensuing meetings.

F. E. Whitney, chairman of the garage committee, reported that the list of charging stations in and around Philadelphia had now been completed, and was in the hands of the printer. Mr. Fink reported that a large new garage was about being opened in New Brunswick, whereby electric vehicles could secure ample service.

F. B. Neely, chairman of the parcel post committee, reported that he had heard on most excellent authority that the government will not purchase any more electrics for parcels post, but is seeking contractors who will lease such vehicles to the service at a very low cost. Also that Mr. Heath will address a convention of Postmasters on the economics of the electric vehicle in parcel post service.

The discussion following Mr. Ruoff's paper was devoted to questions regarding the elimination of various bases, globe sizes and voltages, looking toward the standardization of certain types whereby the users of electric vehicles would receive prompt service and lower prices. E. R. Whitney of the Standardization of the Electric Vehicle Association of America stated that much progress had been made, and that in connection with the standardization committee of the Society of Automobile Engineers, of which R. S. Fend of the Woods Motor Vehicle Company is chairman, rapid progress is being made in standardizing automobile lighting and lamps.

It was brought out that the Bayonet candelabra base, double contact, had been adopted by both associations as the standard base, and that improved methods of manufacture had practically eliminated the G-18½ bulb, by permitting the necessary filament to be furnished in a G-10½ bulb.

It was shown that the price-lists of the lamp manufacturers permitted the ordering of any voltage from 24 to 90 at the same price, and that the ordering of small quantities of odd voltages caused excessive cost and waste in manufacture.

After considerable discussion relating to cell equipment and variations of voltage permitted on Mazda lamps, it seemed to be the consensus of the meeting that vehicle lamps should be listed at intervals of six volts; for instance, lamps of 24—30—36—42—48—54—60—66—72—78—84 and 90 volts should take a standard price. Any voltages away from these should be listed at a considerably higher price, in order to discourage their use.
Statements made by members handling lamps showed that the cost of handling the large variety of lamps called for far exceeded the profit derived therefrom, and that instead of the business producing a profit, and thereby encouraging the keeping of lamps in stock, it produced an actual loss, and that few concerns would care to stock lamps except as made necessary in order to render service to their customers.

Incidentally, Mr. Ruoff brought out the fact that the present Mazda lamp gave 50,000 times as much light for a given amount of cost and energy as Mr. Edison's first practical incandescent lamp. No other business existing between the meeting, a vote of thanks was tendered Mr. Ruoff for his paper, and the meeting adjourned at 2 p. m.

Washington Section:—The Washington section held a meeting January 14, in the commercial office of the Potomac Electric Power Company, E. S. Marlow, chairman, presiding. The two papers presented were,—“Automobiles in the Postal Service” by W. H. Haycock, Superintendent of Signals, Washington, D. C., which appears elsewhere in this issue, and, “Mine Haulage and Its Evolution” by A. H. Fay, Mining Engineer, United States Bureau of Mines.

The meeting was called to order at 8:25 p. m. The chairman announced that pending the reading of the papers, a comic reel of moving pictures would be shown. After the pictures, the chairman introduced Mr. Haycock who read a paper entitled “Automobiles in the Postal Service.” Following the reading of the paper, Mr. Marlow thanked Mr. Haycock for his kindness in coming down and addressing the section, and spoke very highly of the work of the post office department.

The chairman then called upon the chairman of the program committee for his report. Mr. Bartram stated that he had no particular report to make, except that a plan had been thought out of substituting for the regular monthly lunches, an evening supper and entertainment, suggesting that instead of the lunch at Castelli’s on the afternoon of February 28, a supper be given at the Lord Baltimore Club, stating that the cost for the evening entertainment would be $1.50 or $1.75 as against $1.00 for the lunch. The matter was put before the meeting and it was decided upon to have the dinner at the Lord Baltimore Club, and to have all entertainments, in the future, in the evening.

Mr. Marlow then introduced A. H. Fay who presented his paper on “Mine Haulage and Its Evolution.” Following this reading, J. M. Stoddard moved that a rising vote of thanks be given Messrs. Haycock and Fay, which was given.

The meeting adjourned at 10:15 p. m. after which the members partook of a buffet supper.

Los Angeles Section:—December 2 meeting of the Los Angeles section was held in the Jonathan Club, J. Harry Pieper, chairman, presiding.

The garage committee, J. O. Case, chairman, reported having had several meetings with Standish L. Mitchell, secretary and general manager, Automobile Club of Southern California. This club will show on their road-maps the location of all charging stations for electric vehicles. It was voted that Mr. Mitchell be elected an honorary member of the Electric Vehicle Association of America.

T. R. Solomon, one of the members of the Los Angeles section, made a very strong impromptu talk on practical co-operation.

The attendance and publicity committee, A. T. Smith, chairman, reported that each member had been telephoned to on the morning of the meeting in order to bring out a good attendance, and the result was shown.

The exhibition committee, C. H. Carter, chairman, reported that they were co-operating with the papers and program committee, and would have an exhibition at the next meeting.

Volney S. Beardsley described in detail the plan for a west end trip for Beardsley electric owners, a special prize being offered for those covering the greatest number of miles.

H. G. Mors, a member of the Electric Vehicle Association of America, from Vancouver, now located in Los Angeles, described conditions in Vancouver and stated that co-operation among dealers was conspicuous by its absence, shown by the fact that in a city of 100,000 population, there are but thirty-seven electric vehicles.

George B. Muldair, manager field co-operation, of the Society for Electrical Development, described in a very effective manner the work outlined and being accomplished by this organization. His address was most interesting and instructive. Mr. Muldair was much impressed with the attendance and enthusiasm shown at the meeting.

The January 6 meeting was also held at the Jonathan Club with J. Harry Pieper, chairman, presiding.

“Exide Batteries in Electric Vehicles” was the subject of a well prepared paper by W. Franklin Rath, and was discussed by Messrs. Starrett, Guy, Martin and Pieper. Harry W. Harrison read excerpts from F. Nelson Carle’s paper “Special Applications of the Electric Truck,” a paper read at the Fifth Annual Convention of the Association. He also talked on the application of electric storage batteries to everything on wheels. This brought forth a lively discussion indulged in by nearly all of the members present.

The membership committee, H. J. Kister, chairman, presented three applications for associate membership.

The garage committee, J. O. Case, chairman, reported good results in an effort of having a uniform rate for charging, etc., adopted by the electric garages of Southern California. Mr. Case is sending letters to all of the garages in Southern California in an effort to make the adoption of this standard rate universal and to bring in as members of the local section of the association, the owners and managers of all these garages.

It was unanimously voted that S. L. Mitchell, secretary and general manager of the Automobile Club of Southern California, be made an honorary member of the Los Angeles section of the Electric Vehicle Association of America, it being understood that Mr. Mitchell would not be affiliated with the central body.

The attendance and publicity committee, A. T. Smith, chairman, is still keeping up its good work particularly in telephoning to each member in an endeavor to get out full attendance.

T. H. Ducker, superintendent of transportation of the Southern California Edison Company, read comparative tables of cost of operation of four gas cars and four electric cars in service of Southern California Edison Company. The electric cars proving more economical to operate.

New York Section:—A meeting was held by the New York Section on December 30, 1914, Harvey Robinson, chairman, presiding. The subject of the evening was "Operating Electric Trucks Under Winter Conditions," with open forum discussion.

W. Nelson Carle, advertising manager of the General Electric Company, prepared a paper on the above-mentioned subject, which treated with the successful
The number of electric vehicles under heavy weather conditions, and emphasized the necessity of preparedness, indicating the need of motor vehicle trucks being equipped with proper motors, tire grips, and elementary tools for handling snow conditions.

Mr. Carle stated an instance where it was noticed last winter a driver spinning the rear wheels of his gasoline truck in the snow on Broadway, New York, tying up traffic and tearing one tire to pieces. A brief talk with this driver elucidated the fact that the company only allowed him chains for one wheel; that he knew nothing about locking his differential—in fact didn't know the truck had one. Desiring to facilitate his getting away, the observer showed the driver where to cut the wire which was wound about the shaft. The wire cutting was not accomplished until wire cutters were borrowed from a nearby taxi cab driver the truck driver not being supplied with such expensive tools. This showed the lack of preparedness for a storm on the part of the concern owning this truck, which concern operates over 100 trucks in New York.

In discussing the success of operating electric trucks under adverse conditions, Mr. Carle stated that we must not be afraid to look on the dark side of it. The most perfect machines made have moments of failure, especially under adverse conditions under which they are not designed to operate. These conditions are unusual and must be met in an unusual way. Preparation must be made to meet them, and if we do this, many of the failures and lapses would be overcome. He indicated as evidence of the trend of the times a card issued last winter by the New York Edison Company, entitled “Truck Don'ts for Winter.”

A very comprehensive list of charging stations printed on heavy cardboard was recently issued by the United Electric Light and Power Company, and this with similar data obtained from other sources, enables the driver of an electric truck to have first-hand information as regards charging stations where an emergency boost may be obtained. In many cases, the driver is not required to pay for the current at the time receiving it, but his consideration of the truck being taken and the bill sent the next day.

E. A. Graham of the Electric Bond and Share Company referred to the very successful operation of electric vehicles in Winnipeg, Canada, under very severe winter conditions.

W. P. Kennedy dwelt further upon the necessity of trucks being prepared to meet heavy weather.

Inspector Meyers of the Traffic Division of the Police Department was present upon invitation of the secretary, and gave a few interesting remarks upon the subject of traffic under winter conditions and traffic in general, promising his co-operation and expressing his appreciation of the assistance which the Electric Vehicle Association is endeavoring to extend.

W. A. Donkin, manager of the commercial department, Duquesne Light Company of Pittsburgh, stated that there was a 14-inch fall of snow in Pittsburgh, and their electric trucks went through the period without delay, while some of their gasoline trucks gave trouble; also that one of the large Pittsburgh department stores operating a number of electric trucks had similar experience. Mr. Donkin drew attention to the fact that the topographical features of Pittsburgh were very hard on both kinds of cars, Pittsburgh being more or less renowned for its long and steep hills.

**January 19, 1919.**

**Electric Vehicles**

operation on December 15 in the Colorado Electric Club, Chairman E. M. Jackson, presiding. At this meeting, John Salberg of the Westinghouse Electric & Manufacturing Company presented a paper on “Electric Garage and Equipment.”

Mr. Salberg's paper treated with the development of electric garage equipment from its inception up to the present time, going into detail as regards the apparatus required, its arrangement and operation.

G. Drake Smith, agency supervisor of the General Vehicle Company, Long Island City, New York, who recently spent considerable time on the western coast was then called upon. Mr. Smith said in part:

It is with great pleasure I recall meeting your Mr. Jackson at the Chicago convention of the Electric Vehicle Association of America. It's a great industry, gentlemen, and you haven't any reason at all to feel the least bit discouraged at the situation, especially of the electric commercial vehicle and all that goes to making one. While recently in Los Angeles I received word from our company that our company had sold, in the cities of New York and Philadelphia, 62 of our 1000-pound worm drive wagons; 15 more trucks for the Commercial Electric Cart Company; 12 more trucks, weighing nearly 150 of are, and 15 more larger trucks to the Loose-Wiles Biscuit Company, making 92 trucks sold from our New York office with the assistance of our Philadelphia office. When I received word not long ago that our London agent had ordered six more trucks to fill orders in London, notwithstanding the war in progress. In Hartford they are averaging four trucks a month. We put into service in a department store four more electric vehicles, and Mr. Amos, who has charge, showed me the figures of his comparative cost with four cars he had had in service, showing they were delivering in Los Angeles through that department store with their four electric packages at a cost of 4 cents as against 11 cents with the gas cars they had, and that cost of 4 cents takes the goods from the department and pays all the expenses of the shipping department. When he has these four additional electrics, making a total of eight, he is going to sell his car without cost. Halley Brothers of Cleveland, who have a fleet of Bakers, average 3 cents a package for delivery and Cleveland is not an easy city in which to deliver goods from the department store standpoint. Now, of course, there are very few cities in the United States where you find an organization such as the Denver Gas & Electric Light Company, because, as near as I can find out after being here two days, troubles, whatever they may be, are welcomed at the office of the company and are looked after. Every electric vehicle man in the city and those connected with the kindred industries should feel as if they were having the best kind of support and backing.

The Denver Section also had a meeting on January 19 in the Colorado Electric Club, E. M. Jackson, chairman, presiding, at which time, B. C. Wheatlake of the General Electric Company presented “The Theory and Operation of Mercury Arc Rectifiers,” with lantern slides.

**St. Louis Section:** A meeting was held by the St. Louis section on January 12, in Cicardi’s Cafe, M. B. Strauss, chairman, presiding.

This was the regular January meeting of the local section and at which time, a report of the garage committee, consisting of F. E. Stevens, chairman, H. B. Broster, and D. B. Blossom, was made covering data that they had gathered during the past thirty days. The information as divulged was fully discussed; the meeting being very enthusiastic and motion being made that all of the information contained in Chairman Stevens' report be transferred by letter to each member of the association and that at the next meeting, there would be a great effort made to standardize garage prices in the city of St. Louis and vicinity.

**Co-operation:** The general office of the association is co-operating with the B. F. Goodrich Company in the preparation of a booklet on touring information of charging facilities available in cities and towns east of the Hudson River.

**Electric in Motion Pictures:** Electric vehicles are
rarely, if ever, seen in motion picture production, resulting in the spectator thinking in gasoline terms, when motorized transportation is considered. Several months ago, the general office succeeded in having electric vehicles, both commercial and passenger, used in films developed on the Coast.

These films have had wide and successful display. We recently succeeded in having electric vehicles used in a motion picture serial entitled “Runaway June.” The Reliance Motion Picture Film Company, producers of this film, through this office, made arrangements with the New York office of the Baker Motor Vehicle Company for the use of a Baker electric.

A Study in Electric Vehicle Garaging
The Importance and Value of Choosing a Proper Location and Site (Continued from January)

BY F. E. McCALL

Proper location and site having been decided upon the next important step in establishing the exclusively electric garage is choosing a plan of general construction, and proper materials to be used in the erection of the building.

The average garage building is a remodeled structure, usually a spacious building promising considerable floor space. As a remodeled rather than a “built to fit” building there are always many arrangements which are detrimental to the garage man. Then again the value of particular location that is, in a prospective field, has caused many to take what they could find appropriate enough to use as a garage. In order to conduct a garage on a profitable basis, it is absolutely necessary to secure the use of every possible square foot of floor space. Furthermore it is essential that this floor space be so arranged as to be free from posts and available at all times allowing easy entrance and exit both from the street to the garage and from storage stalls to wash racks, repair and battery rooms. There are many garages in which certain of the vehicles especially those standing in positions furthest from the entrances cannot be moved to the street unless many vehicles are moved allowing an opening.

This not only necessitates extra labor but means lost time and congestion.

Often in the remodeled garage it is impossible to overcome such difficulties. In the built to plan station however, there should be little trouble in ascertaining the exact capacity and positions allowing unencumbered internal traffic of vehicles at any time.

The properly constructed garage should be built according to those plans which embody the following meritorious characteristics: (1) maximum floor space; (2) large entrance and exit doors; (3) materials for general construction; (4) maximum natural lighting possibilities; (5) convenient arrangement of storage stalls in reference to principal traffic aisles; (6) easily accessible washing rack; (7) separate battery, forge, engine and repair rooms; (8) office location; (9) employees' wash room.

Maximum storage floor space is secured purely through an efficient arrangement and placing of space devoted to necessary necessities. It should be the architect's principal aim to lay out his plans in such manner as to leave as much room as possible in the main hall.

The properly planned garage should be easily accessible from the street. It has often been said that the more doors the less congestion inside. However, the doors should be so arranged as to correspond with the location of the stall of the particular car. For instance, a garage running parallel with the street and having three openings, one at each end and one in the middle, should clearly indicate that certain vehicles enter door No. 1, 2 or 3, depending upon the location of the car's particular position. The openings themselves should be wide, allowing easy entrance or exit without presenting the least opportunity for damaging wheel hubs, etc.

Modern stations have become thoroughly aware of the fact that in order to present satisfactory garage service, employees, especially hikers, must present a neat and clean appearance. Several eastern garages of late design have constructed special shower and bath rooms, where employees could keep in presentable condition at all times.

Building material is a rather broad subject and depends upon many conditions. Naturally, a station housing fifty to a hundred vehicles represents the care of from one hundred and fifty to three hundred and fifty thousand dollars. This alone should demand a structure fireproof and weatherproof. The interior materials in the latest built garages are practically all of cement composition. Cement faced walls, cement floors and steel framed windows assist in making the station absolutely fireproof. In many garages built close up to buildings offering big fire liability, special fire walls are built in order to secure the station from such risk. Although the electric garage furnishes little consideration from fire from interior sources, the vast investment of vehicles in the care of the garage man makes it absolutely necessary to take special precautions in this matter.

Many garages are forced to pay large bills for electric lighting. Although artificial lighting is absolutely necessary, a well planned garage is so constructed as to take advantage of natural lighting secured through skylights, top windows, and in many cases, glass fronts.

The main interior hall, the space which really represents the garage man's revenue, is as a rule divided into a certain number of stalls. In many garages cars are placed at random on the floor and considerable congestion brings about slow and unsatisfactory service. Modern electric garages have the principal floor space divided into sections separated by cement bumpers in which are embodied charging plugs; thus allowing vehicles to be backed up to both the wall and bumper plugs. This arrangement allows an aisle between each row of vehicles and furnishes incoming or outgoing cars a clear passage.

Every electric garage must reserve a certain space for washing. As the hikers bring in the cars, they are usually left standing near the wash rack. In most instances they cause congestion and if a car due out at 6 o'clock in the morning is brought in after a car due out
at 10 o'clock the next morning, the cars nearest the wash rack must be moved in order to get the 6 o'clock car under the rack. This is superfluous labor, a loss of time, and should be avoided in a properly regulated station. The wash rack should be at the extreme end of the station, where considerable space could be allowed for standing vehicles in systematical position.

Battery, washing, repairing and stock rooms are accessory items in the electric garage. As such they should likewise be individual rooms separated from the principal garage floor.

The garage office is an important factor in that it should be easily accessible from the street by an individual door and should also be so located forward as to allow a clear view of the entire garage, vehicles entering and going out, and in fact so located as to be in touch with the general operation of the entire plant. Many stations have erected their business office on a balcony in the front end of the building, which seems most feasible in that it does not demand floor space and simultaneously furnishes a splendid view. In connection with the balcony business office, a display room of accessories could be so constructed as to be in view from the garage floor.

**Delivery of Freight at Boston Terminals**

*Report of Investigation Made by the Massachusetts Institute of Technology (Continued from January)*

**THE** time elapsing between the arrival of a freight train in the yard and the time of delivery of the L. C. L. freight to the teamster is an important item in the rendering of quick service by the railroad. This is particularly true of the railroads which enter Boston, for an unusually large portion of their freight is hauled less than 250 miles. A study of the times for the several operations made in the yard, office and freight house in handling inbound miscellaneous goods was made at two of the Boston terminals, viz., the New Haven Terminal and the Portland Division Terminal of the Boston & Maine. Observations at each of the two terminals covered all of the L. C. L. or house cars handled in a single typical day.

**Office Procedure with Respect to Delivery Checks:**

The general procedure at the New Haven Terminal at the time the observations were taken was as follows, beginning with the arrival of the waybills. The waybills arrive at the office of the Boston freight agent either on the train bringing the freight or on other trains arriving earlier. In the latter case the waybills are held until the office receives notice of the arrival of the freight train in the yard, i.e., until the train is "booked" at the office. From the waybills corresponding to the cars in a particular train, clerks make out the notices of arrival, the delivery checks, and the freight bills. The notices of arrival of the freight are sent to the consignees by mail or messenger, except those whose teamsters call at the freight yard so frequently that it is unnecessary to send notice to them of the arrival of the goods. The delivery checks are sent from the freight agent's office to the cashier's office in the freight yard by chutes or messenger. In the meantime the L. C. L. cars have been placed at the houses in the yard, unloaded by unloading gangs, and the door location of each car reported to the cashier's office. The door locations are then noted on the delivery checks by a clerk in the cashier's office, and the completed check is placed in a pigeon hole at the cashier's window, i.e., the check is "racked."

A driver must go to the cashier's office and there pay the freight charges in order to obtain the delivery check. If he is a credit customer, he may obtain the delivery check without paying the freight charges at that time. In order to obtain the consignment, the driver must present this delivery check to the clerk in the freight house. This procedure is departed from in the case of perishable freight, and in certain other instances, a memorandum

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*By H. Pender, H. P. Thomson and C. P. Eldred.*
Time of Train Arrival and Racking of Checks:—
In studying the figures given in Tables III and IV, the following facts should be borne in mind:

(1) Practically all of the freight coming into Boston over the New Haven from points outside of New England, other than New York City, comes through the Harlem River and Maybrook gateways. It will be noted from Table IV that the overall times for such “foreign” consignments was much greater than for consignments from New York City and New England points. The difference in the overall times for these two classes of trains arises from the fact that a special effort is made to get out the delivery checks and unload the “local” cars as quickly as possible, which frequently necessitates the sacrificing of promptness for similar operations on “foreign” cars. A like condition does not arise at the Portland Division Terminal because all the L. C. L. freight received there is from New England points.

(2) Seven of the seventeen Portland Division trains arrived between 3 P. M. and 1 A. M., whereas the first New Haven train did not arrive till 1 A. M. The last B. & M. train arrived before 7 A. M., whereas five of the New Haven trains arrived after that hour, one of these being the heavy Fall River Line train from New York City.

(3) An effort is made at the Portland Division Terminal to rack the delivery checks for the master-teamsters as early as possible, irrespective of whether the location for the car in question has been received or not, or whether the car is unloaded or not. This is also done, but to a smaller extent, at the New Haven Terminal. The master-teamsters desire to receive their delivery checks early in order to plan their day’s work, and they ask that this method be followed for their benefit. This accounts for the “negative” time in the item for “Unloading Completed to Delivery Checks Racked” in Table IV, the negative time meaning that the delivery check was racked before the unloading was completed. In making up the average time for the item of “Unloading Completed to Delivery Checks Racked,” the time intervals between the racking of delivery checks and the completion of unloading, when this was the order of events, were taken as negative. The average time thus obtained was 1.8 hour for the New Haven “local” freight as compared to 0.8 hour for the Boston & Maine.

Confining our attention to the “local” freight, the total average time for freight from New York City and New England points arriving by the New Haven and the Portland Division of the B. & M. is approximately eight hours between the arrival of a train and the racking of delivery checks or the completion of the unloading (depending upon which of these two operations occurred latest). From three to four hours elapsed between the arrival of the train and the setting of the car for unloading. About two and one-half hours elapsed between the setting of the car and the beginning of the unloading. The unloading required from one-half to three-quarters of an hour, and an additional time of from one to two hours elapsed before the delivery checks were racked, or, in other words, were available to the teamster. Of these operations, the shortest was the time required for unloading the car and the longest was the time between the arrival of the train and the setting of the car. The variation from the average figures just quoted was surprisingly large, the maximum time intervals in some cases being ten or more times the average. It is these maximum time intervals which cause the greatest amount of dissatisfaction among the teamsters and shippers, who are prone to remember one excessive delay and fail to take into consideration the time required on the average. The fact that the maximum time intervals are so much greater than the average shows that these maximum time intervals are of comparatively rare occurrence.

The time and money available for this study were not sufficient to enable us to investigate in detail the causes for the excessive delays nor to determine whether by changes in the methods employed in the offices and yards the average times might be reduced. One point, however, which became apparent in our investigation was that the more general adoption of the practice of making out the delivery checks from the waybills as soon as they arrive, instead of waiting for the train to reach the yard, would result in a considerable saving in time to the teamsters and would also render unnecessary the issuance of so
large a number of memorandum checks. This system is carried out at the Portland Division Terminal, but at the time of our investigation was not in use at the New Haven Terminal. At the New Haven Terminal the freight was available on the floor of the freight house approximately two hours on the average before the delivery checks were racked, whereas in the Portland Division Terminal less than an hour on the average elapsed between the conclusion of unloading and the racking of the delivery checks.

Racking of Delivery Checks and Removal of Freight:
—Consignees are allowed seventy-two hours from 7 a.m. on the day after that on which the notices of arrival of the freight are sent out before storage charges begin. The observations recorded in Table IV on the Portland Division Terminal were extended to cover the time between the racking of the delivery checks and the delivery of the freight to the teamsters. On the average this total interval was approximately eighteen hours, this average being taken solely for the consignments delivered during the free storage period. Of the 1,027 consignments observed, however, 54 or 5.3 per cent incurred storage charges; that is, were not called for until after the third day. The total of these 1,027 consignments amounted to 476 tons, of which 22.5 tons or 4.7 per cent incurred storage charges.

At this connection data were also obtained on the time intervals between the obtaining of the delivery checks by the drivers and the removal by them of their freight from the freight house. The results are summarized in Table V. Of the 811 delivery checks obtained on the day that notices were sent out, 597 were called for at the cashier's office before noon, indicating that a large proportion of the freight is called for by contract teamsters who make regular visits to the cashier's office each day.

TABLE V.
TIME OF TEAMSTERS' OBTAINING DELIVERY CHECKS AND CONSIGNMENTS.

<table>
<thead>
<tr>
<th>Disposition of Checks and Consignments</th>
<th>Delivery Check Obtained</th>
<th>Consignment Obtained</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of</td>
<td>Per Cent</td>
</tr>
<tr>
<td></td>
<td>Consign-</td>
<td>of</td>
</tr>
<tr>
<td>On day that notices were sent...</td>
<td>811</td>
<td>79.0</td>
</tr>
<tr>
<td>1st day after notices were sent...</td>
<td>115</td>
<td>11.2</td>
</tr>
<tr>
<td>2nd day after notices were sent...</td>
<td>33</td>
<td>3.4</td>
</tr>
<tr>
<td>3rd day after notices were sent...</td>
<td>26</td>
<td>2.5</td>
</tr>
<tr>
<td>Incurred storage charges...</td>
<td>40</td>
<td>3.9</td>
</tr>
<tr>
<td>Total...</td>
<td>1027</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Free Storage Abuse.—A study of Table V brings out very clearly the practice on the part of some of the consigners of abusing the three days' free storage privilege granted by the railroads. The figures indicate a decided tendency on the part of the teamsters (or consigners) to remove the freight at their own convenience, though they have already obtained the delivery checks. This conclusion was also confirmed by determining the tonnage left in the freight house for twenty-two hours or more after the delivery checks for this freight had been obtained at the cashier's office. It was found that 15 per cent of the total tonnage arriving at the terminal on the day observed was left in the freight house for at least this length of time. (This 15 per cent does not include the 3 per cent of the day's business which contracted storage charges.)

For this 15 per cent of the freight the railroad is obliged to act as a free storage warehouse. One possible solution for this free storage evil would be the establishment of the "store door" delivery, whereby the railroad itself delivers the freight, as has been operated for several years in Washington and Baltimore.

Unloads at the Portland L. C. Racks.—Another item of possible inefficiency from the railroad's standpoint is shown by the average loads of the L. C. L. cars given in Table III. The average load was approximately six tons for the L. C. L. cars arriving at the New Haven Terminal, and approximately four tons at the Portland Division Terminal of the Boston & Maine. This indicates that the tonnage of miscellaneous freight carried on these trains is only about 20 per cent of the normal capacity of the cars. The question of the expense of handling this surplus equipment as compared to the time and expense of concern among the shipments in fewer cars or possibly in smaller cars than are now being operated, would be a fruitful topic for further study.

DISCUSSION AT MEETING OF NEW YORK RAILROAD CLUB.

The president—Dr. Pender, you will have an opportunity at the end of the discussion to sum up this matter. Please note whatever transpires, so that you may reply to any criticisms or questions which may be raised.

A number of gentlemen have volunteered to discuss this subject of the paper, and among the first I will call upon is E. D. Rushmore, Engineer, Power and Mining Department, General Electric Company, who spoke as follows:

The subject of freight handling is one of great present importance. When in Hamburg a few years ago I first became interested in this subject through the installation at the docks in that city, and since then have been following the problem with much interest and have had an engineer associated with who has devoted his entire time to the study of the handling of package freight in our railway and steamship terminals. The result has been to partially define the problem and to bring about the development of a few pieces of apparatus which fit into part of this field.

In electrical work a very large amount of attention has been paid to the production of the power, and savings of a fraction of a per cent in economy of power generation are considered noteworthy achievements. Comparatively little scientific study has been given to the problem of distribution of this energy, where approximately three times the investment cost and three times the operating expense, in comparison with the production end, are located.

The subject of the transmission of power has also been well worked out and with our present methods does not seem capable of very great improvement in efficiency. When, however, we get to the distribution end we find an almost virgin field for study. In the production of the materials which make up package freight the possible saving by scientific methods may be many times greater than in the transmitting facilities are in general on a very efficient basis. Our trunk line railroads and steamship lines transport the freight at a low cost and in a very efficient manner. It is, however, when we get to the terminals and to the distributing systems lying beyond them that we find the same condition which holds true in the electrical field.

In general, we find that the cost of distribution is a very appreciable percentage of the cost of production and frequently many times larger, so that it is in the terminals and in the distributing systems, from there to the consumer, that the great opportunity lies for reducing the cost of freight handling.

At the present time, the railroads are seeking for an increase in their incomes from the freight service, and the suggestion has been made that instead of increasing the freight rates a terminal charge be added to the present transportation charge, and this would seem like a logical act. The charge for collection and distribution, as well as the terminal charge, is entirely independent of the distance through which the freight is transported, and while at present not all of these charges are borne by the railroad it may be that, at some time in the future they will be, and they are certainly all of them paid for by the ultimate consumer.

After spending many years in the study of this subject and being associated with the development of a number of devices to be utilized in this field, it has become very evident that there exists a necessity for a co-operation in a form not yet organized for the proper working out of these problems.
They involve, first of all, the methods of handling freight. Then the design of the terminals; the design of ships and of freight cars, and the application of a very large number of special directions, training, terminals, etc., as well as the methods and conveyances used for the distribution from the terminal.

The large number of separate organizations involved in handling freight, the demand for efficient service on the part of the shipper, and the fact that our railway systems works against efficiency, and it does not seem improbable that at some future time this number may be decreased. There also seems to be no logical reason why railroads should not deliver the freight of the individual shippers and organizations of the individual users and organizations who now do it in this country.

There are probably at least a hundred different manufacturing concerns who have products which are available in this field, and as for the methods and conveyances which are interested, all of the port cities are or should be interested, and a large number of other individuals and organizations.

At the present time a number of individuals are making investigations in this line, and a number of manufacturers are advocating the special devices which they manufacture. There is no one solution to this problem, and there is no one device which is going to solve it. For instance, one of the most useful things that can be done would be as far as possible to standardize the size of box or package handled, and no doubt a great deal could be done in this direction.

Manufacturing engineers have endeavored to specialize on this work, but it does not seem as if the conditions would support them at present. Electrical manufacturers are very much handicapped in operating in this field, due to the fact that the devices which will be used in part for this work will be very largely mechanical and will be simply operated by electric motors and controllers, so that in general they will not sell directly to the users, but through the various other manufacturers of these conveying machines.

The time would seem opportune for some organized cooperative effort in this field, and suggestions as to what this should be and how it might be brought about would be of very great value at the present time.

The paper by Dr. Pender and his associates is of very great interest as showing the application of a trained mind to a special problem and putting the results of this investigation into the facts connected with this work in order that the desired improvement and reduction in costs may be brought about.

The President then announced the next speaker, S. G. Thompson, consulting engineer, who spoke as follows:

I have read Dr. Pender's paper with a great deal of interest and being interested in the problems referred to and of the investigations by the Massachusetts Institute of Technology, since they actually refute the criticisms appearing in the paper under the caption "Object of Study." While in their report they point out the disadvantages which may be expected from various solutions of the same problem, or that these criticisms were justified, we find, under the caption "Total Reduction in Time of Yard Visit," that these suggestions were based on the efficiency of the yard alone and put into effect, the total time saving in the day's work would be but 7 per cent. Seven per cent of a nine-hour day is approximately 38 minutes, which is not sufficient to admit of additional trips and could probably be put to no other useful purpose. Therefore, the conclusion to be reached is that the freight terminals may be assumed to run at 100 per cent efficiency.

If I may be permitted to criticize the paper, I might except the term "loafer" referring to the time spent as the checker's office by drivers. I think if the investigators had experienced the physical discomforts of driving to and from the freight stations on a cold day, they would realize that the stopping of the driver for a few moments in the checker's office to get warm could not be classified as "loafer," but possibly as "resting."

In "Underloading of L. C. L. Cars" it is pointed out that the cars arrive at the terminals with only about 20 per cent load. I think if the investigators had pursued the subject to the original loading point of some of these cars that they would find the cars are what are known as "way cars," stopping on the way and unloading and loading at the same place. I believe the conclusion at the terminal they have but a small percentage of the original load or of their total load capacity. It is doubtful if any increase of the total load carried could be made.

The next speaker was William McClellan, New York City.

I am particularly glad to be here tonight, because I am very much interested in this presentation of the great subject of freight handling.

The paper indicates, this being a railroad club, and there being some suggestions in the paper that the railroads have not been at fault in the matter, the question arises as just how we did affect the railroads. We could get back very small if the railroads made any changes. Perhaps there could not be any very great difference made in the operating expenses so far as the railroad companies are concerned. I am not pointing this out to discuss this point, but I am pointing this out for a few general points that have presented themselves to my mind.

You well know that the principle of co-operation is helpful to a tremendous degree. The idea of co-operation is coming in more and more, and very soon if railroad interests were to permit conditions to exist, which, while they did not immediately affect them, would cause the public or shippers inconvenience, cause them expense and trouble, we should be inclined to say that they were robbing the other fellow to our mind.

Every effort is being made all along the line to bring the idea of co-operation to fruition. But there is something beyond all that. The first thought occurring to me is that there is a project to start work on now that could be solved, and letting it solve itself somehow is an exploded idea. In order to arrive at a solution of the problem in the paper we must have recognition of the analytical and practical standpoint.

It means something. There is in this country, the old plan of handling package freight. The methods used in this country are about as crude as they could possibly be. There is very little difference between the handling of package freight fifty years ago. And it is not the fault of the railroads or nor the shippers. They cannot be put upon any particular group of persons. We simply must group these things together and try to solve the problem, and if such a paper as we have before us be recognized as giving the proper method of bringing about a solution, namely, the analytical method, then we have made a good beginning.

And I am happy to say that the technical school has joined with the railroads in trying to solve this problem. In dealing with a problem of this kind a new type of man is absolutely essential. Those who have run a freight yard for many years are not satisfied with the present situation. They are impatient, and they know that such a paper as we have before us be recognized as giving the proper method of bringing about a solution, namely, the analytical method, then we have made a good beginning.

The next feature is that it is intensely practical. We have had, first of all, much talk about the railroads saving a million dollars a day. No doubt all sorts of stunts can be done with the railroad systems of the country, and yet the intelligent man in the country knows that all sorts of things can be accomplished. There is not a railroad man in this room who does not know about certain leaks and losses upon which he could put his finger in his own department and which he sincerely wishes could be stopped. But at the same time it is very hard to decide just where to begin. Nevertheless, we have had that kind of criticism. Little of this criticism has been constructive and suggestive. We all know that this is not the correct procedure, and we know that after all it is the problem that is before every railroad operating man in the country. It is his principal object in life to bring about a solution. Again I must call your attention to the necessity of bringing other minds of a different type to help solve the problem.

The important point that I want to bring out is when a group of trained people who understand the problem, who make their investigations thoroughly, their reports are very different from those we have had heretofore. They are free from all criticism not founded on data, without investigation, and given out haphazard, such reports are made in a helpful spirit and in the hope of progress and improvement. When we get somebody who knows the railroad game thoroughly to take up these recommendations and make the application, and find out how so-and-so can make the various improvements, we have a chance of a solution of the problem, then we may obtain results.

Now, let us go back for a moment to consider this report. People want 7 per cent off on freight, and they want to mean any more trips per day to the truckmen; but the fundamental statement can be made that, if by making all these improvements you can get that car and a lot of other cars out
of the way—if the railroads can get rid of that freight sooner, even 7 per cent sooner than it has heretofore, there is a direct saving to the railroads; and it may be that they can handle many other cars per day and thus decrease the investments in equipment and buildings. And all these internal systems of carriage with electrical contrivances about which we as yet know so little. The suggestions in this paper, the number of practical ideas given for improving the whole system of freight handling, are substantial and will lead to other lines of investigation which may change from 7 per cent to 20 per cent. There is no limit, in my mind, as to what may come with the ultimate result of such a system as this. We may come to totally different methods of handling freight, and the railroad-owned teams, and the railroad men are that they ought to be studied and acted upon. It is not merely criticism. It is a very fine piece of engineering, extremely creditable to all who took part in it, and the total expense, as you will see from the paper, was comparatively small.

Following this, Dr. Pender entered into the discussion:

If I may say a word here to correct an apparent misunderstanding on the part of some of the previous speakers, it has been stated: "The study has shown that reasonable changes would be made in the present system of receiving and delivering miscellaneous freight would effect a saving for the operators of the teams of a maximum of 7 per cent of the working day." The changes referred to are such as may be made with the present facilities without excessive cost. We have not considered any such schemes as using uniform packages or mechanical devices or any scheme which is out of the range of the immediate freight house facilities considered. Were the cost no object a much greater saving in time might be effected, but it is an open question as to how much additional expense the railroads should be called upon to incur without receiving additional compensation.

General discussion followed, led by Prof. D. C. Jackson, as follows:

The variety in the forms of packages as well as of the contents thereof which one finds in the L. C. L. freight house is almost limitless, and this great variety of material has to be taken and sorted and handled in such a way that it may be gotten through from the consignor to the consignee. If the particular freight house considered is an inbound bound house, the packages must be sorted in such a way that the draymen of the teamsters and the railroad men who handle them. If it is an outbound bound house, the packages must be sorted with some system respecting their ultimate destination. Mr. Rushmore has referred to Hamburg as a place at which he has worked and has found that Hamburg, particularly well equipped to meet such conditions as are met in the average L. C. L. freight house of larger American cities, and it is not the view of the system suggested that the other system cannot improve our situation. If anybody will stand on the platforms of the important railway lines in the good-sized cities in England or Germany where freight is handled, they may there obtain some suggestions of improvement. They cannot fail in being impressed by the way in which the package freight is there handled. However, an American observer is likely to be impressed that this is not because of better management as much as by the fact that the package freight to be handled is classified better. This may be partially due to the fact that the foreign railroads (especially those of England) carry much of their package freight by collection from inland points and have them handled by an organization which has been worked out as in the more densely populated portions of the country. I think, however, that Americans will be clever enough to substitute some other process which will do away with a good deal of labor and much of the mismanagement which is connected with the receiving of freight at outward bound L. C. L. freight houses from the steamers of consignors and its delivery at inward bound houses to the teamsters of consignees.

As to the 7 per cent saving of time which is referred to in the paper of the evening, it is not necessary to discuss very long as to whether that saving is of much importance in itself. It is an indication that small changes which may be put into effect will help to alleviate the freight problem. Some railroad men have estimated that a 7 per cent freight house ordinarily carried between certain railroads and the steamers, and alleviating friction is a great aid to improving service. It means saving money as well as saving time. Consequently, improvements which are made in one direction will do a great deal more good than making a mere saving of 7 per cent of time.

There is another thing with respect to the foreign methods that must be considered. The English, French, German and the Dutch railroads, as well as substantially all the other railroads of Europe are dealing with countries of relatively very dense population. The consequence is that they are doing a gathering and distributing service on a much larger scale than we can ever do in the service of our western trunk lines. The foreign lines are therefore particularly prepared to carry on a freight service of the package nature and their cars are specially adapted for that purpose. Thus, for instance, the ordinary freight car of an English railroad is a truck carrying from three to five tons, or seldom over ten tons. In the case of such light tracks of the European roads, the tops are readily taken off the covered cars so that the contents can be easily reached by means of a crane. Also, in such cases if a consignor calls for covered cars and the railroads are short of that sort of rolling stock at the time, they furnish open cars and when the goods are loaded they tarpaulin the goods to the railhead, and they may also rent storage spaces, but they also charge a rental for the use of these tarpaulins. That is, if the railroad chances not to have a convenient box car or flatcar, they have perhaps one which cannot be properly exposed to the weather, the railroad also furnishes a tarpaulin and makes an extra rental therefor. Of course, where the railroads include the collection of the freight from the consignor and its delivery to the consignee, an extra charge is made for this service over and above the railroad service from station to station.

We have relatively little territory in this country which corresponds very closely to the European conditions and our railroads have been must less used to the processes of handling package freight. I presume that this service of our railroads cannot be matched anywhere else in the world either in reliability, rapidity or economy. In fact, the American railroad service generally, if it is compared with the railroads of our European brethren, is not only cutting almost as many people per square mile of land as Wales, None of the other states approach this situation in respect to density of population, and this suggests that some of the railroad facilities which are particularly well adapted to the package service of the other countries might be introduced to advantage in New England to modify the traditional American railroad practice which is so well adapted to transporting freight by rail in bulk.

The mere statement of the relationship of loads to the capacities of the cars used in the L. C. L. service entering Boston, referred to by Messrs. Pender and Thomson, is sufficient to emphasize this point.

Now, in respect to the introduction of electric cranes and other such devices referred to by Mr. Rushmore, I do not think that they will prove a complete panacea for the conditions of the L. C. L. freight houses unless there is associated with their introduction a distinct and considerable reduction in the processes of handling the freight within the houses so that a cleaner and more satisfactory method of classifying the packages with respect to their final destination is introduced. I think that this will come about, and when this comes about, the introduction of the electrical devices will, in my judgment, prove a wonderful aid. A study of this problem (as suggested by Mr. Rushmore) by an organization specially committed to an effort to solve it for the best interests of the railroads and their shippers ought to result advantageously to all of the industries of the country. Such a study has been made in the study at the Massachusetts Institute of Technology which might be further extended, and I have no doubt that the Institute of Technology would be willing to extend it if the railroads and the shippers who are interested in the improvement of the conditions would provide the necessary funds. I am almost sure that if the railroads and the shippers who are interested in the improvement of the conditions would provide the necessary funds for the work of the Institute of Technology, the suggestion of the investigation appropriately, there ought to be sufficient funds available to establish a somewhat extensive bureau that could carry on work for several years.
Goodyear Instructions for Tire Care

The Goodyear Tire & Rubber Company has been advocating for a long time what they call "The Science of Tire Care."

Each truck driver is required to inflate his tubes every morning to a prescribed pressure (90 pounds) before starting out. Then on his return in the evening he applies a gauge to determine the pressure. If this has fallen to or below 70 pounds note is made of the fact. The next morning the tires are again inflated to the maximum pressure and the car sent out for another day's work.

If a similar loss is noted at the end of the second day, the tire is removed and the inner tube examined and repaired if the damage is slight. If the inner tube shows signs of weakness or liability to blow out, it is discarded and a new one put in.

Rim cuts and blow-outs are unknown. And punctures occur much less frequently than where similar precautions are not taken.

Another advantage gained by this means is an increase of 60 per cent in the average mileage received.

Central-Station and Electric Vehicle Interests Meet

Managers and chairmen of committees for the convention of central-station men and electric-vehicle interests, to be held in Boston March 9 and 10, met on January 29 at the Engineers' Club, Boston.

President L. H. Gibbs of the New England section, National Electric Light Association, and of the Boston Motor Car Club, was chairman, and outlined plans for the convention. Present arrangements contemplate two sessions on March 9, at which questions will be discussed after a five-minute opening presentation of the subject by a designated delegate.

March 10 will be devoted to electric-vehicle problems, at morning and afternoon sessions. A visit to the Boston auto show in the evening is proposed.

The following are the managers and the chairmen of the convention committees:

Managers, for first day: Wells E. Holmes, Cambridge, Mass.; second day, E. S. Mansfield, Boston.

Chairmen question box committee, first day, Eugene Carpenter, Martha's Vineyard; second day, Day Baker, Boston.

Chairmen information committee, first day, La Rue Vredenburgh, Boston; second day, David W. Beaman, New Bedford, Mass.

Exhibits at Denver Salon

During the Denver electric vehicle salon held under the auspices of the Denver Gas and Electric Light Company, practically all of the electric vehicle dealers had their 1915 models on exhibition.

The accompanying illustration shows the 1915 Fritchle colonial coupe and a Walker electric truck.

The Fritchle is a Denver made car and has proven to the Denver automobile enthusiasts that this type is capable of negotiating hills and outlying country districts economically and efficiently. Practically every electric vehicle manufacturer is represented in Denver and the city is fast becoming an electric vehicle center.

Cleaning Wire Wheels

According to H. L. Dunbar, Chicago representative of Rudge-Whitworth wire wheels, in cleaning wire wheels a great deal of trouble can be avoided if the proper method is employed consistent with the construction of the wheel. By reaching in behind the wheel and cleaning the rim from the inner side it will be found that little trouble is experienced because the spokes at the rim are five or six inches apart on the side of the wheel next to the car.

The hub can easily be cleaned by reaching through the spokes from the front. The spokes themselves are cleaned by the use of a cleaning brush especially prepared for wire wheels. This brush has a tassel on one end which is used to clean the spokes where they come together forming small openings. This is done by a "jabbing motion." The long expanses of the spokes can be cleaned by use of the other end of the same brush which is made long and round, fitting into any holes that need cleaning.

With a little experience wire wheels can be cleaned every bit as easily as wood wheels, and owing to the fact that wire wheels are becoming so popular it would be to the advantage of every garage owner to look into this matter.
The Electric Automobile Motor

The Early Electric Vehicle and Its Effect on Motor Design

BY H. S. BALDWIN

In order to clearly understand the electric automobile motor, it will be necessary to trace the steps that have led up to its present state of development in this country. For this reason I will divide my paper into two parts, the first dealing with the early development of the electric automobile, with particular reference to its effect on motor design; the second, with the motor itself as now known.

The first part is not a difficult task, as history goes, and does not carry us back much more than thirty years at the most, unless we include the ingenious models of Davenport made in 1835 and of Page, of Salem, Mass., or the more fully developed machine made by Prof. Page, of Washington, D. C., in 1851. Undoubtedly there are those present who can readily recall the several incidents that I shall point out.

The invention of a practical storage battery in 1881 by Brush in this country and Faure in France at once presented a means for storing electrical energy, awakening interest and stimulating engineers and inventors to renewed effort. The first batteries were modified and improved during the next six or seven years, and showed adaptability to the propulsion of road vehicles or "carriages," as they were then called, and in some ways superior to steam, which had been used up to that time. A demand was at once created for a suitable electric motor, and from that day we have been constantly endeavoring to improve and adapt motor design to make it best suited for both the battery and the automobile. I will not attempt to enumerate or catalogue all of the many interesting experimental motor cars that appeared during the ten or fifteen years subsequent to 1881, simply referring to a few of the more successful designs whose builders by their persistent effort blazed the way for the automobile engine of to-day. Various electric motor tricycles and quadricycles appeared at an early date, one being built in 1888 by the firm of Fred M. Kimball & Co., of Boston, for P. W. Pratt, another by A. L. Riker, in 1890.

An early electric automobile was built in Boston in 1891, and another was put on the road by the Holzer-Cabot Company of the same city in the spring of 1895. It may be fairly said, however, that Philadelphia is the cradle of the electric vehicle in its more modern form, as two of her engineers, Messrs. Morris and Salome, built and ran a storage battery automobile in August, 1894. This machine, while crude in detail viewed from the present standpoint, was awarded the Grand Prize of the Times-Herald automobile race in Chicago, November 28, 1895. "For the best showing made on official test for safety, ease of control, absence of noise, vibration, heat or odor, cleanliness and general excellence of design and workmanship." Broad advantages these. Other awards were made to makers of gasoline cars for various qualities and points, but the gold medal went to the electrobat of Morris and Salome. This exploit is indeed something for which the citizens of Philadelphia may well be proud.

Singularly enough an early model of this car was described in the first number of the Horseless Age, of November, 1895. I will review some of the details which I am sure will be of interest. The first electrobat weighed 4,250 pounds, without passengers, and had a radius vary-

*Presented before the E. V. A. Convention.
work was started under the direction of H. P. Maxim, as engineer, H. H. Eames becoming the general manager a little later. This company, although now out of existence, played an important part in the early development of the art of building electric vehicles. Its partial history will serve our purpose in outlining some of the early applications of motors, and will help to show how this detail of the electric car was evolved by successive steps up to the present accepted form.

You may recall that all Columbia electrics were designated by the word Mark, followed by certain Roman numerals and sometimes a lot number. I have often been asked concerning the meaning of this notation, and it may be of interest to know that it originated with Mr. Eames, who had formerly been an officer in the Navy, where it is customary to use the expression Mark to designate a particular form of construction.

The Mark I electric statuette was designed and built in 1895-96. In this car Mr. Maxim used a single motor, having a hollow shaft through which the rear axle passed. Motion to the driving wheels was effected by a train of gears starting with a pinion mounted on the armature sleeve that in turn drove a small countershaft, thence back to the rear axle differential gearing. This type of drive, with some modification, lasted only a year or two, and had one serious objection; namely, that the motor could not be removed without disassembling the entire rear axle and transmission.

In the Mark VI “dos a dos” car, an improvement was introduced by moving the motor forward of the axle, and attaching to the latter by short arms. The countershaft now passed through the motor as before, but the differential gearing was mounted on the armature quill. This arrangement, you will see, gave a single instead of a double reduction with a small pinion on each end of the countershaft, engaging with a large, internal gear attached to the hub of each driving wheel.

In view of the present tendency to return to wire wheels for certain types of automobiles, it may not be out of place to mention that the old Mark VI electric, of which some 25 were built, had wire driving wheels made up on sleeve hubs attached to the main hub by bolts. It was intended that these should be removable, but owing to the necessity for enclosing the gearing, the original idea was not wholly carried out. The author invented the removable wire wheel early in 1898, and while an application for patent was prepared, it was never filed. As the scheme is usually considered of foreign origin, it is of interest to know that it had its source in this country, and was first designed for an electric vehicle.

The Mark IV surrey, built in 1897, had double-motor drive, the motors being supported on a frame of steel tubing mounted in the plane of the axle. Again single reduction was used. This was the only two-motor car built until several years later when the manufacture of the Mark XVI and XVII broughams and hansoms was undertaken. It will readily be seen that the motors of all early Columbia cars were in some way mounted on or directly supported by the rear axle. This fact is mentioned as it has a bearing on the design of the electric motor itself. While the earliest forms of axle mounted motors, either single or double drive, were comparatively light, it was found necessary by experience to gradually increase the amount of material in order to withstand road conditions met in service. This soon led to heavy, low speed motors, usually two, supported on the rear axle by arms cast directly on the frame, and driving by single reduction spur gears. It should be pointed out, however, that the early difficulty of obtaining the necessary high ratio of reduction has been successfully overcome by several later builders of electric trucks and cars, who are thus able to use light, high speed motors sometimes forming part of the axle and producing a direct and compact drive.

Early cars were built having the motor supported on the body, but it was not until 1908 that the first Columbia of this type was placed on the market. In 1905 the first two-motor drive, using the GE-1020 back-gearred motor, was developed for the New York Transportation Company.

The Columbia Company has been taken as typical of American practice in applying the motor to the electric vehicle, particularly as, at various times, it made use of motors of nearly every known make, namely: the C. & C. Eddy, General Electric, Siemens-Halske, Sprague, Riker and Westinghouse, but it should be kept in mind that other companies were working on the problem at the same time, and were possibly earlier and more successful in certain of their efforts.

To sum up,—the earliest motors were, as a rule, of comparatively light weight and high speed, sometimes double reduction, but usually single, of good electrical efficiency, but had rather highly saturated magnetic circuits. They were sometimes mounted on the axle of running frame, and occasionally on the body.

Then came the period of the heavy, low speed motor, two usually being mounted on the driving axle by means of arms cast on the magnet frame or on the heads. They were mostly of single reduction and had somewhat improved electrical characteristics. Hundreds of electric delivery wagons, trucks and public passenger vehicles were built in this way, and many of these are still in service. They had the advantage of avoiding the differential gearing, and, on the whole, gave as good results as could be expected.

The next step brings us to the more modern, high speed motor, usually driving through double reduction, gearing of some form, mounted as a rule on the chassis of the car, but sometimes forming part of the driving axle itself. The electrical and mechanical design of the present motor, however, are worked out with a view to protecting the battery and adapting it to the characteristics of either the lead or the iron-nickel type.

Here it should be pointed out that the Edison iron-nickel battery first appearing in 1901 added a new and valuable factor to the electric vehicle industry through the use of entirely opposite elements and materials from those previously employed. An alkaline solution instead of an acid, steel instead of rubber, and steel in place of lead. These elements insured great strength combined with lightness even with the lower potential per cell characteristics of this battery. Batteries were put into service for practical test, and in 1904 a large number of the E-type were sold. Then followed a developmental period that lasted until 1908 when the present type of cell was perfected and given to the public.

The so-called lead battery had also been going through a period of evolution, and from the early, heavy Chloride-Manchester plates that were used on most of the first Columbia cars a lighter pasted plate was evolved. To be exact, various experimental forms of pasted plate were tried out in Columbia electric vehicles in some of the earliest models. However, the most marked progress has been made at a later date, particularly in the method of adapting the grid to support the active material, separators, clearance in jars, purity of chemicals and advance in various other electrical and mechanical details.
Having briefly reviewed the history of the electric vehicle in its formative period, particularly to show its influence on motor design and application, I would point out that with the few exceptions referred to, motors are now mounted on the chassis, and I hope to have an opportunity at a later date to present a paper on the subject of motor application to electric vehicles, referring particularly to present practice.

I will devote the remainder of my time to the electric automobile motor of to-day, its design, manufacture and performance.

DESIGN AND PERFORMANCE.

The electric vehicle of to-day requires a highly specialized motor to insure the maximum efficiency in the use of current at all times and under all conditions. Furthermore, in mechanical design it must meet the requirements of the problem, which demand great strength and durability combined with accessibility and light weight. These have compelled the motor engineer to use his highest skill in the selection and use of materials. A study of early automobile motors shows that some were of good efficiency, others of very light weight, and still others had excellent mechanical detail, but time and experience have been necessary to properly combine these desirable characteristics. I do not mean to say that the vehicle motor has reached its final state of development, but it must be admitted that it is at this time a very efficient, light and strong motor unit.

The motor used 20 years ago by Morris and Salome for their experimental car had been designed for electric launch work, while Maxim, a year later, equipped the Mark I Columbia with a little Eddy motor, weighing only 50 lbs., having a magnet frame, built up of punchings, aluminum heads and ball bearings. It is interesting to note that several of the early motors, particularly the Eddy, Riker and Woods were of consequent pole design; that is, only two poles carried field coils, the other two being simply spots or pads bored out to the correct diameter. This gave an elongated frame, which was considered desirable on account of its small appearance, the motors at that being being mostly supported by arms attached to the rear axle of the car. It was soon found, however, that better mechanical and electrical results could be obtained by adopting a four-pole motor of cylindrical form, mounted in the same way. For a number of years this type was standard for cars that were built in large numbers. There were usually two motors, one for each driving wheel; the gearing being usually arranged for single reduction. Motors of this class were fairly light at the beginning, but gradually increased in weight from less than 200 lbs. to more than 300 lbs. each. Two hundred pounds of motors were too high a price for the omission of the differential gear and counter shaft, and, although hundreds of cars, so motorized, were built and successfully used, the practice was finally abandoned in favor of supporting the motor on the chassis or body. There are several exceptions to the rule, however, where engineers have employed modern high speed motors, with well designed gearing, mounted directly at the driving wheels. This has certain advantages, when carefully worked out, and is particularly adapted to vehicles having four-wheel drive, or those employing the steering wheels for driving.

The gearless wheel motor that was developed and exploited in Europe has never been adopted in this country on account of the great additional weight that it imposes on the tires of the driving wheels, about 450 to 500 lbs. With European city and suburban roads, gearless wheel motors are reported to be successfully used for public passenger vehicles. In this country a similar form of construction is adopted by a certain manufacturer, but thus far for commercial work only. Furthermore, a comparatively small, high speed motor with gearing of large ratio is substituted for the massive, slow speed machine above referred to.

We will now turn to the design of the electric vehicle motor of to-day. It is slightly heavier than some of the earliest motors and lighter than many of the later ones. It has better electrical and mechanical characteristics than ever before; it provides sparkless commutation and high efficiency at all loads, with great overload capacity and a maximum of torque per ampere.

These improvements are the result of 20 years of practical experience with the automobile motor in road service, also to more highly developed materials and advanced methods of manufacture. These include a better knowledge of the degree of saturation best suited for various requirements, uniform mechanical design for the several frame sizes, especially adapted material for magnet frame, punchings, shaft, commutator, brushes, insulation and annular ball bearings, not to enumerate the many shop methods that have been worked out to handle these to best advantage.

ELECTRICAL RATING AND CHARACTERISTICS.

At an early date 44 cells were standardized for the lead battery, owing to the fact that this number can be efficiently charged from a 110-volt direct current line and when the Edison cell appeared 60 were adopted for it for the same reason. The usual voltage ratings of automobile motors are taken at 85 and 60, but for light cars, industrial trucks and special applications voltages of 48, 36 and 24 are sometimes required. As a general rule, the higher voltages are recommended since efficient charging is facilitated.

The accompanying table shows a typical line of frame sizes, some 9 in all, which are found necessary to meet the exacting requirements of vehicle manufacturers. Each frame, with the exception of the GE-1031 and GE-1028, has two standard ratings, one based on 85, the other on 60 volts, the current in each case being such that the total watt input and speed are approximately the same. For normal operating conditions the motor weight for each type of battery is also identical. It is evident that within certain limits the current and speed ratings can be varied to suit special conditions, although a radical change might require different windings. It is always desirable if possible to select motors of standard frame and rating as this will save both time and money since no special development is necessary.

The capacity of these motors is based on continuous operation at full load with a maximum temperature rise of 65° and 24° C. for the motor and 26° C. and 75° C., taken at the hottest part of the motor, above the temperature of the surrounding air.

As a result of long experience, automobile motors are usually designed of low saturation particularly for commercial vehicles where the service is severe with many starts and stops, also frequent grades. This permits a steep torque characteristic giving high torque or pull per ampere, thus conserving the battery when heavy currents are required. As a general statement five times the normal load torque is required for accelerating and for a grade of 7 per cent, and if this can be obtained by a steep torque curve, the current draw on the battery will be about 2½ times normal load current. This is a highly desirable feature from the battery standpoint. On
the other hand, more highly saturated motors are being specified for passenger cars owing to the demand for higher speed on hills, the service being less severe the results secured in this way are satisfactory. All the motors discussed so far are of the series wound type which has been almost universally adopted for electric vehicle work.

The field coils are usually combined in pairs for series parallel connection. The accompanying curve has been made from recent road tests and shows in an interesting way the effect of operating an electric truck on various grades with the field coils in series parallel as compared with series connection. It will readily be seen that the series parallel point is the more desirable for grades above 1 per cent, the reason being that the field resistance is reduced with lower FR losses giving a higher total motor efficiency. This results in a higher speed on grade, and reduces the length of time the battery is discharging at the high rate.

The shunt motor has always had certain attractions as it can be used on descending grades as an electric brake, and at the same time charge the battery somewhat on the so-called regenerative principle. It has also the characteristic of maintaining practically the same speed on the level up grades and down grades. The recent tests of a passenger vehicle its action was favorably commented on. Experiments are now being carried on to ascertain if this form of winding offers permanent and practical advantages.

MECHANICAL DESIGN.

I will now show a number of views to illustrate in a general way the development of the automobile motor with special reference to the frame. First, appeared the rectangular type, the magnet frame being made of laminations forging or steel casting. It was of consequent pole design having two wound and two unwound poles. The heads were usually bolted in place, and contained, as a rule, ball bearings of the adjustable type used prior to the invention of the annular ball bearing.

This was followed by the cylindrical motor, the magnet frame in some cases being flattened to make it octagonal. The frame at first made of one-piece steel casting with supporting arms integral, the heads being two flat castings or discs designed to carry the bearings which were now usually of the plain type, either ring oiled or waste packed. It will be seen that this was the prototype of the modern motor in so far as the magnet frame is concerned, the only differences being the omission of the arms and an increase in size of the opening on the pinion end to allow the steel casting to be made more readily. The location of the brush rigging and shape of the hand-hole cover were the same as at present.

The earlier examples of this type had four cast steel poles, but these a little later were laminated to reduce losses in the pole faces. The arms interfering, it was impossible to machine the outside of the magnet frame, which was consequently somewhat heavy, rough and irregular.

There were two modifications of this general type of construction, one of which had a cast steel magnet frame in the form of a ring of just sufficient length to give the necessary magnetic section, the arms being integral and heads of cast or malleable iron forming the ends and extending to the magnet frame. The other embodied a plain cast steel cylindrical frame, the supporting arms being cast on the malleable iron heads that extended to meet it and affording the necessary space at the ends of the motor. Many motors of each type of this second class were successfully used, but it will readily be seen that the one first described was the simplest and strongest, since the arms were one with the frame casting and the heads carrying the bearings were not overhung. The second and third types usually had six poles as this was thought to afford greater torque for a given weight. It was found, however, that the gain was not sufficient to warrant the extra poles and field coils and after a few years four poles were adopted as standard. The poles of these motors were laminated to reduce the pole face or Eddy losses. Before leaving this class, it should be mentioned that one large manufacturer supplied motors, at this period, of the third type; that is, with the arms cast on the heads, but the magnetic portion was composed of punchings with poles integral held together by two rings and eight bolts.

The third and present class is very similar to the first type of the second class except that the pinion end opening is not reduced to nearly the armature diameter as was done in the former. This change, however, was important as it permitted better castings and by machining the outside ample space was afforded for supporting bearings. This was useful in other ways for applying the motor to the car or attaching the transmission parts. The third class of motor design has now been in successful use for nearly ten years, and has been adopted either directly or in modified form by nearly all vehicle motor manufacturers. An important advantage is its flexibility to meet the special requirements of users. In the earlier classes having arms and lugs cast on the magnet frame or heads, a large amount of time was lost in correspondence, preparation of drawings, special patterns, jigs and the like, which together with the inevitable changes were the source of much delay and expense to all concerned. Again, if a car manufacturer desired to make a somewhat radical modification the motors and material on hand could not be used causing great loss or perhaps deterring him from improving his product. The motor manufacturer co-operates with the user and drills and taps such holes as are required for supporting and adjusting brackets, thus simplifying the problem.

I would like to say a few words regarding inspection and tests not only of the parts but of the motor as a whole. These are regarded as most important points of motor manufacture, and are carried out with the greatest care. Occasionally mistakes or omissions are discovered, but it is surprising how insignificant they are compared to the great number of motors built. Every detail part no matter how small is inspected before it can pass on for assembly or stock. The parts are again inspected in every case after assembly, and so on, each unit is given a series of tests until it is assembled with others in the form of a motor. The motor is then given a final complete inspection, the several points observed being recorded on a special form.

The electrical test is also a matter of great importance, and is usually made by belting two motors together, one running as a motor and the other as a generator. This test is carried a sufficient length of time to insure that each motor is free from electrical defect and then the order is reversed,—the generator becoming the motor.

Speed and current readings are taken before and after the run also the normal load or rated speed, and all important engineering and commercial data is entered on a card with the date and serial number of the motor for record and future reference.

The motor now receives final inspection after which it is sent to the shipping department.
Field of the Electric in England

Paper Presented Before the Wolverhampton District Engineering Society, England

BY W. E. WARRILLOW

Some taunting force in Nature seems to have decreed that only by painful and laborious stages should man overcome the difficulties which arrest his progress towards the ideal electric storage battery. The mechanical device which converts electrical into mechanical energy, the electric motor, is a remarkably efficient apparatus. Its employment as a reliable and economical propulsive agent in tramway and railway practice is an everyday engineering fact. Yet the independent electric vehicle, with an almost identical mechanical drive, has only just been able to rear its head among its now powerful rivals, gas and steam. Such a paradox seems like a mockery of man's attempts to apply physical forces and phenomena to his daily needs. Gas and steam cars, in their often clanking, clangorous, snorting progress through the public ways are something of a hideous mechanical derision of the efforts of the electro-chemist to sweep them into the limbo of forgotten things. But hopes of the future of the traction storage battery are running higher than before. The motor car manufacturer in this country has come to realize that there is "something" in the battery vehicle. An industry which has so signalized over the mechanical complexities of the gas engine, will discover, on closer association with it, that the electric and its problems are worthy of its zeal. Engineers have succeeded in perfecting a prime mover, in which the Otto cycle of induction, compression, expansion and exhaustion, takes place in a cylinder forty times in a second, have surely a satisfactory certificate with which to demand admission to the ranks of electrical experimenters?

In proclaiming the merits of the electric vehicle in the heart of the Midlands, where so many motor car makers are, it is hoped the sufficient interest will be aroused in the subject to provoke profitable discussion and awaken among motor car engineers an enthusiasm which will find practical outlet in manufacturing activities at no distant date.

A Comparison of Electric Vehicles and the Electric Service:—Attention may first be called to the almost universal character of public electricity supply mains in the principal cities and industrial centers in this country. The present day central station engineer is becoming keenly alive to the commercial possibilities of his undertaking, and realizes that all energy consuming devices, and especially vehicle batteries, will make valuable sources of income. Men of this type have co-operated with battery and vehicle makers and formed what is known as the Electric Vehicle Committee. This organization is now at work fixing maximum rates for battery charging, increasing charging and garage facilities, standardizing equipment details such as charging plugs and boards, and generally doing propaganda work among prospective vehicle users by the circulation of suitable literature. Closely allied with the question of the electric service is the general employment of electric motors for turning the wheels of industry. Now, efficient industrial production and efficient transport should go hand in hand. The electrically-driven factory and the electric vehicle for the distribution of its products locally represent the ideal combination and a standard of uniformity which cannot fail to appeal. This

standard is not only reproduced in the equipment, but also in the staff, for the electrician who takes care of the power installation can be put in charge of the electric vehicles. The motto of the movement might well be: "Electric power for the factory and battery transport for the product."

The Battery.—The available batteries for electric vehicles are made in two types (1) the lead plate, or acid type, and (2) the nickel iron or alkaline type. The lead accumulator, for electric service is constructed with special plates in which the active material is retained in position, in spite of vibration or the wash of the electrolyte. The "Ironclad Exide" battery is a typical example of a modern lead accumulator which the makers guarantee for a period of two years. During this time a minimum mileage of 24,000 can be run with it without washing out or renewal of plates. Under boosting conditions this mileage will be increased to 36,000. Ordinary flat plate lead batteries, in which the active material is washed out or shaken out in service, need to be washed out about every three months if they are in shallow boxes. After about 12 months' service, or 12,000 miles, this class of battery requires re-plating. The nickel iron battery, of which the Edison is at present the only practical example, is of a special mechanical construction, the active material being held in tubes in the positive plates, and rectangular pockets in the negative plates and thin nickel steel plates are used as supports in each case. The containing box or can is of corrugated steel. The makers of the Edison battery give a four-year guarantee, and during this period a minimum of 48,000 miles can be run with the battery; with high rate boosting, such as may be needed in "bus service, when as much as 100 miles a day may be run, the mileage during the guarantee period will be as much as 140,000. The terms of the guarantee are that the battery shall give its full rated capacity at the end of four years, irrespective of the work to which it is subjected. Technical comparisons of these distinctive types of cell show for the lead high electrical efficiency, high voltage, small space occupied, but considerable for the nickel-iron cell there appears lower electrical efficiency, lower voltage and larger space occupied, but light in weight and great mechanical efficiency. Both types of battery are guaranteed, and with the exception of the item mechanical efficiency there is nothing technically to choose between them. Commercially, the comparison must take account of first cost and the terms and conditions of the guarantee. The nickel-iron battery is about three times the cost of an ordinary flat-plate lead battery and twice that of the special lead battery, but its guarantee period is double that given with the latter, and its construction appears to confer upon it the mechanical superiority. The makers do not hesitate to say that no treatment short of deliberate destruction will harm the battery in any way. Both types of cell have been in practical service in the United States for some years past, and comparative data upon their respective performance is now beginning to be available. With the further development of the electric vehicle valuable service may be rendered by a scheme of co-operation on the part of existing garage interests in various parts of the country, interests which have been built up
in connection with the petrol vehicle business.

The Chassis.—The electric vehicle differs very little as to its chassis details from a gas car, the frame being of rolled steel channel sections, the rotating parts fitted with roller and ball bearings, the wheels of the artillery type, the front and rear springs being independent, and the shock absorber, according to the capacity of the vehicle. Springing and braking are also upon somewhat similar lines. In the assembly of the essential electrical details, such as battery, motor and controller, individual electric vehicle makers have various views. The battery is either underslung between the front and rear wheels, divided between the space under the bonnet and that under the driver’s seat, or mounted above the frame under the driver’s seat. The last method is approved by one American maker because it keeps the center of gravity high, and is also said to throw very few strains on the frame. Present practice, however, favors the underslung battery. The system of driving varies between (1) worm on the motor shaft direct on to the back axle, (2) silent chain to counter-shaft and thence to the rear wheels by roller side-chain, (3) gearless hub motor, (4) encased motor in back axle driving through epicyclic gear in each rear wheel, and (5) separate motors driving each front wheel through single reduction gear. No. (2) is the most commonly employed method on commercial electric vehicles. The controller is placed either under the bonnet, under the floor or under the driver’s seat, and is operated by a lever moving round the steering column or by a lever at the side of the driver. Practice varies as to circuit-breakers and safety devices for cutting off the current when the brakes are applied. The motors used on electric vehicles are specially built for the work, and are generally series wound, though one or two makers fit compound motors and introduce a regenerative braking notch on the controller. The dashboard is provided with instruments which indicate the condition of the battery during the periods of charging and running. An indicating amper-hour meter is the most popular instrument, because it is provided with a differential shunt, by means of which the readings are a true measure of the battery output and also indicate the effective input, allowing for battery efficiency. Recently a simple form of battery overload detector has been introduced by the Electrical Power Storage Company, and this is already giving satisfactory service on one or two vehicles.

Operating Costs.—The operating costs obtained from the use of many thousands of commercial electric vehicles show marked economies over gas vehicles, though all the conditions appear to be unfavorable by comparison with those in this country; roads are notoriously bad, rates for electrical energy are high, and the price of gas is low. Over here the opposite is the case with all three of these items. Virtually a true comparison cannot be drawn between the electric battery vehicle and other mechanically propelled vehicles. The makers of the latter, both gas and steam, can produce columns of cost figures in support of their case, but these figures do not apply to the sphere of utility for which the electric battery vehicle is suitable, and in which neither of its so-called rivals has yet been put into satisfactory service. The sooner it is realized that the electric is more than the competitor of the horse than the gas or steam vehicle the more readily will the idea of the operating cost be appreciated. It will also be understood why each prospective case for the electric vehicle must be considered in the light of local conditions, and not compared haphazard with a steam or gas car, which never has and never can operate economically under the same conditions. A safe index of the economy of the electric vehicle is the fact that those who have given the modern patterns of commercial vehicle a trial in this country are giving orders for further vehicles. This circumstance clearly proves that in its field the commercial electric really has no competitor, not even among the best of the other mechanically propelled vehicles.

Speed and Mileage.—The purchaser of a gas truck buys a machine with a range of speed quite beyond that which the law permits. The vehicle is marked “12 miles per hour” to comply with the letter of the law, but it may, even when fully loaded, be driven at half the speed of an express train, and what is more it is so driven. The driver cannot resist the temptation to use the reserve of power which is needed for climbing hills, to “belt along” on the level. The gas vehicle must go fast and it has, unfortunately, given the vehicle user an impression that commercial motor transport must be fast transport. In truth the motor user is made to buy high maximum speed in his vehicle when he does not want it. Now, the electric battery vehicle has a low maximum speed, from 20 miles per hour in the light truck to 7 miles per hour in the highest capacity wagon, but it will give a good average speed, and it cannot be over-driven on the level. It is a good though not a fast hill climber, and will ascend the most severe gradients. The high speed of heavy commercial vehicles brings about excessive road wear, and ultimately a definite speed limit will have to be enforced in order to keep the roads fit for service at all. The use of a number of moderate speed commercial vehicles like electrics in the streets of towns and their suburbs would assist in keeping down the speed of the gas and steam vehicles in populous districts within the limits of public safety, while the restriction would also have a salutary effect on the road surface. The normal mileage of a commercial electric vehicle ranges from 35 to 50 per day, on one charge of the battery, that is charging at the long hour rate. This mileage can be increased by the process of “boosting” or charging the battery at anything from two to five times the normal charging current for short periods. This rapid charge is usually applied in the dinner time of the driver, and the increased mileage obtainable will of course, depend on the nature of the work. If a vehicle has done 40 miles during a morning, if the battery is boosted 20 minutes, it will travel another 9 miles, or 40 minutes boost will give another 15 miles, and an hour’s boost will give 20 miles additional. The experience of electric vehicle users in the United States has proved the great value of boosting. It certainly makes the vehicle more than capable for commercial service than if it were only capable of being run the comparatively short mileage which one normal charge of the battery will give.

The Operating Field.—The commercial electric battery vehicle occupies a position somewhere between the hand cart and the gas and steam van. The class of duty for which it is specially and distinctively suitable is that known as short haul frequent stop service, which embraces almost every branch of town delivery and city transport. There exists a very wide field of utility for the electric which cannot economically be entered by any other type of self-propelled vehicle. It may be advantageously employed by tradesmen, and the heaviest about-town haulage contractor alike. There is a most encouraging future for the electric among municipalities, railway companies, teaming undertakings, electricity undertakings, and in general.
may be reminded that it was due to the spur of progress with the motor car on the continent that they "got busy," and were stimulated into building up British automobile engineering to its present stable position among the nation's industries. From a mechanical point of view the electric should attract them because certain of its problems have been practically solved in the development of the gas car, gears, roller and ball bearings and tires being notable examples. The future of the electric is not entirely bound up with the battery. The work of the battery maker will be assisted the more vehicles are put on the road, and opportunity given to study their performance in all details under practical service conditions. The gas vehicle industry was brought up on the bottle of experiment held in the hand of the user of the car, who also helped to fill the bottle. At present, commercial conditions do not admit of quite the same amount of experimenting at the expense of the buyer as was the rule in the early days of mechanical transport, and with the electric vehicle it is hardly needed.

The principal inducement for the motor engineer to turn his attention to the electric vehicle is the inherent prospective demand. The economic spheres of both steam and gas vehicles are now becoming well defined and motor engineers, after twenty years' experience, may as well be frank and admit the limitations of these vehicles. If they will divide modern transport conditions under its chief service heads, they will obtain (1) out and home service, (2) long-distance point-to-point service, (3) medium distance in frequent-stop service, and (4) short distance frequent-stop service. It is imposing too great a task upon the motor car engineer to design a single vehicle, gas or steam, which will economically meet the requirements of all these services under everyday operating conditions. It is useless to attempt the impossible. It is better engineering to allocate to each class of duty the type of vehicle the design and construction of which limits its economic operation to that service. The matter, resolves itself into the logic of specialization than which nothing has contributed more to engineering and industrial progress. Motor car engineers will lose nothing in prestige if they apply themselves to the task of removing from the electric vehicle the stigma which has rested upon it for so many years. They will have the hearty co-operation of the electrical industry, and if they enter the field now they will find the conditions favorable to regular progress and stable development.

The Value of Sociability Runs

When a man wants to buy an automobile he is often quite likely to buy a gasoline car, when, as a matter of fact, the electric may actually suit his particular purposes better. This is partly because he sees more gasoline cars and hears more about them than he does about electrics. He has not absorbed as much information on the subject of electrics as he has on gasoline cars because the opportunities for general observation are not so plentiful.

There is a way of supplying the public with this general information which is peculiarly effective because it is so novel that it attracts especial attention. It has the merit of educating the public in regard to electric vehicles through the medium of entertainment,—a medium which makes the lesson vivid. This method is unique and forceful in that owners of electrics,—not salesmen nor printed advertisements,—stimulate public interest in the cars. This is the "sociability run," for which the electric is particularly adapted.

Such a social event is participated in by owners of electric cars, both ladies and gentlemen, with prizes offered for speed and mileage, and with a pleasant luncheon party at the end. The runs are good for electric vehicle interests because, for one thing, they do not make undue claims upon the electric's mileage capacity, yet they give leeway for mileage to be the prime factor of interest. These contests are individual in that speed and mileage records are made with all the cleanliness, quietness, and dignity compatible with the social gathering and luncheon party, and because the simplicity of the operation makes it possible for several passengers to accompany each driver for the pleasure and sociability of the ride. A special feature of interest is that the ladies can always win as good records as the men. An amusing incident occurred on a suburban run two years ago: An unusually timid woman who enjoyed the social aspect of these events, but who was fearful of automobiles and bicycles, and who never rode behind horses without trepidation, was of the party but did not venture into any car even for the pleasure of the ride which the run afforded. Accustomed to complicated gas cars, she was much struck by the simple and silent running of these electrics, and aroused surprise and good-natured laughter when she said, "I do believe I'd like to run one of those myself!" Thereupon, with friendly urging and instructing, she experimented and the afternoon's run caused a good deal of amusement by coming in third in the speed record, and she subsequently bought an electric brougham of her own.

These sociability runs hold news interest because people of well-known social positions usually take part, and the features of prize awards as well as the actual records scored, attract attention. For these reasons such events invariably gain good newspaper publicity, being featured with photographs and allotted more space than is accorded mere manufacturers' tests and announcements. Such publicity is valuable to the specific companies whose makes of cars are named, and is stimulating in general by surprising the public at the popularity of this type of car, and arousing interest in what it can do. These events always result in a stream of inquiries to the manufacturers and to the Electric Vehicle Association in regard to further data on operating records and costs, etc., with demands for complete catalogues.

In short, the Sociability Run is a live method of sales promotion which is much too good to be neglected.

Buffalo Suspends Business

The Buffalo Electric Vehicle Company, Buffalo, N. Y., has found it necessary to suspend active business. It has endeavored since July 1 to dispose of an issue of bonds, but on account of general business depression was unable to do so.

The board of directors has decided to dispose of the assets of the company, and desire to do so to the best possible advantage of the creditors. They have selected John W. Van Allen, of 248 Strong Square, Buffalo, to represent the interest of the stockholders and term note-holders, and the Marine National Bank of Buffalo, which is a creditor to the extent of practically three-fourths of the indebtedness of the company, has selected Frank L. Bapst to represent its interest in the liquidation.

John F. Gilchrist, president of the Electric Vehicle Association of America, purchased one of the new model Chicago electrics during the recent automobile show in Chicago.
Electric Vehicle Service in Department Stores

A discussion on the Advantages of Electrics in Parcel Delivery

At the regular monthly meeting of the New York section of the Electric Vehicle Association of America, held January 28, Edward F. Callan, of the Callan Department Store, One Hundred and Twenty-first street and Third avenue, New York City, presented a paper on "Electric Vehicle Performance in Department Store Service," which was followed by an open forum discussion of this application of the electric. Mr. Callan's paper follows:

On September 29, 1913, we installed our first electrics, one a half ton and the other a ton. The body on the half ton is regular delivery style, all panel, 90 inches long and 46 inches wide; the body on the ton vehicle is the truck style, 120 inches long, 57 inches wide.

Our experience has proven that a ton model would have been better suited for our delivery purposes instead of the half ton, as our autos must carry everything from a paper of pins to an entire bed combination or furniture. Most stores with large equipment can use both these styles.

These two electrics displaced seven horses, five wagons, and one day stable man. This stable man had also been used as a driver on days when deliveries were heavy or on days when it was necessary to send a wagon to Jersey. The two horse drivers were broken in as chauffeurs. During the preceding spring we employed an extra horse driver.

Our delivery was now entirely motorized, as we had been using two gas cars, one a two-ton, the other a ton, for two years. These two gas cars had each replaced five horses.

For loading, the following device is used: A box 60 inches long, 30 wide, 60 inches high, which has been loading in the shipping room in the basement, with capacity of about 200 packages, is taken up to the sidewalk and put on the machine and then raised and put onto the auto.

Our delivery route, with the two electrics and two gas cars, same as with gas and seven horses, was from Fifty-ninth street east and west, north to the city limits and all points in Westchester, Mt. Vernon, New Rochelle, Pelham, Williamsbridge, City Island, Kingsbridge, Yonkers, Tuckahoe and Bronxville. These routes were covered once every day, leaving about 9 A. M. Three times a week we delivered in Port Lee, Englewood, Morningside, Edgewater, etc., New Jersey. In the afternoon there was one trip south to One Hundred and Sixth street and one north to One Hundred and Thirty-fifth street east of Eighth avenue. Each one of our autos is equipped with a service recorder which records time running and of stops and of careless driving. About six months ago one of these recorders detected a "joy rider" on the gas car.

One electric now covered the morning route, formerly covered by a team of horses, south from store to Fifty-ninth street, east and west 15 miles. This same electric covered in the afternoon the two routes from store south to One Hundred and Sixth street and from store north to One Hundred and Thirty-fifth street, east and west, east of Eighth avenue. These routes were formerly covered by two single wagons, two horses and two drivers.

The other electric covered the morning route of a single wagon (double when necessary) in the Bronx (18 miles) to One Hundred and Seventy-seventh street and in the afternoon the Jersey route, 15 miles. On other days of the week this electric picked up freight or ran out a late local trip.

Shortly after the installation of these two electrics we thought it would be advisable to have an extra auto in case of a breakdown and also to improve our delivery. We therefore ordered another one-ton electric, the same style and make as the first two. This third electric was put in service on December 1. We then split the route of one of the gas autos, which was covering the route west of Third avenue, from the store west to One Hundred and Thirty-first street north to Yonkers and Tuckahoe and part of the electric covering route south to store. The reason for splitting the gas car route was to make it possible to deliver up to One Hundred and Fifty-fifth street all the purchases of one day on the following day before noon. This was not practicable with the gas car, as some of the deliveries had to be made on the way home, which, of course, at times customers complained of. That is to say, if a customer living at One Hundred and Fifty-fifth street and Eighth avenue purchased some goods in the store at 3 o'clock in the afternoon under the old arrangement we could not make delivery until 6 o'clock in the evening until the following day.

We were now covering in the morning the same routes as before, but were giving better service. In the afternoon we were now able to run out two trips south to Ninety-sixth street east and west, and two trips north to One Hundred and Fifty-fifth street east and west. We therefore had extended our routes in the afternoon ten blocks north and south and to the North River instead of to Eighth avenue. Hence, in the afternoons we were doing just double and covering more territory with two electrics than we formerly did with two single wagons.

Another improvement to our delivery was an afternoon trip at 2 p.m. in the Bronx up to One Hundred and Sixty-first street. During Christmas holidays we were also able to run out a Bronx trip to One Hundred and Sixty-first street at 7 p.m. These trips had never been attempted before the installation of the electric.

During December, 1913, the three electrics performed the work during December, 1912, by seven of our own horses, one or two hired horses, four drivers and one stable man. During December, 1912, we also hired a horse van for one week for delivery of toys which we did not have to hire in 1913. Hence one driver, one stable man and a hired van were done without.

During December, 1914, the same performances were made with an increase in deliveries of 753 stops. Packages averaged about 1/2 to a stop; at the time we were not keeping a record of the number. We had, however, owing to poor delivery work by a driver, to hire a truck for two days. This time the
truck was not a horse van but an electric. There was one other exception this year to our December, 1913, performance and that was the replacement of the gas car on the west side route by an electric. I think the story is better told in the yearly statement I have here.

I believe the cost of current would have been lower in this case if the battery had not been a new one, which necessitated taking boosts every day outside at 13 cents kw. hours instead of at home at 5 cents kw.

On the arrival of the third electric we started to experiment on what could be done on long hauls. Of course we had already tried out the half-ton electric and had obtained 48 miles without a boost. But we thought a half ton would not be large enough and would prefer a one-ton. We had in mind if possible to sell the two-ton gas car, as it was now too large. For the route it covered the first year in service, now divided, on account of the increased number of deliveries, between itself and an electric. What we had in mind was to take the one-ton gas car from the west side and put it on the route of the two-ton gas car, then put an electric on the west side route. This route was from One Hundred and Twenty-fifth street, Amsterdam avenue north to Tuckahoe, taking in Highbridge, Kingsbridge, Bedford Park, Woodlawn, Yonkers, Bronxville, Spuyten, Duyvil, etc. This is a very hilly section, but roads are on the average fairly good. After a week test we found that we could not expect more than 35 to 38 miles, without a boost, with the autos we were operating. We wished to avoid taking boost, except in an emergency, as they would have to be taken late in the afternoon.

We did find, however, that there was a difference from $2 to $3 a day in operating charges between the electric and the gas car on the same route. This difference made the years keener than ever to replace the gas with an electric. The gas car, of course, made better time, but that extra time was well made up in expense bills.

About the first of the year 1914 we tried a one-ton electric belonging to a company then in business different, which. We tried it and the records of these will explain why we bought it.

I also have if you wish to hear them, records of the other electric during storm last February, at which time, I understand, there were people who did not send their cars out.

This electric (our fourth) does not make the same mileage the one-ton gas car made but that is because the present driver used the surface cars whenever possible, whereas the driver of the gas car always covered the ground with the auto.

During August last year the electric covered the same ground as the gas car did the year before but with a saving of $80 in operating cost.

During the past September while our gas car was in the shop our ton electric made the route with fairly good success.

Last October we put the half-ton electric on the west side route and it has done the work without trouble. On account of changing the old battery, however, to a new one the amper hour discharge was not very good. This made it necessary to take a boost, which of course was a delay. We had to make this charge of account of changing the wheels on the one-ton electric on that route to patent Spring wheels. These wheels increased the current consumption considerably and it was necessary to take boosts where before it was not. The spring wheels did reduce their battery expense, as we have not had a leaky or broken cell since their installation.

In the past month we have taken the half-ton off this route, as it was too light for the winter, and put the ton back. The rear spring wheels have been taken off and the old ones put back to increase the mileage. Since the first of the year we have been operating only three electrics and one gas car. On fine days, preceded by a fine day, when we are quite sure roads will be hard, we have been sending an electric on the suburban route covered usually by the gas car. This means a difference of $2 in operating charge in favor of the electrics. This, of course, is not possible on stormy days or when roads are in bad condition after a storm. We were, however, only able to do this the first three days of the year.

It is my opinion from our experience that any distance up to 40 miles belongs to the electrics. And in some parts of the year I might safely say 50 miles.

I favor the electric because of its simplicity. An owner had some chance of watching them and seeing that they are being properly taken care of. I, inexperienced as I am, can give such autos an intelligent inspection every morning. If anything is wrong I can can the driver to task and there is no such thing as excuses. Remember, I do not pose as being a mechanic by any means but I know that these morning inspections make for better operation and that drivers take better care of their cars. Anybody can do what I do every morning, which demonstrates the simplicity of the electric.

Imagine my attempting to make an inspection of the gas car or calling down the driver. In the first place I would not know where to begin, and in the second he would simply stand me on my head. With gas cars you must know something besides what is given with the usual everyday intelligence.

We use monthly bonus system with all our drivers. Each month there is awarded a first prize of $5, and second prize of $2.50 to two of the drivers of the four electrics having the lowest repair bill, best time out in the month and the driver having the driving records maintaining the highest average mileage per ampere hour and running on schedule time. Of course if none of them have good record no bonus is awarded.

In comparing the gas with the electric canto it seems to me, from our experience, that the gas car is rather expensive proposition for the owner operating only one of two on account of continued repairs, adjustments, etc. This owner must depend on the maker for his repairs, etc., while the owner operating a fleet of five or ten and more can with economy employ skilled mechanics to inspect and make all minor repairs, adjust the car, etc., at night. Of course it may be suggested why not employ a skilled mechanic as driver? This is not always practical, especially in our business, as a good mechanic does not always make even a fairly good delivery man. Two years ago we had an experience with a skilled mechanic as driver on one gas car and a skilled delivery man as driver on the other. The mechanic, whose car gave little trouble and his repair bills were few, while the other man's car was just the opposite, was always a novice as a delivery man compared with the one who was not a mechanic. Some owners, whose stops are few, can employ skilled mechanics as drivers and it matters not how little they know or ever know of delivery, but giving a man, as we often do, 100 or
125 stops, covering 50 to 65 miles, through Westchester and vicinity means he must know a whole lot about delivery. Drivers who are good mechanics and delivery men are few. This is another point in favor of electrics. I think I can safely say that there are few, if any operators in the city covering daily with any one car the number of miles and making the same number of stops. Our business is one in which delivery must be prompt, never beyond 24 hours, and excessive cost must be borne until it can be reduced without hurting the delivery.

We only charge and flush the battery. All other work, when necessary, is done by the maker, who receives a weekly report of each auto showing a regular charge and an overcharge, also the gravity reading of all cells on each auto once a month.

The service received from the manufacturer and the battery maker has been excellent. They are quite different from the gas car maker, who from our experience anyway always seem to have one end in view, that is to make the bill as big as possible. I am never anxious to look at a bill for repairs on the gas car.

Our mechanical expenses might have been lower if we had not had the maker give each car since its installation a monthly inspection. This inspection is not charged directly against the car, but is paid out of a fund allowed, $2.25, any amount above that is charged to "Running Repairs." I believe this inspection has and will tend to keep down the repair bills. I think the reading of our truck statements will be more interesting than any comment I might attempt to make on them.

Coming down to the last and important point, "expenses," I must admit I am somewhat timid to continue, because in the many articles I have read there seem to be so very few who had any expenses or upkeep. It does not seem quite right to me that they can go along for a year or two without spending as much as a nickel, as some of them claim.

The paper developed considerable discussion in which it was brought out that Mr. Callan's paper was an effective answer to the argument of many small business men that they cannot effect economies with electrics because they would have use for only two or three trucks.

S. G. Thompson, of the Public Service Company of New Jersey, called attention to the value of the exact operating figures in that they showed vindication of the theory that the electric was cheaper than the gas car in its field of proper application.

Day Baker, of the General Vehicle Company, cited the instance of the Pacific Mills at Lawrence, Mass., where a saving of 22½% was effected over horse on short haul work, which resulted in the entire transfer of material being taken care of at present by nineteen electric trucks.

Mr. Beatty, of The Murphy Varnish Company, Newark, N. J., explained that his company had replaced fifteen horses with two electrics and one gas car, reducing the operating costs from $5,200 to $3,600, and by changing the methods of delivery reducing the rates charged to the other departments and increasing the income on the haulage account by $1,200.

R. Louis Lloyd, of the Philadelphia Electric Company, and chairman of the Philadelphia section of the Electric Vehicle Association, called attention to the excellent record cited in Mr. Callan's paper and called attention to the fact that the performance of electrics during the blizzard in Philadelphia last year enabled the newspapers to deliver their editions more surely and promptly than was the case with horse or gasoline cars.

### Maintenance of the 42-Cell Battery

Commenting on the fact that the Woods Company, Chicago, is using a battery of its own design, Mr. Simonson, general sales manager, stated that many people do not understand the economy of a 42-cell battery in an electric car. It is a fact that no more current is used in completely charging the 42-cell battery than is consumed in charging a battery of 42 cells. This may sound strange, but it is due to the fact that in charging less than 42 cells there is an unavoidable waste of electric current which, in the case of a 20-cell car, amounts to about 50 per cent.

The failure to understand this fact leads many people to wrong conclusions as to the most economical battery equipment. It is an entirely erroneous idea to suppose that it costs more to charge a 42-cell Woods battery than it does to charge any number of cells less than forty-two.

It should be remembered, however, that the power delivered by the batteries is in proportion to the number of cells in the battery. Therefore, the 42-cell battery is the most economical from the standpoint of cost per unit of power delivered by the batteries to the motor.

The storage battery of the type used on electric cars has been greatly improved in the last few years. For instance, the better batteries require no washing or cleaning of plates, thus doing away with what was formerly quite an important item of expense in the upkeep of an electric car.

### Spring Makers Discourage Overloading

Manufacturers of leaf and supplementary springs have been asked by the commercial vehicle committee of the N. A. C. A. to co-operate with the Society in its efforts to discourage the overloading of motor trucks.

Attention of the truck makers having been called to instances in which dealers and truck owners have asked spring makers to increase the capacity of the rear spring suspension of trucks so that loads greatly in excess of the rated capacity of the chassis could be carried, a circular letter was addressed to spring makers in general, stating that the truck manufacturing members of the Chamber of Commerce almost unanimously deprecated such practice, which leads to overloading and consequent injury of the vehicle.

It was pointed out that the springs as originally built into the chassis are carefully proportioned to the axle, wheels, tires and driving mechanism, which are guaranteed only for the factory-rated load capacity, and that the substitution of stronger springs and the carriage of heavier loads causes unexpected stresses in these parts, with probable consequent breakages.

### Columbus Dealers Form New Association

At a recent meeting of the electric automobile dealers of Columbus, Ohio, the Columbus Electric Automobile Dealers' Association was formed with E. E. Averry, president; H. D. Brasher, vice-president, and L. M. Browne, secretary-treasurer. The organization is affiliated with the national associations.
ELECTRIC VEHICLES

The Outlook for 1915
Prominent Dealer Predicts Universal Motor Transportation for Pleasure and Business

The requirements for rapid transit in city life has found its natural outlet in the automobile and with the awakening for road improvements throughout the country, this mode of transportation is sure to steadily increase and it is not too much to say that the motor vehicle is largely responsible for the onwardness and betterment of social conditions—to say nothing of physical and financial conditions as well. 

The demand for more speed in the ordinary channels of transportation on land and sea has found its reflex in the heavy demand which has been created for the electric and gasoline motor car, the motor boat and the motor propelled airship.

The motor industry is a good sound business which requires only the direction of sound business principles to make it the equal of any industry on the face of the globe and in the accomplishment of this result, must have the benefit of the association of business training to the highest degree.

It is a fact that during the business depressions under which staple lines have suffered at one time or another, since the event of the motor vehicle, this new industry, which has grown to such gigantic proportions, has suffered the least of all industries. The basis for this fact must be the fundamental requirements which it meets in the modern conditions for more speed, and while the "mania" has decreased to almost healthy proportions, yet the basic fact is evident that the world at large is "moving on" and the motor vehicle, speedy and convenient, is the efficient means of meeting almost every condition.

The increase in the number of cars manufactured at low prices does not indicate a decrease in the well-to-do buyer, but is an indication of the advance in values at the lowest prices, which advantage the well-to-do buyer is quick to grasp.

This phase of the automobile industry is solid proof of the remarkable improvements which have taken place in their construction, and as a consequence, directly resulting, the overhead expense of manufacturing, which means as well, costly experiments, have been greatly reduced and there has been at the same time a material improvement in the maintenance cost as well as that of guarantee and service.

These factors have allowed the manufacturer to increase his output with relatively the same factory expenses and "help" and at the same time to lower the list prices.

The moderate priced car today in quality and durability more than equals the high priced car of a few years ago and similarly the modern high priced car is infinitely better than its predecessor, and has refinements and costly attachments and conveniences that make good its present selling price.

One would be safe in saying that manufacturers would not return to the old conditions if they could in which higher prices prevailed combined as it were with the multiplicity of ignorant features and experience and untold annoyances, which the experience of years and the ingenuity of American mechanical and electrical engineers have overcome, resulting in the present day comfortable and safe machine.

The magnitude of the automobile industry in the mind of the public is viewed to a more or less extent by the appearance of the complete car but the importance of the industry depends not a little upon the part makers, who specialize in the manufacture and improvement of the minutest parts as well as the most important features that go to make the present day car what it really is.

There are manufacturers of tires, tire rims, wheels, hubs, bearings, axles, driving shafts, transmissions, motors—both gasoline and electric—chains, frames, electric start and other electric appliances, lamps, hoods, windshield, tops and bodies, and the enormous leather industry, which is one of the most important items of the automobile make-up. All of these and hundreds of other features, are of like importance in the making of the complete automobile that stands before us today in a nearly perfected form.

Many of the manufacturers in this country "assemble," that is, they buy component parts from the best makers of their class of goods and which are best adapted for their particular use and price and many of the best cars in this country are made from standardized parts of manufacturers who have a known reputation for making high class automobile parts from the motor to the least important part of the car.

This is not to say, however, that a manufacturer of automobiles does not make any of the essential features himself and which individualizes his car from others.

In the assembling and choice of the component parts, every maker of automobiles has his own ideas as to how a machine should look and be put together and in consequence no two cars are exactly alike.

The importance of the electric pleasure car does not altogether lie in the pleasure it affords as much as its utility to come and go at the will of one's desire and need.

As an illustration, the physician who uses a run-about, can come and go wherever there is a call for his services, and in consequence, his practice is not limited as in the day of the horse.

The delivery of merchandise as well knows no districts. The motor car plies its way far from the environments of city life.

The automobile is possibly the most important reaction of modern times and is exerting a dominant influence under all conditions and in all climes.

The automobile has evolved the motocycle, the motor boat, the motor air-ship and the motor sub-marine. We are, therefore, undoubtedly living in a motor age.

The year 1915 will see a remarkable increase in the demand for commercial cars, a demand that is steadily and in time will overwhelmingly creep upon the maker just the same as the demand for pleasure cars exerted the manufacturers to the utmost season after season.

It is needless to say that the preponderance of evidence from the war zone of the adaptability of the motor car to perform reliable service, economically and expeditiously, will be one of the principal factors for the increase of commercial machines in this country for they are finding in Europe no outlet for other means of transportation which equals the serviceability of the motor car.

"The needs of the least experienced in this country as to the importance of the motor truck service for their own
individual requirements is so evident that they can no longer close their eyes to this means of increasing their business."

Many trucks have been sold for city uses whose labors have been unbelievable as compared to past conditions of delivery service. There are also trucks in the country which take turns in hauling passengers and merchandise according to local conditions and seasons.

A certain wholesale fruit concern in Rock Island purchased a truck to deliver to cross-country places within a radius of twenty miles where in many instances there were no train connections and its business in consequence has increased 100 per cent during the past year.

Nothing is too small for the motor delivery wagon and bussiness concerns whose partners own pleasure cars can well afford to consider the advisability of the commercial car investment for their own business uses.

The era of motor car commercialism is upon us. The manufacturers will do well to take time to consider how they shall meet a demand that will equal if not surpass the wonderful developments of the pleasure car.

There is no business in which closer relations exist between the banker and the manufacturer than in the automobile trade and it is safe to say that the most important features of the financial relations between the manufacturer of automobiles and his banker is not merely the accommodation extended during the disposal of the complete car but it is in the help extended by the banker from the beginning of the "car making" until it is ready for the market and finally placed in the hands of the user.

The manufacturer of automobiles could not get along without the co-operation and financial assistance of his banking house as it is no small problem to make and assemble cars and get them ready prior to the season's demands but by the necessary assistance which is extended by the banker to the car maker, he has been equipped to place on the market a rapid and economical means of transportation which has been instrumental in improving the social conditions of life in every part of the world and will settle road building conditions in this country by advancing them nearly one hundred years.

Battery Knowledge Rare Among Layman

Among the users of electric vehicles there has been so much of a feeling of mystery when the storage battery has been in use. The construction of the battery and its methods of assembling work are generally described in technical terms that mean little or nothing to the average owner. To the layman the storage battery is a piece of electrical apparatus which, because of its having been described in so many long and complicated terms, he concludes must necessarily be exceedingly intricate and difficult to use.

Electric vehicle owners during their early acquaintance with the storage battery looked upon with some respect and some fear, but after using the battery for a short time they invariably discover that a storage battery is neither difficult to operate or care for, nor does it demand of its user the knowledge of an electrical engineer. Acquaintance with the battery soon causes users to lose their fear of it, while their respect for it increases. As a matter of fact, the storage battery is the very best friend of the electric vehicle owner. A good storage battery will stand almost any amount of ill treatment. It is a patient friend that does not complain, or groan under a great amount of mistreatment. This desirable quality, although to be admitted under some conditions, is, nevertheless, an unfortunate feature of the storage battery. If the battery could combat its mistreatment in some audacious way so that its owner could realize that it was not being properly cared for, there is no doubt that it would be less frequently imposed upon. When it requires a drink—and its preference is most always for pure water—it is very often dosed with sulphuric acid. The storage battery is too often overloaded or underfed.

Even with such mistreatment it furnishes power to carry its owner in his "electric" silently and without trouble. If the battery be frequently and continually mistreated, however, its staying qualities are, of course, affected, the result being that, while originally it propelled an electric pleasure car from 80 to 90 miles, it will eventually run the same car only 60 miles. Such experiences quickly teach an electric vehicle owner that a little information about storage batteries will surely prove very profitable to him. In looking into the subject he finds that the rules for the care and operation of a battery are very simple and that he can easily follow them. The observance of these rules soon restores his battery to its normal condition.

Battery makers always stand ready to furnish any information of instructions that will aid a user in securing satisfactory service from a battery, and any vehicle owner who believes that the battery he owns is not giving him the best results it is capable of, should at once communicate with the maker of the battery he uses.

Electric Vehicle Statistics

According to statistics compiled by the Electric Vehicle Association of America there are over 25,000 electric passenger cars in use in the United States and over 12,000 electric commercial vehicles. Although registration figures are available for only eighteen states, and in four of these trucks and passenger cars are not segregated, these states alone have 21,083 electric passenger cars and 5,199 trucks. In four of the states there are no electric commercial cars.

An idea of the distribution of electric vehicles throughout the United States, so far as may be gained from the table of registrations appearing herewith, shows that New York, as in the case of gasoline machines, is in the lead with 7,455 passenger electric and 2,461 commercial. Pennsylvania is second with 5,000 passenger vehicles and 1,000 trucks. Ohio has 3,877 electric cars of both passenger and commercial types registered, no separate list being kept. Massachusetts has 925 passenger machines registered and 748 commercial vehicles, a somewhat surprising proportion when compared with the figures for the other states.

Waverley for Navy Yard

The Waverley Company of Indianapolis has under construction for the Navy Yard on Puget Sound, Washington, a three-ton electric shop truck with three-ton trailer for handling plates and angles from storage to machines and from machine to machine through the naval repair shop. The tractor is of unusual design in that with a wheelbase of sixty-six inches the platform of the car is five feet by eleven feet, the principal overhang being in front of the front axle. Mounted on the platform of each car is a turnable five feet two inches in diameter running on rollers and operated by hand spikes for the quick and convenient unloading of the heavy plates or beams it is designed to carry.
Proper Care of Truck Springs

Paper Read at the Detroit Truck Convention

SPRINGS take the brunt—springs are probably called upon to stand more grief and punishment than any other part of a heavy-dust truck. The variation from no load to full load is so much greater than on a pleasure vehicle, that it is worthy of attention.

Assume a three-ton truck to weigh 8,000 pounds or four tons, above the springs. When loaded a strain of seven tons is upon the springs against four tons empty, a gain of 75 per cent.

A pleasure vehicle weighing two tons is only asked to take an additional passenger weight of 1,200 pounds, or a gain of 30 per cent. These figures indicate that the truck springs must handle close to two and one half times the variation of a seven passenger pleasure vehicle.

This comparison of weight increase, due to carried load, refers to normal rated load only. In cases where overloading is practiced it is evident that the gain is greater and consequently the springs are called upon to handle even greater variations.

In most cases truck makers are attaching the rating plate in a prominent place, cautioning against loading beyond rated capacity, but we all know how these rating plates are disregarded.

Again, some truck makers allow for an overload capacity in their design beyond the advertised rated capacity, and when the spring maker is advised of such conditions he is able to accommodate the same in the spring design.

There is danger in letting it become generally known that a given truck is capable of handling a certain overload, as many truck salesmen, in order to clinch a sale, will tell the prospective customer that, while the normal rating is, say three tons, the truck is really designed to carry five tons. This is unfair to all concerned, as the customer immediately considers the vehicle as having a five-ton capacity, and will load up accordingly, occasionally even exceeding this limit. The result is self-evident; all margin of safety disappears and the ultimate life of all parts is shortened accordingly.

The next item is the solid tire of the truck that throws additional vibration upon the springs. The frame of a truck is far more rigid than that of a passenger vehicle, which throws the distortion, due to road vibrations, upon the springs of the truck.

Next, and of great importance, is the distribution of load. In a pleasure vehicle the position of the carried load is pre-determined, but on a truck the placing of the load is entirely up to the discretion of the driver.

The relation between bulk and weight of goods transported is widely variable, sometimes even in one load. The necessity of evenly distributing such a load in proportion to weight instead of volume is a point that must be observed.

Quite often there is a temptation to place a heavy casting or piece of machinery on the very rear of the platform. A little thought and analysis will show that such loading throws a complex set of strains upon the springs that cannot help but be harmful. Such a

*Chief Engineer, Perfection Spring Co.
the first place, the springs are called upon to absorb and dissipate energy, and there are only two ways in which this energy can be absorbed and dissipated,—
and both ways are in the form of friction. The two kinds of friction involved are internal and external; the internal being work done upon the molecular structure of the steel; and the other in external friction between the plates. The external friction is small and, with the present unwarranted demand for lubrication between spring plates, little reliance can be placed upon this form of absorption. This leaves the internal friction of the molecules as the only means of absorbing the desired energy. The more energy the molecular structure of steel is called upon to absorb, the sooner its power of absorption will be overcome. Therefore, it is quite evident that the larger volume of steel employed to absorb this energy, the greater will be the life of the springs. It is surely true that a certain amount of energy must be absorbed in the springs, and the more steel the more life. Hence, a reduction of steel means a reduction of life.

It also follows, where the springs are designed with sufficient steel to absorb the energy brought about by the normal rate of load with a liberal factor of safety for overload, that when the normal load is exceeded up to the overload, the factor of safety disappears; and when the load exceeds the overload capacity, the life of the springs will be reduced at an alarming rate.

It should be borne in mind at this time that springs and tires are two things on any motor vehicle which must wear out, since they are the only two items on a vehicle that are deliberately distorted in normal service. Fortunately for the truck maker (and unfortunately for the spring maker) springs do not wear out in as short a time as tires, but they ultimately must wear out. And when springs that have stood up to the mark for a considerable time begin to weaken and settle, it is time to replace the entire spring instead of having them "reset." Resetting of springs is something like retreading a pneumatic tire, or putting a pair of half soles on an old pair of shoes. It is not economical to put more rubber or leather on half of shoes where the uppers are practically worn out. We all know that retreading an old pneumatic tire is of little value as the carcass is near the end of its life; and for the same reason it is not good policy to reset an old pair of springs, as the molecular tension of the steel indicates that it is near exhaustion when the springs begin to settle, assuming the steel to be of sorbitic micro-structure after heat treatment.

Spring clips should be inspected at least once a week and tightened as much as possible. If the clips become loose, the spring will break between the clips. If there is undue stretching of the clips, the difficulty might be overcome by having new clips made of better material, as it is always cheaper to replace clips which are too light than to have broken springs as a result.

The bearing place upon which the spring rests on the axle should absolutely conform to the curvature of the spring at that point, as sufficient bearing surface is just as important as tight spring clips.

Don't employ blacksmith repairs—if a spring plate should break, it is important to have it repaired or replaced immediately by a skilled spring maker. Quite often a break in a plate occurs at a place where it does not immediately cripple the entire spring, but it is simple to understand that the breaking of one plate throws extra work upon the other plates which will break in turn. If one of the intermediate plates should break at the center bolt, the spring clip should be tightened down until it is possible to have the break repaired. Very often rebound clips are loose and broken. Missing rebound clips very often result in broken main plates.

On chain drive trucks there is always an ample allowance for adjustment to offset the stretch and wear of the chains. As the chains become stretched to a great extent, it is wise to remove an entire link and then shorten the adjustment so as to keep the spring shackles (at each end of the spring) standing at about the same angle.

A spring is a complete unit as produced by the spring maker. The removal or addition of a plate entirely disarranges the grading of the original plates, and should never be practiced under any circumstances. It is also very bad policy to replace a broken plate by any plate that happens to be of the same width as the spring. It is far more desirable to have a competent spring maker attend to the repair or replacement.

In view of the preceding, there follows a list of things to be observed in the operation and care of the truck, if there is a desire to give the springs a fair chance to offer their longest life.

RULES OF REASON.

(A) Evenly distribute load; prevent shifting of load.

(B) Do not overload beyond rated capacity. The factor of safety allowed by the maker is for the owner's protection as well as the maker's.

(C) A wheel out of round due to flat spots on a solid tire, imposes a severe and dangerous shock upon the springs. Keep the wheels round.

(D) Keep excessive side play out of shackles and hangers to minimize the lateral shock on the springs when on rough roads.

(E) Give careful attention to all parts subject to friction. Keep them amply lubricated, as an excess of grease keeps the dirt out.

(F) Take corners slowly, with or without load.

(G) Back into a curbstone or platform gently as your radius rods might buckle and throw the jolt upon the springs. In driving the front wheels against a curb or any obstruction, the shock must be taken by the springs alone.

(H) When loaded, drive gently over rough road or obstruction, remembering your frame is rigid and the springs must take the strain.

(I) Drive at moderate speeds at all times. Remember your solid tires have little resiliency.

(J) If you have to tow a car, hitch the tow-rope to the frame—not to the axle.

(K) If an accident occurs, and a spring hanger, or the frame near the hanger is bent, have it straightened at once. A spring distorted by a bent hanger is liable to break under load.

(L) When adjusting chains, remove a link when the adjust-ment would throw the shackles to a bad angle.

(M) Keep spring clips tight at all times. If a center bolt should break due to loose clips replace it at once.

(N) On a crowned road, drive as nearly in the center as possible, as driving to the right throws an extra load on the right hand springs.

(O) If a plate breaks, have it repaired by a competent spring maker at once, or the other plates will break in turn.

(P) Tighten or replace loose or broken rebound clips.

Battery Manufacturer Changes Company's Name

Because of the existence of a battery jar marketed under the name "Titan" and the fact that any battery using these jars might appear as a Titan Battery, the Titan Storage Battery Company of New York has changed its name to the General Lead Batteries Company.

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The Electric in Ambulance Service

Past and Present Methods of Motor Ambulance Service, Gas, Electric and Horse Drawn

By A. Jackson Marshall

The European war has created a great demand for better ambulances, so that one outcome is Britain’s prize offer for the best model, an offer that is drawing considerable attention to the field of ambulance service. Like the Crimean and Civil wars, this one will mark an improvement in hospital transportation, the chief importance of which lies not in ambulance in occasional wars, but in that steady civil hospital service that we have always with us. As this steady service is on the eve of being greatly influenced, a review of ambulance service as it has been and as it is now, is especially apropos.

The ambulance, which is now a familiar and essential feature of municipal welfare in times of peace, originated — and that not long ago — from the exigencies of war. The origin of the ambulance service now prevailing only dates from the last decade of the eighteenth century. Before that time, no facilities were provided for the removal of the wounded during a battle, and aid often came a day late. It seems curious that although war is as old as the world, systematized ambulancing is comparatively new. In 1792 a surgeon, Larrey, introduced a system of ambulances that was warmly supported by Napoleon I. About the same time trained stretcher-bearers were organized to carry the wounded to vehicles while battles were still in progress. Only in the last twenty years has the system been so well organized, a system to which Germany has given more attention than any other nation. The British never reached the height of the continental systems. In the Peninsula war this was the source of constant complaint. In the Crimean war, the British army was without any ambulance corps, a lack that was the focus of much bitter criticism at the time, and which led to the organization of such a service.

Ambulance service was by this time a recognized feature of armies, and in our Civil war, this service attained a very complete organization, especially from March 1864, when Congress passed an act entitled "An Act to Establish a Uniform System of Ambulances in the United States," a definite and single system of ambulance arrangement for all the armies of the United States in field. From this organization grew that of the present day city emergency service, which dates from 1869 when Dr. Edward B. Dalton inaugurated the work at the Bellevue Hospital in New York City. Dr. Dalton had been in charge of the field ambulance corps of the Army of the Potomac during the Civil war, and when he was requested to submit a plan of ambulance operation for New York, he was guided largely by his battlefield experience. The methods installed then have served practically unchanged during the forty odd years since; in fact, they have served as a pattern.

It was not until ten years after this installation in...
New York that the British Ambulance Association of St. John of Jerusalem founded a similar system in England for the purpose of emergency relief in city accidents, with corps in all the large towns and also in Canada, Australia, and India, all under the central control of the mother association. In the United States, however, each city operates its ambulance service independently. This is worked out in several ways; in Boston by the police, in others—notably New York—by the hospitals, while Chicago boasts an admirable municipal control.

In its early day, the ambulance corps of an army consisted of four types of service, hand-carried stretchers, wheeled stretchers, mule stretchers, and horse-drawn vehicles, the models of which passed through many evolutions. With the increased range of guns, and the rapidity of army movements, the ambulance underwent a change to adapt it to the necessity of accompanying regiments which had acquired speedier means of transport. To fill this need, the motor was applied to the ambulance so that in the field today, the ambulance service is almost entirely made up of automobiles.

The types of gasoline driven cars employed by the various armies are now familiar from pictorial weeklies and Sunday newspapers. Not so familiar is the ambulance of peace. The horse-drawn vehicle has always been popular and will continue to be relied upon in blizzard service and in other emergencies when the motor is not dependable. But aside from these exigencies the motor car is the accepted type of modern ambulance. In an edition of the Encyclopedia Britannica for 1902 there are pictured various types of English ambulances—all horse-drawn—while the only illustration of an American ambulance is an electric of the New York Hospital.

It is said that the British army finds a serious impediment to the perfection of the army ambulance service in the high cost of maintenance in time of peace. It is interesting to examine the ambulance system which is intended to exist through the time of peace, that is, the municipal system. Probably the best example of this is found in New York City where ambulances bring emergency relief to more than 100,000 sick and injured every year, rendering a service that is not equalled in this country, and it is doubtful whether under normal conditions, it is surpassed in continental Europe.

This emergency system operates under the supervision of the Board of Ambulance Service which consists of the police commissioner as president, the charities commissioner as secretary, the president of Bellevue and Allied Hospitals, and two members appointed by the mayor. The board was authorized by the state Legislature in 1909 and the effect of its supervision on a service that heretofore had been run rather carelessly and with no responsible head, at once made a very apparent improvement. This result is because of a stricter supervision of methods employed and to the assignment of fixed routes to each hospital, in order to cover the ground most efficiently, and to avoid duplicating the same service.

An important article by Norman Maul on ambulance service for metropolitan hospitals appears in the January and February 1915 issues of the Modern Hospital to which credit is due for data here. This article states that the first auto ambulance was placed on service about 14 years ago. Today 51 of the 102 ambulances in New York are motors. Horses have been found indispensable, but gas and electric vehicles are steadily coming more and more into use. An example of the division of work is seen in the schedule for Bellevue's equipment. Here there are fourteen horses, three gasoline cars and four electrics which in 1912 answered 11,700 calls. The horses are held in reserve, the gasoline cars make long runs, and the electrics take first calls, answering probably half the total calls daily and operating chiefly in the immediate neighborhood. Bellevue is the parent of three other hospitals; Gouverneur on the lower East Side, Harlem up-town, and Fordham in the Bronx. Gouverneur and Harlem serve typical city districts with congested streets, good pavements, and short runs. Gouverneur uses two electrics and two horse vehicles and in 1912 these answered 6,870 calls. Harlem with one electric and three horses had 7,992 calls. Fordham operates through the outlying districts of the Bronx where there are wide roads, little traffic and fast runs often of five miles or more. It therefore uses a gas car and a steamer which in 1912 responded to 3,768 calls.

The New York Hospital has seven auto ambulances, all electrics, one of which has some interesting records. In the Triangle Shirt Factory fire it carried eight patients at one trip to the hospital half a mile off, and on another occasion it made a 50 mile trip to a hospital beyond the city limits on a stormy day with mud in some places up to the hubs. Only an hour's boost was necessary to get the car home. The House of Relief, the down-town branch of the New York Hospital, has one electric and two horse drawn ambulances. Evident satisfaction in the electric appears from a report of the superintendent, Dr. Thomas Howell, who concludes: "We find the electric vehicle much more satisfactory than the horse-drawn ones, especially during the hot weather. During one hot day about 80 calls were answered, and the electric ambulance responded to those with the longest radius, answer 30 calls in 24 hours." Such experience, coupled with the important item of economical running cost led this hospital to keep adding to its electric equipment, the latest installation being 2 new electrics which began work last fall.

In contrast to this is the costly operation of ambulances at the Polyclinic. This hospital operates
three high powered gas cars. One has a speed of 55 miles an hour, and another is capable of 48. They handle about 4,711 calls a year. These cars cost $8,000 and during their first year of operation cost $17,459.82. This includes more than a thousand dollars for liability insurance, $2,900 for repairs, about $900 for gasoline, oil, and sundries. It does not include depreciation which the hospital officials, judging from one year’s experience, think would be about 30 per cent.

The oldest motor ambulance still on service is an electric belonging to Mt. Sinai Hospital, and although it is not now on emergency duty, it is interesting on account of its age. It was presented to the hospital twelve years ago, costing the donor at that time, $3,000. Used exclusively for transfer of private patients, it averages 300 calls a year. The annual operating cost varies between $600 and $700 in the years when no extensive repairs are made to $1,600 or $1,800 in years when it is thoroughly overhauled and new batteries supplied.

The powerful gas car with its capacity for high and long continued speed is well known, but every one is not so familiar with the electric. Those who have supposed that the electric is merely a slow-coach for nervous old ladies, may be surprised to learn of its extensive use in ambulance service, so that perhaps it is worth while mentioning briefly some of the characteristics of the less-known type.

The electric can make as good time on city routes as a gas car, and an unlimited mileage is assured by restoring the batteries whenever the car comes in from a run and is waiting for the next call. It is essentially the car for use in congested streets because of its simplicity of operation and ease of control. It starts and stops without lurch or jar and runs without noise or vibration, which makes it particularly well fitted for ambulance service. It is distinguished by its quietness and cleanliness and as a general rule can be operated more cheaply than any other vehicle. The electric is particularly good for service through crowded streets but it is not a rival of the high powered gas car, since each ambulance type has its own best field: the horse is indispensable as a reserve force; the gas car has its field for army service and long distance runs; and the electric is best fitted for city use.

**Electric Vehicles**

**Electrics at Boston Auto Show**

Mechanics Building was again chosen as headquarters for the Boston automobile show which opened March 6 and continued through the week with an exhibition of both passenger and commercial vehicles. Passenger electrics and commercial trucks, while not shown in so great numbers as in former shows attracted considerable attention and developed many new prospects especially for the commercial type.

The exhibition halls were well decorated and illuminated by a unique arrangement of many colored electric lamps in clusters and festoons. Two orchestras played popular airs and the entire exhibition was well up to the standard of this year’s national shows both in attendance and enthusiasm.

Exhibits of electric vehicles and accessories were as follows:

**Anderson Electric Car Company,** Detroit, showed three models, two four-passenger broughams, and a model 50 cabriolet; vehicles equipped with Thin-plate Philadelphia batteries, assembled at the Anderson factory.

**J. W. Bowman Company,** Boston, exhibited a four-passenger brougham, one of the silent Waverley models.

**Rauch & Lang Carriage Company,** Boston, showed a model B-5 four-passenger brougham, worm drive, with wire wheels.

**E. Y. Stimpson,** Boston, representing the Milburn electric, had on exhibition a four-passenger coupe, a two-passenger roadster and a light delivery wagon, all equipped with Philadelphia batteries. The Milburn car was seen for the first time in Boston. Its lightness and low cost are talking features. It weighs about a ton less than other cars and sells at $1,200. For two years the Milburn Wagon Company, of Toledo, has been experimenting on a car which can be produced at low cost and yet combines beauty, speed and comfort. The body is of the full streamline type and is hung low on four cantilever springs. The wheelbase is 100 inches, giving space for a roomy body.

**Andover Motor Vehicle Company,** Andover, Mass., showed a one-ton contractors’ wagon equipped with Edison battery. Features were the height of battery, which is divided into four parts, of 12 cells each, suspended two feet from the ground, on steel frame hinged to the chassis. By removing the casing on either side of the vehicle, each battery section can be swung out and the cells made accessible in a minute’s time. The company claims 40 to 70 miles a day on a single charge, with a speed of 12 to 14 miles per hour. A novel entrance to the driver’s cab by a door in the front, gives economy of space and enables the weight of load to rest evenly on the wheels.

**General Vehicle Company,** Day Baker, New England manager, showed a 1,000-pound truck chassis, noteworthy for high speed through its worm drive. When the brake is applied the power is automatically shut off. When the switch is thrown to the neutral point the brake is locked and the car cannot be tampered with when left standing. A second chassis was exhibited for a two-ton chain-drive truck.

**New York City Has New Electric Garage**

In order to fill the need for a garage with facilities for taking care of electric passenger vehicles in New York City, Wright’s Garage, Inc., 158th street and Riverside Drive, has been equipped with charging apparatus for giving complete service.

The number of vehicles of this type in the Washington Heights section of the city has been increasing rapidly during the past few years and Earl D. Wright expects to care for a large number of the popular electric broughams and runabouts in the near future.

The United Electric Light and Power Company serving light and power on the Heights as well as throughout the Borough of Manhattan is interested in this recent development and prophesies a big future for the electric vehicle for passenger and commercial purposes.

**Rules of the Road**

The Chicago section of the Electric Vehicle Association is preparing to send to all users of electric passenger cars in that city a pamphlet abstracting the more common traffic rules formulated by the police department. Suggestions will also be offered for the proper operation of electric vehicles, and particular emphasis is to be laid on the point that slow-moving vehicles should keep to the side of the roadway, surrendering the crown of the pavement to faster traffic. D. C. Arlington has the preparation of the booklet in charge.
Chicago Electric Garage Owners Meet

Electric Vehicle Manufacturers and Garage Owners Celebrate Association Anniversary

ELECTRIC garage owners and electric vehicle dealers in Chicago have participated in many banquets and entertainments under the auspices of various allied electrical associations, but those who attended the First Birthday Anniversary of the Electric Garage Owners' Association, held at the Lexington Hotel March 12, mutually agreed that this was the most successful "get together" assembly of electric vehicle and garage interests ever promoted.

Practically all the owners of exclusively electric garages were in attendance, and of further interest, every electric vehicle manufacturer was represented by its local representative. Business competition was entirely forgotten. Stories, toasts, songs and a talk from all of the "lights" in the industry created a degree of enthusiasm practically unknown in previous garage association meetings—especially those under the auspices of the Chicago Garage Owners' Association, Chicago's gas-electric garage organization.

Electric vehicle and garage interests seem to have come to a unanimous decision that in order to secure the greatest success for the electric in Chicago, vehicle representatives and exclusive electric garage owners must band together as an individual association and devote their entire efforts exclusively in behalf of the electric vehicle. And this is but the natural outcome when it is remembered that the very first garage owners' association was formed at the instance of Chicago electric vehicle men, this association later being controlled by the greater gas car membership who naturally gave but little interest to the battery propelled type.

As the guests were seated before the banquet table, luxuriantly decorated with lilies and carnations, President Lille asked for a motion to suspend the regular business meeting of the association and to proceed with the banquet. This carried, the first course of an excellent dinner was served while the diners sang songs under the leadership of that "popular comedian" Lou Wagner.

It was generally admitted that the dinner was the "best ever" and competition from "Hollywood" celery to "Volkhar" blend was about evenly balanced among the courses.

Applications for membership were next read and the following applicants elected: Gail Reed, sales manager, Walker (Chicago) Electric; John Buck, McDuffee Company and Mr. Barnes of the Philadelphia Storage Battery Company.

President Lille then appointed Lou Wagner as toastmaster and indeed "some" toastmaster he made.

The toastmaster first called upon Attorney Potter who delivered an excellent address on the reason of the association and its relation to the Chicago Garage Owners' Association.

The three newly elected members then presented their reasons for inclining their interests in the association after which Roy Herrington was chosen by the toastmaster as probably the "best fellow" in the electric vehicle selling game. Mr. Herrington in his characteristic modesty responded to the toastmaster's invitation to speak to the guests, with an optimistic talk on the future of the association and its members.

Announcement of the electric vehicle salon to be held in Chicago some time in May was next made and all electric vehicle interests seemed particularly enthusiastic over this new issue.

Toastmaster Wagner next commented on the value, the co-operative spirit, and the necessity of ELECTRIC VEHICLES magazine in this field after which the editor offered a few short remarks in prediction of the success of the association, as an exclusively electric garage men's organization.

Songs by the guests followed; quartets including such famous songsters as Messrs. Rudd, Jones, Ross, Sollin and D. E. Whipple competed for the favor of the remaining guests and indeed the local vaudeville houses never could have furnished such merriment.

Pretty cabaret singers, a regular whistler, and a moaning ragtime violinist furnished splendid entertainment. And what's more everyone took home the memories of at least ten good stories from that famous toastmaster Lou Wagner with his inexhaustible supply of new ones.

Never in the annals of the electric vehicle industry have electric vehicle manufacturers and garage interests met on such an equal basis of understanding. Although not the slightest suggestion of business was discussed from any angle, still all those present were sincere in the belief that this rejuvenated society was an absolute necessity and as such, should be supported by all those connected with the industry. It is not the intention of this organization to function on a competitive spirit toward other Chicago garage associations but on the contrary to promote electric vehicle interests exclusively and co-operate in all matters of common interest to the motor vehicle industry in general.

Pittsburg Has Milburn Representative

Among the surprises at the Pittsburg automobile show was the appearance of the Milburn light electric, for which Rodney S. Pullen, one of the oldest and best known electric men in Pittsburg, Pa., has taken the agency, with headquarters at 2212 Spring Garden street, trading as the Milburn Electric Car Company.

Mr. Pullen has for a number of years been connected with the Baker electric.
The Electric a Man's Car

The Utility of the Electric Offering Speed, Mileage, Economy and Constant Service

By D. E. Whipple

The American business man is no longer a mere automobile buyer who may be influenced this way or that by the sales talk of an automobile salesman. This same business man who a few years ago was helpless so far as being able to wisely determine the merits of various automobile types, is today keen not only on car construction but also on the type of car to purchase for the particular work it has to do.

So it is only a logical sequence that as business men study the automobile situation in its relation to their daily transportation requirements, they more and more favor the electric car of today.

The effeminately designed car of several years ago with its dainty trimmings, short mileage radius, and slow speed, naturally could not have filled the demands of the hustling, impatient-of-delays American business man. But the American business man's characteristics which prevented his buying an electric car of the old type, are now prompting him to buy the electric car of today.

The appearance of the 1915 electric cabriolet roadster model is worthy of approval by the reddest of our red bloods. Every line of its low hung body bespeaks speed, efficiency, and power. In performance the new roadster models have proven their practicability beyond a doubt.

Many men who in the past have more or less patiently put up with the delays occasioned by one of the thousand sources of trouble in the gasoline car, especially in cold weather, have learned that they have been carrying an unnecessary burden.

Sales reports of the Anderson Electric Company, builders of "Detroit" electrics, including the cabriolet roadster, shows that the sale of its cars to men for their own use have increased more than 200 per cent since the snappy appearing, fast and sturdy men's models have been offered for sale. Much of the electric car advertising in the past has been devoted to promoting the electric car exclusively for women. True it was that the characteristics of the electric car of the early days were somewhat effeminate, but this situation has changed.

Business men find the electric roadster or cabriolet models of today ideal in appearance, simplicity of operation—low upkeep cost—availability for immediate use at all times of day or night, continuous satisfactory performance in winter as well as summer, and flexibility in crowded traffic. Aside from these characteristics which may be secured in the electrically propelled vehicle only, a demonstration will prove to the most skeptical that ample speed and mileage is offered.

It is amusing to stand in the sales room of one of the progressive electric car manufacturers and listen to the conversation between a prominent business man of the city and the salesman who has just given the somewhat doubting gentleman a fifty-mile spin in an electric. The conversation usually winds up about as follows:

"That ride was certainly a surprise to me. It is a wonderful little car. I can not believe that I have been fussing with that big gas car when it was possible for me to secure such an excellent little proposition as this. To tell the truth, I did not know that electric cars had advanced so far. I will take this roadster with the wire wheels. It is surely a little beauty."

The national automobile shows have presented exceptionally good evidence of the interest which men are evincing in the battery propelled type.

In previous years electric vehicle exhibits were constantly visited by women. The prospective admirer was usually the wife or daughter; rarely the man. In many instances elderly men interested in the simplicity of control and the weather proof characteristics of the enclosed coupe, purchased purely because they believed that this particular type would satisfy their demands. Until recently manufacturers catered to this class of purchaser and instructed their publicity departments to carry this message to the public.

Without any doubt this had a tremendous effect in branding the electric inferior to the ambitions of the average man.

However, electric vehicle manufacturers have developed their cars to such a state of perfection that in this late day the very mechanical features, representing long life, continuous service and economical operation permitting satisfactory speed and mileage have practically demanded the attention of those men interested not only in the beauty of the vehicle but in the operation and expense of maintenance.

Many instances have arisen where both a gas car and an electric were used in the same family, constant trouble and expense for repairs, etc., including time lost, often forcing the husband or brother to use the electric. In practically every instance the constant "ready to run" electric converts such motor car drivers exclusively to the use of the electric, and the gas car is disposed of.

Then again, where the electric was considered ideal primarily for women shoppers, men have practically adopted it for social calls. The very fact that the driver of an electric car keeps immaculately clean and comes and goes at his own option are self-convincing reasons why the electric is bound to become a man's car.
Electric Vehicle Association Men Hold Dinner

Officers and Directors Banquet Past President Frank W. Smith

The officers and directors of the Electric Vehicle Association of America gave a dinner at Delmonico's, February 15, to their past-president, Frank W. Smith, in appreciation of the tremendous amount of work which he accomplished during his term.

This association is an example of the spirit of cooperation which characterizes industrial organization today. The association has just completed its most progressive year under the administration of Frank W. Smith.

The dinner, a surprise to Mr. Smith, began at 8 p.m. and at its conclusion an address was made by John F. Gilchrist, of the Commonwealth Edison Company, Chicago, who succeeds Mr. Smith as president. During this address a series of lantern slides illustrating Mr. Smith at different stages of his life were flashed up. After his response to this, Mr. Smith was handed a letter from Thomas A. Edison regretting his absence from the dinner, and a copy of this letter was projected upon the screen amid great applause.

Two addresses followed, by James H. McGraw and J. W. Lieb, who spoke on the relation of the central station to electric vehicle development.

The more serious side of the affair was then ended and the rest of the evening was given over to laughter, which was started by stereopticon views of some very clever cartoons and caricatures of Mr. Smith, followed by a standing toast.

Among those present were the following gentlemen, with guests:

Electric and Gasoline Vehicle Competition

A Discussion of the Practicability of Both Types Which Demand Competition in Sales

IT has been repeatedly said that there is no real competition between gasoline and electric motor trucks. While this is true to a very large extent some competitive problems do arise which should be carefully considered and discussed.

Some companies manufacture a long line of both gasoline and electric trucks. They do not do so because there are two distinct fields, but rather because they recognize the fact that both types of vehicles are necessary to meet the varying requirements of different classes of business.

Motor truckmen, I think, agree that in frequent short haul city and suburban work nothing is superior to the modern, well designed electric truck. On the other hand, it is conceded that for long distance work the gasoline truck usually excels. On this theory the belief has grown up that there was a definite line between the fields of electric and gasoline trucks. However, in actual practice there is what might be termed a zone of service wherein the two lines compete, just as a 2-ton gasoline truck may be competition for a 1-ton or 1½-ton gasoline truck.

In other words, many situations arise where the wisdom of applying gasoline or electric trucks for a given work is, to a considerable extent, at least debatable.

The electric enthusiast may be able to put up an excellent case in favor of his truck. The gasoline man, on the other hand, may be able to put up an argument equally as plausible. And in such a case the problem must be approached with utmost fairness and impartiality in order that a decision may be reached best for the man who is to buy the truck and pay the bills.

We must always keep in mind the user—the man who is to be the customer. We must satisfy him first and we must make our recommendation conscientiously so that there will be no question that he will be absolutely satisfied during the life of his investment.

This naturally leads us to the question, "What should the determining factors be where it is agreed that either gasoline or electric trucks could do the work?" We agree that there is no conflict where one truck or the other is obviously best. The question is, "Which type should be recommended when either can do the work?"

In considering this point let us assume that there is available a sufficient and convenient supply of cur-

rent at a fair price. Let us assume, too, that road conditions are favorable to the electric truck. The question then resolves itself into one of investment and running expense.

I believe that no one will disagree that for continuous service over a term of years the electric truck cost less to maintain than the gasoline type. This fact results naturally from the nature of the truck itself.

The electric motor with only one rotating part will naturally require less upkeep expense than the internal combustion engine with its multiplicity of reciprocating parts. If we are aiming to give a customer maximum miles for minimum dollars over a period of years, we cannot go far wrong if we go on record strongly in favor of the electric truck.

As against this advantage of lower upkeep there could be placed the disadvantage, at least from a sales standpoint, of the greater first cost of the average electric truck and the possible inconvenience of charging in some classes of service.

In the case of the first objection, this can often be met by so arranging the facts before a purchaser that he forms a conception of the cost of operating his truck during each year of its life. Viewed from this angle, the electric truck is often considerably less expensive than would be a gasoline truck of the same capacity which costs less to buy in the first place. Of course, with some business houses the first cost is a major consideration, and when it is, the argument of the lower annual cost of the electric is difficult to impress.

In the case where the possible inconvenience of charging is advanced as an objection it might be overcome by the fact that the actual running time of the vehicle is rarely such that a sufficient number of hours in the 24 are not available for proper charging. It is then merely a matter of getting down to "brass tacks" with the customer in figuring out his actual needs and determining the free hours which can be used in giving the battery the proper attention which is required to keep it constantly in operation.

We—who are interested in the electric vehicle—have often wondered why, with its very many advantages, it has not been adopted by business institutions in greater numbers. There are many influences which have worked against the electric vehicle, and I think a consideration of some of them brings us to some definite steps we can take to promote the electric vehicle cause in this country and which if promoted will hasten the adoption of this type.

*Read before the Detroit Motor Truck Convention.
In the first place, the large volume of publicity of every nature in favor of the gasoline passenger car has undoubtedly indirectly benefitted the gasoline truck. Among other things, it has educated the public chiefly on the gasoline motor and has made it possible for exclusive advocates of gasoline trucks to make greater progress than they otherwise would have enjoyed.

It is not difficult to talk to a man about something with which he is already fairly familiar. The gasoline truck salesman has often made great strides on this account. For the same reason gas trucks have been more popular with drivers than electrically propelled trucks, and this popularity had a decided influence on sales.

Owing to the greater familiarity on the part of the public at large with the gasoline motor, many time honored objections to the electric have grown up, largely through ignorance of the actual capabilities of the electric machines.

It has been said that the electric quickly ran out of juice and that gasoline was quickly obtainable anywhere. Many objections have also been made to the electric storage battery, and many have seen fit to judge the modern, highly efficient batteries of to-day by the antiquated apparatus of a good many years ago.

One of the reasons for this is that in the earlier days the battery salesmen were not as cautious as they might have been in selling installations which were fitted to the vehicle or its work. There have been any number of cases where the wrong battery has been sold on account of the buyer dickering with the salesman for a price—the salesman figuring that he “put it over” by selling a lower capacity battery. As a result the electric truck industry suffered accordingly.

The battery equipment necessary to an electric truck has also offered considerable sales-resistance owing to its weight, the thought being conveyed to the prospective buyer that increased weight means increased upkeep expense on tires, chassis and the vehicle proper. The argument has often been used, “Why carry this unnecessary weight on a 1-ton job, etc.?" Popular notions as to the high price of batteries has also led to the elimination of the electric in the minds of many possible truck buyers.

I express this belief as a result of actual conversations with many business men who have bought trucks, I find that they have preconceived ideas which are very difficult indeed to get around, and of course it is not easy for the layman to understand why the price of a battery for some trucks is almost equal to the cost of the rest of the entire job, which includes motor, frame, control, wheels, tires, etc.

This is not to criticize battery cost, simply to bring up some obstacles which have been encountered in the sale of electric trucks. These we should be prepared to meet in our talk with the public regarding electric vehicles generally. Specifically, every man interested directly and indirectly in the sale of electric trucks, or electric cars, should be prepared to intelligently discuss these matters with men actually interested or casual acquaintances who might bring up the subject.

The strength and power of word of mouth advertising is unquestionable, and if we are all prepared to pass the right word along, we will be surprised at what it will do to remove some popular misrepresentations which are undoubtedly obstacles to our greater success.

If we are to successfully compete against the large volume of publicity and the word of mouth advertising which the gasoline vehicle is constantly getting we must all put our shoulders to the wheel and be prepared to do our share, even with men who are casually interested in the subject. We can never tell when a word dropped here or there may be the unknown influence which makes or breaks a sale.

Even the prospect who wants to buy an electric truck wants to feel confident that the matter of charging can be handled conveniently and without trouble. He must be assured that he can patronize some nearby station with charging facilities, or that he can without great expense install a charging apparatus on his own premises. Considering the situation locally, there are many parts of the city in which there are no facilities for public charging.

It is rather unfortunate that there seems to be such a diversity of opinion as to the suitable charging equipment required. Some well informed electrical men will advocate one type of apparatus and others, equally well informed, will maintain that some other equipment should be used. From the array of facts which the truck salesman or manufacturer has before him, it is difficult to draw a concrete, distinct, simple recommendation which can be made to a prospect.

If it is hard for the manufacturer or his salesman to decide just what equipment is needed for a certain installation, after having received recommendations from several reputable houses, what chance has the prospective buyer of forming an opinion on this subject? I refer particularly to the instances where the truck salesmen leave it up to the prospective buyer to decide just what installation he should purchase. This condition, which has been general, should receive careful study with a view of arriving at some standard method of charging and a uniform plan of presenting the subject of the apparatus to the buyer.

Somewhat related to this matter of charging and charging apparatus is the thought in the minds of some prospective buyers that there is something mysterious or unknown in the use of electric vehicles. They seem inclined to feel that by adopting the electric they are about to tackle a mechanism which is entirely beyond them. Right here is where the advertising and publicity in support of the gasoline type has removed it from this round of the unknown.

Another time-honored objection to the electric type is its claim—lack of flexibility. That is to say many users seem to value the feeling that they can take their gasoline truck which has run all day, and, in an emergency, fill up the gasoline tank and run the greater part of the night. We all know that in actual practice a truck is very seldom used in this way.

I believe we should all seek to convince the logical user of an electric truck that any advantage he might derive from the added flexibility of the gasoline type would be more than made up by the economy of
the electric in his service. The claimed advantage of flexibility for the gasoline type has been supported by the knowledge of the greater speed of the gasoline machine.

As a matter of fact, while the gasoline truck in the main is a speeder than an electric of the same capacity, it is true that the effective traffic speed of a truck, whether gasoline or electric, cannot be forced above a well determined point.

In other words, in city work a truck of a certain capacity can go about so fast and no faster, whether it be propelled by gasoline or electric power. This is true, first, because of traffic conditions, and, second, because of practical considerations in handling the machine itself.

Force the speed of a 5-ton gasoline truck, for instance, above ten miles per hour and you have greatly increased all operating expenses. This is true of motor trucks or power developing mechanism. Doubling the speed quadruples the operating expenses.

Owing to its very nature the gasoline machine has a larger radius of action than the electric. That is to say it can be driven farther in a day, if necessary, than the electric. Motz has an electric and a gasoline city and suburban truck service, however, the average number of miles covered does not exceed the mileage capacity of a modern efficient storage battery.

The points which favor the electric are many. Wherever an electric truck will do the work, it is the type to use irrespective of any consideration which might be given the gasoline truck.

In the first place, the maintenance and running expense of the electric is unquestionably lower than that of a gasoline truck in like service. It is quiet, efficient and always reliable, and it is generally agreed that reliability and service are two of the biggest factors in favor of motor trucks.

It is also true that the electric, because of its simplicity of operation, can be more readily handled by the ordinary driver. A skilled mechanic is not necessary to handle it. In fact, the entire care of an electric truck requires no skilled labor except in keeping the battery in good condition. The battery man must know exactly what he is doing. He must be thoroughly experienced, capable and on to his job.

It is a known fact that an electric truck will stand still cheaper than a horse or a gasoline truck. It will also travel 50 miles a day at less cost than either horses or gasoline trucks and its life is much greater than that of either the horse or gasoline truck. Why, then should not the electric vehicle dominate the truck industry.

Electric Tests at Indianapolis

On July 1 a contract is to be let by the post-office officials for the transportation of mail in Indianapolis, and a series of experiments is being conducted with electric delivery wagons, the outcome of which will be watched with interest by electric car users in Rochester, N. Y. The experiment is being conducted with a view to determining whether it would be cheaper to own or rent electric trucks and how far truck service should be extended into congested districts. The Indianapolis post-office is using three electric delivery wagons manufactured by a concern in Connorsville, Ind., in making the experiments. It is expected that the data also will be of value to the post-office department at Washington and to many other cities confronted by volumes of mail delivery.

Electric Patrol for Boston

The police of Boston are being assisted in the work of keeping the city streets free from drunks and crooks by means of an up-to-date electric appliance. It is nothing less than an up-to-the minute electric patrol wagon.

This vehicle, which was designed and installed at Station 4, under the direction of Day Baker, who is always providing surprises in electric vehicle transportation, is the smartest looking hurry-up wagon in the Boston department.

The chassis is one of the new G. V. worm driven design, with the battery under the hood, which is of the Renault type. The motor, controller and all electrical apparatus are located under the seat. The brake-levers are so arranged that when the brakes are applied, the controller immediately moves into the neutral point and cannot again be put on until the brakes are released.

The body of the vehicle is eight feet long by five feet wide and six feet high, swung-up seats, interior electric lights are handily arranged.

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A test run showed a speed of 23 1/2 miles per hour. The wagon is very handily operated through the heavy traffic. The celerity with which the wagon leaves the house when an alarm comes in is one of its great features. Within 20 seconds from the completion of the alarm, sees the electric on the street, hurrying to make an arrest or in case of accident, carrying officers to aid in rescue.

Some of the regular patrons of our city's police protection and island hotel, have already remarked on the up-to-dateness of the wagon provided to hustle them to the station house.

This machine has now answered as high as 39 calls a day, and this was during the time that the streets were in the worst possible condition from snow and slush.

Goodyear Retains Motz Salesmen

Since the Goodyear Tire and Rubber Company, Akron, O., has taken over the sale of Motz cushion tires, there has been considerable speculation as to the future activities of salesmen widely known in the trade under the former Motz organization. The following Motz salesmen have become members of the regular sales force, specializing on Motz tires: J. V. Harding, H. E. Harding, E. F. Thompson and F. B. Heese.
Why the Milburn is Designed for Twenty Cells

Mileage and Speed Dependent on Energy Delivered to Rear Wheels Not on Number of Cells

O PINION apparently prevails that the mileage or speed of an electric car is dependent upon the number of cells. A little consideration would show that mileage and speed of a given car are entirely dependent upon the amount of energy delivered to the rear wheels. It is quite apparent, therefore, that a battery having 40 cells with a capacity of eight kilowatts cannot drive a given car farther than a 20-cell battery having the same capacity.

The argument that the 20-cell battery is not as efficient as the 40-cell battery is incorrect. As practically the same motor efficiency can be obtained on a 40-volt motor as can be obtained on an 80-volt motor, with correct design in both cases. Also, by proper wiring, it is possible to deliver practically the same percentage of the battery capacity of a 20-cell battery to the motor as with a 40-cell battery; thus, the Milburn Light Electric delivers 90.3 per cent of the battery energy to the motor, which is as good as any 40-cell car in operation.

The selection of battery equipment for a given car is governed by the following factors:

First, initial cost; second, weight; third efficiency of car operation; fourth, facilities for charging; fifth, maintenance and renewal cost.

No selection can meet perfectly all of these conditions; thus, as Thomas Edison has justly said: "A single cell battery has the lowest initial cost, the lowest weight for a given capacity and the lowest renewal cost." It is impossible, however, to obtain electric motors operating efficiently on the voltage of one cell, and in addition, the standard garage equipment in this country is such that it would not be an economical charging proposition. The ideal selection for charging has been up to this time 40 or 42-cell battery, inasmuch as practically all direct current supply lines and motor generator sets are at present designed for 110 volts and the tendency has, therefore, in the last few years, been for electric manufacturers to adopt this number of cells as standard for that reason. Recent developments in charging apparatus, however, have rendered it possible to make economical installations which will charge 20 or 21 cells as efficiently as 42 cells.

The three conditions met in charging are: first, private owners; second, garages already having equipment with 110 volt direct current supply and third, garages having no direct current supply. For private owners, very low priced motor generator sets are at present on sale, which will charge either 40 or 20 cells with practically the same degree of efficiency. For garages having 110 volt direct current supply and equipped for 40-cell charging only, small balancer unit can be installed at an approximate cost of $150 to $200, which will split the 110-volt direct current into two 55-volt lines, thus making it possible to charge 20 cell batteries at exactly the same efficiency at 40-cell batteries.

For new installation in garages not having direct current, alternating current motor generator sets are at present on sale, which consist of one alternating current motor and two 55-volt motor generators. This outfit will charge either 20-cell batteries, without loss from one generator, or 40-cell batteries from the two generators in series, with equal efficiency in both cases. Also the initial cost in both cases is even less than the single generator at present being installed for 110-volt direct current output. It can be seen, therefore, that standard equipment now on the market makes it possible in every case to secure the same efficiency in charging 20-cell batteries as was previously obtained with 40-cell battery. It should be noted in this connection that increasing the number of cells beyond 21 or possibly 22 makes it impossible to utilize this balancing arrangement and that with a car of 24 cells it is still necessary to charge from 110-volt circuit with rheostatic control.

Thus, material saving in the first cost, in weight, and in renewal price can be obtained by using 20-cell battery. In the Milburn Light Electric, with the optional equipment of 20-17 plate batteries, the battery weight, complete with trays, is approximately 750 pounds. The weight of 40 cells 9 plate battery, which gives exactly the same capacity, is 800 pounds, showing 50 pounds saving in weight due to selection of battery alone.

The saving in initial cost to the customer of the 20-cell battery over the 40-cell battery is approximately $75. The saving in renewals on the 20-cell battery over the 40-cell battery amounts to over $30 per year as long as the 20-cell battery has another advantage inasmuch as there are only one-half the number of cells to be given attention, and better battery operation and life are obtained with a given amount of attention.

Twenty cells with a normal output of 8,160 watt hours complete with trays, etc., will weigh approximately 750 pounds, while a battery of forty cells, which has the same watt hour capacity, will weigh about 800 pounds.

Thus, in the light electric 50 pounds total weight is saved merely due to battery selection.

The cost of a complete renewal of the twenty-cell battery is about $160, while to make the same kind of a renewal of forty-cell battery, which, as stated, has the same energy capacity, would cost approximately $200.

The 20-cell battery offers many advantages and has really proven its ability.

*Chief engineer, Milburn Electric.
ELECTRIC VEHICLES

A REAL ELECTRIC GARAGE ASSOCIATION

Electric vehicle and electric garage interests are giving serious attention to a recently organized society known as the Electric Garage Owners' Association of Chicago, which from the start seemed to furnish the connecting link of co-operation between these so closely allied industries.

Although this association was at first commonly regarded as "something else again" in the vehicle game, pioneers in the industry will remember that the promoters of this organization were the same that promoted the first garage association in Chicago, later monopolized and controlled by gas car interests.

Electric Vehicles has long felt the necessity of an exclusively electric garage association, not only in Chicago but including every electric vehicle center in the country. The existence of such an association is essential. It binds electric vehicle manufacturing and electric garaging interests to each other on a common footing. It offers them an opportunity to get together and thrust out policies now in operation—many of which unfortunately injure the industry as a whole—and new policies of mutual benefit to both interests.

Further, the new organization being composed purely of electric vehicle interests, will devote untiring efforts exclusively to advancing electric vehicle sales and satisfactory garage service.

No other Chicago garage association has ever offered even fifty per cent of its efforts in behalf of the electric.

In this late day of newly developed methods of competition the electric vehicle industry really needs, and needs badly, an association to assist it in gathering together the loose ends of co-operation. One of the new conditions to be considered is that certain gas car manufacturers are discouraging sales of electrics by offering gas coupe cars very closely resembling the electric coupe in design and in many cases soliciting present owners to trade their electrics in for gas car types. Since gas car competition offers such a serious menace, it is hardly natural that electric vehicle interests wish to retain their membership in a society which is controlled by those employing such radical, not to say vicious, methods of competition.

In view of protecting such interests, which can be done only by banding together, the new society extends an invitation to all electric vehicle garage men to assist in this co-operation by becoming active members.

Electric Vehicles, the only exclusively electric vehicle publication in the field, has quite naturally been asked to assist in this effort, and in consequence will publish the association's official reports and all matters of importance to its members.

The success which the association has already achieved was splendidly shown in its anniversary banquet held on March 12. Practically every electric vehicle dealer and exclusive electric garage interest was present and all were unanimous in the assurance that the association would secure their sincerest support.

And it is surely a pleasure to find that the "wolf in lamb's disguise" has been uncovered and competition opened to an equally prepared and fortified effort.

With the assistance of an exclusively electric vehicle publication, it is expected that this new association will take immediate steps in impressing upon the minds of the public the real strength of this industry.
ELECTRIC VEHICLES

CO-OPERATION with the Gas Car

Co-operation is a fine word, and inspires splendid altruistic thoughts. The best part of it is its practical nature, which makes its application benefit both parties without costing anybody anything. But co-operation that is all on one side—where the second party fails to co-operate—is a joke.

Electric vehicle men have said a great deal about dividing the field with the gas car in proper proportion. They talk of co-operating with gas car men; and they even go so far in some cases as to give the gas car a boost by recommending it for work which honest observation has shown it best fitted for. Thus the frank and candid electric truck salesman, when asked to prescribe for a case of rapid, long-distance transportation, unhesitatingly recommends a gasoline truck, explaining meanwhile how the electric is better for short haul work.

This is all to the credit of the electric vehicle men, and quite beautiful. A good many of them are actually living up to the co-operative spirit they preach.

But has anybody ever heard a gas car man recommend electrics for short haul work, or any other work? A hundred times out of every hundred the gasoline representative takes the business that is handed him on a platter by the friendly electric man, and then goes hard after all the other business besides.

Electric vehicle men say their cars are not in direct competition with gas cars. "Each has its place and its use." They observe judicially. But the gas car man says nothing. He regards the electric as real competition, whether the other fellow does or not: not very heavy competition, perhaps, but still something to be fought. And he fights it—leave it to him for that. He neither talks nor practices co-operation. He will never admit of any condition wherein his car is not superior to any electric.

If there is any one-sided "co-operation" to be done, the gas car people could better afford to do it than the electric car people. The electric has no business prospects it can spare to the gas field.

Co-operation means reciprocation. If we must co-operate with somebody, let it be those who can and will reciprocate. Let the electric truck people and the electric passenger car people work together a little more closely than they do. Let the good work of co-operating with the central stations, and persuading them to co-operate with us, go on. Let us co-operate with each other. But let us have no more of this talk of co-operating with the gas car people, of boosting gas car sales and admitting alleged advantages of the gas car. The most disastrous belief in the business is that "electrics do not compete with gas cars." A gas car salesman who worked on that theory would lose his job without the usual two weeks' notice.

Unknown to Fame

While we believe the majority of electric vehicle men (under which head we include the makers of trucks, passenger cars, batteries, tires, charging apparatus and all the other accessories) are ready to agree to the usefulness of a specialized trade paper, there have always been some who contested that belief.

The function of a trade paper is first to carry in its reading pages, to all those interested in its field, information of value to them; and second to carry in its advertising pages further information which will induce the same interested readers to transact business with the advertisers. Inasmuch as trade paper news is largely dependent on the charges and achievements of manufacturers and dealers, the reading pages are most interesting and valuable when they aid and co-operate with the advertising pages.

Those manufacturers and dealers who profess a disbelief in the usefulness of a trade paper generally base their conclusions on the conviction that their names are already well known in the field, and that consequently the trade paper could add little or nothing to their reputation and renown.

Elusive fame! How many thousands there are, well able to buy, who do not know by name a single make of electric car; how many thousands more who, recalling a name or two, have no idea where they may learn more about them.

How many sales are lost because they are never conceived; how many prospects die aborting, no one can tell. The aggregate loss to the electric vehicle business, because possible customers never get the information they should have, must be enormous.

Undoubtedly most of those who feel their first faint glimmer of interest in the electric let it die of neglect. But a good many of them write to us. They ask us questions about trade names and addresses that betray a woeful ignorance of the "well-known" electric vehicle trade-marks.

We do not know whether the publishers of gas car papers are asked by their readers to let them know by return mail if the Packard is still on the market; where the Buick is made; who makes trucks; and a host of similar questions. We do not believe they are. For these makers generally carry their names and addresses in the advertising pages. Yet in the electric field we constantly get similar and parallel inquiries, because our readers are unable to find the answers by any ordinary search.

It is a grave mistake to suppose that the public carries in its mind any card index of electric cars. Even most of those who covet an electric do not know one brand from another; nor are they likely to learn under present conditions. No potential "prospect" will go out of his way to develop an interest that is merely casual; he must have at least a little information in front of him.

There are at least a dozen gas cars whose names are common knowledge—household words. There is scarcely an electric that can claim the same thing, even in a restricted sense. The letters we are continually receiving prove that there is a remarkable lack of information on the subject. And if that does not show that a trade paper has plenty of work before it in this field, then "prospects" have no value and the dissemination of information is desirable.

Central Station Help

Car manufacturers who are always complaining about lack of co-operation by the central stations must admit that we have here in Chicago at least a company that not only sits in the game, but willingly goes the limit—The Commonwealth-Edison Company.

This central station has done more to stimulate electric vehicle sales in Chicago than any other company of a similar nature has ever done in any other city in the country.
Electric Vehicle Association Developments

Sectional Development Work, Reports of Committees and New Announcements

The following is a review of some of the activities of the Electric Vehicle Association of America since the last report of the Council Meeting of Jan. 15.


The secretary reported on the general activities of the association, including a brief report of section activities excerpts of which follow:

Chicago Section:—The February 2 meeting was held in the Hotel Metropole, W. J. McDowell, chairman, presiding.

The chairman read a report from the committee on the "Betterment of Garage Collection and Accounts," by G. H. Atkin. The committee thought that the other garage associations had taken this matter up and adopted a new regulation which they have put into force as regards collections and accounts. D. C. Arlington moved that the report be accepted and that the committee receive the thanks of the Chicago section. It was seconded and carried.

The chairman spoke concerning the schemes he had in mind for commercial vehicle advertising. The gist of his remarks, however, was to the effect that the project would probably have to be put aside for the time being, as he had found that the necessary majority of concerns interested could not be induced to put their money into this proposition at this time.

On February 9, Chairman McDowell presided as usual, and G. A. Freeman, chairman of the membership committee, told of his plans for a local membership campaign, also in the other larger cities. Mr. Freeman reported two new members, namely, Messrs. W. J. Burns of the Philadelphia Storage Battery Company, and J. W. Shepard of the Electric Products Company.

J. P. Lyons of the Electric Products Company remarked largely upon the subject of electric vehicles in general and the Wotton Charging apparatus in particular. He called attention to the importance of the vehicle batteries, the possibilities of the present-day electric car, as regards touring, etc., and described the various inherent features of the Wotton Charging apparatus made by the Electric Products Company, Cleveland, Ohio.

F. E. McCall, secretary of the Chicago section, in commenting upon the vast amount of detail in the designing of charging equipment for different cell batteries, made the suggestion that a large part of the aforesaid detail could be practically eliminated if vehicle companies could be induced to put out better equipment with a standard number of cells. This suggestion brought forth extensive discussion. Nearly everyone present remarked upon the simplification of charging apparatus, batteries, etc., which would be bound to come from the adoption of such a standard. In order to take some decided action in the matter, it was moved by G. A. Freeman that the chairman be authorized to appoint a standardization committee for the purpose of doing what was necessary to standardize the number of cells in vehicle batteries, to have unlimited scope, and if necessary, to take up the subject of sizes of jars, trays, etc., even to working along the lines of standardizing vehicle lamp voltages, lamp sockets, etc. This motion was seconded and carried.

At the February 16 meeting which was held in the Hotel Metropole, J. T. Hartley, sales manager of the Sangamo Electric Company, Springfield, Ill., was present and gave a practical talk on the Sangamo ampere-hour meter for use upon electric vehicles and in public electric garages. The speaker gave a very good description of the design and the working of the meter itself, and further explained the possibilities of the use of this type of meter, also telling of some of the ills to which it had been subject. Considerable discussion took place, and Mr. Hartley answered numerous questions put to him.

Philadelphia Section:—The Philadelphia section had an executive committee meeting on February 9, at the Automobile Trade Association, R. L. Lloyd, presiding.

At this meeting, it was regularly moved and seconded that the Philadelphia section do everything to make the week of October 18, an Electric Week, with particular reference to the electric vehicle.

Chairman Lloyd urged upon every committee chairman to get his committee together at an early opportunity and have some really effective work done by the organization.

Washington Section:—An executive committee meeting was also held in the Washington section on February 4, in the offices of the Potomac Electric Power Company, Charles M. Marsh, secretary-treasurer, presiding in place of Chairman E. S. Marlow, absent on account of illness.

There was discussion at some length with regard to whether the meetings of the section be held at different places instead of remaining at the offices of the Potomac Electric Power Company. It was decided that for the next meeting or two the meetings be held at the
Power Company’s offices as they have been heretofore.

There was a discussion with regard to the next sociability meeting of the section. It seemed to be the opinion of those present that it was better to change the kind of entertainment every month. It was decided to have a supper some time in February with a vaudeville show afterwards.

The matter of February advertising was the next matter brought up for consideration. The Washington Times was suggested.

**Los Angeles Section:**—A meeting of this section was held on February 3 at the Jonathan Club. Chairman J. Harry Pieper, presiding.

The first paper was prepared and read by R. H. Morris on the Milburn Light Electric. This was a most comprehensive paper containing in full detail a report on the Milburn Light Electric. Mr. Morris justly claimed that the Milburn in its present condition and at its present price, is not a competitive car, in other words, it is in a class by itself, a light car at a light price.

Ralph C. Hamlin, who has lately taken the exclusive agency for the Ranch and Lang Electric for Los Angeles and southern California and has just returned from a trip to the Ranch and Lang factory in Cleveland and through the East, gave a short talk on business conditions as he found them and a descriptive talk of the Chicago automobile show, which he claimed was the best show he had ever seen. He further promised to join the association before the next meeting.

C. B. Criddle, general agent of the Southern Sierras Power Company, Riverside, California, a new active member of the Los Angeles section, on being introduced, talked on the necessity of charging facilities throughout southern California and promised that his company would co-operate to the fullest extent toward the establishment of a continuous chain of charging stations.

Harry N. Sessions, commercial engineer of the Southern California Edison Company, a pioneer in the electric vehicle business on the coast, gave an impromptu talk along reminiscent lines that proved most interesting. He also read a paper “Storage Batteries” written in his well-known humorous vein, bringing out points in regard to the care of storage batteries that astonished even the representatives of the different storage battery companies who are members of this section.

J. O. Case, chairman garage committee, read a report of his committee just previous to the regular meeting as to charging conditions in Southern California. Since the last meeting, several charging stations have been installed and his report showed that two more would be installed before March 1, leaving but one short gap between Los Angeles and San Diego which will doubtless be shortly filled, thus giving a complete chain of charging stations between Los Angeles and San Diego, which will give electric car owners an opportunity to drive their machines to the San Diego exposition, feeling sure of proper charging facilities along the line.

**New York Section:**—The New York section held a meeting on February 24 in the Consolidated Gas Company Building Auditorium, New York City.

Day Baker of the General Vehicle Company, Boston, Mass., and former treasurer of the association spoke on “Installing the Initial Truck.”

B. P. L’Hommedieu and H. Weida, both gentlemen from the India Rubber Company, New Brunswick, New Jersey, spoke on “The Construction of Hard Rubber Battery Jars” which was followed by a demonstration.

**St. Louis Section:**—A meeting was held in the St. Louis section on January 21, in Gudic’s Cafe, Chairman M. B. Strauss, presiding.

E. P. Chalfant, secretary of the Electric Automobile Manufacturers’ Association, and a director of the Electric Vehicle Association, gave a short talk on the relation between the electric vehicle and the central station.

The question came up regarding the attitude of the electric garages toward the question of outside work, particularly in connection with rectifiers and C. E. Michel of the Union Electric Light & Power Company advised that they have a man who is a particular expert in taking care of rectifier troubles and they are always glad to have him go out to look into any question of trouble on rectifiers on their lines without charge to the customer. It was the consensus of opinion that it would be a very good plan for the garages to refer all customers to the Union Electric direct where there was any question regarding the rectifier working properly.

The question of joint advertising on the part of the various electric dealers and the Union Electric was referred to and Mr. Archer, chairman of the advertising committee, was requested to get up a complete report for the next meeting showing just what could be obtained in the way of advertising on such a basis.

**Cleveland Section:**—The Cleveland section held a meeting February 2 in the Hollenden Hotel, J. P. Lyons, vice-president, presided.

The subject for discussion at this meeting was “Constant Potential System for Charging Electric Vehicles.” A. F. Davis of the Lincoln Electric Company gave a paper on the design of charging apparatus. A. B. Burke of the Electric Storage Battery Company gave a paper on the theory and its effect on battery life. J. W. Fraser of the Philadelphia Storage Battery Company gave an abstract of the paper read by H. P. Dodge at the Philadelphia convention, mentioned above, and also an extract of this paper recently read at a Chicago section meeting. This was followed by a general discussion by the various men present on the constant potential method of charging, each man being limited to three minutes.

M. R. Berry of the Electric Products Company outlined the purpose of the Electric Vehicle Association, and stated that this discussion on constant potential charging of electric, was merely an example of what their next meeting would be. He asked that all of the members of the section offer suggestions to the Papers and Program Committee as to what they would like to have discussed, in order that the meeting and the discussions may be made as popular as possible.

**REPORT OF THE MEMBERSHIP COMMITTEE.**

Nineteen new membership applications were pre-
sented to the council, which were regularly approved. There were three cancellations and one decease which were also acted upon.

The membership of the association according to sections and classes of membership follows:

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PITTSBURGH.

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<th>Auxiliary</th>
<th>Press</th>
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NEW YORK.

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DETROIT.

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### Garage Rates in New York City

The following rates for storing, washing, charging, etc., are typical for New York City:

<table>
<thead>
<tr>
<th>Car Type</th>
<th>Capacity</th>
<th>Rate</th>
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</thead>
<tbody>
<tr>
<td>Passenger</td>
<td>750 lb</td>
<td>$40 to $55</td>
</tr>
<tr>
<td>Commercial</td>
<td>1000 lb</td>
<td>45 to 55</td>
</tr>
<tr>
<td></td>
<td>2000 lb</td>
<td>50 to 55</td>
</tr>
<tr>
<td></td>
<td>3000 lb</td>
<td>50 to 75</td>
</tr>
<tr>
<td></td>
<td>4-ton</td>
<td>55 to 75</td>
</tr>
<tr>
<td></td>
<td>3½-ton</td>
<td>55 to 95</td>
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<tr>
<td></td>
<td>5-ton</td>
<td>60 to 100</td>
</tr>
<tr>
<td></td>
<td>5 to 110</td>
<td></td>
</tr>
</tbody>
</table>

An alternative is offered in the following schedule for storing, washing and charging commercial cars, electric power being billed at five cents per kilowatt hour. Watt-hour meter to be furnished by customer.

### Motor Vehicle Law Upheld

The constitutionality of the Iowa motor vehicle registration law was upheld in an opinion handed down by the supreme court in the case of the State vs. B. H. Gish. The state has no more right to prohibit the use of motor trucks than it has to prohibit the use of lumber wagons but that it has the power to pass a regulatory law, the court decided.

Gish was arrested for not having a number when he had paid the tariff and was waiting for the state to deliver the tag.
Assisting the Dealer

The Duty of the Manufacturer to Instruct and Educate Representatives in Selling

THERE has been a mistaken policy upon the part of many manufacturers of instructing and educating dealers in the marketing of their products, in a hasty and superficial manner.

Dealers in any other kind of machinery equipment are men who have been thoroughly trained not only in every mechanical detail of the product they are selling, of its possibilities of load and overload and of its care and operation; but they are also familiar with the other devices with which this same sort of work has been and is being done.

It is a peculiar fact that almost any man you meet feels that he knows about all there is to be known about delivery, the fact that it has been reduced to almost a science would never occur to the popular point of view to a great extent with the dealer.

Generally speaking, he is supplied with reams of printed matter and told to "go to it."

This means calls for help to the factory, sending special salesmen and fostering the spirit of dependency; it means oversold trucks and wrong applications, poor service and dissatisfied customers.

No conservative manufacturer of the present day is so anxious to sell his trucks as to take risks of this sort on sales made from his own office, yet very many of them are putting themselves in the position of doing exactly that thing through lack of proper training of their dealers.

It is absolutely essential, therefore, that the dealer should be trained in the same school as the factory salesman, and the problem of this sort of schooling has been handled successfully by the manufacturers in many different ways.

The important point is not how this teaching should be accomplished but rather what are the things to be taught—in other words, what are the absolute essentials for every man to know who would attempt to sell motor trucks?

Briefly then, as a general summary, let us take up some of the important features.

The first point is a complete and definite knowledge of all the mechanical details of his own product, and this, we assume, is general among most dealers. We also credit them with a sufficiently accurate knowledge of the same features of other types of that class.

On the following points of operation, however, the dealer has often had little, if any training.

What horses can and cannot do; what electric trucks can and cannot do, and what gasoline trucks can and cannot do. Each of these taken on a basis of:

First, economy in cost; second, operation; third, maintenance; fourth, time, quantity and quality of work accomplished.

Consider the above as a mathematical problem, if you like. There are certain factors of economy, maintenance and work; these reduced to terms of horse, gas or electric operation, increased or decreased by the percentage of favorable or unfavorable condi-

*Vice-president, Baker Motor Vehicle Company.
Calculation of Electric Motor Characteristics

A Discussion of Motor Proportions and Resulting Vehicle Performance

BY A. A. NIMS

The kilo amperes turns (k. a. t.) per pole is the product, divided by 1,000, of the field turns per pole by the current in amperes flowing through them. The normal operating connections being with the four field coils connected in series parallel, only one-half of the armature current flows through each coil.

The saturation curve of Fig. 1 shows that with this excitation a magnetic flux of 0.58 megawattcrosses the air gap under each pole, inducing in the armature conductors rotating beneath it an electromotive force opposing the battery voltage and known as the counter electromotive force (abbreviated c. e. m. f.).

The armature of a motor always rotates at such a speed that this c. e. m. f. differs from the terminal voltage by exactly the voltage drop in the brush contacts and the windings of the motor.

The voltage drop at the brushes depends upon the brush density or amperes per square inch of brush cross section.

Brush density = \frac{30}{2 \times 1 \frac{1}{8} \times \frac{1}{2}} = 26.7 \text{ amperes per square inch.}

Fig. 2 gives the voltage drop at the brushes with different brush densities for a good American brush.

Brush drop for 26.7 amperes = 2.00 volts.

The voltage drop in the windings is (0.04 \times 0.0265) \times 30 = 1.995.

Total voltage drop = 2.00 + 1.995 = 3.995 volts, say 4.00 volts.

The c. e. m. f. is then 75 - 4 = 71 volts.

A refinement, oftentimes desirable, particularly with batteries of high terminal resistance is to allow for the variation of battery voltage with increasing demands. For this purpose curves can be obtained from battery manufacturers showing the relation between battery voltage and current output.

The next step, determination of the motor revolutions per minute, involves the fundamental equation of electrodynamic induction, of which space does not permit the explanation, but which, reduced to the terms of a direct current machine, is as follows:

\text{Flux in megawatts} = \frac{C.\ e.\ m.\ f. \times \text{circuits} \times 60 \times 100}{r.\ p.\ m. \times \text{commutator bars} \times \text{turns per bar} \times \text{poles} \times 2} \quad (1)

Reduced to this particular machine it is

\text{c. e. m. f.} = 2 \times 60 \times 100 = \frac{93 \times 1 \times 4 \times 2}{r.\ p.\ m.} \times 16.12.

*Paper read before E. V. A. Convention.
ELECTRIC VEHICLES

Hence
\[ r. \text{ p. m.} = \frac{\text{c. e. m. f.}}{\text{flux}} \times 16.12 = \frac{71}{0.58} \times 16.12 - 1976. \]

The watts input of course the product of voltage and input current =
Watts input = 75 \times 30 = 2,250 watts.

The \( fR \) losses, including brush drop losses, are the product of total voltage and current —
\( fR \) losses = 4.0 \times 30 = 120 watts.

The core loss watts may be computed from core loss curves. The curves given in the *Standard Hand Book for Electrical Engineers*, section seven, paragraph 112, give workable results. In using these it should be remembered that the flux divides below the armature teeth and twice the area of the axial section on one side of the shaft should be taken as the effective area.

Then the density below the teeth becomes
\[ B = \frac{0.58}{2 \times 5 \times 0.95 \times (4.0 - 0.62 - 1.0) 0.0256 \text{ mega lines per sq. in.}} = \frac{25.6 \text{ kiloines per sq. in.}}{25.6}, \]
or

The figure 0.95 is to allow for the small spaces between laminations.

![Diagram](image)

In any dynamo electric machine the frequency is equal to
\[ f = \frac{\text{r. p. m.} \times \text{pairs of poles}}{60}. \]

In this case
\[ f = \frac{1,976 \times 2}{60} = 66 \text{ cycles.} \]

The curves referred to, for a density of 25.6 kiloines below the teeth and a frequency of 66 cycles per second, give a core loss of 3.1 watts per pound of armature core. In figuring the volume,
\[ V = 5 \times 0.95 \times (4^2 - 12) \times 3.1416 = 224 \text{ cubic inches and the weight is} \]
\[ W = 224 \times 0.284 = 63.6 \text{ pounds.} \]

Hence the core loss at 30 amperes is
Loss = 63.6 \times 3.1 = 197 watts.

The remaining portion of the losses that are considered is the brush friction loss. Fig. 2 also shows that the coefficient of brush friction varies with the peripheral speed of the commutator. The speed of this commutator is
\[ s = \frac{5 \times 3.1416 - 1976 = 2,588 \text{ feet per min.}}{12} \]

Traction motors of all kinds are given a heavy brush pressure, so that a pressure of 4 pounds per square inch is allowed, which at this speed means a coefficient of friction of 0.21.

Total brush area = \( 2 \times 2 \times 1/2 \times 1/2 = 234 \text{ square inches.} \)

Brush friction loss = \( 4 \times 234 \times 0.21 \times 2,588 = 4,900 \text{ feet pounds per minute} = 4,900 \times 0.0226 = 111 \text{ watts.} \)

This gives a total loss of 120 + 197 + 111 = 428 watts and therefore an output of 2,250 - 428 = 1,822 watts.

The efficiency at this load is, therefore,
\[ e_m = \frac{1,822}{2,250} = 81 \text{ per cent.} \]

It is not claimed that the method outlined above possesses a high degree of scientific or even technical accuracy. It is, however, believed sufficient to illustrate the general method followed and accurate enough for at least 75 per cent of the determinations of motor characteristics. It will be understood, of course, that the brush curves of Fig. 2 refer to only one variety of brush and that each brush has its own characteristics. Again if the dimensions of the armature core or slots, the air gaps, the poles or the frame are changed the saturation curve is affected and must be redetermined.

RELATION BETWEEN VOLTAGE, SPEED, WATTS AND TORQUE.

The torque of a vehicle motor is a purely mechanical conception, viz.: the tangential force, applied at a radius of one foot from the center of the armature shaft required to drive the motor load. It is often given in pound feet, meaning the product of any force in pounds by the radius in feet at which it must be applied to drive the motor load. If the radius is \( r \) feet and the force is \( p \) pounds,

\[ \text{foot pounds per minute} = p \times 2 \times 3.1416 \times r \times \text{r. p. m. and the equivalent watts are} \]
\[ P = p \times r \times \text{r. p. m.} \times 2 \times 3.1416 \times 0.0226 = p \times r \times \text{r. p. m.} \times 0.142. \]

Therefore the torque of a motor is
\[ \text{watts output} \times \text{watts output} = \text{volts \times amperes \times efficiency} \]
\[ p \times r = \frac{\text{r. p. m.} \times 0.142}{\text{r. p. m.}} \]

Now the watts output = watts input \times efficiency
\[ \text{volts \times amperes \times efficiency} \]
\[ p \times r = \frac{\text{r. p. m.} \times 7.04}{\text{r. p. m.}} \]

Then it will be observed that if a 75-volt motor runs at 1,600 r. p. m. at 35 amperes with an efficiency of 82 per cent the value of the torque is fixed. Hence it follows that if a vehicle manufacturer specifies the speed and efficiency of a constant voltage motor at two current values, he specifies also the slope of the torque curve, and it is not in the power of the motor designer to alter this slope without departing from the other specifications.

In the case under consideration the torque is
\[ p \times r = \frac{1,822}{1,976} \times 7.04 = 6.5 \text{ pound feet.} \]
To obtain Table II, for the fields in series, the procedure is exactly the same. It should be noted that in this case the whole current passes through each field coil, so that the kilo ampere turns per pole are

\[ \frac{48}{1,000} \times \text{ampere.} \]

This results in increased flux, slower speed and greater torque for a given current, greater \( PR \) losses and lower core and brush friction losses.

By taking the values of current, speed, efficiency, and torque from these tables, we can plot the usual characteristic curves for the motor in question, which has been done in Fig. 3.

**VEHICLE MOVEMENT.**

Vehicle movement, by which the output of the vehicle motor is absorbed, depends upon three factors, inertia, train resistance and gravity, all of which must be at times overcome by the torque of the motor. Inertia enters into consideration whenever the rate of travel is not constant but is of most importance in starting the vehicle from standstill and in bringing it to rest. Train resistance is in evidence whenever the vehicle is in motion and includes all the forms of friction, bearing, gear, tire and wind. The effect of gravity is felt most directly when the road is not level. The values of these factors have been analyzed and their effects on vehicle movement can be computed as will be outlined in the following paragraphs.

**Inertia.**—The fundamental formula for linear acceleration,

\[ F = \frac{\text{Weight in pounds}}{\text{acceleration in feet per second per second}} \times \text{acceleration in feet per second per second.} \]

(5)

is universally expressed in traction practice as

\[ \text{Force in pounds per ton} = 91.1 \times \text{miles per hour per per second} \]

(6)

The weight is to be a ton of 2,000 lbs. The acceleration is to be 1 mile per hour per sec., or 1,467 feet per sec. per sec. Then

\[ F = \frac{2,000}{91.1} = 21.9 \times 1,467 = 91.1 \text{ pounds per ton.} \]

For any other value of acceleration, \( A \), the weight is given in m. p. h. p. s.

\[ F = 91.1 A \text{ pounds per ton.} \]

In addition to the force required for accelerating the chassis and body of a vehicle in a linear direction, there is another force required to accelerate the rotation of the motor armature and other rotating parts. The ratio of the force for linear acceleration to the sum of the two is usually represented by \( K \) and the value of \( F \) in the last equation should be increased in proportion. That is, the equation should read

\[ F = \frac{91.1 K}{A} \]

(7)

If we give \( K \) a value of 0.91, which is fair, the value

\[ K = \frac{W}{W' + n' \omega'} \left( \frac{r'}{R'} \right)^2 + n'' \omega n'' \left( \frac{r''}{R''} \right)^2 \times \text{g.r.}, \]

where

\[ W = \text{weight of car in pounds,} \]

\[ W' = \text{weight of one wheel,} \]

\[ n' = \text{weight of one armature,} \]

\[ n'' = \text{number of wheels,} \]

\[ n'' = \text{number of motor armatures,} \]

\[ g.r. = \text{gear ratio.} \]

He also gives a fair value of \( \left( \frac{r'}{R'} \right)^2 \) as 0.6 and of \( \left( \frac{r''}{R''} \right)^2 \) as 0.5 which reduces the long formula to

\[ K = \frac{W + 0.6 \omega' \omega' \left( \frac{R'}{R''} \times \text{g.r.} \right)^2}{W'} + 0.5 \omega \times \left( \frac{R''}{R'} \times \text{g.r.} \right)^2. \]

Assuming a weight of 375 pounds for the four wheels, \( K \) figures out for the vehicle referred to on page 16.

\[ K = \frac{4,200 + 0.6 \times 375 + 0.5 \times 1 \times 95 \times (4/17 \times 8)^2}{375} = 0.91. \]

Then at any speed \( S \) in miles per hour or 88S in feet per minute, the power per ton required to accelerate a vehicle at any rate \( A \) is

\[ \text{Power} = F \times S = 100 A \times 88S \]

\[ = 8,800 A S \text{ in ft. pounds per min.} \]

\[ = 199 A S \text{ in watts.} \]

**Train Resistance.**—The term train resistance as used in connection with traction, refers to any opposition to motion at constant speed on level grade. The sources of such resistance are so numerous and the effect of each is so difficult to measure that they have been grouped and their joint effect has been investigated experimentally. Of the forms of friction, bearing and gear are the least important, leaving wind resistance and tire friction to account for most of the opposition to progress on a level road.

It should be borne in mind that the driving wheels have the double duty of carrying their portion of the load and of transmitting the reactive effort which propels the vehicle. In supporting the load they share with the other wheels the tire friction of the train resistance, and in propelling the car they act as a friction transmission which has additional losses that will be included later under the subject of transmission efficiency.

The available figures for train resistance of automobiles cover a wide range of values. Some informal tests on a 1.6 ton vehicle made by an associate of the writer in 1912 indicate a value of 35 pounds per ton at 20 m. p. h. In the Standard Handbook (section 13, paragraph 41,
ELECTRIC VEHICLES

Fig. 4] Churchward gives a figure of 41 pounds per ton at 20 m. p. h. A. G. Clark in his Motor Car Engineering, volume 1 gives values ranging from 24 pounds per ton on tarred macadam roadway to 60 pounds per ton on flint and gravel, rolled and wet. H. E. Wimperis, with a motor wagon whose complete weight was 3.28 tons, found a value of 60 pounds per ton at 20 m. p. h. when running in neutral on a hard main road.

The most recent investigation of this subject which the writer is familiar, is that of Prof. W. C. Marshall, described in The Automobile of April, May, 1913. His tests on a touring car weighing 2077 tons indicate a value of 70 pounds per ton at 20 m. p. h. on a good, hard, level macadam road.

Since the air friction on a moving body increases rapidly with the speed, train resistance is not constant at all speeds. However, it is generally felt among electric vehicle men that any variation up to a speed of about 20 m. p. h. may be neglected. Such an assumption greatly simplifies computations and at the same time does not greatly affect the accuracy of the prediction of vehicle performance as will be shown later.

When it is considered that between 70 and 100 watt hours per ton mile are good values for the energy consumption of an electric vehicle, it will be seen that most of these figures for train resistance are high for electric vehicles. Therefore, an average value of 40 pounds per ton is assumed for further discussion. Then at any speed below 20 m. p. h. the power per ton required to propel the car on a hard level road is:

\[ \text{Power} = 40 \times 885 = 3,500 \text{ S foot lbs. per minute or} \]
\[ = 80 \text{ S watts} \quad \ldots \ldots \ldots \quad (11) \]

\[ \text{where } S \text{ is the speed in miles per hour as before.} \]

Gravity:- On a grade of G per cent the force in pounds per ton aiding or retarding the motion of the car is

\[ F = 20 G \]

and the power per ton involved at any speed S is

\[ \text{P} = F \times S = 20 G \times S = 1,760 G S \text{ foot-pound per min. or} \]
\[ = 40 G S \text{ watts} \quad \ldots \ldots \ldots \quad (12) \]

It can easily be conceived that there is some grade down which a car will roll at constant speed; this may be termed the resistance grade and is of such a value that the power because of the down grade is just equal to that required to overcome the train resistance at the constant speed. This value may be determined by equating the two values for power.

\[ 40 G S = 80 S \quad \ldots \ldots \ldots \quad (13) \]
\[ \frac{40 G S}{80} = 2.0 \text{ per cent.} \]

Similarly there may be conceived a grade down which a car would accelerate at the rate of one mile per hour per second if the opposition of train resistance were removed. Its value may be determined in a similar way.

\[ 40 G S = 193 \times 1 \times S \]
\[ \frac{40 G S}{190} = 5.00 \text{ per cent.} \quad \ldots \ldots \ldots \quad (14) \]

This value may also be arrived at by considering a falling body, whose rate of acceleration is 32.2 feet per second per second which is equal to 22 miles per hour per second. The acceleration on a slope is equal to the product of the acceleration of a falling body and the sine of the angle of variation from the horizontal; that is \( 22 \sin \theta = 1; \sin \theta = 1/22 = 0.0455 \). The grade in per cent is the sine of the above angle; hence a 4.5 per cent grade will give an acceleration of one m. h. p. s. if there are no rotating parts to be accelerated. Dividing 4.55 by 0.91, the constant for the inclusion of rotating parts, gives 5.00 per cent.

The total power required to propel an electric vehicle may be summed up as follows, in terms of equivalent grades:

\[ P = \frac{40 W}{(G + 5.0 A + 20) S} \quad \ldots \ldots \ldots \quad (15) \]

where \( W \) is the weight of the vehicle in tons.

This power is that produced by the tractive effort of the wheels, and as the value desired is that delivered by the motor shaft, the above figure must be divided by a percentage, \( e_t \), representing the efficiency of the transmission system from motor shaft to ground. Then

\[ P = \frac{40 W}{(G + 5.0 A + 20) S} e_t \quad \ldots \ldots \ldots \quad (16) \]

Figures for this value also cover a wide range. In a paper before the Society of Automobile Engineers delivered by Prof. D. C. Gallup of the Worcester Polytechnic Institute, he states that “the transmission losses may vary between 10 per cent and 50 per cent of the engine output depending upon the general condition of the mechanism and particularly upon the condition of tires.” In an electric vehicle there is no friction clutch or gear box and the torque generated by the power plant is perfectly uniform. In judging the performance of a vehicle proper adjustment of the mechanism and good condition of the tires are understood, so that a value of 90 per cent will be assumed for the transmission efficiency between motor shaft and ground. Then

\[ P = \frac{40 W}{(G + 5.0 A + 20) S} \quad \ldots \ldots \ldots \quad (17) \]

Since the watt hours per ton mile are the watts at any speed divided by the weight and speed, from the above

\[ w \text{ h. p. t. m.} = 45 (G + 5.0 A + 20) \ldots \ldots \ldots \quad (18) \]

At constant speed on a level road, this gives

\[ w \text{ h. p. t. m.} = 90 \]

The measured watt hours per ton mile are the input to the motor while the above figure refers to the output of the motor, and is, therefore, a conservative figure.

From this analysis of vehicle movement it is seen that there are but two indeterminate or empirical elements, the remainder yielding readily to mathematical treatment. The more accurately train resistance and transmission efficiency are determined, the more accurately can vehicle performance under given conditions be predicted.

VEHICLE PERFORMANCE

In Fig. 3 the regular characteristics of a vehicle motor were plotted in the usual way. In regard to any self propelled vehicle the two important questions are what speed, and how much power. The current is of importance only that the designers, both of motor and vehicle, may know whether the motor will overheat or whether the demand upon the battery will exceed its capacity.

Equation 17 shows that the power required by a vehicle is proportional to the speed, and therefore, the power characteristics of a vehicle may be plotted to the same co-ordinates as the power characteristics of the motor.

It has been assumed that the motor previously considered is to be mounted in a vehicle which will weigh 4,200 pounds complete with passengers. The gear ratio is to be 8 to 1 and the wheels diameter 34 inches.

To the speed scale there has been added a corresponding scale of miles per hour, determined from the following considerations:
the motor until full series connection is reached, the car will accelerate at the rate of about 2.4 m. p. h. p. s. on a level grade up to a speed of about 5.6 m. p. h. If the series connection is retained the rate of acceleration will decrease until constant speed is reached at 11.7 m. p. h. If at a speed of 7.6 m. p. h. when the car is accelerating at nearly 1 m. p. h. p. s. the connections are changed directly to series parallel the acceleration will momentarily rise to 2.4 m. p. h. p. s. and then fall off again until constant speed is reached at 16.2 m. p. h. If the car be started on a grade instead of on a level, the rate of acceleration just given would be decreased by 0.2 m. p. h. p. s. for each per cent of up grade and increased by the same amount for each per cent of down grade.

If the current is cut off from the motor when traveling on a level at 16.2 m. p. h. it will coast with a retardation equal to the effect of a 2 per cent grade or 0.4 m. p. h. p. s. If on an up grade of 1 per cent the retardation will be 0.6 m. p. h. p. s. if on a down grade of 1 per cent the retardation will be 0.2 m. p. h. p. s. If more accurate information is desired concern-

motor shaft at any speed, their intersection will show the performance speed under the corresponding motor connections and conditions of grade and acceleration.

For instance, with the fields in series parallel connection, the vehicle will run at 22.2 m. p. h. on a 1 per cent down grade, 16.2 m. p. h. on a level, 13.4 m. p. h. on a 1 per cent upgrade and so on up to a 12 per cent grade where the speed will be 7.7 m. p. h. The corresponding current values are 34 amperes, 47 amperes, 59 amperes, 170 amperes. For the same grades and the fields in series, the speeds are 15.5 m. p. h., 11.7 m. p. h., 10.0 m. p. h., 5.8 m. p. h. and the current values 20 amperes, 37 amperes, 47 amperes and 160 amperes.

The current in a vehicle motor often reaches five times the rated value, and that figure or 175 amperes is assumed for a maximum permissible value. With this current flowing the vehicle will climb a little better than a 12 per cent grade at 7.5 m. p. h. with fields in series parallel or a little higher grade yet with fields in series.

If the car is started and the controller so manipulated that approximately 175 amperes flows through the motor the acceleration of the vehicle on the different controller positions the motor characteristics can be computed as in Tables I and II. The only differences being that the resistance of the motor is increased by the external resistance introduced at each controller position. The additional motor characteristics can be plotted and used in the same way as the two shown for series and series parallel field connections. If a shunt is used to obtain a higher operating speed, the motor characteristic is computed in a similar way. The reduction of the field due to the shunted current must be considered and the ohmic resistance is actually decreased by the effect of the shunt on the fields.

**TABLE I.—CHARACTERISTICS OF 75 VOLT MOTOR—FIELDS SERIES—PARALLEL.**

<table>
<thead>
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<th>Field</th>
<th>4 Poles, 48 Turns per pole. Series—Parallel Resistance, 0.0263 ohm at 60 dege.s C.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amperes</td>
<td>30.0, 40.0, 55.0, 75.0, 100.0, 125.0, 160.0, 200.0</td>
</tr>
<tr>
<td>Watts per pound</td>
<td>0.072, 0.096, 0.12, 0.15, 0.18, 0.22, 0.28, 0.35</td>
</tr>
<tr>
<td>Megamaxwells per pole</td>
<td>0.38, 0.57, 0.69, 1.25, 1.41, 1.53, 1.62, 1.68</td>
</tr>
<tr>
<td>Brush volts per pole</td>
<td>30.0</td>
</tr>
<tr>
<td>Current</td>
<td>3.50, 4.00, 4.68, 5.65, 6.65, 8.10, 10.58, 14.20</td>
</tr>
<tr>
<td>Frequency</td>
<td>30.0</td>
</tr>
<tr>
<td>Watts per pound</td>
<td>3.50, 4.00, 4.68, 5.65, 6.65, 8.10, 10.58, 14.20</td>
</tr>
<tr>
<td>Core loss watts</td>
<td>197.0</td>
</tr>
<tr>
<td>Peripheral speed</td>
<td>2,588.0</td>
</tr>
<tr>
<td>Friction coefficient</td>
<td>0.21</td>
</tr>
<tr>
<td>I/R losses watts</td>
<td>11.0</td>
</tr>
<tr>
<td>Total loss</td>
<td>428.0</td>
</tr>
<tr>
<td>Output watts</td>
<td>1,822.0</td>
</tr>
<tr>
<td>Efficiency, per cent</td>
<td>81.0</td>
</tr>
<tr>
<td>Torque pound-feet</td>
<td>0.65</td>
</tr>
<tr>
<td>Horse power</td>
<td>0.50</td>
</tr>
<tr>
<td>Kilowatts</td>
<td>0.50</td>
</tr>
<tr>
<td>Cells</td>
<td>34.0</td>
</tr>
<tr>
<td>Number of cells</td>
<td>79</td>
</tr>
</tbody>
</table>

On the heavy
what speed, and how much power. The current is of importance only that the designers, both of motor and vehicle, may know whether the motor will overheat or whether the demand upon the battery will exceed its capacity.

Equation 17 shows that the power required by a vehicle is proportional to the speed, and therefore, the power characteristics of a vehicle may be plotted to the same co-ordinates as the power characteristics of the motor.

It has been assumed that the motor previously considered is to be mounted in a vehicle which will weigh 4,200 pounds complete with passengers. The gear ratio is to be 8 to 1 and the wheels diameter 34 inches.

To the speed scale there has been added a corresponding scale of miles per hour, determined from the following considerations:

grades the grade resistance, which is truly proportional to the speed, is so great that it overshadows the variation in train resistance and the vehicle characteristic becomes practically a straight line. In any case the variation in the vehicle characteristics is within the limits of reliability of the determination of train resistance values, so it is sufficiently accurate to consider the train resistance independent of speed below 20 m. p. h.

This method of graphical determination of vehicle performed readily lends itself to the comparison of motors and vehicle equipments. A sheet of motor characteristics can be printed like a drawing and to each print can be quickly added the proper m. p. h. scale and the vehicle characteristics for each of a number of different equipments. Those for which the particular motor represented is suitable can be quickly determined. Or, conversely, the vehicle characteristics of one equipment can be readily added to the characteristics of a number of motors, when plotted as described, and comparisons between the motors obtained directly.

These advantages of legibility, scope, simplicity and comparability constitute distinct advantages over the plan of indicating a motor’s characteristics as a generator of tractive effort by the usual form of series motor curves, with amperes as abscissa, and sound arguments for the general use of the method herein described as a means of transmitting information between motor manufacturer and vehicle builder.

Garage Fixes Stringent Rules

Robert Bland Electric Garage, Evanston, Illinois, has issued the following rules for drivers of electric cars employed by the garage:

1. Report on duty on time, in a neat and clean condition. Show your respect for the car owner, who often rides with you.
2. It is your duty to report all car imperfections to the foreman.
3. Add oil to the oil before entering your car.
4. Switch off all lights on entering garage.
5. Examine car thoroughly for damages. Notify car owner of damage before leaving car in garage.
6. Always remember that you are not destroying your own property and you should care for it as you would your own. As the owner is your best friend, he makes it possible for you to hold your position.
7. Do not deliver a car under any circumstances that is not thoroughly clean and in first-class condition.
8. To use liquor while on duty means your discharge.
9. Smoking in owner's car means your discharge.
10. Carrying your friends in owner's car means your discharge.
11. Exceeding the speed limit of third third means your discharge.
12. Driving on car tracks means your discharge.
13. Carrying home owner's key means your discharge.
14. In driving owner's car attend strictly to your own business. He does not want you to entertain him. He knows that you are a practical automobile man, without you telling him.
15. Any deviation from the above rules will afford the car owner perfect service and will make it possible for you to hold a remunerative position.

Five dollars reward will be paid for name of hiker operating cars out of this garage over third speed, without the consent of the car owner. Cars must not be operated in the garage over first speed.

This is a splendid example of proper garage management. The above rules apply to every electric garage and include many which are negligently avoided by garage employees, often resulting in lost accounts, dissatisfied customers and damage cases.
Wire Wheels vs. Wood Wheels

Paper Presented Before the Society of Automobile Engineers

BY GEORGE W. HOUK*

A GREAT many articles have appeared during the past three years on wire and wood wheels. In two or three instances tests have been conducted with a view to ascertaining the relative strength of as well as relative tire economy with the respective wheels.

In one test of wire, wood and steel wheels, 34-inch steel and 36-inch wood and wire wheels were used, giving advantage to the steel wheel. In making comparisons I have selected equal sized wheels, with equal width rims. None of the wheels was specially selected. The wood wheels were examples of those used by two leading American companies, one a manufacturer of a $4,000 and the other of a $500 car.

In a paper presented to the society in June, 1913, I described the method of testing by impact. I have since learned that the results from this method are not as easy to determine as those of a steady pull applied to the rim of the wheel with the hub anchored, or with the pull applied to the hub. Fig. 1 shows the machine used in the tests, the leverage of beam being 20-to-1.

Referring to Fig. 2, it is noted that in the case of the 34x4 1/2 No. 6, 72-spoke quick detachable clincher wire wheel, with the load applied at the rim, starting at 500 pounds, the deflection was .020 inches, and applying the load in 500-pound increments, at 4,000 pounds, the deflection was .200 inch, or about 13/64 inch. The permanent set was .035 inch. At 8,000 pounds load the permanent set was .085 inch, or less than 3/32 inch. At 9,000 pounds load four spokes snapped, the permanent set being .177 inch, or less than 3/16 inch. No other damage occurred in any way.

In selecting a wood or artillery-type wheel for comparative test, we used what is considered a very strong pleasure car wood wheel, supported by a pressed steel brake-drum of 16 inches diameter and 1/4 inch thickness, the dished spokes being 2 1/2 inches thick from the hub to the brake-drum outside diameter, and 2 inches at the felloe. The weight of this wheel, including brake-drum and demountable rim, was 90 pounds; deducting 23 pounds, the weight of the brake-drum, leaves 67 pounds actual weight of wheel, as against 42 pounds in the case of the wire wheel; the wood being 67.5 per cent heavier.

At 4,000 pounds load the permanent set of the wood wheel was .125 inch; at 5,000 pounds, .203 inch. Between

*George W. Houk Company.
with a 6-inch arc of contact for receiving the load. The load on a 34x4 inch No. 4 66-spoke quick detachable clincher wire wheel was increased 1,000 pounds at a time and the deflection noted, up to 15,000 pounds, at which the permanent set was .020 inch. All spokes were tight and no injury was observed in any part of the wheel.

The spokes used in the wire wheels were of .175 inch wire, upset from .175 inch, tapering to .193 inch under the head, with thread rolled to .192 inch diameter for nipple, the spokes being swaged to .156 inch diameter to within about 1½ inches from each end. All spokes were equally spaced at the rim, as well as the hub, this method of spoking being a radical departure from the foreign methods. The spokes are placed at an angle of 40 degrees to a tangent at their point of contact with the hub. The old method of building a wire wheel, allowing the hub to float during the tightening of spokes, and having the truer locate the tread, as well as its trueness, left some of the spokes carrying most of the load, causing spoke breakage. By fixing the position of the hub before the spokes are tightened, and using a wrench turned by a flexible shaft driven by weight-controlled friction to tighten the spokes, a wheel is produced with equal spoke tension, leaving a slight inaccuracy to be overcome by the truer. The seating of nipples at the rim requires very careful and accurate punching to give them a full seat.

The means for detaching wire wheels call for much careful study. They may be classified as "positive locking" and "self-locking." In the former the locking nut remains where the wrench leaves it. There is some danger of the operator not pulling the locking nut home and seating the shell into the inner hub. Relatively few miles of travel under this condition will cause damage to both shell and hub. The self-locking nut, if left loose, will find its seat as soon as the wheel has traveled a mile or so. This is due to the eccentric motion of the outer hub in relation to the inner hub; the frictional surface of the threaded portion of the locking nut offering more resistance than the contact surfaces of the smooth taper permits it to creep, and the nut will travel in the direction it should. A simply spring-latch, with the point beveled, in the direction of its travel, with a notched ring inside the hub, will insure all lost motion being taken up by the automatic self-locking operation permanently until the wrench is applied.

In making a comparison of wire and wood wheels with regard to wear of tires, I have no real tests to support my belief, but the experience gained from three years' contact with consumers who have tried both types of wheel, justifies a claim of superiority in favor of the wire wheel as high as 30 per cent. The radiating surface offered by the wire spokes, and the small weight at the periphery of the wheel, are considered factors to this end.

The question "What harm is caused by the rusting of spokes?" is often asked. I know of no complaint on account of rust when the wheels have been carefully cleaned and treated with a rust-proofing compound before enameling. Nickel plated wheels rust easily, resulting in spoke breakage.

It is claimed that more labor is required to wash a wire than a wood wheel. This is not the case when a properly designed brush fitted with stiff bristles is used.

Another advantage wire wheels have is that when a 60-inch tread is required, by changing horizontally the relation of the rim to the hub, the same axles and hub mountings can be used as with 56-inch tread.

Two hundred and fifty-three makers of gasoline and electric trucks and industrial trucks have entered their names as makers of commercial vehicles in 1915. Thirty of these are new, while fifty-seven makers have dropped out.
Wood Wheels vs. Wire Wheels

Paper Presented Before the Society of Automobile Engineers

BY R. B. MUDGE

ELECTRIC unsatisfactory, and it is noted that the wood and wire wheels. Several papers on the subject have been presented to the society, advancing many arguments on either side, some practical and based on experience; more theoretical and with little or no definite facts to back them up. This was, and to a certain extent still is, necessarily so, although the past year has added materially to the available data on the subject.

WIRE WHEEL OF FOREIGN ORIGIN.

Necessity fosters new ideas, and when a thing in its present form is unsatisfactory, a remedy is sought either through improvement of the original or through some radical departure from the principles of the existing type. The proposed remedy, particularly if of the latter class, must necessarily be largely in the nature of an experiment, and may or may not be successful. Such was the situation with the automobile wheel abroad. The foreign wood wheel might not have been entirely satisfactory.

The wood material available was much inferior in quality and not entirely suited to the purpose. Knowledge of the proper way to treat this wood to preserve its full natural strength was lacking. The methods of assembling the parts to get the best possible results were perhaps not as widely understood as on this side of the Atlantic. Little improvement was possible since the greatest weakness lay in the character of the material itself, and, accordingly, experimentation along new lines followed, and the wire wheel appeared. Its success is absolutely questionable. Several tests were made in England by the wire wheel people that seemed to indicate superior strength in the wire wheel, as compared with those made of English oak, and there is no reason to doubt that the tests were reliable. Again, tests made in London to observe comparative tire wear resulted quite favorably for the wire wheel. These results, however, can scarcely be accepted as conclusive, since the runs were made for the most part, if not wholly, over city streets, where the wire wheel would be most apt to compare favorably. On the other hand, many inherent weaknesses were revealed to offset whatever advantages were apparent, and the users of this type of wheel are still in the minority. As introduced in America, conditions were different. The wood artillery wheel in general use here was rendering satisfactory service, and there was little inducement to take up the innovation.

Powerful performance even under road conditions far more favorable than those to be encountered in America. Thus the burden of proof remained with the wire wheel advocates, and up to the present time the same situation prevails. In view of this fact, the supporters of the wood wheel have confined themselves largely to consideration of the various claims put forth for the new type, some of these claims being extravagant in the extreme.

TIRE LIFE.

One point which has been brought up many times, and one which is of prime importance, is that of the relation of the life of a tire to the type of wheel on which it is used. Many unqualified assertions have been made as to the great saving due to use of wire wheels. It is pointed out that being lighter, the total unsprung weight of the car is less; that having less peripheral weight, the flywheel action is reduced; that possessing greater resiliency, there is more "give" in sudden starting and stopping; that the so-called "suspension principle" gives greater distribution of load.

Comparisons made between wood and wire wheels, designed for the same car, and equipped with the same type of rims in each case, have demonstrated that there is little or no difference in weight between the two. The wood wheel is often placed in a somewhat disadvantageous light by taking its weight equipped with one of the heavier types of demountable rims, as against the wire wheel equipped with only a simple light clincher rim. This is likewise the condition under which the peripheral weight is shown greater on the wood wheel.

WOOD WHEEL MORE RESILIENT.

It seems to be a popular idea that the wood wheel is a rigid, unyielding structure, while the wire is springy and resilient to a high degree. The real state of affairs is somewhat different, as has been proven beyond a doubt in a number of tests, made in outside laboratories by disinterested parties. The wooden unit, with its springy arches of tough, seasoned hickory, and its spokes united

*Chief engineer, Hayes Wheel Company.
in a peculiar interdependent bond at the mitre, does not take up the load at the one point of contact only, but distributes it over the entire lower half of the wheel in varying proportions. In actual test, the load sustained by the wheel averages about 2 1/4 times the strength of a single spoke, or in other words, each spoke in turn assumes less than 43 per cent of the total load.

The wire wheel when being composed of tension members, takes all the load in the upper half of the wheel, and the lower half offers no resistance against flattening of the rim, except the stiffness of the rim itself. The wire wheel people argue that their product has greater circularity than the wood wheel because of sixty or seventy points of support along the rim instead of ten or twelve. They say the wood wheel tends to become a ten- or twelve-sided polygon, while the wire wheel has so many members bearing on the rim as to maintain a perfect circle. Yet none of the members in the lower half of the wheel, where the blow is struck, can stand any appreciable compression, and they are therefore useless as far as preventing the rim from becoming crushed down entirely is concerned.

Several tests were made at the University of Michigan, which bear out this point well, and likewise demonstrate the true state of affairs as to ability to give under a shock and power of recovery after loading has been released. The wheels tested were for the same car, mounted on the same hubs, and both equipped with clincher rims. The wheels were placed between two heavy compression heads and crushed. The wood wheel flattened slightly on the rim after 8,000 or 10,000 pounds had been applied, but otherwise showed no distress until the breaking point was reached, when it started to go down and would take no higher loading. This was at 17,000 pounds. The wire wheel behaved in a peculiar manner. The spokes bent almost immediately upon application of the load, and at 5,000 or 6,000 pounds the wheel was no longer in a condition to be of any use. Further load was sustained by the rim alone, which steadily flattened out across the two-thirds the diameter of the wheel. At 8,000 pounds the rim steadily became crippled under continued pressure, without increase of load until flattened as above mentioned. Then the wheel took further loading up to 13,500 pounds. After release, the wood recovered to nearly the original circle. No recovery at all was apparent in the wire wheel.

Considering the alleged springiness of the wire wheel from another standpoint, let us refer to another test made at the same time. This experiment, which Mr. Menneef, engineer in charge of the laboratory, termed the rim-dishing test, was designed to approximate as nearly as possible the conditions under which the wheel receives the shock in service when skidding against a curb. The wheels of the same type as in the foregoing test were mounted on their axles in each case, with the bearings in place, and the axles clamped securely, leaving the rim free all around. Then the load was applied at one point on the rim. The test was started at an initial loading of 100 pounds, and increased by increments of 200 pounds, with the deflection recorded after each additional loading. After every other reading the load was run down to the initial point and the amount of permanent set measured and recorded.

Load deflection curves were plotted and results obtained as shown in Fig. 1 and Fig. 2.

One striking point to be noticed is that while the deflection of the wire wheel was greater than that of the wire wheel, yet the permanent set was found to exceed that of the wire wheel but little, showing that the large deflection under load was due not to weakness, but rather to elasticity. To quote Mr. Menneef in that part of his report wherein he refers to the wood wheels: "The deflection curves are very nearly identical for the three wheels, and are very flat. This might seem unfavorable until it is seen that there is a comparatively small set, which proves that the deflection is one almost entirely of elastic nature." Further bear this out, the wood wheel sustained a considerably higher load than that at which failure occurred with the more rigid wire wheel. This is of vital importance, when it is considered that greater strength is shown where the greatest strength in service is required, namely lateral strains.

A wheel has many times the strength of resistance against loading, as compared with skidding, curb impact, and strains of a like nature, and it is under the latter conditions that failure will occur, if at all. In speaking of the resistance against direct loading, let us mention briefly, the surprising developments in a test made at the university along this line. A wheel and axle assembly was set up and the load applied exactly as though under a car. The load was run up to 24,000 pounds, and at that point the axle gave way in a sharp, clean break, with no flaws in the steel apparent. The wheel was slightly flattened at the rim and one spoke bent a little, but was otherwise intact. The wire wheel, subjected to an equal loading, became a misshapen wreck.

In every test made the wood wheel excelled in elasticity, in both dishing and compression; showed greater strength in a direction in which greater strength is vital; and displayed greater resiliency and recovery under direct pressure, a point in which wire wheel advocates have claimed superiority and on which they have largely based their claims to easier riding qualities and longer tire life.

The road test of the Pennsylvania "Vacuum Cup" Tires, recently conducted by the testing laboratory of the Automobile Club of America, furnishes some interesting data having a definite bearing on the question of tire life. In this test, similar cars were driven at the same average speeds, over the same routes, which were changed daily to include both good and poor country roads and city streets. To eliminate the personal element, the drivers changed cars daily, and after half the probable mileage had been covered the wheels were interchanged on the chassis. Obviously, the conditions were as nearly the same throughout as could ever be possible. The tires on the wood wheels averaged 8,076 miles as against 6,470 for the wire. The maximum mileage for any tire was 10,164, obtained on a wood wheel. The maximum mileage on a wire wheel was 9,220 miles. The point of longer tire life on wire wheels, with the subsequent question of economy, would appear to be an exploded theory.

**Wire Wheel Faults.**

There are several objections to the use of wire wheels, aside from the question of strength, riding qualities and effect on tires. The initial cost is high as compared with that of the wood wheel. The spokes are frequently snapped through contact with curbs, car tracks, or in deep ruts on country roads. This throws the wheel out of balance, and out of true, and prompt replacement of the broken members is essential. Thus the question of repairs becomes burdensome and an annoyance as well. Again, the problem of keeping a wire wheel clean is one that appeals but little to anyone with experience in this connection. One serious feature is that under severe usage the spokes tend to loosen up, particularly if one or two are broken, so as to throw uneven tension on the rest. This causes sufficient play around the spoke
ELECTRIC VEHICLES

March, 1913.

seat to allow moisture to seep up through inside the rim, to the detriment of the tires.

Everything considered, the wire wheel certainly has not met with marked success in America. The action of cars for the runners who, after trying the wire wheels have gone back to the wood wheel is significant. Further, the wire wheel has fared but little better abroad, where the conditions for its adoption are apparently much more favorable than in this country. An article published during the summer gives some interesting information on the present-day use of automobile wheels, classifying them according to the percentage of the total number used. The figures may be tabulated as follows:

<table>
<thead>
<tr>
<th>Wheel Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood Wheel</td>
<td>4.7%</td>
</tr>
<tr>
<td>Wire Wheel</td>
<td>36.9%</td>
</tr>
<tr>
<td>Steel Wheel</td>
<td>58.4%</td>
</tr>
</tbody>
</table>

The wood wheel has yet to prove its worth, and car owner and manufacturer alike show little tendency to forsake its allegiance to the truly reliable wood wheel.

Electrics in Mail Service

The Post Office department, according to the Electric World, has prepared advertisements inviting proposals for the service of carrying the mails in regulation screen wagons and for the service of furnishing the equipment for carrying the mails in cities and towns in the States of Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa and Missouri, from July 1, 1915, to June 30, 1925. Proposals will be received by the Second Assistant Postmaster General, Washington, until 4:30 p.m., April 16, and decisions will be announced on or before May 3.

Requirements are for regulation screen-wagon, mail-messenger, transfer and mail-station service between the post offices and railroad stations, terminal railway post offices, steamboat landings, mail stations, points of exchange with electric or cable cars, etc., and for screen-wagon, city-delivery and collection service. It is announced that proposals to perform service on any of the routes named in the advertisements in automobiles of such style and construction as may be acceptable to the Second Assistant Postmaster General, instead of in wagons drawn by horses, will be received. Each proposal must be accompanied by a statement giving a description of the motor vehicle it is proposed to use, with the horse-power of the engine and the speed per hour that will be made. In the event of the proposal for automobile service being accepted, the department reserves the right to arrange schedules and to change the running time so as to provide schedules better adapted to the more expeditious mode of transportation.

Cities in which automobiles are specifically asked for are given in the accompanying table, together with the carrying capacity of the vehicles required. No particular type of automobile is specified.

<table>
<thead>
<tr>
<th>City</th>
<th>Screen Wagon</th>
<th>Collections and Delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1,000</td>
<td>1,500</td>
</tr>
<tr>
<td>Akron, Ohio</td>
<td></td>
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</tr>
<tr>
<td>Cincinnati, Ohio</td>
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<tr>
<td>Dayton, Ohio</td>
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<td>Hamilton, Ohio</td>
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<td>Toledo, Ohio</td>
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<tr>
<td>Warren, Ohio</td>
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<td></td>
</tr>
</tbody>
</table>

*288 post offices.

Electric a Family Car

The sphere of the modern electric pleasure car has so broadened in the last year that it will not seem an exaggeration to state that within a short time a large percentage of the demand for pleasure cars in the cities will be met and completely covered by the electric pleasure cars.

The fact that it is a family car and used by every member of the family, from the youngest to the oldest, emphasizes certain demands in the construction which have heretofore have either been ignored or unthought of by electric car manufacturers. The majority of the modern electric cars have reached a standard of construction which every one knows affords wearing qualities, strength and safety.

Some builders have spent more time in perfecting the safety features than others, but practically all are known to be reasonably durable, safe and easy to operate. But the one essential which really is in greatest demand is how much comfort can be assured? The first requisite of complete comfort is ample seating room. This includes sufficient body length that will enable the occupants freedom from cramped positions and give them the ease which is desirable.

21 Years Old Electric

An electric car, built in 1893, has been presented to the New York Electric Vehicle Association by S. S. Mendell. The car is equipped with three wire wheels and pneumatic tires of the same age. The inventor's name is not known.
New York's Co-operative Electric Garage

Largest Electric Garage Houses One Hundred Passenger Electrics Under the Supervision of the E. U. A.

The new co-operative electric garage of the New York Electric Vehicle Association, at Central Park West and 62nd street, is now in full operation with a quota of one hundred electric pleasure cars housed and cared for beneath its roof and the entire project is succeeding beyond the fondest hopes of its originators. The task of putting the largest electric garage in New York City on the map is no easy one and has been accomplished by the New York Electric Vehicle Association with the aid of three of the leading makers of electric pleasure cars, Detroit, Baker and Rauch and Lang, all of whom have made the new garage their New York headquarters with handsome showrooms on the avenue. The association takes entire charge of the running of the garage from leasing the building to billing the car owners. The cost of keeping a car at the garage averages approximately forty-five dollars per owner, including all necessary service, care, charging and boosting.

There are many features of interest in connection with such a big electric garage as this, particularly its electrical and charging equipment. The charging switchboard is probably the largest of its kind ever installed and controls 48 charging outlets of varying voltages. The meters have a capacity of 200 kilowatts, almost enough to warrant a special panel in a generating station, and two 750,000 c.m. cables carry the service into the building. These cables have a combined capacity of 3,200 amperes and 120 volts or 400 kilowatts. The garage has a total floor space of 30,000 square feet, more than half of which is devoted to the storage of cars and the rest to offices, service and stock rooms and repair shops. There are 8,000 feet of copper wire and 1,400 feet of conduit, exclusive of connecting cables used in the electrical system of the garage. The outlets are so arranged that all of the cars can be charged in their regular positions without shifting or moving. The equipment takes care of batteries ranging from 24 lead cells with a charging rate of 8 amperes, to the 60-cell Edison batteries requiring 100 amperes. The average charging time is from four to six hours.

Every possible effort is being made by electric garage interests to give vehicle owners a maximum of satisfactory service. The Fashion garage, Chicago, has adopted a novel method of stimulating electric use which has been practiced with much success. This new method furnishes patrons with a special call and delivery service while they do their shopping in the downtown department stores. Two men in uniform are stationed at a well-known store in the business district where they await the summons of car owners who wish to have their vehicles taken care of while down town. Calls are sent in by telephone, or the vehicle users stop by the store, pick up the "hiker," and continue to their destinations, the "hiker" driving the car back to the garage or returning it to the owner at an appointed hour and place.

Since this special service has been available the number of car owners taking advantage of it has averaged eighteen a day. The Salvat garage houses 180 electric cars. No charge is made for the service, but the obliging "hiker" is usually rewarded with a "tip" from the car owner. The plan has worked out so well that the local section of the Electric Vehicle Association is considering the establishment of a more comprehensive "hiker" service of similar kind, to be available to all Chicago users.
Value of Efficient Motor Truck Drivers

*Motor Troubles Decrease as Drivers Become Skilled*

Mot or truck troubles, in the judgment of business men who are giving the problem close attention, decrease in proportion as drivers are obtained who understand the piloting and care of the cars.

Such drivers are far more numerous and far easier to get than they used to be, and with their increase is destined to pass a large proportion of the difficulties that attended the early days of the commercial vehicle.

Considering the youth of the motor-truck industry, the number of skilled pilots now available is little short of remarkable.

It is not to be forgotten that a whole new race of drivers had to be developed.

Early in the industry this lack of trained men presented the chief obstacle to the general adoption of trucks.

The men who understand street traffic and all its problems had been trained to driving of horses, and were in many cases not friendly to the coming of the motor power that might have the effect of retiring them from their position. Even where there was a willingness to serve, the lack of a knowledge of the gasoline engine and the electric machine operated against the success of many a good man.

The automobile chauffeur did not offer the solution, for he had been trained to the handling of pleasure cars. His weakness for speed was a handicap. Moreover, he lacked the business knowledge which in many cases is essential for the kind of service the delivery man of the vehicle must render to his firm.

The man who sold the truck had to assist in the finding of a man to drive it, and he welcomed the duty, for he knew to what extent its satisfactory performance was dependent on its pilot.

Such co-operation was hearty and intelligent.

Often the driver was taken to the factory. He was offered a chance to study construction. He saw what the motor of a truck was and how repairs and adjustments could be effected. By such training many men now prominent with big concerns gained their knowledge of the rudiments.

Firms purchasing trucks and having horse drivers whom they wished to retain in service turned such men over to the selling company and paid their salaries during a course of instruction.

Gradually came an improvement, gradual but sure.

A system of inspection was developed by many companies to see that their machines were getting the right kind of treatment. The driver was watched to see whether he was getting the right mileage from his expenditure of fuel and tires, whether he avoided the serious faults of overspeeding or overloading, and whether he was giving his machine the kind of treatment that assures longevity.

A warning came to the driver who was remiss in any of these points, and in case his offenses continued, notice was served to the owner of the truck that it was in incompetent hands and that a change would benefit the valuable piece of rolling stock.

In actual practice this system did not work discord between driver and owner or between driver and the company that sold the car. The drivers have made the discovery that their material situation was destined to be greatly improved by the transition from horses to power vehicles. They could make more money, and make it in better hours and under more comfortable working conditions. So they strove to become efficient as quickly as possible and welcomed the assistance of the factory experts who could show them the way.

This co-operation steadily improved conditions. It also shifted the blame for occasional remissions of the machine. It was found that, in the hands of the skilled driver, a machine would bring results. Failures could usually be traced to the greed of the owner in abusing the machine by overspeeding or overloading, or to the ignorance of the driver.

The crop of good drivers grows daily. The demand is producing the right kind of men. It has been found that a driver does not have to be a mechanical wizard. There is no mystery about the motor truck of today. Any man of reasonable intelligence can in a short time attain a complete knowledge of the mechanism of either a gasoline, steam or an electric truck and become sufficiently skilled to keep it clean, to make minor repairs and adjustments and better still, to keep the machine going along uninterruptedly at the highest state of efficiency.

Chauffeurs of pleasure cars who took some little time to grasp the difference of method required for the truck have now come into this knowledge, and many such are to be found in the employ of big commercial enterprises which are getting the most successful results from their trucks.

The experience of many leading firms show that there is no obligation when putting on trucks, to hire veteran operators. Many a plodding driver of a slow-moving horse and wagon, whose mechanical knowledge was a minimum, has been converted into the best of motortruck pilots because he is careful, conscientious and never strives to make excess demands on the vehicle.

It is almost the rule to find firms giving the preference to their horse drivers when installing trucks. Instead of trying to make the pleasure-car chauffeur into the business man needed to represent the firm at the home of the customer, it was decided easier to convert the wagon driving business man into a chauffeur. Such men swiftly shift to the truck the care they gave to the horse. They approach the new work in the right spirit.

The result has been surprisingly satisfactory. Less and less complaint is heard concerning the work of the drivers. Naturally, the result is best where there is close control from the business office. By a system of tapes that register the number of miles covered by the truck, it is possible to keep a close touch on the number of stops and their duration, the daily performance of the car. Add to this a proper record of outlay for repairs and replacements, as well as for tires, gasoline, lubricating oil, electricity, etc., and the firm has in possession an exact record of the work of each driver. It is then readily possible to tell which ones are best protecting the employer's interests.
ECONOMICAL operation of electric vehicles so closely depends upon economical handling of the charging problem that it may almost be said that the success of the electric really hinges on the charging question.

Whereas in the early days the average user of a commercial electric turned his vehicle over to the nearby garage, to-day this same owner has added more electrics and has assumed the responsibility of charging and housing his own vehicles.

The utility of this type motor vehicle has been so generally accepted that practically every user in this late day has become sufficiently educated in the care of his vehicles that it is now more a matter of securing the proper facilities and apparatus than the actual mechanical knowledge and operation of charging, inspecting, etc.

Users of large installations already have come to realize this, and accordingly are taking great pains in selecting proper equipment for this purpose. The new installation at the recently opened plant of the Ward Bread Company in Boston affords a good illustration in point. The equipment was designed and supplied by the Cutler-Hammer Manufacturing Company, of Milwaukee, and is built on the multiple-unit principle, much like a sectional bookcase, so that enlargement of the system in order to keep pace with the growth of the business is practically rearranged.

The switchboard, which is illustrated in the accompanying picture, is installed in a gallery of the engine room adjoining the garage proper. By this means an attendant is able to care for the batteries under engine-room conditions and without leaving the board, while the only attention ordinarily required of the vehicle is the insertion of the charging plug.

The present equipment consists of seventy vehicles and consequently the board is made up of thirty-five duplex sections, each designed to care for two batteries. In addition there is a group of special panels at the extreme right designed to be used for charging, discharging and forming batteries. A power plant on the premises furnishes direct current at 115 and 230 volts on a three-wire system of distribution.

Each section of the board is a complete unit, carrying cast grid resistances on the back. On the front is a double-throw knife-switch, a 15-step horizontal slider type rheostat, a reverse-current circuit breaker, enclosed fuses and two-candlepower indicating lamps.

Each panel carries two rheostats, each of which is designed for charging a 42-cell lead battery, at 30 to 8 amperes. By means of the double-throw switches, the operator is enabled to connect the batteries to be charged on either side of the line, thus keeping it in proper balance at all times, while a special 300-ampere zero-center ammeter and overload relay mounted over the center of the board is arranged to ring a bell if the line is thrown out of balance by more than a predetermined amount at any time.

The circuit breakers on the panels are arranged to open the circuit should the power be shut off so that the battery currents would be reversed, while the breaker is interconnected with the charging rheostat in such a way that the operator cannot possibly begin to charge a battery without first cutting in the entire resistance.

In addition to other precautions, each charging outlet is provided with enclosed cartridge fuses. For taking readings from the batteries special slips are provided on the switches, it being possible to take voltage and ampere readings simultaneously without interrupting the current.

Volt ammeters are mounted on swinging brackets at each end of the board for taking readings of the charging circuits.

Three of these four reading instruments are used for the regular panels, while the fourth is used for the special forming and charging panels on the extreme right of the board. There are six of these sections, each of which is capable of charging a 42-cell battery at 30 to 8 amperes, and discharging at 30 to 15 amperes, the rheostat being a 30-step design.
Cord Tires for Passenger Electrics

Tire Construction Which Insures Greater Resiliency

BY T. D. BREWSTER*

*Goodrich Rubber Company.

This tread gum tapers to the edge, being rather thin aside from that portion which is to be in direct contact with the road. This sort of a tread formation has been found to adhere more closely to a tire construction as is the cord tire, than would the ordinary tread used on regular fabric tires. After the tread is applied, the ring which originally contained the staples is removed, allowing the staples to remain in the tire, they being held in position by the cord formation which has been woven over them. The next operation is to remove the core, which is in five pieces. The tire is now taken to tables and the side strips and bead applied. This bead is constructed of fabric. After the bead has been applied, it is covered with ordinary tire fabric, and over this tire fabric, is another covering of specially constructed fabric, the intention of which is to do away with any possibility of the cracking of the gum at the side of the tire, just at the top of the rim strip, which sometimes occurred in our former construction, on account of the fabric bead strip not being elastic enough to respond to the movement of the cords while in service and thereby creating a strain on the side walls of gum that soon cracked them through. That the new construction is effective is evidenced by the fact that since inserting the strip of specially built up fabric, we have entirely eliminated the trouble mentioned. After this operation has been completed and by the addition of extra side strips, the entire casing covered with gum, it is taken to a hydraulic press where an iron ring is forced over the bead, giving it firmness and shape. This hydraulic press is operated at 350 pounds pressure. From here the tire goes to the curing ovens, where, just before being placed into the molds, a water bag is inserted, which holds formation when the heat is applied and the gum softens during the process of curing. The cure is 1 hour, fifty minutes, at 55 pounds steam pressure. After curing the casing is taken to the finishers where the salvage edges are sheared off, soapstone applied to the inside, floating flaps inserted and the tire prepared for market.

Bead and Tread:—Cord tires are built in the quick detachable clincher type only and are designed for use on quick detachable rims, though they can be applied to regular clincher rims. They are used without lugs, other than the valve lug. The regular tread with which this tire is equipped is the ribbed tread. It has proven to be an excellent tread for a tire of this construction, and is also a most satisfactory tread, especially effective against side skidding.

Every part of the cord is made and wound into the tire under equal tension and the result is that all internal strains are conveyed uniformly throughout. There are no slack threads and no over-worked parts.

Every part of the tire carries its share of the load and all parts work together as a unit. The methods of
construction insure a maximum degree of uniformity.

It is an indisputable fact that pneumatic tires are ideal equipment for electric pleasure cars. Practically all electric car builders will concede the advantage of pneumatic equipment owing to its rendering the car so much more efficient. The cord tire is produced for this service, possessing the requisite strength, durability, long life, and satisfactory riding conditions. The construction of the cord tire combines a high degree of resiliency with unusual strength which makes it without doubt the best all around tire for electric pleasure car service, efficiency and durability considered, on the market today. It should, therefore, and will, prove a satisfactory pneumatic tire equipment on any and all types of electric pleasure cars.

Comparison With Solids.—On account of its durability it can with safety be recommended to the trade as being in all respects a much more superior equipment than solid or so-called cushion tire equipment, whose only recommendation is the fact that they do not puncture. Punctures occur so seldom now with the well-kept, swept or flushed city streets that liability to puncture is no longer a talking point. The fact that running conditions, wear and tear, and general high cost of upkeep of car on which the solid or cushion tire is used are excessive is painfully apparent to any one who has used that tire equipment. This inefficiency is all the more noticeable with solid or cushion tire equipment where cars are driven over rough or uneven surfaces or at high speed. In fact, there is no pleasure experienced in riding in a vehicle under such conditions due to the shaking and vibrations noticeable in all cars equipped with solid or cushion tires. One demonstration of the same car equipped with cord tires as equipment as against the same car under same road conditions and at the same speed in comparison with cushion or solid tire equipment will readily convince any one of the accuracy of this statement. The fact that trucks and other heavy commercial vehicles are equipped with solid tires would of itself indicate their appropriateness for equipment on such vehicles rather than for a handsome, attractive, car for pleasure purposes only.

Chicago Section Discusses Vehicle Maintenance

At a meeting of the Chicago section, Electric Vehicle Association, held on February 23, R. Macrae, electric vehicle engineer of the Commonwealth Edison Company, presented an address on methods and cost of commercial vehicle operation.

Mr. Macrae stated that operating methods have not kept pace with the developments in the vehicles or batteries and accessories. The failures of electric vehicles, especially in the commercial field, are in practically all cases due to faults in operation or in methods of maintaining the vehicles. He cited instances showing that much of the trouble encountered with electrics is due entirely to neglect or ignorance in caring for the car, and these experiences tend to retard the proper development of the industry.

Statistics were presented on the operating cost of several commercial vehicles that are giving satisfactory service, although the vehicles themselves are of inadequate design and operating under adverse conditions. One vehicle referred to, a 1,000-pound type, operates only about four or five hours per day, and covers a distance ranging from eight to fifteen miles. This rig is used for towed delivery and the driver devotes a part of his time to other duties. The average kilowatt-hour consumption per month for this vehicle is 149, the batteries being charged every second day. The average cost of current per month is $7.45, and the storage charges are $18.00 per month, making a total monthly operating cost exclusive of driver's salary, of $25.45. This vehicle represents a first cost of only $500, and was purchased second-hand. It is equipped with a 32-cell Philadelphia thin-plate battery.

Another vehicle referred to was a two-ton truck for delivering fish. This vehicle averaged 500 miles per month, the energy consumption being 452 kilowatt-hours. The cost of operation per month for this car averaged $44.60.

A 3,000-pound parcel delivery wagon, commented upon, covered an average mileage of 1,226 per month, the energy consumption averaging 795 kilowatt-hours. In this case the cost of energy averaged $39.70 per month, while the garage charge is $25.00 per month. The vehicle is equipped with 60 cells of Edison A-6 battery.

Mr. Macrae called attention to a report which has been submitted to the City Council of Chicago by the Efficiency Committee of the Civil Service Commission covering garbage haulage, in which a table of comparative electric vehicle and horse-drawn costs are presented. According to this table, the cost of operating an electric vehicle is shown to be proportional to the mileage covered. For the short hauls, these figures showed the horse-drawn equipment to be much more economical than the electric, while for long hauls the electric was shown to be cheaper. Mr. Macrae pointed out that the conclusions drawn in this report were entirely erroneous, and he presented data showing the cost of delivery by means of electric vehicles for short hauls to be much lower than the cost for horse-drawn wagons doing the same work. He thought that some effort should be made to provide the council with proper data on the subject.

In conclusion, he made a plea for a greater standardization in battery equipment, arguing that the large number of batteries containing various numbers of cells be eliminated to a few standard-size batteries. This would greatly simplify garage practice and insure vehicles receiving better care.

From the co-operation of the truck companies, inspection by users and the ambition of the drivers themselves is steadily being produced an improved supply of trained drivers. The motortruck industry and the commercial enterprises with delivery problems are alike gainers.
Educating the Public in the Field
Suggestions in Selling and Advertising Methods to Keep the Electric Favorably Before the Public

BY F. C. HENDERSCHOTT

The best method for undertaking a task implied by the title of this article would be to first classify best prospects and then devise methods to insure getting the larger degree of results. It is not sufficient to maintain proper garages, service and rates. In order to reap a maximum of return it is necessary that the public not only know about your service and rates but also that sufficient educational effort be made on behalf of the public to insure a maximum of interest and desire.

In every community there are certain classes of prospective buyers from which best results may be expected. In the large cities, for example, experience shows that physicians, dentists, veterinaries, lawyers, merchants, bankers, salesmen covering local territory, the families of the above, especially where there are ladies who might be induced to take an interest in the electric car—utility corporations—for superintendents and other outdoor men. This list is not intended to cover the entire field, but merely as an indication of how prospects may be classified.

Among the more prosperous of suburban residents who commute daily and who reside too far from the railroad stations to walk there is also opportunity for compiling lists with which to conduct educational work. Very often the electric is used by this classification for the purpose of making morning and evening trips to the station, leaving the car free for the balance of the day for family use. In small cities or towns, in addition to all those mentioned above, there may be considered, as good prospects, persons living in the suburbs or adjacent thereto whose business requires them to visit town daily or frequently. This applies only to the electric vehicle used for purposes of pleasure and convenience. It would seem desirable then to first make a compilation, in each community where an educational campaign is to be made, of prospects which promise the larger measure of returns. Having secured such lists, proper data must be prepared before an educational campaign can be undertaken. What is it the prospect will be most interested in? Price, of course, but not alone price, as you will be dealing with prospects of varying degrees of wealth. But every prospect will be interested in the question of service, operation and charging stations. Every prospect will also be interested in the question of price for current. It would not be desirable to use the same data in soliciting prospects, as more emphasis should be laid on the case with which an electric can be controlled when appealing to the wives and daughters of the family than would be necessary in an appeal to the business man. It is not my purpose in this brief paper to undertake a discussion of the merits of the electric automobile as compared with various forms of competition. Such data is readily available and, of course, should be incorporated into the printed matter that will be used in the various campaigns of education.

First, we should thoroughly investigate the subject with the view of getting a correct understanding of just what we hope to accomplish through such educational work. After this has been done and the lists have been carefully selected, concentrated effort should be carried on with the view to introducing the electric automobile into the community under most favorable conditions. Generally, newspaper advertising, while it has its desirable features, is subject to the criticism of lack of concentration. Admitting that there can be no better advertisement than a satisfied customer, the first effort should be to get the electric car introduced into the community, and this can be done through carefully selected lists more advantageously than through general publicity campaigns. Every point in favor of the electric car should be carefully set forth in the printed matter which will be used in conducting these educational campaigns. As inquiries come in they should be followed up quickly and very careful attention should be paid to the training of the salesmen who are to call in response to the written inquiry. Such salesmen should not only know every technical feature of the electric car, but they should likewise be thoroughly schooled in the value of courtesy, the generally recognized psychological features of salesmanship, and it has been proven that oftentimes a lady demonstrator will make a more favorable impression upon a wife or the daughter or the sister in a family, as she can demonstrate how easy it is for a woman to control the electric car. Every well-established sales force should contain at least one woman demonstrator.

Educational campaigns should be undertaken very systematically and every detail should be carefully studied.
as to insure the very highest return in results. The relation of the central station to such campaigns would necessarily be varied. It would seem, however, desirable that educational effort be conducted jointly by the manufacturer and the local central station. In the cases of some prospects luxury and elegance would be the predominant features, while with other prospects economy and service would predominate. This is a detail which would have to be carefully worked out. The interests of the central station centers, of course, in the sale of current. It is not material whether the car sold be high priced or low priced. The interest of the manufacturer centers in the sale of his product. But, if the client plainly indicates that he is not interested in a high priced car but desires primarily wear and low operating cost, his wishes must be carefully respected and such a prospect should be placed in communication with the salesman of the car designed to more fully meet his requirements. Full use should be made of the value of satisfied customers operating electric cars in the community where the car has been previously introduced. What such operators say as to the ease with which the car can be operated, low upkeep, convenience for charging and all favorable selling points should be carefully compiled and placed in the hands of the prospect.

An educational plan for extending the use of the commercial electric vehicle would, of course, differ as the requirements of the prospective purchasers would be shown from a careful compilation and analysis. Different data would necessarily be required, into which would enter the question of insurance, case of operation, the non-requirement of skilled chauffeurs, etc. But the same methods should be pursued as to the compilation of best prospects, the training of salesmen, the quick and careful following up of all inquiries and the making of satisfied users of the commercial electric vehicle. A compilation that could be made, no doubt is now available, of what branches of industry have adopted the commercial vehicle to the greater extent and why they have found it to their advantage to do so. As in the case of the pleasure vehicle, the campaign should be very carefully prepared and when inaugurated should be vigorously pushed, every inquiry assigned to insure the prospect being placed in communication with the manufacturers who are producing a car which would most nearly meet the requirements of the prospect. Educational campaigns should not be undertaken hastily. Every detail should be given most careful consideration and, once undertaken, the work should be carried on vigorously, systematically and continuously. It is evident that such campaigns should be inaugurated at proper seasons, but they should not be spasmodic. Once undertaken, the educational work should proceed just as vigorously and constructively as any other feature of the business. After a campaign has been inaugurated many desirable features would become apparent and all such should be incorporated into the work; thus, through a process of elimination and adaptation, a higher degree of efficiency would be reached.

TO SUMMARIZE

(1) Carefully compile a list of prospective purchasers which experience in the sale of the electric vehicle has shown to be best prospects.

(2) Printed matter, such as booklets, charts, etc., should be sent to this list with the view to (a) interest the prospect, (b) creating a desire. Such printed matter should be supplemented by personal letters and other forms of communication as might seem desirable.

(3) A carefully trained force of salesmen should quickly and effectually follow up every inquiry which is received from prospective purchasers.

(4) As the list of prospective purchasers includes women, or as a car is oftentimes purchased at the request of the women of the family, in communities where such an expense can be justified, a woman demonstrator should be maintained among the sales force.

(5) Careful use should be made of users of electric vehicles in the community in which the educational campaign is made.

(6) The educational campaign may be extended to other lists after a sufficient number of electric vehicles have been sold in a given community. At the beginning of a campaign, however, effort should be concentrated on best prospects.

(7) Ease of operation, life of the electric vehicle, convenient charging stations, low rates for current and every other point upon which prospective purchasers would desire to carefully inform themselves should be given special attention both in the printed matter used and by the salesmen.

(8) Inquiries should be carefully classified to avoid attempting the sale of a high priced, luxurious car to a prospect who is interested primarily from the standpoint of economy and service.

(9) For commercial vehicles careful compilations should be made of the different lines of industry which are now using the greater number of electric commercial cars and data should be carefully compiled showing why the electric car has made rapid progress in such lines of industry.

(10) Educational campaigns should not be spasmodic, but should be inaugurated at proper seasons and vigorously and constructively carried on. Once inaugurated, educational work should become a fixed feature in the policy of every central station and should be just as carefully directed as are subjects of illumination, power, etc.

Transcontinental Run for Electric Vehicles

Plans are being made by the Electric Vehicle Association of America for a transcontinental run over the Lincoln highway next summer, in which both pleasure and commercial electric vehicles will participate. The series of mileage tests to be held on the indoor track at Grand Central Palace, New York, during the Electrical Exposition and Motor Show, which opens next Wednesday, October 7, have been arranged largely to furnish the mileage data needed for preparing a schedule.

The principal mileage test at the Electrical Exposition and Motor Show will be made by the General Vehicle Company, which will operate one of its thousand pound delivery wagons, continuously during the ten-day period of the show. Two batteries will be provided and while one is in use the other will be recharged. This plan is followed in several commercial installations where high daily mileages are required. With proper facilities the changing of batteries requires but a few moments.

This will be the first time that such a mileage test has been made by an electric vehicle, and the outcome will be watched with much interest. Other tests to be made at the show will be for the greatest mileage on a single battery charge. The E. V. A. A. will officially supervise and appoint observers for these tests.
Motoring Laws, New and Proposed

A Brief Review of Important Legislation Affecting Motorists

Ohio

AUTOMOBILE owners and chauffeurs are attempting as a unit to defeat the measure which provides for the licensing of all drivers of motor cars, whether they are owners or hired drivers, and no member of the family of an owner is permitted to drive the car unless he or she is licensed, and such members will have to pass an examination in order to secure a license. Likewise, should this bill be carried, no person under 18 years of age will be permitted to drive a car on the public highways of the state. Under the provisions of the Ohio act, chauffeurs are divided into two classes, those who drive and make repairs and those who drive only; chauffeurs of the first class must make an average of 80 and those of the second grade an average of 60 in the examination. The penalty for any person employing an unlicensed chauffeur would be $25, and anyone operating a car without a license would be liable to a fine of $100 and 90 days' imprisonment.

California

Nothing very drastic is being done in California, the majority of the bills introduced at Sacramento having road amendments for the theme of legislation. All of the principal bills to date seek to solve the unsatisfactory road administration conditions in the various counties. One bill seeks to abolish road districts and road district funds, creating one central fund, directed by a county highway engineer, who would be chosen from the county board of supervisors in conjunction with the state board of engineers. Another bill in California proposes similar operation of highways, with the exception that the county surveyor shall be the road engineer, save in such counties that are too large for one person to satisfactorily fill both positions.

Tennessee

An act "to provide for the extension of courtesy to automobile owners of other states extending like courtesies to automobile owners who have complied with the laws of Tennessee, so as to permit the operation of automobiles which have complied with the legal requirements of other states, within the State of Tennessee for two weeks, without necessity of registration and numbering," has been introduced in the Tennessee state legislature.

Missouri

Missouri is getting after lawbreakers vigorously, and the present proposed change will prohibit the erasure of numbers and manufacturer's brands from cars and accessories. In addition a bill to regulate the licenses charged by municipalities, fixing the maximum that may be levied at not exceeding 50 per cent of the state registration tax. The bill further requires the opening of branch registration offices in St. Louis and Kansas City for the convenience of owners in these cities, which have more than two-fifths of the motor vehicles owned in the state.

In St. Louis four bills have been introduced that have to deal with the regulation of the automobile. One measure prohibits dazzling lights and specifies the exact distance a direct ray of light is permitted to be thrown.

Another bill provides that no horn or other noise-making apparatus shall be sounded except as a warning signal to pedestrians or to attract the attention of a traffic policeman.

Texas

Texas is framing up a bill providing for the state registration of automobiles and the payment of a license fee which would bring the state a revenue of fully $500,000 a year. With the exception of the disposition of the proceeds from registration, the measure is identical with the New Mexico law, which is said to have proved entirely successful. The new law will tax all vehicles except traction engines, road rollers, fire wagons, ambulances and vehicles run only on rails. Every automobile owner must register his machine annually with the secretary of state, and the fees will be as follows: The law provides for a dealer's license fee of $12 a year.

This law would not apply to non-residents until their machines had remained in the state for 60 days or more. The enactment of this law will abolish the county motor tax, but would permit cities and towns to require owners of cars to register their state numbers, and to charge them a fee of 50 cents annually.

Michigan

A motor tax bill has been introduced in the Michigan house of representatives, providing for an additional tax of 25 cents for every 100 pounds of weight. This new bill is to replace the act of 1913, which was declared invalid by the Michigan supreme court. The reason for adding a tax on the weight of motor cars is the fact that many low-powered cars are much heavier than high-powered machines, and the latter do not wear out the roads as much as the former. This, it is said, will provide a more equitable taxation, and trucks and other commercial vehicles will have to pay a more just proportion, considering that they wear the roads more than the passenger cars.

Massachusetts

The Massachusetts highway commission is endeavoring to secure a uniform highway act, and in its report to the legislature asks for the following changes in the law: For the passage of a statute to provide uniform penalties for the operators of all motor vehicles; for the definition of the words "chauffeur" and "dealer"; for authority for the commission to make the road improvements it deems best; and for power to suspend the right of any resident of the state to operate automobiles.

New Hampshire

A new method of a single tax on pleasure automobiles has been introduced in the New Hampshire legislature. The new law makes the registration fees payable to the secretary of state, and takes the place of both the present license and tax.

No other fee or tax is to be collected of any automobile, except the operator's license. One-fourth of the money collected by the secretary of state is to be turned over to each town or city where the motor vehicles are owned. Likewise, a law has been introduced in New Hampshire to compel all motor vehicles to stop just short of a railroad crossing. This law is considered
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entirely too drastic, as it is pointed out that hundreds of machines entering and leaving Nashua on a Sunday would have to stop at the Acton tracks, despite the fact that there is no train service on Sundays and very few trains throughout the week. Another New Hampshire law that is termed drastic by the motorists of that state, reads: "The driver of any motor vehicle approaching or passing a car on a street railway which has been stopped to allow passengers to alight or embark, shall slow down such a vehicle and if necessary for the safety of the public shall bring such vehicle to a full stop. Upon approaching a pedestrian who is upon a traveled portion of the highway, and not upon a sidewalk, such vehicle shall be slowed down, and a timely signal shall be given with the bell, horn or device for signaling."

Delaware

A number of bills have been introduced in the Delaware legislature seeking to amend the motor law. The proposed changes call for the revocation of the license of an operator who is convicted of operating the machine while under the influence of liquor, the same to be certified to the secretary of state by any mayor, justice of the peace or the judge of the municipal court of Wilmington. In this way the various convictions will be noted, and on the third offense the operator’s license will be revoked. Another section of the proposed law requires business cars of non-resident owners regularly using the roads of the state to carry Delaware license tags. The court has held that under the present law this is not necessary except where cars are engaged in business within the state.

A separate bill will be introduced authorizing the governor to appoint at his discretion an automobile inspector for each county during certain seasons of the year, the inspectors to be used to enforce the motor vehicle statutes and empowered to make arrests. They will be appointed from month to month and will receive $50 for each month of actual service and railroad fare.

Maine

The most important bill to be presented to the Maine legislature is that calling for the entire operation of the automobile registration law in the hands of the state highway department, which will completely eliminate the secretary of state in respect to motor car fees. The state highway commission favors the plan and it is stated that the move would be for the better enforcement of the law at less cost.

At the present time the various state legislatures are considering these bills, and their disposition is anxiously awaited by motorists throughout the country.

Waverley Electric Shop Trucks

The accompanying illustration shows the newly constructed Waverley electric shop trucks ordered by the U. S. Government for the Navy Yard at Bremerton, Puget Sound.

Structural steel construction of rectangular chassis frames reinforced with longitudinal cross members to carry a three-ton load, cast steel wheels with 24 inch solid tires, a structural steel bumper on the tractor amply braced against head end collision, short and wide riveted steel platforms surrounded by steel turn tables—the first impression might well be that of a gun platform for an armored car.

Yet the purely industrial purpose for which they were designed becomes evident on closer inspection. The use for which the tractor and trailer were planned is limited to the floors of the navy yard and its shops.

When tractor and trailer are fully loaded with three tons each they will have a maximum speed of 5½ miles an hour running on the level.

A 30-cell 21-plate lead battery is provided for this not extravagant speed and it is ample for a mileage of 30 miles on a single charge.

The driver’s seat is offset from the body of the tractor to give the complete surface of the platform, 5 by 11 feet, for loading space. A fifty foot cable connects the trailer to the tractor giving ample room for the longest beam that could be carried on ordinary flat cars. The ends of such a beam will rest on the two turntables, giving it free play for turning as the cars round the corners of a building or pass from the main runway to a cross aisle.

The turntables are of great use also in loading and unloading beams, angles and plates. The entire design of the car is the result of years of experience in handling heavy materials in an extensive and well organized manufacturing plant.

Waverley Battery Shop Truck.

Rolling mills, structural steel works, boiler shops, oil tank builders, armor plate and gun factories, locomotive builders, wire mills, blower manufacturers, and all makers and users of heavy machinery, heavy castings, heavy plates and girders will find this tractor and trailer of interest to them.

Walker Uses Johnson Shock Absorber

The Triple Action Spring Company of Chicago, manufacturer of the Johnson shock absorber, has been awarded the order for the entire equipment of the Walker Vehicle Company, manufacturers of all high-grade shock absorbers, secured only after a most drastic test of all high-grade shock absorbers. The test was made on a car equipped with hard rubber tires, over the roughest kind of roads.

The Johnson is adjustable to all kinds of road and load conditions, and is a shock absorber with a recoil check.

The Chicago branches of the Detroit and Ohio electric equip as standard, Johnson shock absorbers to all cars sold in their territory. The electric car test is the most severe of all. The Johnson shock absorber is made for all makes of electrics.

From the standpoint of the manufacturer, production and value of cars, domestic consumption, exports and total amount of investment, 1915 will be the greatest in the history of the automobile industry in the United States.

Thomas A. Edison recently stated that in fifteen years more electricity will be sold for electric vehicles than for lighting.
Manufacturers’ Guarantee and Service

Paper Read Before the Detroit Truck Convention

A MANUFACTURER’S written or published guarantee in these days takes about the same form whether the manufacturer be a producer of motor trucks or pocket knives.

In substance, it guarantees the article sold to the user against defective material and poor workmanship, and thus it becomes largely a matter of form, and very frequently the customer does not even inquire if there be any guarantee on the article he purchases. He assumes, and rightly, if he is buying from a reputable manufacturer, that if there is anything wrong that is manifestly the fault of the manufacturer it will be made right without question.

The object sought by all reliable manufacturers or dealers is to have their customers satisfied. Therefore, whether or not they have a set form of warranty, they will endeavor to make good anything that can be chargeable to neglect or oversight in the factory.

The simple form of warranty just referred to, if made by a reliable concern, is all that is necessary for the protection of the customer and all that he has reason to expect or ask; for if a piece of machinery is properly constructed of good material it will give the user satisfactory service if properly operated.

This last point is the one where the difficulty comes in adjusting claims under the manufacturers’ warranty. Every manufacturer has had experience with the man whose machine “went wrong” without any reason whatever. The owner insists that the material was “absolutely rotten,” or that the thing wasn’t made right.

When I sold buggies I have been called upon to make good a buggy pole that “just broke in two while driving along a perfectly smooth road,” when an inspection of the broken pole showed it to be a perfectly sound piece of hickory.

Equally ridiculous claims are made on truck manufacturers or makers of any kind of machinery.

So far as the manufacturers’ warranty is concerned, the standard form adopted by the Automobile Chamber of Commerce covers all that is necessary. I believe, however, that the warranty should cover a longer period than the 90 days in the form adopted.

As a matter of fact, any manifest defect in material or workmanship will ordinarily appear the first time a machine is put to a real test, but the very fact that it has been customary in almost all lines of machinery, implements and vehicles to make the warranty cover a longer period, the customer expects it and if he is at all particular to notice the warranty he feels that in investing the amount necessary to buy a motor truck he should be protected for a longer time than three months.

In treating the subject of service I must, obviously, do so from my own viewpoint.

Every right-minded manufacturer will agree that the word “service” in connection with the motor truck business has been permitted to run riot and cut up a lot of didos unbecoming the dignity it stands for.

Salesmen have talked “service, service, service” to the exclusion of all points of merit they might claim for their trucks.

The manufacture and sale of motor trucks is an industry comparatively new to the world, but one that in the very nature of things must soon be recognized as one of the leaders.

Every great industry that has survived long enough to gain the recognition of the world and become an important factor in the commerce of the nations has been built up by adhering to good, old-fashioned business principles; and those principles must be applied to the motor truck business if it is to survive and be a success, and the sooner those of us engaged in the industry realize this fact and apply those principles, the sooner will our success be assured and the sooner will our real service to the world be recognized.

Not many years ago we didn’t hear so much about service to customers as it is advertised today. Manufacturers and merchants advertised their wares to the public, guaranteed them to be as represented, but said very little about service excepting to give the customer value received.

The country merchant went to the city and selected his goods. He paid his own railroad fare and hotel bills. The consumer went to the retailer, bought his goods and carried them home.

As competition increased, the merchant added free delivery. The manufacturer and jobber sent out salesmen and in addition created a fund to pay the dealer’s way to the city and his hotel bill, and soon we began to hear about the hard cost of living.

After automobiles proved a success as pleasure vehicles the motor truck for commercial purposes came into being—and it came rapidly—competition became fierce. Business men wanted motor trucks, but the prices were high.

The truck was a strange animal and the customer was shy. Then as manufacturers we began to make foolish promises. We said, “You need not be afraid of it; we’ll take care of it for you, inspect it every day, sleep with it at night and furnish any new parts that may be needed.”

While we didn’t say, “Let your drivers abuse it and neglect it and we’ll stand for it and keep it on the job without expense to you,” we inferred it, and the keen competition furnished the incentive for each fellow to invent some new promise in the way of service.

I do not want to be understood as championing “old fogey” ideas, or not being willing to fall in with every really progressive movement, but there are a few basic principles in business, as in the arts and sciences, that cannot be dispensed with if one is building for the future.

When viewed soberly, all this talk of service as delivered to the prospective truck customers appears ridiculous, because for the most part it was not a sales argument to convince the customer that he would get real service out of his truck, but a declaration about the “service” his truck would get out of the manufacturer, free inspection, free parts, possibly free garaging, use of a substitute truck while the cripple was in the hospital.

I say such promises assume the ridiculous for the manufacturer who does a national business. Although the promises might be fulfilled in the large city where the manufacturer maintains a fully equipped branch house, but how about the hundreds of customers in the

*General Manager, G. M. C. Company.
smaller towns where there may not be even a local agent? What manufacturer can sell trucks at a reasonable profit and maintain inspectors and repair men within the call of every customer?

The first service to the customer is to intelligently analyze his haulage problem and not only recommend, but insist on him buying the size and kind of truck that is adapted to his business—that will be the most profitable for him to operate.

The next service is to be careful to see that the truck he gets goes to him in good working order. The next service is to see that the man who is to operate the truck is thoroughly instructed in the way to use it as well as in the way not to abuse it—to caution him against overloading and over-speeding, and to also impress these things on the man who pays the bills.

At that point we consider the truck the property of the man who bought it and try to make him feel the responsibility for its proper care and maintenance. Another service that is due the customer is to provide a stock of parts at our nearest service station so that in the event of breakage a new part can be supplied without unnecessary delay.

If a part is broken and it proves to be defective, the new part should unquestionably be furnished by the manufacturer in accordance with the warranty.

In our organization we have our field service men and our regular salesmen about the country; and if any serious trouble develops we promptly dispatch a man to look after it.

This service we do not charge for, but if work or repairs are needed because of the abuse of the truck by the owner we expect him to pay for it.

It is the duty of the salesmen and service men to keep in touch with owners and offer them advice when needed, but not to promise a customer that we will inspect his truck at regular intervals, for the reason that such a service would be impracticable in the conduct of a national business without adding an expense that would increase the price of trucks to the user. Neither to promise to furnish a spare truck to be used while the customer's is undergoing repairs, for this also is a promise that no manufacturer who does any considerable amount of business could live up to without going bankrupt.

The average man is fair-minded. At least he wants to be and wants to be so considered, and we have found that customers readily agree with our policy where it is explained to them.

As to when service in the way of free repairs should be given, it is very difficult to make an ironclad rule. As stated before, the object of all of us aim at, whether we be manufacturers, truck dealers or merchants in other lines, is to make satisfied customers.

We can't always do it, for some are unreasonable. There, again, is where good, old-fashioned common sense and judgment is necessary. Circumstances must largely govern your decision in each case where there is any room for doubt.

With relation to the garaging of trucks in connection with service, we decided that manufacturing and selling trucks was one line of business and operating a garage another line. A truck manufacturer should not be expected to furnish garage room and garage service, either free or at a price, any more than he should be expected to furnish a driver for the truck.

To sum the matter up, the motor truck business should be conducted the same as any other legitimate business.

Give the customer value received in his initial purchase, instruct him in the proper use and care of his truck and make your guarantee good—co-operate with the customer to enable him to get the best results from his purchase, but insist that he assume the responsibility of caring for and insuring his own property.

Motor Truck Building for Panama-Pacific Exposition

Motor truck manufacturers will have a building erected exclusively for their exhibits at the Panama-Pacific International Exposition. It was decided to erect the building at this late moment, only when it was seen that in order to accommodate in any measure and to insure a representative showing of motor trucks, special provision would have to be made for housing the displays. Allocations of space are being made in the new building and are being rapidly filled.

It had been originally intended to place the displays in the Palace of Transportation with the pleasure car exhibits, but the demand for space for other exhibits was so great that but comparatively little space would have been available. The new building will be ready for occupancy on March 20 and will be opened to the public on April 1.

The building is being erected and will be one story in height and have a total of floor area of 71,000 square feet. The space which will be available for exhibits is 54,650 square feet.

The European war has created extraordinary trade conditions and has caused Americans to look more to the excellent products made at home. The several million people who visit San Francisco this year will be expecting to see representative displays of American-made products. Added to this fact and which is of particular interest to the motor truck manufacturer, is the knowledge that west of the Rocky mountains lies one of the greatest fields in the world for the motor industry. It is practically as yet untouched in the matter of motor transportation. The old fashioned stage coach is still greatly in evidence for hauling freight in the mountains for long stretches of distance. It has been estimated that there are some 50,000 miles of stage road tributary to the railroads in the West, all of which are available for the motor truck. Three of the states in the Pacific region, Washington, Oregon and California have been spending millions in the improvement of their highways. The motor ing industry will reap the bulk of the benefit from this "good roads" movement. The pleasure car makers have been well aware of this fact and today as a result of a scientific selling campaign, California particularly is one of the greatest states in the Union for the automobile dealer.

The pleasure car and motor truck show which is to be held will be the first one west of the Rockies and every effort is being put forth to make it a noteworthy one.

Edison Exhibits at Exposition

The Edison Storage Battery Company will have a novel and attractive exhibit at the Panama-Pacific Exposition in full sway by March 1. Thousands of storage batteries are already on the ground and being placed for the brilliant scheme of illumination which has been planned for this exhibit.

The Edison storage battery has often been called the life saver of the electric truck industry and it surely has earned this deserved reputation. Many visitors to the exposition will have an opportunity to investigate this wonderful battery and its relation to electric truck efficiency.
Factory Guarantee and Free Service

BY J. H. THOMPSON

FACTORY guarantee is one of the most important subjects that confronts manufacturers and dealers in the marketing of motor trucks. The fundamental principle on which the guarantee furnished by the manufacturer is based, is a legal limited liability instead of an unlimited business asset. It makes it impossible for the dealer or the manufacturer to live up to it. The guarantee as it stands today is no guarantee at all, but is more of an excuse or reason which is given to the purchaser of a truck to appear in court with the manufacturer, if necessary.

Guarantees used by most of the truck manufacturers, warrant their product to be free from defects in material and workmanship for a certain period under normal use and service. They agree to furnish, free of charge, any parts that are returned to their factory, if in their judgment the part is defective and if the truck has not been subject to misuse, negligence or accident, or has not been operated at a speed exceeding the factory-rated speed or loaded beyond the factory-rated load capacity.

This warranty means that the dealer as well as the owner of the truck, is in the hands of the manufacturer. What chance has the dealer when the factory depends entirely upon the judgment of their inspectors and service managers who are naturally working for the factories' interest. In cases where parts are presented for inspection and are found to be defective by the manufacturer, the dealer is presented with the parts gratis and are expected to gratefully thank the manufacturer for his leniency. No mention at this time is made in regards to the charges for the installation of the defective part. That is ignored by most manufacturers and left entirely to the discretion of the dealer as to who is to pay the labor charges. This item is one that causes the most dissatisfaction among our users at the present time. For illustration: A new motor truck has been delivered to a customer, and defects in the material and workmanship are found that necessitate a replacement. The part found to be defective may not cost over a dollar, but the labor connected with the replacement of this part will run into considerable money. Is it fair, then to assume that the purchaser of this truck, while he has had the admission of the manufacturer and dealer that the part was defective, should have to stand the labor connected with the replacement of this part, or do the factories think that it is a duty of the dealer to absorb these charges? This is not up to the dealer, and these charges should be absorbed by the manufacturer. They will naturally state that to allow for the installation of defective parts there would be a large range of labor charges owing to the fact that some dealers are equipped and in better position to handle the work than others, and so for a less amount of money. Granting this, it would be satisfactory to all dealers here if the manufacturer would submit a schedule of labor allowance even at the cost he figures it would take his experienced mechanics to make the installation.

In other lines of marketing different products, re-

Rudge-Whitworth Wire Wheels for Electrics
Furnished by the manufacturers of five different Electric Automobiles. Successfully used in Europe and America since 1902.
53 West Jackson Blvd.
Telephone Wabash 8531
CHICAGO

VOLKCAR

Storage Batteries are used as standard equipment in Chicago by one of the largest passenger car manufacturers in the world.

Marshall Field & Co., Chicago's greatest electric commercial fleet user equipped its last seventy delivery trucks with Volkar Batteries

We invite your inquiry and wish to assure owners and garage men that we are at their service at all times in matters pertaining to the subject of storage batteries.

Volkcar Storage Battery Company
2437 Michigan Avenue
Teaming With Electricity

Man power, animal power, water power, steam power, gas power—Electric power. Thus has the old world moved. To team with Electricity (in the proper field) is just as logical as to drive an entire plant thereby.

Keep your eye on the Electric Truck! It has smashed more precedents in the last three years than a million horses. Teaming with Electricity involves a principle which touches the very roots of trackless transportation. Do you realize this or are you looking at the storage battery through 1905 glasses?

Buy one Electric Truck! Hook it up with your other Electrical equipment. Extend your Electrical economies as the others have who use 9,000 Electric Trucks. We will gladly help. Just write.

General Vehicle Company, Inc.
Long Island City, N.Y.
New York, Chicago, Boston, Philadelphia

Copyright, 1914
How Electric Car Values Were Proved in Chicago

Who is better qualified to know electric car values than the electric garage man? His judgment is worth everything to you. It is based on the actual known performance of electric cars long after they have left the show rooms. And he has no cars or "promises" to sell.

So we had a prospective electric car purchaser learn for himself what electric garage men had to say of electrics. This investigation was especially significant because Chicago is the world's greatest electric car city. In all, thirty-two of the largest electric garages were called on.

The result surprised even us. We did look for a 90% Rauch & Lang preference. Eighty per cent would have been a splendid showing.

But in every instance the Rauch & Lang was acclaimed as "The Best Electric on the Market," or words to that effect.

The investigation was impartial, being conducted by a third party who had no other motive than to find out just what electric car stood highest with the electric garage men of Chicago—and why.

Call and let the Rauch & Lang tell its own story

RAUCH & LANG ELECTRICS
McDuffee Automobile Company
2457 South Michigan Avenue, CHICAGO

TO THE THINKING BUYER

If you are contemplating the purchase of an electric car, your first consideration should be in choosing a car which will best meet your requirements.

Electrics are now being built in open and closed models, fast and slow in speed, heavy and light in weight, standard and special battery equipped; all ranging from $750 to $5,500 in price. Low initial price and the persuasions of keen competition often mislead many into the purchase of the wrong car for their requirements.

Your final decision should be based on a comparison of the materials which enter into the construction of the particular cars from which you are about to choose; the advantages of particular arrangements; and the service which the manufacturer has established as a reputation in past years.

Argo, Borland and Broc models, manufactured by the American Electric Car Company, will, without a doubt, meet your particular requirements, both in price, (because of quantity production), efficiency and economy, (as shown by past records), and service which is cheerfully granted to every owner.

The AMERICAN ELECTRIC CAR COMPANY
Manufacturers of Argo, Borland and Broc Electrics

FACTORY
SAGINAW, MICHIGAN

CHICAGO OFFICE
2634-40 MICHIGAN AVE.
Features of The Walker Electric—worth your attention

THE WALKER "ADAPTABLE" CHASSIS—Our twelve years of varied experience with many makes of commercial vehicles taught us that every use to which a truck is put requires a chassis and body adapted to that use. The Walker Drive, being self-contained, permits us to vary the wheel base and thus produce trucks of correct proportions throughout—to meet your needs—without extra cost.

THE WALKER BALANCE DRIVE has a high and permanent efficiency due to its correctness of principle—its simple, practical design, the accurate and permanent alignment and balance of its ten simple working parts:

One Electric Motor — Located in the hollow, torpedo-shaped rear axle.

One Differential — Direct connected to one end of the hollow armature shaft.

Two Drive Shafts — Extending from the differential sockets into the center of each hollow rear wheel—with a pinion on the wheel end of each shaft.

Four Idler Gears — Two in each rear wheel, mounted on the axle yokes.

Two Rim Gears — Fastened to the inside of the tire rims.

Electric Trucks have an established reputation

In every use the Electric Vehicle has overcome delivery problems. Backed by its recommendations the Electric Vehicles are the choice of transportation experts—they produce the results required. Their value is seen in their efficient service. Competition in business demands the best in service—the record of the Electric Vehicle is your standby in deciding on the transportation method for your business.

The Electric—The Vehicle to inquire about

Because you need uninterrupted, dependable, delivery service at all times, you should know the Electric Vehicle. Their superiority has been proven. Our vehicle expert is at your service for information on any phase of the electric vehicle situation.

Phone Randolph, 1280 Contract Department

Commonwealth Edison Company
120 West Adams Street
Chicago
THE 1915 "LIGHT" BAKER COUPE
Baker Electrics

‘No Other Electric Requires So Little Attention As a Baker’

Garage men the country over will tell you that the Baker gives them less trouble than any other car. The new light Baker is a full half ton lighter than the big, heavy electrics, affording all the advantages of light weight (easy steering, easy handling, low upkeep) plus full speed, full mileage, full power and full strength.

BAKER ELECTRIC SALES COMPANY

2530 Michigan Boulevard

Telephone Calumet 5630
Electric Buses Promise Valuable Method of Transit

Trackless Motor Cars in England Show Big Earning and Eliminate Congestion

At this time when the phenomenal wild-fire spread of the “jitney” is focusing so much attention upon the city traffic problem, a consideration of passenger transportation is forced to mind. It is natural sequence that the “tramp jitney” is succeeded by organized bus systems. The bus line, however, is not to be confounded with the irresponsible, individual “jitney.” Not infrequently “jitneys” are operated by unscrupulous persons, many of whom lack knowledge of traffic requirements and regulations. A bus company consists of competent men who have given traffic questions a great deal of study. Moreover, the average “jitney” proprietor owns no property of such intrinsic value as to be able to discharge any indebtedness which he might incur, such, for instance, as damage claims. The bus line, however, necessarily has property.

The “jitney” has won its popularity by merit of its great flexibility, its ability to adjust itself to situations quickly, and to accommodate people living out of the way of ordinary routes. The extensive introduction of “jitneys” in this country is waking up an appreciation of the worth of bus service—a worth which England has fully realized for some time.

In considering the efficiency of bus service, therefore, it is best to examine such service as it occurs in England where omnibuses are doubtless more generally used than anywhere else. In London alone, omnibuses carried nearly 734,000,000 passengers in the year 1913, which is nearly twice as many as were carried in 1910, and is 90 per cent as many as were carried by street cars, and 60 per cent more than were hauled by the local steam railways. From these figures, it will be seen that motor buses have had a tremendous effect in relieving the traffic congestion, and this, in proportion, typical of most English cities where there are many bus routes from 15 to 20 miles in length. Pertinent to this condition was an article by a member of the London council in the News, October 31, 1911:

“The motor bus needs no track, no expensive, dangerous and disfiguring overhead wire intanglements, no excavations, no tearing up of roads, no difficulties with sewers, underground gas, water or electric mains, no rail equipment, no costly track to keep up, and no vast generating stations to operate. If a motor bus breaks down, it is side-tracked, and soon mended or cleared away; but if one tramcar has a mishap, it holds up an entire procession of cars and dislocates all other kinds of traffic.

“Is it any wonder that the motor bus has cut fiercely into the receipts of the London tramways, and would it be surprising if this all-conquering, self-propelled and mobile vehicle should compel us in the not very distant future to bid a costly farewell to yet another system of street traction which may have outlived its utility?”

Development was set forth comprehensively in an address before the ninth annual conference of the Municipal Tramways Association, by its president, Christopher J. Spencer:

“In considering future developments, the trackless (or railless) trolley system naturally comes first into view. The introduction of this new method of transit into this country will undoubtedly extend the sphere of usefulness of the trolley system. The tramway construction boom stopped, not because every district that required better facilities was supplied, but because financial reasons made it impossible to proceed any further into districts unable to support a capital expenditure of $70,000 to $75,000 per mile of tramway laid. The gasoline-propelled vehicle came along to meet this want, but notwithstanding its great development and general excellence the gasoline-propelled machine with its internal combustion engine, its gear box, clutch and differential has not by any means equalled the electric motor in either first cost, simplicity, reliability or efficiency. In a word the operat-
ing costs of a gasoline motor omnibus service are so high per bus mile that not much advantage, if any, is gained over the tramway including its capital charges.

"The railless system, comes along with a vehicle as reliable as a tramcar, and at least as cheap to operate, but with a capital expenditure on street work so low that the bugbear of heavy interest and sinking fund charges is practically non-existent."

In installing buses, the chief aim is to choose that type of car which gives the most efficient service on congested streets, and which, at the same time, costs as little as possible to operate, (for in a business based wholly upon running vehicles for profit, it is obvious that the operating cost is vital.)

Exhaustive analyses of the operating records of electric, gasoline, and horse-drawn vehicles show that the electric can be run more cheaply than the other types. It has also been learned that the electric is the vehicle most flexibly manipulated through traffic, on account of its extreme simplicity of operation.

The electric is practically noiseless, has no offensive odor, does not disfigure highways, and because its speed is absolutely fixed and positive, it can be depended upon not to exceed traffic regulations. For these reasons, this type of car is being much favored for city operation, especially through residential sections, both in American and English cities, and in Paris and Berlin as well, and is now on the ascendency.

Since plainly bus service plays a leading part in English transportation, studies of electric buses in English service will be particularly significant.

Since the war has necessitated the commandeering of the majority of available horses and gasoline vehicles for the troops, English merchants have installed electric vehicles to take the places of those of which they have been dispossessed, and in the same way the English bus companies have filled their gaps with numbers of electric buses, importing from America for this purpose, and now that electric vehicles have been given this opportunity of demonstrating their efficiency, they have made good, and promise to hold their place in the future.

A typical report of electric bus service appears in the London Electrical Times for February 4, 1915, which states briefly that the bus line at South Shields, England, "continues to be a financial success." This line, which acts as a "feeder" to the corporation tramway system, operates 2 buses which, during one period of 3 weeks ending December 19, had receipts amounting to $370.18 the number of passengers being 19,621. The mileage covered during this time was 3,137.30, the average takings per car mile being 11 cents. These buses were installed in August, and their total receipts to January amounted to $1,816.48, the average per car-mile for the whole period was 12 cents.

Two other electric bus installations in England which are doing well are those at Loughborough and York. The same build of car is used in both these places, and a report of the York bus line, which consists of four battery driven cars, is given prominence in the March 11 issue of the London Electrical Times.

These buses were installed by the York Electric Corporation as "feeders" to the tramway line, to traverse narrow streets in the older portions of the city where street railways cannot be laid. The routes are by no means easy, as the roads are not altogether good, and there are steep grades. An engineer who collected data on the performance of these buses, writes: "We were surprised at the steady pace maintained up stiff ascents." The batteries have each a 300 ampere-hour capacity and when fully loaded the bus will run 50 miles on a single charge, at a maximum speed of 12 miles an hour. Although a higher speed could have been provided for, this maximum is all that is required at York, for many of the streets are very narrow, with sharp turns, and high speed is out of the question. The batteries are charged at night at the corporation electricity works and receive five-minute "boosts" during the day. These buses are proving very useful.

Worth consideration is the report by Robert Birkett, Borough Engineer and general manager of Electricity Corporation of South-End-On-Sea, England, to the chairman and members of the Light Railways and Electric Lighting Committee, in which he reports his investigation of electric bus performance to determine whether bus service fills requirements in Southend. Mr. Birkett's report is, in part, as follows:

"The buses were first put into operation on June 26, and were all kept in regular service until August 13 when, owing to the war, the service had to be curtailed. The service was then reduced to 5 buses until the termination of the season when it was further reduced to two buses.

"The three gas-electric cars were frequently out of service owing to defective parts having to be rectified. The gas-electric had frequently to make a detour in its route owing to difficulty in climbing Pier Hill. The motors have been changed at the expense of the contractors, thus effecting a slight improvement. The electric bus is the most reliable and free from breakdown, due, no doubt, to the simplicity of the mechanism. The electric bus is so free from moving parts (there being only the motor with chain drive and differential) that a stoppage due to breakdown of parts is almost negligible. It will be apparent that fewer spare buses of the electric type will be needed in a larger fleet as compared with gas buses. From the table of costs of these buses, it follows that a fleet of electrics will cost per annum less than with gas buses working a ten minutes' service totaling 201,500 miles per year."

"The electric buses in use in America are of many models, and range from the 22 to the 38 passenger type, those carrying 32 to 38 passengers having an outside upper deck. Fourteen miles is the average round trip. It is necessary to equip one of these buses with a battery suitable for a 5-ton truck because of the vehicles' heavy superstructure. Namely, this battery has a mileage in average commercial service at average loads, of 40 to 50 miles per charge. The draft on the battery bus line service, however, is heavier than in ordinary commercial truck service owing to the frequent stops and accelerations. Allowance for this is allowed by an arbitrary reduction of 15 per cent which makes the assumed mileage capacity of the battery in bus service 34 to 42.5 miles a charge. This mileage is considerably augmented, however, by 15-minute "booster" at the end of each round trip.

"Electric bus development in the United States has been rather backward, partly because omnibus service has, until recent years, been comparatively small, and because the electric had not been tried at it. This latter is partly due to the fact that the initial cost of gasoline cars is cheaper than that of electrics but in the long run it becomes plain that gas car maintenance is so much more costly that the choice of the lower initial price is not always economy."
That the use of electrics is not by any means an impracticable experiment of inexperienced persons or concerns willing to take chances, is evidenced by the large installations of electrics by careful and responsible investors, who have given much thought and many tests in determining efficiency in motor transportation.

Many million dollars have been invested in electric commercial vehicles by the most conservative business organizations in the United States, including express companies and others to whom reliability of transportation equipment is of vital importance, and, as stated above, no corresponding collective investments have been made in any other type of commercial motor vehicle.

Wherever they have been installed within the field of their rational application they have not only remained, but by influence of their economy have forced increase in their number. For some years they have been successfully employed in considerable numbers by many government departments such as the navy department, treasury department, government printing office, the Insular bureau and by some contractors in the service of the post office department.

An approximation of the value of some of these large investments is as follows:

<table>
<thead>
<tr>
<th>Company</th>
<th>Electric</th>
<th>Gasoline</th>
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<tr>
<td>American Express Company</td>
<td>220</td>
<td>154</td>
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<tr>
<td>Adams Express Company</td>
<td>325</td>
<td>160</td>
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<tr>
<td>Ward Baking Company</td>
<td>610</td>
<td>50</td>
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<tr>
<td>Marshall Field</td>
<td>230</td>
<td>70</td>
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<tr>
<td>Jabez Ruppers, company</td>
<td>120</td>
<td>37</td>
</tr>
<tr>
<td>George Ehret Brewing Company</td>
<td>130</td>
<td>0</td>
</tr>
<tr>
<td>Commonwealth Edison Company</td>
<td>114</td>
<td>0</td>
</tr>
<tr>
<td>New York Edison Company</td>
<td>114</td>
<td>5</td>
</tr>
<tr>
<td>Gimbel Brothers Company</td>
<td>119</td>
<td>0</td>
</tr>
</tbody>
</table>

(Number operated in 3 cities only).

The constant stopping to take on passengers presents to the bus company much the same problem that is faced by department stores, bakeries, laundries, etc., in house-to-house delivery. The constant stopping demands a car which is not only easy to stop and start, and which will do so without jolting, but especially one where this halting does not mean undue strain and waste of power and money. To answer this purpose, American department stores, bakeries, etc., have made their big fleets of electric vehicles. For the same reason, the Government has been installing electrics for parcel post delivery. The electric has proved to be peculiarly well adapted for this class of service. The largest installations of electrics at the present time are those known as America's "big fleets," that is, commercial delivery systems which are present larger than any fleets run solely for passenger transportation, as for instance, the fleet of the Detroit Taxicab and Transfer Company, which will soon consist of over 70 electric cabs.

The biggest electric fleets in the United States are as follows:

<table>
<thead>
<tr>
<th>Company</th>
<th>Electric</th>
<th>Gasoline</th>
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<td>Jabez Ruppers, company</td>
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<td>New York Edison Company</td>
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<td>5</td>
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<tr>
<td>Gimbel Brothers Company</td>
<td>119</td>
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</table>

These installations, which have been made on the ground of economy and reliability, illustrate the proved dependability of the electric, and show the extensive use to which they are put in services, which require constant stopping, as in house-to-house delivery. For this reason and for the ease of control, which operates as a "Safety First" factor, and ease of motion, which makes it for comfortable travel, the electric is well suited for a public conveyance as well.

Some of the underlying considerations in the nature of development of electric vehicles which have influenced this degree of confidence are the following:

The principles of their design are founded on those developed in the street railway industry, the critical component parts of their equipment being made in the same large electrical apparatus manufacturing establishments. Their reliability and simplicity are on a par with that of the street car, and they have many superior features contributing to a wider range of usefulness without the necessity of any higher grade of operator than that which prevails in street railway service.

They are made up of the least number of moving parts of any type of motor vehicle, so designed and applied as to be practically fool-proof. Their performance is so predetermined that the operator has little to do but to apply the power and steer the machine.

It is not contended that electric buses form a panacea for all passenger transportation ills, nevertheless, when intelligently installed, they can be expected to deliver a performance highly satisfactory to traffic authorities, "safety first" conditions, passengers and investors.

First Electric Motor Truck Show

For the first time in the history of automobile shows, an exhibition devoted exclusively to machines using electric power for both interior and exterior service, was held in the building of the New Bedford Gas and Edison Light Company, New Bedford, Mass. Practically every kind of an industrial truck, to which class the exhibition was confined, was shown. Besides the exhibits of the General Vehicle Company from its Boston, Mass., service station, which was one of the largest contributors to the show, there was a Walker truck, a Chicago product, which made the run from Boston to New Bedford, a distance of approximately 56 miles, in 4 1/2 hours, which is considered fast time for a truck made to carry 1000 pounds.

One of the exhibits was a General Vehicle interior truck for use on warehouses and in large warehouses, mills, factories, etc. It was equipped with a 10-foot platform with a carrying capacity of 3000 pounds. Included among the advantages of electric motor trucks pointed out, was the fact that five electric trucks would do the haulage of 40 horses, and another was that the trucks do not require as much space, the saving in cost being estimated at from 25 to 35 per cent.

Many of the leading manufacturers of trucks, electric batteries and devices for electric automobiles in this country were represented by exhibits.

War Holds Up Ball Bearings

Under the recent decision of the German government in relation to its war embargo, all ball bearings and parts are absolutely prohibited from export from that country. The ball bearing interests in New York City are optimistic, however, stating their belief that the embargo is only temporary, and that concerns in this country have large stocks on hand that are sufficient to supply the demand until the embargo is lifted.
Detroit “600” Club Banquets

Chicago Sales Organization, Anderson Electric Car Company are Guests of Manager D. E. Whipple

An informal dinner and party held in the dining room of the Chicago Automobile Club was given to the sales organization connected with the Detroit “600” club, Saturday evening, April 10, by D. E. Whipple, Chicago manager.

In every respect, from the opening toast, “Here’s to a banner Detroit year,” to the closing tune of Home Sweet Home, the event was one of the most enjoyable
guests then gave a standing toast to the host.

The banquet proceeded while the guests between courses rendered popular airs under the direction of the toastmaster. In fact, the musical portion of the program waxed so enthusiastic that quartets arranged by the toastmaster and led by Messrs. Salvat and Jones competed for vocal honors to the enjoyment of all present.

It was just about the beginning of the seventeenth—well the chicken course—that favors were presented to the guests. Rattlers, cow horns, jumping snakes, various colored sailor hats, and ribbon confetti were in abundance. Further, a clever trio of cabaret singers and dancers and one of those mysterious sleight of hand performers furnished excellent entertainment.

With the coffee and cigars, toasts were given in honor of the host, D. E. Whipple, Chicago manager. Splendid songs, ragtime by the professor at the “ivories,” and several competitive tango exhibitions completed the evening’s entertainment. And all present unanimously wished the host a banner year with 600 Detroit’s in Chicago this season.
Electric Vehicle Operation

A Paper Present Before the Chicago Section, Electric Vehicle Association

BY R. MACRAE

The electric vehicle industry is a subject that has to be looked at from so many different angles that it is difficult to determine just how much importance should be attached to any particular phase of it. What may appear from one point of view to be practically the whole subject may seem to be only a small part of it when viewed from another standpoint.

The man who turns out elegantly finished electric vehicle bodies may think that he should have the center of the stage; the battery manufacturer is well aware of the fact that without his efforts electric vehicles would be impossible; the central station man is just as quick to see that it takes an ample supply of kilowatt hours to keep an electric vehicle in operation, and so on for all the others whose efforts contribute to the success of the business. It may be some time before the different factors involved can be seen in their true relations.

A particular part of the subject that should claim a great deal of our attention at the present time is that of electric vehicle operation. Improvements in operating methods have not kept pace with developments in other branches of the industry, and the result is that we hear of electric vehicle failures where there should be no reasonable excuse for such failure. But some one may say, "Why draw so much attention to the failures? If a man buys an electric vehicle and tries to run it wrong end first and makes a failure of it, that does not prove anything against the electric vehicle."

This, of course, is true, but the man who has had that experience never attributes the failure to the method of operation. He tells everyone that he comes in contact with that electric vehicles are no good and that the man who sold the rig to him managed, as they say, to "slip one over" on him. He feels it his duty to warn every one against electric vehicles.

A few years ago the general impression was that all electric vehicles were failures and the man who claimed that they had any chance in competition with gasoline and horse drawn vehicles was looked upon as a hopeless electric vehicle crank.

This of course is not the present attitude of the public with regard to our industry, but the majority is not yet convinced that electric vehicles are as economical and reliable as we say they are. At this stage of electric vehicle development one electric vehicle which fails to make good does more to retard the general introduction of electric vehicles than the sale of half a dozen electric vehicles does to help the industry along.

It is, therefore, absolutely necessary for us, if we are to see our street traffic carried on by electric vehicles, in the near future, to eliminate the haphazard methods of operation that have been responsible for ninety per cent of the electric vehicle failures. I refer more particularly to the operation of commercial vehicles.

Pleasure vehicles are now as a rule well cared for in public garages, and besides, the owner of an expensive car in many cases does not trouble himself or herself very much with regard to economy of operation or even reliability, provided the car looks as expensive as it really is.

I will give just one instance to show how absurd an estimate of the value of electric vehicles in general may result from one man's lack of knowledge concerning the operation of an electric vehicle.

Two or three months ago one of the power salesmen of the Commonwealth Edison Company, while talking with the proprietor of an establishment on the North Side, asked, "What did the man who had this place before you took it do with the electric delivery wagon that he had? Did he sell it?" The answer was, "No, I don't think so; I think that he just left it out in the yard and some one came along and took it." I heard from another source that that was practically what had happened.

Apparently the owner of this car was so firmly con-
vinced that he had a "gold brick" that he did not even make an effort to sell it. The rig changed hands a couple of times, each one making something out of the transaction. The man who now has it paid $150.00 for it.

It is a well built modern type delivery wagon with standard equipment throughout. On the same day that the present owner towed it into the garage he put 10 kilowatt hours of electricity into it and sent it to a railway station in the afternoon with a load of merchandise. All that was needed to put the car into first-class running order was a new set of positive plates.

The condition of the old plates indicated that the rig had never been properly charged. The negative plates were in good condition, but the positive plates, grid and all, were in a condition resembling cinders. There was scarcely any sediment in the bottom of the jars, such as would be the case if the vehicle had been properly operated.

The original owner of this car had probably been told that no skilled labor is required for the operation of an electric vehicle and he did not understand that this is simply an overworked quotation which no one is supposed to take literally.

I have here several operating records which show conclusively that electric vehicles can more than hold their own against any vehicle now on our streets when a little intelligence is used in operating them. The kinds of service represented include a laundry supply wagon, a wholesale fish delivery truck and a dry goods parcel delivery truck.

The records are not as complete as they might be and give only garage costs, but they are actual records, and taken together with the fact that the owners of these vehicles are considering the use of more electrics, they demonstrate beyond any question that there is economy in operating commercial electric vehicles in Chicago even in single units. It has been well known for some time that they are economical when operated in fleets.

I wish to draw particular attention to the record shown in Figure 1, because it is the record of a car which has not done a whole day's work on any day for the last six months, although it has been in daily operation. Reference is made to the comparatively small the fact that the original cost of the vehicle, second hand, amount of work that this vehicle is doing because we hear it stated so often that electric vehicles must be kept moving in order to pay for themselves and that they can never be operated as economically as horses in the downtown district, because the congestion of traffic will not allow electric vehicles to make any greater mileage in a day than a horse-drawn vehicle is capable of doing.

This record shows that a man who is satisfied with the amount of service that could be obtained from a horse-drawn vehicle can get that service for less money from an electric truck, no matter how small the daily mileage.

This vehicle is seldom required to make more than eight of twelve mile per day. It is always back to the garage at noon and the driver is occupied with something else for the rest of the day. It will be noticed that the car is charged as a rule only every second or third day.

The daily energy consumption is less than 6 kilowatt hours and the garage bills for the last six months amount to $1.03 per working day. This includes small repairs and a new set of controller segments, also repairing damage done to the rig by a collision with the elevated railway structure. Allowing half a day for the driver's time, the expenses for garage and driver amount to $2.25 per day. On account of the light service and was less than $500, $1 per day, or 60 per cent of the cost, is more than enough to allow for interest and depreciation, which clearly brings the cost of service below the cost of operating a horse-drawn vehicle. It may be objected that $500 is too low a figure to allow for the cost of this vehicle, but a better rig can now be bought new for $900 and it is perfectly safe to say that from now on any one who wants a rig like the one we are now considering can get it for $500.

On account of the fact that this rig is equipped with only 32 cells of lead battery and is therefore a misfit on a 115 volt charging circuit, the energy consumption is more than 30 per cent higher than it would be if the vehicle was designed for the voltage conditions under which it is operated. Less than 75 per cent of the energy used for charging is taken up by the battery, the balance is expended in the rheostat and helps to heat the garage, although this heating service is not intentional.

Figure 2 shows a month's garage record of a two-ton truck used by a wholesale provision house; monthly mileage -95; energy consumption 452 kwh.; washed seven times in the month; garage bill $44.95.

Figure 3 shows a month's garage record of a one-ton truck used by a department store for parcel delivery; 1226 miles per month; 749 kwh.; washed every night; total garage bill, with electricity at 5 cents per kwh., $64.70.

A separate record sheet is kept for each car, the record blank being fastened by means of thumb tacks to a thin board which fits into a suitable rack or cabinet (as shown on the lefthand side of the switchboard). With regard to the method of keeping garage records, it is well known that every battery manufacturer gives two or three different methods of charging batteries and once in a while recommends the use of a new method. The vehicle manufacturers also have their ideas in regard to charging, and so have the garage men. The method of keeping the records here shown is not offered as a model of garage operation, but merely as one of the methods of
doing the work. At first thought it might seem to involve a great amount of labor to keep individual records of each car, but in actual practice it is found to be a very convenient method because it eliminates guesswork entirely. It may be said at the start that this garage al-

![Graph](image)

though only about six months in operation has already to take care of cars with six different voltages. There are cars with 40 and 60 cells of Edison battery and 32, 39, 40, 42 and 44 cells of lead battery. In view of the number of different voltages a reliable voltmeter might be considered an indispensable instrument for such a garage. It happens, however, that the charging board in this garage is probably the only one in the country that is not wired with voltmeter connections. There is a volt-
meter on the board, but it is used only as a polarity indicator, and never as a voltmeter for regular charging. The board, however, has a recording watt hour meter on each charging outlet and there happens to be an amper hour meter on each car. The accuracy of the meter on the car can be readily checked by the watt hour meter on the board and the amper hour meter is kept in step with the rise and fall of the gravity of the battery by gravity readings taken toward the end of the charge.

Accurate figures have been secured on the cost of operating electric vehicles compared with the cost of operating with horses, taken from a report made to the Chicago City Council by the Civil Service Commission. They have reference to the use of electric vehicles for garbage collection, street cleaning, etc. These figures are mentioned not because they are considered of special value, but to show how much we are in need of more reliable figures. These figures show, or claim to show, that electric vehicles cannot be operated as economically as horses if the length of the haul is less than 2 miles for the round trip, but that they are more economical for hauls that are over 2 miles. The manner of arriving at these conclusions is not satisfactory. A glance at these figures, which claim to be accurate to three places of decimals, will show that they were not obtained from any actual experience with hauling over the different distances specified, but were arrived at by making some general assumptions based on the performance of electric vehicles somewhere else, and the values for the different distances calculated from these assumptions. In order to turn out any quantity of such figures, all that is needed in a formula and a good slide rule. What such figures are worth is another question.

Figure 4 is a diagram taken from the same report, which claims to show the relation between the cost per load and the length of the haul, when garbage hauling is done with a 3-ton electric, also with a horse-drawn vehicle with two horses and a driver at $5.50 per day. It will be seen that the line which shows the costs for electric cuts the line that shows the cost of doing the work with horses at the point which represents a 2-mile haul, and that both lines are straight. In other words, the ratio between miles and dollars per load is constant.

It does not require any figures to show that there is no fixed ratio between mileage and cost per load for any kind of hauling or any kind of vehicle. If a man has a load of goods on a wagon it costs practically the same to deliver that load one block away that it does to deliver it two blocks away, and for very short hauls the curve of cost is therefore almost parallel to the base line. It does not, however, cost the same to deliver the load two miles that it does to deliver it one mile, nor does it cost practically twice as much to deliver it four miles that it does to deliver it two miles. The cost does not bear a fixed ratio to the distance. The rate of variation is different for different distances and for different kinds of vehicles. In other words, the curves which show the cost per load are not straight lines, but curves whose curvatures are different at different points.

![Table](image)

The data in Figure 5 is not intended to show what the cost of hauling garbage with electric vehicles would be, but rather to show that the machine-made figures which the city council now has on the subject, are unreliable, and that if electric vehicles are more economical
for the average length of haul now made with horses, that they must be more economical also for the shorter hauls.

In other words, that we can better afford to have an electric vehicle standing idle than to have horses standing idle. The actual cost of hauling with electrics would depend more on the man who had charge of operating the electrics than on any other factor. It will, I think, be admitted that $2,000 is enough to pay for an electric truck capable only of doing the work of one double team and that the depreciation allowed for such light work as a 6½ mile haul is more than sufficient. Some one may say, “Your battery will go to pieces at the usual rate, no matter how light the work.” This is not so. Ten cents worth of electricity per week will keep a 20 kwh. battery, which is not discharged, in good condition almost in-

While standing on the dock in Detroit, with several other persons who were occupied in watching the boats passing up and down the river, a colored preacher came along. Standing a little to one side, he took off his hat, opened a bible, and looking up at us, he said, “Some of youse people may perhaps think that it ain’t none of mah business to address you, but de Lawd has sent me and I’ve got somethin’ to say to you. I ain’t no Jeremiah, but Ise gwine to tell you some of your devilmints.” The data on Figure 6 tells us some of our devilmints. They show that there are over twenty-five different voltages used on electric cars now on the market. It is hardly necessary to say what this means to the man who tries to operate a public garage, and how great a waste of electric energy it involves.

One hundred and fifteen volts is the voltage available in Chicago for charging electric vehicles, and it is for the manufacturers of batteries to tell the vehicle manufacturers how many cells can be charged economically from this voltage. Vehicles intended for use in Chicago should be provided with that number of cells without regard to the number that may be suitable for other localities. In deciding upon the number of cells it must be remembered that 115 volts at the service switch where the current enters the building is not 115 volts at a corner of the garage that may be half a block away and that two or three volts should be allowed for leeway, in addition to the ordinary voltage drop in the charging circuits.

A few years ago the piano manufacturers of the eastern cities were very much annoyed by the fact that there were so many old pianos scattered around that were too good to break up and not good enough to furnish any music. To get rid of at least some of these pianos a large number of them were loaded on a train and taken to Atlantic City and there made into a bonfire. A similar method might be used to advantage here for getting rid of some of the misfit electric cars that are found in all garages. One of the bad features of these cars is that they never seem to wear out, and one person after another buys them and when he does not get satisfactory service from them blames the garage man, the battery manufacturer, or the central station company. $1,000 or less would buy enough of these cars to make any garage man would pay $10 to see. This or some other means should be employed to get rid of such cars in order to simplify and reduce the cost of electric vehicle operation.

**Fig. 6**

\[ \text{Fig. 6 showing map of Chicago, the shaded portion of which indicates the district where 115 volt d.c. current is supplied. As practically all the heavy hauling of the city is done either within or across the boundary line between the A. C. and D. C. districts, it is evident that the logical location for a garage intended for commercial vehicles is within the D. C. district. This district is bounded roughly on the north by North avenue, on the south by 39th street, and extends from the Lake back in some places to Ashland avenue.} \]

Killings by Reckless Driving Held Manslaughter

The state supreme court of Iowa made a decision of far-reaching importance to automobilists last month in which it laid down the rule that automobile drivers who kill persons in the highway by reckless driving may be convicted of manslaughter.

The decision was in the case of G. W. Biewen of Keokuk county, a farmer, who was convicted for the killing of Clarissa Hammes, a child eighteen months old, in the road between Harper and Richland, on August 16, 1913. He was sentenced to a term of not to exceed eight years in the penitentiary, and on appeal the supreme court affirmed the decision of the lower court. The case is the first in Iowa in which a driver has been sentenced for manslaughter while using an automobile as a “dangerous weapon.” The record shows that Biewen went on and did not offer aid to the injured child. The mother of the baby witnessed the accident.
The Electric Vehicle Situation in New England

Central Station Managers Meet and Discuss Maintenance and Operating Costs

The New England section of the National Electric Light Association held a most interesting and instructive convention, March 11 and 12.

The second day's session was devoted entirely to the discussion of the electric automobile, storage batteries and accessories.

Discussion on these topics as presented is reviewed in the following: F. B. Neely, Philadelphia, presented data bearing upon the life of "iron-clad" batteries, one of which, four years in service, has run 35,000 miles. Thin plate cells have a working life of from 450 to 450 working days and have operated up to 8,500 miles, negative plate life reaching 630 days. The speaker, with others emphasized the importance of taking out substantially the full charge of the battery regularly in order to get the best service. Mr. Neely described the constant-voltage method of battery charging, which expedites this work, but this method was criticised on account of its first cost by subsequent speakers. The tendency among central stations to increase the size of garage conductors was mentioned. Special attention has lately been given to the reduction of breakage in the removal of elements from cells. Methods of reducing shocks to cells by trucks backing against platforms were briefly discussed, including the adoption of the flexible jar and replacing the solid lead connection with lead-coated copper.

Other speakers advocated standardizing batteries at forty-two or forty-four cells, pointing out that the cost of charging is as great for a battery of twenty-four cells as for the larger number.

C. F. Smith, Boston, recommended that chains be treated by boiling for an hour in a caustic solution, immersing in tallow and beeswax, and then replacing, with the daily application of heavy cylinder oil. At the Amoskeag Mills, Manchester, N. H., a chain-cleaning and lubricating equipment has been developed which runs the chain through a bath of oil. Two sets of chains are provided for each electric truck, and these are changed weekly.

W. M. Thayer, Hartford (Conn.) Electric Light Company, described a new offer by which each purchaser of a General Vehicle electric truck during 1915 at Hartford is to receive a dividend based upon the size and number of trucks bought. The dividend will be declared on January 1, 1916, and will range from $4 times the number of 750-lb. equipments placed in service to $14 times the number of 5-ton trucks delivered, the maximum dividend on the former size being $100 and on the latter $350 per truck. Sixty-one electric trucks are now in use under the company's battery service system, and these have run more than 1,000,000 miles and operate in eighteen distinct lines of business.

The Buzzards Bay company is soon to introduce a plan of battery charging which will provide electric-garage rates comparable with the retail price of gasoline. The object is to enable the garage owner to make as good a profit from battery charging as from the sale of gasoline. Every large town in southern New England now has an electric-charging station. In further discussion a number of central-station men advocated the building of electric vehicles for passenger service with less ornamentation than the majority of the present types. What is wanted by business men is a moderate-priced, serviceable car good for 30 miles or more on a charge.

A. F. Townsend, Blackstone Valley Gas & Electric Company, Pawtucket, R. I., submitted data as to the cost of operating two Bailey electric runabouts through 1914, the machines being used by the superintendent of the Pawtucket division, by the meter department and in street-light patrolling. The total cost of operation and maintenance for the year was $2,577 for the two machines, or 7.39 cents per car-mile; fixed charges were $920.10, or 2.62 cents per mile, and the total expense was $3,497.10, or 10 cents per car-mile. One machine ran 14,822 miles and the other 20,041 miles, the respective energy consumptions being 9316 kwh. and 10,971 kwh. on the direct-current board, the average energy consumption being 0.62 kwh. and 0.55 kwh. per car-mile respectively. Electricity was billed to the cars at 3 cents per kwh. One car averaged 44 miles per day and the other 60 miles. Unit data for the two cars together are as follows: Energy, 1.73 cents per car-mile; tires, 2.38; operating labor, 0.68; repairs, 2.32; miscellaneous, 0.13; distilled water, 0.10; battery solution, 0.05; total operation and maintenance, 7.39; depreciation at 12.5 per cent, 1.59; interest, 6 per cent, 0.76; insurance, 0.27; total fixed charges, 2.62 cents; grand total, 10.01 cents per car-mile.

Mr. Townsend also gave the following figures of operating cost for a 1912 model 1000-lb. Baker electric delivery wagon in the company service, covering twenty-five months ending January 31, 1915. The car ran 14,426 miles at a total cost of $2,257.26, or 15.53 cents per mile. The unit items, all in cents per car-mile were: Tires, 1.35; electricity, 2.44; lubrication and waste, 0.04; rectifier tubes, 2.13; electrolyte, 0.02; washing and oiling, 0.36; testing batteries, 0.01; miscellaneous, 0.14; accident insurance, 0.79; fire insurance, 0.41; property damage, 0.31; miscellaneous supplies and expenses, 0.43; truck supplies, 1.47; battery supplies, 0.01; truck labor, 2.48; battery labor, 0.18; fixed charges, 2.9; total, 15.53 cents.

P. D. Wagener, General Vehicle Company, Long Island City, N. Y., stated that the electric vehicle is making a relatively slow progress as compared with the gasoline machine, but that the former is by no means at a standstill, considering the unfavorable conditions of business. Among the reasons why the electric has not been so freely purchased in the past as could be desired are lack of definite appreciation as to the limitations and capabilities of the equipment, incomplete understanding as to the relative economic advantages of the electric and the gasoline vehicle, lack of confidence in the business electric vehicle as a standardized device far beyond the experimental stage, lack of understanding of the simplicity and economy of the electric vehicle in operation and maintenance, and uncertainty as to the storage battery. The pessimist in the central station tends to keep back a whole city from the benefits of electric-vehicle service. Care-
ful adaptation to service is of great importance. More than 60 per cent of the orders are repeat orders, which shows satisfied users, even if the electric gospel spreads slowly. The speaker questioned if the time were ripe for the production of a low-cost vehicle in view of the demand for high mileages per charge. If the manufacturer could be sure of a good demand for a light-weight cheap electric vehicle, produced in quantities to be absorbed by present users who are experienced in the operation and proper care of electrics, the venture might be a success. On the central-station side, many investors fail to realize the possibilities of increasing dividends through off-peak battery charging, which requires little or no additional investment, and which can be applied to the noon valley in the load curve as well as to night operation of plants, when the cost of the additional energy for charging is so small that it cannot be found in the coal consumption. The speaker pointed out that unit costs of electric-vehicle service are apt to be higher in central stations than in commercial deliveries, on account of the protracted periods of standstill in the former case due to local work which must be done before a car can move on to the next place.

Fred H. Smith, Worcester, Mass., said that the Worcester Electric Light Company stands ready to assist local purchasers of commercial electric vehicles to pay for their machines on the instalment plan. He submitted extended data as to total costs of service for eighteen months in company machines ranging in size from runabouts to a 7000-lb. cable truck, including all fixed and operating charges. These ranged, figuring energy cost at 2 cents, from 11.2 cents to 60.6 cents per car-mile, the usual cost being from 11 cents to 13 cents. In the cable-truck service the maximum above quoted is far above any other figures on account of the long standstill periods when the machine is hauling cable through ducts, etc. Mr. Smith said that, while the unit costs are fairly high, the company simply could not begin to do the work with horses that is performed by electric vehicles.

Arthur D. Putnam, Worcester, said that upkeep cost is favorable with the electric vehicles on account of their moderate speed.

A brief discussion touched on the use of electric vehicles in snowy weather, the wisdom of a boosting charge in the noon hour being emphasized by several speakers. It was generally held that electric trucks stand up to their full daily mileage even in snow, provided that the company gives the boosting charge. The energy consumption may be increased 30 per cent.

C. F. Smith, Boston Edison Company, said that by reducing the sprocket and gear ratios in the truck-wheel good results in mileage are obtained. He emphasized the importance of routing machines so far as possible to use up substantially the full charge of a battery daily in order to be able constantly to realize the capacity of a given equipment. Another speaker said that if an overcharge is given twice a month, a battery not fully discharged daily will give its rated service. Some discussion also took place relative to the need of more accurately determining motor requirements on light-weight cheap electric vehicle, produced in stock parts.

K. A. Skinner, Providence, R. I., urged the importance of keeping spare controller parts on hand so that protracted delays in truck service due to minor troubles can be avoided. Failure to do this in one case tied up an eighteen-hundred-dollar truck for seven weeks. Mr. Day Baker, Boston, said that electric vehicle manufacturers cannot as yet afford to put in trial machines for extended service. He reviewed the successful performance of many trucks in snowy weather, and, in answer to the question why truck weights are not lower, cited instances where owners had grossly overloaded their vehicles. Figures were presented by the Malden (Mass.) Electric Company to the effect that the cost of service with two Bailey electric roadsters, figuring all charges, was from 11.5 cents to 12 cents per car-mile during a recent six months' period.

The discussion was followed by a brief one on electricity in fire-department service. W. O. Adams, Eldridge Manufacturing Company, Boston, said that about fifty machines are now electrically driven, the most notable installations being in Philadelphia, Pa., and Springfield, Mass. The advertising value of electric fire apparatus is very high. The routes are fixed, the equipment receives good care, and the batteries are likely in most cases to be required to propel their equipment not more than 500 miles per year. With proper care the equipment is absolutely reliable. Day Baker said that the original batteries are still in service at Springfield. Every tray in the department is interchangeable, and one extra tray of batteries is carried in each engine house, each tray being completely discharged once a week. The cost of electricity for the Springfield service would hardly feed six horses. The revenue from this service is low, but it is well worth while for central stations to encourage the use of such equipment from the publicity standpoint.

Garagen Complain of Manufacturer's Tactics

At the March 9 meeting of the Chicago section, Electrical Vehicle Association, vigorous protests against some aspects of the inspection service given by certain electric-vehicle manufacturers to purchasers of their cars, where the result of such inspection is to disquiet the owner and to embarrass the garage operator, were entered by Harry Salvat and C. F. Wiedmaier, two operators of exclusively electric garages. According to the speakers, the sales agents invite their customers to bring their cars in for bi-weekly or monthly inspections at the local branch offices, and after such examinations furnish the owners with printed inspection forms which list twenty or thirty car parts and call attention to the most minor troubles or maladjustments in a way that often causes the owner to lose confidence in his garage.

Mr. Wiedmaier cited an instance where a manufacturer's agent had stored a customer's car and had allowed the battery to become dry. When the garage operator overhauled the car and discovered this condition, he took every precaution to protect the negligent agent and nursed the battery back to good condition again. Some little delay resulted, and through a cross-connection of the telephone wires, Mr. Wiedmaier found that the agent had, without investigating, explained to the customer that his garage man must be at fault and neglectful of the customer's car, although the garage man was at the time endeavoring to protect the agent's storeroom against the possibility of criticism. Mr. Salvat urged the standardization of electric-vehicle parts as the only solution of the heavy investment burden which the small garage owner must now carry in stock parts.
ELECTRIC VEHICLES

When Dr. Charles Proteus Steinmetz delivered a paper last year predicting the early appearance of a simple, low-priced electric car, nobody knew that he had in his mind a specific vehicle. But announcements made within the last week or so indicate that he was thinking not only of a certain car, but of a rather peculiar example of the electric automobile art.

The chief point wherein the new car differs from conventional construction is in its motor. The arrangement is very ingenious; the field of the motor rotates and drives one rear wheel, while the armature drives the other, thus dispensing entirely with a differential gear. As a step toward simplicity and economy we can see no possible objection to this scheme; for its mechanics does not involve any doubtful or even difficult factor. But it is well to analyze the arrangement for the reason that Dr. Steinmetz, we believe, has been misquoted in regard to it. He is alleged to have said this:

By reason of this type of action the motor is doubled in power; if, in an ordinary motor, the armature were to revolve at the rate of 1,500 revolutions a minute, it would here be revolving at a rate equivalent to 3,000 revolutions a minute because the field would be adding its independent 1,500 revolutions. It can be appreciated readily, therefore, that this motor will either require half the current to drive it with equal power, or that it will show double power on the same amount of current.

Now this is so obviously erroneous, it becomes evident at once that Dr. Steinmetz never said it. For the benefit of those who may have read the quotation without understanding the principles of an electric motor, we will explain that the speed of rotation of a motor armature is in its relation to its field and not to outside objects. Analogously, the speed of a railway locomotive is doubled if it is running on double track, or to put it another way, the speed of stepping on a ladder is doubled when the ladder is doubled.

The locomotive had an actual speed of thirty miles an hour and the track was running backward at a speed of fifteen miles an hour, the net progress of the locomotive would be fifteen miles an hour, and not thirty. So the actual speed in revolutions per minute of a motor such as Dr. Steinmetz describes is the sum of its armature speed in one direction and its field speed in the other direction. Since both armature and field may revolve at any rate of revolution of the field in one direction subtracting the figure from the rate of the armature will give the other direction. With an armature speed of 1,500 revolutions per minute, the field would revolve backwards at 750 revolutions and the armature forward also at 750 revolutions.

An ordinary motor has an efficiency of eighty per cent or more. Therefore to say that any new form of motor will give equal power with half the current, or double power with equal current, is to offer an efficiency of 160 per cent—perpetual motion with lots of power to spare. Dr. Steinmetz never claimed that a motor whose field and armature both revolve will return no more of the power put into it than if either its field or its armature were stationary. Its only advantage is the mechanical feature of dispensing with a differential, because the motor itself is differential. It acts the same as two motors—one on each wheel. That this advantage is worth while we are perfectly willing to concede, together with the claims for lighter and cheaper construction.

The new car uses the principle of braking by coasting against the motor, incidentally making it a generator and giving the batteries a boost. That also is feasible and practical.
ELECTRIC VEHICLES

CHOOSING DEALERS

THERE is nothing in common between talking machines and electric vehicles. But those of open mind are willing to glean suggestions from humble sources, and possibly there is an idea in the history of two of the older manufacturers of talking machines, their methods of selling and the manner in which they grew.

Between the products of these two companies there is as little choice as there is, say, between two makes of electric cars selling at about the same price. If one customer found a reason for preferring the first machine, another customer was convinced that the second machine had its points of superiority. The opportunity, apparently, was equal.

These two companies, properly to market their products, found it necessary to establish agencies or dealers at various points across the country. One company selected the method of establishing its own branch offices or stores wherever the prospect of trade was promising. The other company adopted the plan of appointing agents wherever a man could be found willing and competent to handle such an agency. Under this plan it was not unusual to find several stores in one city block selling this brand of machine; whereas the same city probably had but one branch store of the other company.

A short time ago, before this arrangement was changed, the company with branch stores had about eighty such branches. The company operating on the agency plan had something like twelve hundred agents. Its sales increased by leaps and bounds; it made money rapidly and was enabled to spend huge sums in advertising and so still further augment its sales. And at this late day, the other company has finally adopted the same system.

There is a marked tendency among electric vehicle manufacturers to appoint as dealers only men already established in business or who have good financial backing and credit. This is unquestionably the safe, sane and conservative plan, and goes far to assure an eminently satisfactory relationship between factory and dealer. But sometimes one is moved to wonder if a little more of the sporting spirit, a willing-ness to gamble with some of the salesmen's talent that has all the qualifications except the established business and large credit, would not encourage a more rapid growth of the industry.

There are available plenty of good salesmen who would be glad to devote their entire time to selling electrics in a given territory, even if their total sales amounted to but a few cars a year. If selected for their enthusiasm, industry and tact, they would add much to the morale of the business.

On the other hand, the established dealer usually takes the agency for an electric merely as a side line. His chief interest is in the line of gas cars he handles; and because of the diversity of models and prices in the field, he may carry more than one make of gas car—but never more than one make of electric. Is any electric vehicle man optimistic enough to believe the electric can win out under such conditions?

The electric is surely entitled at least to exclusive agencies. Better by far a small dealer whose whole allegiance is to the electric than the largest and most solidly established dealer in whose hands the electric is but one of a half dozen makes of cars—and all but that one gas cars.

THE HALF-HOUR LAW.

Many of the larger cities of the United States have enacted legislation which allows a vehicle to stand in the business district for but thirty minutes. Increasing numbers of automobiles resulting in serious congestion are claimed as the reason for the origin of such legislation. On analysis, what does such legislation really develop for the community? In cities like New York, Chicago, Philadelphia, Detroit and Cleveland, where such legislation is already legally in force, the down-town thoroughfares are in most instances broad. In no instance is traffic hampered by standing vehicles, congestion arising on the contrary from moving vehicles. The thirty minute law has but one natural result, and that quite contrary to the one expected. Because of this new legislation owners are forced to move their vehicles every half hour, whereas previously they moved them about once an hour, with the result that the city has twice as many moving vehicles constantly. This added and superfluous moving of vehicles adds to the congestion, whereas if these same vehicles were allowed to stand in the same place unmolested many would not be moved more than twice a day, morning and evening. To the owner of an electric, rarely burdened with a chauffeur, such legislation means an absolute deprivation of the use of his automobile except in the evening or on Sunday. The electric is purely for city service and the present legislation is directly impedimental to the purpose which the electric is designed to fill.

Electric vehicle manufacturers and dealers should use every influence and power available in averting the calamity of such legislation, which will result so disastrously to the private owner, the garage man, the dealer and the manufacturer.

FIRESTONE TIRE FOR ELECTRICS

A new tire designed especially for use on electric pleasure cars has been developed by the Firestone Tire & Rubber Co., Akron, O., and was recently placed on the market.

The new pneumatic is built up with unusually heavy gum cushions between the layers of fabric to provide a high degree of resiliency; the construction is worked out with a view to obtaining the greatest possible economy of power, and the makers state that the result has been very satisfactory. But one type of tread is used—the Firestone dual tread, in which there is a central depression between two raised sections.

The prices, in some of the more popular electric car sizes, are as follows: 34 by 4, $34; 34 by 4 1/2, $40; 36 by 4 1/2, $43.

SOUTH DAKOTA FEE STILL $6

Though the South Dakota legislature has passed a law reducing the automobile license fee from $6 to $3, it is not yet in effect. The $6 will stand for 1915, the new law not taking effect until January 1, 1916.
Electric Vehicle Association Developments

Sectional Development Work, Reports of Committees and New Announcements

The following reviews the activities of the Electric Vehicle Association of America since the last report of the council meeting of February 15: Philadelphia Section.—A meeting of the Philadelphia section was held on March 10, in the Colonnade Hotel, with Chairman R. Louis Lloyd presiding. A. W. Young of the Public Service Electric Company read "Electric Truck Operation," by Walter Metz.

The special committee on Hammonton Charging Station reported that a number of offers of apparatus had been secured, that subscribers were being solicited, and additional information could be obtained from the local electric light company.

A discussion of the so-called "jitney" bus entered into and participated in by some of the members who have had several years' experience in operating street buses. A consensus of the discussion appeared to be that it was hopeless for a company to attempt to compete with the trolley line over the ordinary city streets for a five-cent fare, but that if the hauls could be short enough, and not subject to street car competition, such an enterprise would undoubtedly pay. In the discussion, it was pointed out that the overhead charges, insurance and depreciations were of such large amounts that the operation of the line in question did not prove successful.

It was also pointed out that the majority of "jitneys" now operating were doing so without the payment of license fees, overhead charges or insurance; that such operators were as a rule irresponsible, and that the proposition at the present time could hardly be considered a business one.

Washington Section.—The Washington section held an executive committee meeting on March 4 in the offices of the Potomac Electric Power Company, R. B. Emerson, vice-chairman, presiding in the absence of Lothrop, spoke on department store deliveries, as follows:

Our delivery system originally consisted of one colored man with a trunk strap and some car tickets. The next year we had two colored men, two trunk straps and more car tickets. The next year, the first horse-drawn wagon was put in service and so the number of these wagons increased as the business grew, until the first electric delivery wagons were introduced in the business. These wagons were General vehicle type with direct drive motor, which had been in a fire, but even then they were very good machines and stood a remarkable amount of abuse. However, you are making today a very much better machine. You may be interested in knowing how we handle the delivery and goods.

You go to the counter and make a purchase, which is turned over to the wrapping clerk. The packages are then collected at 20 minute periods by a collector who deposits them in a chute which delivers them in the packing and shipping room. Here the packages are assorted according to sections of the city, and then according to routes. Next they are turned over to the drivers. Packing the delivery wagons is quite an art, as the packages have to be packed in such a way that they will come out as required.

Deliveries are made in the thickly settled parts of the city three times each day: 8:30 A.M., 12:30 P.M. and 3:30 P.M. In the suburbs deliveries are made twice each day, and in Rockville, Maryland and Falls Church, Va., once. In the case of Falls Church, Va., a gasoline automobile is used in summer time, but in winter when the roads are in bad condition we have to go back to the two-horse team.

The cost to deliver packages these days is over 5 cents, as against 2 cents in the early days of the business.

We have propositions from local delivery concerns whereby it would cost us 25 per cent less to deliver, but should this be adopted our customers would not receive the same service. Any time you have any suggestions to make regarding our delivery, we would be very glad to hear from you. We do not guarantee to adopt them, but will give them consideration.

In reply to questions, Mr. Everett stated that in his opinion where stops are frequent, the electric automobile is undoubtedly the best means of delivery, and that he

*Secretary Electric Vehicle Association.
had one route on which an electric machine is used, which covers an area of 30 miles and in which 600 packages per day can be delivered. Each wagon has a driver and a jumper, but only one man can leave the wagon at a time, due to the danger of packages being stolen. If arrangements could be made whereby parcels could be left at each station, and men leave the wagon at the same time to deliver, very much quicker service and the delivery of more packages per day per wagon would result.

A. S. Peck, forester, United States Forest Service, then spoke on our national forests, which lecture was accompanied by stereopticon slides and moving pictures.

Detroit Section:—The last meeting of the Detroit section was held on February 8 in the Edelweiss Cafe, J. W. Brennan, chairman, presiding, at which time the first monthly dinner was held.

Edward Fitzgerald, secretary to the mayor, addressed the meeting in the absence of Mayor Oscar B. Marx. Hon. John G. Gillespie, police commissioner, spoke interestingly of the electric vehicle and the traffic problem.

E. W. Lloyd of the Commonwealth Edison Company, Chicago, Ill., and vice-president of the National Electric Light Association, read a very comprehensive and thorough paper illustrated with lantern slides. In addition to indicating what Chicago is doing for the electric vehicle, Mr. Lloyd presented some facts regarding the performance and handling of electric machines in Berlin, which proved to be more than ordinarily interesting.

Los Angeles Section:—A section meeting was held in Los Angeles on March 9 at the Jonathan Club, J. Harry Pieper, chairman, presiding.

The first paper of the evening was one prepared by A. Jackson Marshall, secretary of the association, entitled “Electric Taxicabs,” which was read by Harry Mason of the Chanslor & Lyon Company, which was very well received.

H. J. Kister, new business manager of the Los Angeles Gas & Electric Corporation, read a paper prepared by William P. Kennedy on the progress of electric vehicles, which proved to be most interesting and spoke well for the future of the electric.

Chairman Pieper gave a short talk on the advisability of all the members of the Los Angeles section co-operating in conducting an electric page in the papers at least once a week and appointed a committee to investigate the matter.

E. H. Mulligan, district agent at Pasadena, Cal., for the Southern California Edison Company, and one of the best boosters of the electric vehicle in that part of the country, talked most interestingly on his experiences with the first electric pleasure car that the company owned. He drove down the main street of Pasadena and was hit with one of the large suburban street cars in which his car was completely wrecked and he was seriously injured. Three batteries survived the accident and the same batteries are still in service, the accident happening about two years ago.

St. Louis Section:—The last meeting of the St. Louis section was held on March 12 at the American Annex Hotel. Chairman M. B. Strauss, presiding. After the luncheon the question of charging equipment for use in private garages was discussed very thoroughly with the result that it was agreed to ask the different makers of charging apparatus to give talks on their apparatus so that the St. Louis section may be thoroughly familiar with the advantages of the different classes of apparatus available today.

New York Section:—The February meeting of the New York section was held on February 24 in the auditorium of the Consolidated Gas Company, Chairman Harvey Robinson presiding, at which time a very interesting program was presented. Mr. Baker, Boston representative of the General Electric Vehicle Company, outlined some of his experiences in introducing electric vehicles in New England. His subject, "Installing the Initial Truck," dealt with the great care which must be taken to satisfy a buyer from the start and of the necessity for keeping in touch with him to see that he uses the car to the best advantage.

An innovation at the meeting of this section was the presentation by Messrs. P. B. L'Hommedieu and H. Weida of the India Rubber Company, New Brunswick New Jersey, of hard rubber storage battery jar construction. The jars were constructed before the audience from the raw material. All stages of construction were included up to the vulcanizing of the finished jar. This demonstration aroused considerable interest and the members asked a number of questions.

Secretary A. Jackson Marshall of the national organization and Secretary David F. Tobias of the section made announcements concerning the national and local affairs.

Harvey Robinson, D. C. Fenner, Frederick B. Neely, F. F. Sampson and R. Vandernostern took part in the discussion of Mr. Baker's paper.

Cleveland Section:—A meeting of the Cleveland section was held on February 16 in the Hollenden Hotel, George S. Milner, president Electrical League of Cleveland, presiding.

W. G. Pancost, sales manager of the Rauch & Lang Carriage Company, gave a talk, outlining the materials which enter the production of electric vehicles, which he claimed prohibit a low-priced car being placed on the market.

Publicity Work:—Great progress is being made by the Electric Vehicle Association, through its fourteen sections and general office, in educating the public with regards the general application of electric vehicles through the medium of the local and foreign newspapers and miscellaneous magazines.

The extremely important part that the sections are playing in this needed development is probably best evidenced by the work of the Washington section, which section has been responsible for at least three special editions of the principal daily newspapers in Washington, D. C. Each of these three editions contained two full adjoining sheets of exclusive electric vehicle publicity in which was included miscellaneous advertisements and a great wealth of interesting articles as indicated:

Washington Star, issue of Sunday, November 22, 1914, carried in addition to miscellaneous advertisements the following articles: “Electric Fire Apparatus”; “Electric Vehicle Advance Due to Standardization”; “European Development of the Electric Vehicle”; numerous miscellaneous articles.


Washington Times, issue of Saturday, February 13, 1915, published two full adjoining sheets containing the following articles: “Improvement of the Electric Car”; "High Society Purchases Electrics"; "Grace and Beauty in Electric Cars"; "Electric Best for City Service"; "Electrics Improved and Sold Cheaper"; "Electric Ve-
hicle Association Growing”; “Leaders in the Electric Field”; “Detroit Electric Finds Ready Field.”

This exceedingly meritorious development has greatly stimulated electric vehicle conditions in Washington, and makes an advance over anything of a like nature heretofore achieved in either the electric or gasoline field, and is tangible evidence of the value of co-operation as made possible through the association and its sections. Other sections are doing splendid work along similar lines, and as always is the case with a combination of preparation and aggressiveness is bound to be productive. In this work the sections have the hearty support and co-operation of the general office.

The committee of the association, to date, as appointed by President Gilchrist, are as follows:


Electric Vehicles


Parcel Post Delivery Committee’s Activities:—The parcel post delivery committee, as chairman by James H. McGraw, has been especially active, having issued a 20-page booklet to the entire membership of the Association, and to the central stations in the one hundred cities in which contracts are about to be let for the service of carrying the mails, in an effort to have electric vehicles installed.
Part I of this booklet is devoted to the previous activities of the committee on the subject of "Electric Vehicles in Parcel Post Service." Part II deals with references to the Post Office Department's advertisement as regards proposals for carrying the mails in the states of Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, and Missouri, from July 1, 1913, to June 30, 1919, proposals being received until 4:30 p.m., April 16, 1915, and decisions announced on or before May 3, 1915.

Part III consists of extracts from the annual reports of the postmaster general, second assistant postmaster general, and the purchasing agent for the fiscal year ending June 30, 1914.

This booklet is informative, interestingly set forth, and is available upon request.

Membership Committee:—There are at present in the general office of the association fifteen associate membership applications awaiting the approval of the council.

Electrical Week:—It has been suggested by the Society for Electrical Development that one week in the year be set aside for a "National Electrical Week." The association contemplates co-operating in every possible way in order to get publicity for electric vehicles during this week by instituting sociability runs, parades, etc.

The committee having this development in charge, as chairmaned by A. W. Burchard, of the General Electric Company, is now considering the best time of the year to have this "National Electrical Week," and would appreciate suggestions from electrical interests.

Electric Vehicle Handbook:—The association has made a special arrangement with the publishers of the Electric Vehicle Handbook, and is now prepared to furnish this book, which is the recognized authority on the operation, care and maintenance of electric vehicles, at the reduced price of one dollar per copy to members of the Electric Vehicle Association only.

Baker Reduces Price of Latest Models

Baker electric car prices have just been revised downward. For the first time in the history of the industry a full sized, high grade, well known electric coupe is listed under $2,500. This is the new light Baker electric coupe, identically the same beautifully designed, expensively equipped car which was put on the market just at the beginning of the 1915 season and until now has sold for $2,800. The new price is $2,475. The new price of the Baker double drive brougham which heretofore has sold for $3,250 is $3,000; the Baker roadster, which until now has sold for $2,300 is $2,000.

These new Baker prices are based upon a greatly enlarged scale of production of the light Baker electric coupe which during its first few months on the market has proven to be by all odds the most satisfactory model ever turned out of the Baker factory. By concentrating upon this model and producing it in quantities never before undertaken, they have so far reduced the manufacturing expense, as well as the general expense per car, that they are able to make this unusual price revision on all models.

The following is quoted from a statement by the secretary of the Baker company, George II. Kelly, made in his announcement of the price revision to the Baker dealer organization.

"We have constantly argued for and built light weight electric cars, and even while building heavier models we have always continued with the lightest coupes on the market, and our light coupes have always been our leaders.

"When we designed and put on the market our new light Baker coupe, it was with a feeling that we had achieved the finest result of our sixteen years' experience. Here was a car weighing a half-ton less than the big heavy electrics, combining all the advantages of light weight with the very finest quality. Immediately when this car was announced, the interest which was created, its instant success, and the general enthusiasm on the part of everyone who bought it, proved to us beyond a doubt that the public demand is growing more rapidly every day for a lighter electric, and we believe before long there will be a very limited market for the big heavy cars.

"Having demonstrated to our own satisfaction that our position was correct we have determined to go ahead on a greatly increased scale of manufacturing and produce the light Baker coupe in larger quantities than we have ever before undertaken. The manufacturing saving, and the saving in general expense per car, on account of this larger production, enables us to announce a lower price not only of this car, but for the Baker double drive brougham and the Baker roadster as well."
New Type Dey Electric Announced

Dr. Charles P. Steinmetz Discusses Latest Electric Vehicle Features

A new type electric automobile has been announced by the inventor, Harry E. Dey, an electrical engineer of New York City, to be developed by the Dey Electric Vehicle Syndicate.

Eight professional men, of which Dr. Charles P. Steinmetz is a member, and Captain Max E. Schmidt, of New York, is chairman of the board of managers, will finance the development. A three-passenger run-about type, incorporating Mr. Dey's ideas, is being built and will be brought down to between 1,100 and 1,200 pounds, and it is expected that the price will be approximately $750.

The entire driving mechanism is made a part of the rear axle, and a great number of accessory elements necessary to the construction of the automobile of today are said to be eliminated. The following extract from a interview in the New York Times of March 24 gives the views of Dr. Steinmetz with respect to the new vehicle.

"It is beautifully simple," said Dr. Steinmetz. "In every electric motor, as you know there are two chief parts, the field and the armature. In the ordinary motor the field is stationary and the armature revolves. In certain motors this rule has been reversed and the armature held stationary while the field revolves. But in this power plant something quite revolutionary takes place. Both field and armature revolve. This unique motor is incorporated in the rear axle. The field portion drives one of the rear wheels of the car and the armature portion the other wheel, so that in this way the motor acts as its own differential.

"This does not mean any enormous increase in mileage on a single charge of the storage battery. Rather it means that a comparatively light battery may be used with satisfactory results. Moreover, doing away with the motor separate from the axle and attached to it by shafting has other interesting advantages. In the first place, it frees the bottom of the car body so that the battery alone need be carried there. This means the saving not only of the space actually necessary for the motor itself, but also of the space used by supports, cross-members and braces to hold the motor in place.

"Secondly, this arrangement brings about a great saving in weight by making it possible to lighten the whole construction of the frame, since a far less rigid structure is needed when there is no shafting and no bevel gearing to keep in mesh. The advantages of the device are cumulative.

"I see no reason why a simplified electric of this character," Dr. Steinmetz continued, "should not be made, under quantity production, to sell for as little as the cheap but good gasoline car—or for less. It is far more simple and it should be lighter by many pounds. We hope to get this car within the thousand-pound limit. As to price, that, of course, must depend on the method and extent of manufacture. One reason why electric automobiles cost so much today is that they are made by the hundreds. Economic car production should be by the hundred thousands, as has been shown in the field of the gasoline car.

"Of course this power plant is applicable to any kind of electric vehicle that does not run upon a track—the light delivery truck, the heavy duty truck, even the lawn mower, as well as the pleasure car of all types. It is not its application that interests me so much as the thing itself; a step forward, very decidedly."

In addition to the driving part of the car, Mr. Dey has perfected a system of control in connection with it, which Dr. Steinmetz also described with enthusiasm.

"By this control," he said, "the necessity for using brakes, except under unusual circumstances, is done away with. Its technical side need not be gone into at the present time, but its effect is to make the motor act as its own brake and also to prevent it from slowing down so greatly on up-grades. This feature of swiftly dropping speed in going uphill has always been against the electric. This is because with more work to do the field of the motor becomes more highly magnetized and does not allow the armature to revolve so rapidly. This feature is minimized by this new control so that there is far less diminution of speed on the up-grade."

"On the down-grade the same control features make for very satisfactory operation. On a long hill, under ordinary circumstances, the brakes would have to be used a great deal. But with this control and motor, if the former be set at the half speed position the motor will act as a brake as soon as a speed equivalent to half speed on the level is reached through momentum.

"It will do more than that. As soon as the speed called for by the half-speed position is passed, the motor acts as a generator and begins to put back current into the battery. Of course this does not mean perpetual motion," the doctor said smilingly. "You do not put back as much current going down the hill as you have drawn out of the battery going up, but you do boost the battery to an important extent, nevertheless.

"I have made some tests to show just what this boosting amounts to. I find that the motor begins to act as a generator, that is, feed back to the battery when a grade of two and one-half per cent is reached. If the control is set at the half-speed position it feeds back full power; that is to say, it charges the battery with current at the rate that the battery gives out current when running on the level—at a grade of seven and one-half per cent. If you go down the hill at full speed, which is not infrequently possible on long hills with good roads, you charge back full power on a 5 per cent grade.

"These tests, naturally, were made with a car of a specific weight, and the percentages would vary somewhat with the weight of the machine, but they indicate the principle involved and the possibilities of this new system of control. It is very convenient to be able at least partially to eat your cake and have it, too."

Asking as to the manufacturing plans of the Dey Electric Vehicle Syndicate, as the group of men who
have perfected this car is called, Dr. Steinmetz responded that that was uncertain. He was not sure, he said, whether the syndicate would undertake manufacture itself or issue licenses to manufacture under its patents. This was a matter still under discussion, he added. He was emphatic, however, about the opportunity which the inventions opened up for quantity production of electrics to sell at a price in competition with low-priced and popular gasoline machines. "There is nothing that I can see," he concluded, "to prevent this electric from being put out under quantity production methods. From the scientific side it appeals to me very much. It is so nice and simple."

Timken Company's Recent Purchase

The Timken-Detroit Axle Company has announced the purchase of the plant, buildings and machinery of the Metal Products Company. This expansion is made necessary by the quantity of new business recently taken on by the Timken-Detroit Axle Company. Prominent among the new contracts recently made are those of the Hudson Motor Car Company, the Chalmers Motor Company and the Saxon Motor Company. It is understood that this plant will probably be devoted to the manufacture of the smaller sizes and types of Timken-Detroit axles now in demand on high-grade moderate priced cars.

Economics Effected in Moderate Size Electric Garage

In the March issue of Electric Vehicles there appeared a description of the vehicle charging equipment installed in the big new Boston baking plant of the Ward Bread Company.

The accompanying views show the front and rear of a moderate size charging equipment in the bakery of A. B. Hastings & Son, Campello, Mass. This was recently installed, replacing another equipment and has effected very satisfactory results. The electric service furnished this concern is single-phase, alternating current so that the charging equipment is now made up of two Wagner rotary converters used in combination with section or unit type of charging rheostats which are made by the Cutler-Hammer Manufacturing Co., Milwaukee, Wis. Since the new equipment has been installed, expense of repairs and renewal of parts have been eliminated and the mileage of the wagon, it is reported, has been increased 20 per cent to 30 per cent.

The illustration Figure 1, shows the four sectional charging units mounted on the middle frame with a Wagner rotary panel on each side. The charging is easily cared for. No technical experience is necessary. The rheostat handles are within easy reach conveniently arranged for charging a number of electrics at the same time from the one location. Automatic protection against over-charge, against charging back into the line, etc., are easily obtained. The second illustration, Figure 2, shows the Wagner rotary converters as well as the neat back of the charging panel. The rheostat units and panels of this type are furnished completely wired, the service and battery leads only need be secured to accessibility located lugs.

Head of Family Responsible for Accidents

A verdict holding the head of a family responsible for an accident caused by an automobile owned by the wife or other member of the family has just been rendered by a jury in Judge C. C. Butler's division of the Denver district court. The jury also awarded the plaintiff $3,750 damages for injury, which is said to be the largest amount ever allowed in Denver in an automobile accident case. The suit was brought against Ben Kemper and wife by J. A. McIntyre for injuries caused by Mrs. Kemper's electric car, which she was driving at the time of the accident and which she also personally owns. Mr. Kemper's defense against responsibility was based on the ground that his only connection with the accident or with the ownership of the car itself was through having bought the car and given it to his wife as a present.

Mr. Kemper's lawyers have filed a motion for a new trial, and if this is denied they threaten to carry the case to the state supreme court.

The developments of the case are being watched with interest by representatives of companies writing liability insurance for automobile accidents.
ON March 13, 1915, the monthly meeting of the Birmingham Electric Club was held at the Swan Hotel, Birmingham, England, when W. Y. Anderson, the acting president, took the chair. The attendance was slightly above the average, and W. E. Warriillow gave a lecture on "electric vehicles," illustrated with lantern slides of modern commercial vehicles. The lecturer called attention to the revival of the electric battery vehicle in Great Britain, and in his opening remarks emphasized the necessity for electrical men, especially those of the older school, regarding the commercial electric in the light of later developments, and not that of the somewhat unfortunate and partly disastrous experiences of 15 to 20 years ago. The experience of mechanical transport during the last 10 years had brought out the limitations of the gas and steam vehicles, and had defined their spheres of economic operation as those embraced by long distance and medium distance infrequent stop service. Motor engineers were coming to realize that in the field of short distance, moderate speed, frequent stop service, both steam and gas-driven vehicles were not commercially economical. The lecturer appealed to motor car manufacturers in the Birmingham district to include the electric commercial vehicle in their range of products, so that the particular field of mechanical road transport to which it belongs could be adequately filled by it. He cited the increasing interest on the part of a few British engineering firms in the electric battery vehicle, and hoped that this would soon lead to the upbuilding of manufacturing facilities in this country. He also referred to the work of the Electric Vehicle Committee in arranging maximum charging rates, standardizing charging plugs, and in providing garage facilities wherever possible. Details were given of chassis design, the lecturer stating that the standard tendency in the heavier commercial electrics was towards the single motor drive, by chain or gear to a differential jack shaft, and thence by side roller chains to the rear wheels. The position of the battery varied according to the maker; in one case it was underslung between the front and rear wheels, and in another on the top of the frame under the driver's seat, the advantage of the latter arrangement being to keep the center of gravity high. The existing types of alkaline and acid batteries were compared, and stress laid upon the mechanical advantages of the former, and the electrical advantages of the latter. The advantages of boosting to give increased daily mileage were pointed out. Regarding operating costs, the author explained that the makers preferred to give specific figures, and each individual set of conditions under which the vehicle would be required to run. By refraining from publishing general figures the makers realized that they reduced the risk of creating a wrong impression of the capabilities of the electric. The vehicle was not to be regarded as a panacea for all the ills of power-propelled road transport, but the success of the electric in its own field was undoubted, and was merely awaiting wider appreciation among power vehicle users. Touching upon the question of speed, it was now becoming evident that the users of gas about-town delivery vans had a vehicle with a speed range in excess of their requirements, and their machines were usually driven at an excessive speed, with resulting excessive wear of tires and straining and jarring of the frame and bodywork of the vehicle. The damage to the surface of the roads by heavy commercial trucks driven at a high speed was a matter of national importance, and the government was directly concerned itself with it, with a view to finding a solution of the difficulty. If the claims of the electric to consideration, as a moderate speed vehicle were consistently put forward, its wider employment in towns would set a lower standard of speed which would contribute to public safety, and to the more economical operation of motor delivery services. The lecturer showed lantern slides of the modern commercial electric to indicate that the industry was flourishing in the United States, and that many commercial and industrial concerns in this country were putting the vehicle into daily use. Considerable interest was shown in the small industrial trucks and battery cranes, which would, it was thought, prove most valuable in the Birmingham district.

Several central station engineers and motor car makers' representatives were present, and an interesting discussion took place. The chairman pointed out that the Birmingham district was ideal as to contour and road surface for the electric vehicle. The guarantees which battery makers were now giving could not be obtained for engines from the gas car makers.

A. C. Roberts said that there was a field for the battery tractor in stone and granite quarries, where horses were mostly used. Since the war most of the animals have been commandeered.

W. A. Jackson (borough electrical engineer, West Bromwich) said that the gas trucks in his district had been taken by the government; they had got some more, but fortunately the government had taken them, and they then decided upon four Edison battery vehicles. They were slower and more costly vehicles to buy than gas, but with the figures of working guaranteed by the makers they would save $2,000 per annum over the gas-driven machines. He was confident that their experience with these vehicles would be so satisfactory that the West Bromwich Corporation would ultimately replace the horse-drawn vehicles now used by the street and cleaning departments with electric dust carts, etc.

G. Donovan agreed with the lecturer that electrical men should cease to damage the electric by criticisms based on experience of 20 years ago. He hoped that the sale of the small industrial electric trucks would be vigorously taken up in Birmingham.

Mr. Johnson asked several questions regarding the increased mileage to be obtained by boosting the battery.

Mr. Hargreaves (Edison Co.) said that he took three commercial vehicles a distance of 3,000 miles through the Midlands last summer, and had experienced no difficulty in obtaining a charge. He had on several occasions demonstrated the hill-climbing powers of the commercial electric, and made convincing tests to tradesmen and others by doing a typical day's work for them by transporting their goods.

Mr. Walker (Walker, Horricks) thought that the American electrics were crude in construction, and might be improved in many details. The standard was below that of gas-driven chassis. He was not convinced that the sige motor drive made the best job from
a control point of view. He inquired if the Electric Vehicle Committee had yet standardized the voltages for vehicles.

R. J. Mitchell (Edison Co.) explained the constructional features of the Edison nickel iron cell, and passed around specimen plates, and a complete cell for inspection.

Mr. Steventon expressed surprise that a gearless motor could be built light enough to run at as low a speed as 96 revolutions per minute, taking this as the speed at which a 26-inch wheel would turn to give 8 miles per hour for the vehicle. He remarked that the electric vehicle was likely to be hit rather hard by the addition to gas vehicles of such accessories as dynamo lighting and self-starting sets which removed many of the disadvantages from the petrol-machine.

Mr. Bisch (British Westinghouse) said that the Wolseley and Austin motor companies would probably have not interested themselves in the electric had they not had some confidence in its future. He thought that an English-made electric was a necessity.

Mr. Warrillow replied suitably to the various points raised, and the meeting concluded with a hearty vote of thanks to him for coming from London to give his lecture.

Statement of Edison Electric in England

Bernard Drake, chairman of the British firm of Edison Accumulators, Limited, stated at the company’s annual meeting held in London, March 12, that in initiating the electric-vehicle industry in England they must be constantly running demonstration cars and following up inquiries in such a way as to educate the public relative to the results obtained under various working conditions. It had been necessary to prepare special designs to suit the conditions prevailing in England which in many cases differed from those in America and elsewhere. The company has obtained orders for more than one hundred electrics. One London firm has ordered fifty Edison battery delivery trucks for their regular service.

At the end of 1914 the company had sufficient unexecuted orders on its books to have enabled a profit to be shown if it had been possible to obtain the equipments in time. The net loss for the year was $8,345. Encouraging reports were coming in respecting the vehicles operating, the cost per ton-mile comparing very favorably with other road-transport systems; reliability, ease of control, economy and quiet running mentioned as good points. Cost of generating and supplying current was steadily decreasing, whereas the cost of gasoline or other fuel for the internal-combustion-engine commercial and private cars had been continuously rising.

Mr. Edison was reported to have said that in his opinion the nickel-iron-alkali battery would play an important part in the transportation of the future, and this statement was already verified in America, but in England they were slow to move in anything new and it was often difficult to overcome the want of enterprise shown by the older establishments, stores, cartage contractors and other firms, who waited for their more up-to-date competitors to show what could be done. Orders received by the Edison company since December were over three-fifths of the total received during the entire previous year.

Charging Vehicle Batteries at the Curb

Another invention has been perfected for the convenience of motor vehicle owners. Electric cars can now have their batteries charged at the curb without entering the garage. The charging outfit is a very compact apparatus capable of supplying any electric pleasure or commercial vehicle with enough current to send it on for five to twenty miles on ten minutes’ to one hour’s charge.

A slate panel is mounted within an electrically welded-steel box only accessible through a steel spring-lock door. The box contains ammeter, pilot lamp, rheostat, fuses and one main line switch. Connecti-
Power Wagon Operation in Central Station Service

A Complete Review of the Advantages of Power Wagon Service

Wherever the words "central station" are mentioned, they are meant to include electric lighting and power companies operating over a large congested area.

The nature of the work, which such companies are called upon to handle, is very diversified—necessitating the maintenance of trucks or vehicles capable of conveying small articles weighing from one to two pounds, and large pieces of apparatus weighing from ten to twenty tons. Therefore, the problems confronting such companies differ greatly from similar problems met with in other lines of business. In reality, it can be said to stand in a class by itself; due to the fact that it embraces not only the small package delivery of the ordinary department store, but also the heavier work usually done by teaming contractors, as well as work requiring the use of specially designed vehicles, such as tower wagons, pole trucks, cable trucks, etc.

It is the aim of all central station companies to provide quick transportation at the lowest possible cost, and it is with this end in view that the power wagon, as a means of transportation, has been adopted. Central station policy is to give to its consumers the best possible service; and without the aid of the power wagon this is impossible. Complaints and deliveries of all kinds, when attended to promptly, tend to keep a consumer in a better frame of mind, and serve to act as an advertisement of the efficiency of central station service.

The electric vehicle has not usurped the entire field, as is evidenced by the number of gasoline vehicles in use, although the majority of gasoline cars in use are of the runabout and touring car type, which are used by heads of departments and officials, leaving the bulk of the actual work to the electric vehicles. At the 1913 convention of the Electric Vehicle Association of America it was reported that there were 971 electric vehicles in use by eighty-six central stations, and this number has greatly increased during the past year.

A close study of the performance of gasoline runabouts and touring cars operated by a large central station shows that in a great majority of cases such cars could be economically replaced by modern electric vehicles, reducing accidents to a minimum, on account of eliminating the tendency to speed; reducing depreciation on account of the increased life of the electric vehicle; and greatly increasing the advertising value of such vehicles in the uses of electricity.

The majority of the transportation work done by the central station is required during the day; but it is necessary, however, to have trucks that can be operated at any time. It is not infrequent, especially after bad storms, that vehicles are called upon to do both day and night service. This is accomplished by having charging stations properly located throughout the district, at which points the battery can be given a boost; and also by having extra batteries that can be used in extreme cases.

There are a great many questions which must be considered in the successful operation of power wagons, but possibly the most important are the conditions under which they are called upon to operate. It is a fact that in no city are these the best that might be desired. To economically operate a power vehicle it is necessary to keep it moving all the time. A vehicle which is delayed even only a few minutes at a time reduces its efficient working value. Conditions exist, however, over which we have no control or jurisdiction, that continually cause such delays. The most glaring may be attributed to the usual congestion at freight stations, while others are caused by improper devices to facilitate the quick loading and unloading of vehicles at store house and other points.

Where a great many vehicles are used, it is necessary to maintain a garage and a working force to repair and give proper attention to all vehicles. This repair force plays an important part in vehicle performance, and if competent, should detect and make a great many minor repairs during periods of charg-
ing, which if neglected might eventually cause damage or accidents, necessitating the withdrawal of the vehicle from service for a period long enough to make extensive repairs. This period of inactivity decreases the working value of the particular vehicle, as it necessitates the assigning of another vehicle in its place in order that the regular routine work may continue. It is obvious, therefore, that continual inspection materially decreases the number of extra vehicles that must be maintained. The custom of the larger central stations is to place all vehicles in charge of a transportation department. This department is held responsible for their operation and maintenance and keeps records showing the performance and cost of maintenance of each vehicle, or class or vehicles. These records are kept in such a manner that data can be obtained giving the daily, monthly or yearly cost and performance of each power wagon.

The work performed by the various classes of vehicles may be divided as follows:

1. Power wagons for incandescent lamp deliveries;
2. Power wagons for arc lamp deliveries;
3. Power wagons for meter deliveries;
4. Power wagons for distribution and high tension work;
5. Power wagons for underground work;
6. Power wagons for emergency and trouble work;
7. Power wagons for general work.

In addition to the above classifications, mention should be made of specially designed vehicles, such as pole trucks, tower wagons and vehicles equipped with hoisting derricks, etc.

INCANDESCENT LAMP DELIVERY.

The vehicles used for incandescent lamp delivery are generally of 1,000 pounds capacity or less. These vehicles must necessarily be so built that they will not jar and break the filaments of the lamps which are very fragile, and also must be capable of covering large distances on one charge. Such vehicles are constantly in touch with the consumers and if attractive in appearance have considerable advertising value.

ARC LAMP DELIVERY.

The vehicles used for arc lamp delivery are generally of one-ton capacity and are fitted up specially for this purpose only. Such vehicles are equipped with racks which are capable of holding approximately thirty lamps, so arranged that the lamps can be strapped in—thus keeping them from swaying with the motion of the wagon, and protecting the mechanism of the lamp. This permits the floor of the vehicle to be kept clear for the storage of globes, carbons, etc. Such trucks must be capable of giving a large mileage, as they are called upon to cover long distances.

METER DELIVERY.

The vehicles used for meter delivery are generally of 1,000 pounds capacity, and are usually so equipped that the meters are placed upright on the sides of the vehicle, in padded pockets, so that the jar of the wagon is taken up by the pads. In some cases, however, meters are delivered in the vehicle that distributes the balance of the meter material. These vehicles also transport gangs of men from job to job, leaving sufficient material at each location to complete the work. Such vehicles are specially equipped for carrying meter material, the meters themselves being carried in their original boxes packed in excelsior.

DISTRIBUTION AND HIGH TENSION WORK.

Vehicles used for distribution and high tension work are generally of from one to three-ton capacity, and are equipped to facilitate the handling of all the material and tools that may be required. The material carried on these vehicles from day to day depends on the class of work and the number of jobs the vehicle is required to do. The equipment of tools, however, usually remains the same. For service or light construction work the one-ton vehicle is generally used, and carries in addition to its regular allotment of tools the required amount of material for the various jobs to which the vehicle may be detailed. The three-ton vehicle is used for heavy construction work, carrying in addition to about one ton of tools, the necessary wire, cross-arms, pole hardware, etc. These vehicles are equipped with special racks and compartments for carrying ladders, pike poles, digging sets, etc.

UNDERGROUND WORK.

Vehicles for this class of work generally consist of large trucks, equipped with a winch, specially arranged for the pulling of cable. Such vehicles have been an important factor in central station work, effecting material saving in the rapidity with which such work can be done. Before the adoption of this type vehicle, most of the cable was pulled by a hand winch, which was very slow and ineffective. Since
its introduction, however, cable pulling has become comparatively easy work, probably the hardest part being the handling and moving of the four and five-ton reels which carry the cable. In some cases such vehicles have been equipped with a motor driven centrifugal pump, with which manholes can be pumped out.

**EMERGENCY AND TROUBLE WORK.**

This division includes the vehicles which probably are of most importance to the consumers. They are lightly built, being equipped with a body capable of carrying a ladder, together with enough material to take care of emergency and trouble work, and must be ready for service at any time during the day or night. After bad storms such vehicles are invaluable in clearing up trouble and restoring the system to its normal condition.

**GENERAL WORK.**

The vehicles necessary for this division of the work must be such that they can haul anything from small one-pound packages to apparatus weighing ten tons or more; and be capable of making all freight deliveries; transferring materials from one storehouse to another, etc. They must have capacities varying from 1,000 pounds upward, and be so equipped that loading and unloading can be done with all possible speed, and must be capable of a very large mileage per charge. Such vehicles are usually built in accordance with the work they are intended to do; some being equipped with winches to facilitate the loading and unloading of heavy articles of merchandise.

Under this division must also be considered the special vehicles such as tower wagons, pole trucks, pole derrick trucks, etc.

The tower wagon is a vehicle used in some form or other by most of the central stations and varies considerably in design. As the name implies, a tower wagon consists of a tower mounted on a power vehicle; the tower in some cases being constructed of angle iron, and in others consisting of simply an “A” ladder mounted on the body of the truck. Most of the vehicles, however, are equipped with a substantially built tower, which can be raised or lowered as the occasion demands, and are generally used for trimming and changing lamps on poles which are not stepped, or which are suspended from elevated structures.

The method of raising and lowering these towers vary, some being operated by hand, while others are raised and lowered by motor power. The motor operates by current furnished by the batteries of the vehicle and is usually independent of any other part of the mechanism of the vehicle. Some of these vehicles permit of double operation, that is, they may be operated by the driver from the regular driver’s seat, or from another seat located on a level with the top of the tower, thereby saving the driver from continually climbing up and down the tower.

This type vehicle is a great labor saving device, and is quite popular among the central stations, as is shown by the number of them in use—not only in this country but even in South America.

Another special vehicle is that designed for the hauling of poles. These trucks can be divided into two classes: First, trailers hauled by a tractors; and, second, long wheel base trucks.

The hauling of poles has always been a slow, tedious job, and while some central stations still use the horse-drawn vehicles, it is interesting to note, however, that they are gradually falling in line and are considering the use of power vehicles for this class of work.

The design of a pole hauling vehicle introduces some very interesting problems.

There has been built a specially designed, long wheel base, four-motor driven truck, steering from both front and rear, and equipped with an electrically driven winch, to facilitate the loading and unloading of poles. This truck is capable of hauling all lengths of poles from 25 to 90 feet without interfering in any way with the operation of the vehicle.

The pole hoisting or derrick trucks are not generally a specially designed vehicle, but must be an open side truck without a top, in order that some form of derrick may be fitted on the platform. The design of derricks mounted on these trucks vary greatly in shape and form; some being operated by hand power and others by electrically driven winches. These derrick or pole hoisting trucks are used to erect iron or wood poles, and greatly reduces the amount of labor necessary for this class of work. They cannot be economically used for single pole erections, but are generally used where there are a number of poles to be erected close to each other. With the use of this truck it is possible to erect four times as many poles in a day as can be done when erected by the old method, using pike poles, etc.

The following table contains interesting data taken from the records of a large central station, illustrating the actual performance during the month of June, 1914, of a vehicle of each of the classes here described.

<table>
<thead>
<tr>
<th>Class</th>
<th>Capacity of pole, feet</th>
<th>Total miles</th>
<th>Service days</th>
<th>Average miles per service</th>
<th>Maximum working per day</th>
<th>K.W. hrs. per mile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tower wagon</td>
<td>1,000</td>
<td>560</td>
<td>30</td>
<td>18.6</td>
<td>30</td>
<td>.75</td>
</tr>
<tr>
<td>Telescopic lamp wagon</td>
<td>500</td>
<td>991</td>
<td>26</td>
<td>35.8</td>
<td>51</td>
<td>.39</td>
</tr>
<tr>
<td>Merchandise delivery wagon</td>
<td>1,000</td>
<td>1,164</td>
<td>26</td>
<td>44.7</td>
<td>62</td>
<td>.51</td>
</tr>
<tr>
<td>Meter and installation wagon</td>
<td>1,000</td>
<td>989</td>
<td>26</td>
<td>38</td>
<td>50</td>
<td>.55</td>
</tr>
<tr>
<td>Arc lamp wagon</td>
<td>2,000</td>
<td>1,059</td>
<td>30</td>
<td>33.5</td>
<td>46</td>
<td>.66</td>
</tr>
<tr>
<td>Service wagon (in service 9 years)</td>
<td>2,000</td>
<td>770</td>
<td>27</td>
<td>28.5</td>
<td>36</td>
<td>.92</td>
</tr>
<tr>
<td>Merchandise delivery wagon (large packages)</td>
<td>4,000</td>
<td>1,004</td>
<td>26</td>
<td>38.6</td>
<td>56</td>
<td>.82</td>
</tr>
<tr>
<td>Construction wagon (in service 9 years)</td>
<td>6,000</td>
<td>309</td>
<td>26</td>
<td>11.9</td>
<td>24</td>
<td>1.94</td>
</tr>
<tr>
<td>Pole truck</td>
<td>12,000</td>
<td>814</td>
<td>25</td>
<td>32.5</td>
<td>46</td>
<td>1.49</td>
</tr>
</tbody>
</table>

To illustrate the stability of the electric power vehicle, proving conclusively that they are the most economical type of vehicles for central station service, a brief summary of the average performance of eleven one-ton trucks, which have been in continual service for nine years, is herewith given:

The average mileage performance of these eleven trucks for nine years is 4,855 miles per truck, per year, with a maximum mileage of 7,017 and a minimum of 4,016.

For the year 1913 the average mileage per truck was 5,136 miles, with 7,756 miles as a maximum and 3,876 miles minimum, showing that they are capable of doing just as much work now as when they were purchased new nine years ago.

The large difference between the maximum and minimum miles per year, per car, can be explained by stating that some of these vehicles were used for changing arc lamps and general delivery, which re-
quired them to cover a larger territory than the vehicles used on other classes of work.

The majority, however, were used on construction and service work, the mileage depending on the time required to perform each job. Only on rare occasions were such vehicles used to their full mileage capacity; the majority of cases the mileage per day being less than twenty miles.

**Batteries.**

The battery situation can be briefly stated by reviewing the records of a large central station company.

The particular company in question has operated electric vehicles for a period covering ten years. In that time the usual battery troubles were encountered—mostly because of the lack of experience on the part of the operating company. This inexperience, how-

ever, can be said to have affected the first few batteries only, and does not materially affect the records in general.

It would seem fair to divide battery statistics into two periods, and make a third division to include the more modern batteries, of which little is known, except that they show a marked increase in length of service and in mileage furnished.

From 1904 to 1910, the records in question indicate that the total average life of batteries was fourteen months, with an average total mileage of 6,417 miles.

From 1910 to 1914, batteries similar in type show an average life of nineteen months and 8,140 miles.

This comparison is interesting, in that it shows a comparison of the same type of battery, covering first a period of six years and then again four years, with the performance of the same type battery exceeding the first by five months and 1,600 miles.

These records are all based on batteries used in vehicles ten years old, the weight of which is greatly in excess of similar capacity vehicles of the more modern type; and all vehicles being used in the same class of work.

The actual life and mileage performance of the modern battery can not at this time be determined. There are several in use by this central station company that have been in continual operation for approximately thirty-five months, with a mileage record to date of approximately 20,000 miles.

Advantages could be gained were the manufacturer of commercial electric vehicles to adopt a standard size battery compartment for all vehicles of the same capacity, thereby allowing the interchange of batteries between vehicles of different manufacture.

**Tires.**

In equipping an electric vehicle with tires, the most important question to be considered is that the vehicle be equipped with the proper size tires—only too often has it been the case that vehicles have been undertired when they were purchased, thereby necessitating the operating company to increase the size of the tire equipment to carry the weight and capacity of the vehicle.

Another important factor is to select tires that are composed of the proper compound, to give the necessary resiliency, thereby increasing the working value of the electric truck, by enabling it to give more miles per charge.

**Summary of Advantages.**

It is difficult for a transportation department of a central station company to show a book profit when comparing power to horse-drawn vehicles. The advantage in any power wagon lies in its ability to cover the required distance between jobs with all possible speed and to deliver material with a minimum amount of delay. A transportation department will almost invariably show an increase in yearly transportation costs, but this must be carefully studied in connection with the increased amount of work accomplished by the power vehicles. Such an analysis will undoubtedly show large amounts in favor of the power wagon.

**Motor Truck Convention at Detroit.**

It has been decided that the motor truck convention to be held May 5 and 6 in Detroit by the National Automobile Chamber of Commerce will be held in the banquet hall of the new Statler Hotel.

Members of the Commercial Vehicle Committee of the N. A. C. C. are at work on the program.

The list of papers to be prepared has not yet been decided upon, but it will embrace subjects of uppermost interest to manufacturers, such as service to be rendered to users by the makers and dealers, standardization of capacity rating, shows and demonstrations, and so forth.

The convention will be open to non-members as well as to members of the N. A. C. C., as were the first two motor truck conventions ever held in the United States, which were conducted in 1912 by the National Association of Automobile Manufacturers, predecessor of the N. A. C. C., and which resulted in the adoption of a standard warranty, standard speed ratings, body weight allowances, caution plates, frame widths and lengths and standard demonstration charges.
A MONG those things which might be termed "pathetically ridiculous" is the attitude of the average central station executive toward the electric vehicle. It is a surprising, and possibly somewhat amusing, fact that as a general proposition the electrical industry is not interested in the electric vehicle, notwithstanding that this particular type of machine bears the hearty endorsement of the technical and commercial leaders of the entire central station field itself, and with but one or two notable exceptions has a greater earning power per horsepower of connected load than does any other type of electrical apparatus. However, it is not intended at this time to discuss this mooted question, as the result of any lengthy argument doubtless would be to leave the situation just where it has been since the subject of central station co-operation in electric vehicle promotion was first introduced some seven or eight years ago, and, further, no time would remain for the presentation of the subject of this paper, namely, "The Development of the Electric Vehicle Market Through the Power Solicitor." In fact, the only reason that the impasse attitude of the central station is broached at all is that the arguments showing the reason why the power solicitor should give his time to electric vehicle development are equally applicable to the central station industry as a whole, which arguments are forthwith presented as a secondary introduction to the subject under discussion in the following paragraphs pertaining to the possible market for and income from electric vehicles.

There seems to be a common impression that the electric machine is particularly adapted for use in the larger cities (with emphasis on the "larger"): This is true only in the sense that the larger cities naturally present a greater market than do the smaller; yet if pains be taken to analyze the situation closely we discover the startling fact that there are but eight cities in the United States of over 500,000 inhabitants, and only seventy odd having a population of over 75,000. Also, where the period of electric vehicle development has been sufficiently long to establish these machines, we find that the ratio of machines to population is considerably greater in the smaller communities. For example, in Chicago, with a population of approximately 2,200,000, there exists one passenger machine for every 750 inhabitants, while in Cleveland, with but 25 per cent of that population, there is one machine for every 340 inhabitants. One explanation for this condition is that in the larger city apartment-house dwellers predominate, who, through force of circumstances, must depend upon public garages for the care of their machines, while in the smaller cities private garaging is more generally possible.

As a matter of fact, the real business in the electric passenger vehicle is to be found among that class of buyers with whom depreciation and economy of operation are important considerations, and it is just that difference between public garage charges and the expense of maintaining a car "on the premises" which deters a majority from purchasing. In other words, the free use of private garages with proper intermit-
connected this exceeds that of any other current consumer, as is indicated in the following table, No. 3:

In order to arrive at some idea of the aggregate probable income in cities of from say, 250,000 to 350,000 inhabitants, we consider the cities for which the census was compiled, the value of the power vehicle load based on the average current consumption for all sizes of vehicles (see Table III) would be as follows:

<table>
<thead>
<tr>
<th>Population</th>
<th>K. W. H. Consumption</th>
<th>Income at 3 cents per K. W. H.</th>
</tr>
</thead>
<tbody>
<tr>
<td>250,000</td>
<td>6,343,293</td>
<td>$190,298.79</td>
</tr>
<tr>
<td>350,000</td>
<td>7,638,411</td>
<td>299,152.33</td>
</tr>
</tbody>
</table>

From the foregoing it is apparent that this vehicle load presents a valuable source of revenue to the central station; and that its development is not made a part of the daily work of power solicitors is probably due to the fact that a comprehension of its value has not been brought home to the central station management, or that it has not been fully appreciated. Naturally the employee reflects the attitude of his employer, and unless the management itself is appreciative of the value of the vehicle charging load, it is not to be expected that the average power solicitor will exert himself in its development, it is.

In one unaccountable reason the electric vehicle is supposed to be inherently incomprehensible except to the expert in that particular line. Although this is not so, this belief provides an excuse for the power solicitor to sidestep any proposal that he interest himself in the sale of electric vehicles on the plea that he is not adequately informed as to their design or possibilities, and therefore cannot discuss their use with a prospective purchaser without exposing himself to criticism because of his ignorance of the subject. Now should we investigate, to ascertain if this be really so, we should probably find that ordinarily the power solicitor does not attempt to seek such information, even though special means for obtaining it are available, but absolutely ignores all data on the subject which may lie at his hand. This he will probably continue to do until his employer insists upon his assuming some responsibility in the development of the vehicle industry.

WHAT OTHERS HAVE ACCOMPLISHED.

I have in mind a situation in a city of from 250,000 to 275,000 inhabitants where the central station new business agent became alive to the possibilities of the electric vehicle. He had little difficulty in imparting his enthusiasm to his power men, and to-day the vehicle development is a part of their regular duties. Through the assistance of manufacturers and others in his own organization, he saw to it that these men became sufficiently informed in electric vehicle practice at least to pave the way for subsequent visits from the vehicle salesmen. Just how this worked out is shown by the fact that in one year twenty-seven new machines were sold in the territory and the vehicle charging income amount to over $14,000.

In another city whose central station was likewise blessed with a progressive New Business administration, an appliance salesman who had developed from a position as meter reader was sent to the manufacturers of both vehicles and storage batteries for instruction, from which, with the added assistance of his own organization, he soon developed into a promising vehicle man. In the year following his period of education he was instrumental in producing the sale of 19 machines valued at over $61,000.

In still another instance a sign solicitor in a small town of some 10,000 inhabitants developed so rapidly that in but three years' time he became District Representative for one of our leading electric vehicle manufacturers.

This all goes to show that the power solicitor or central station representative can become a competent electric vehicle salesman if he wishes to do so, and whether or not he so wishes depends largely, if not entirely, upon the sentiment of his employers toward the electric vehicle. Let the management heartily endorse the electric machine and endeavor to promote its use, and little difficulty will be experienced in getting the rank and file to fall into line.

Assuming that a promising attitude on the part of the central station is shown, the natural questions are: How shall the power solicitor be educated? and How shall the business be developed? There are several methods of procedure, the choice of which depends largely upon local conditions. Naturally the logical way would be to employ an experienced vehicle man as a direct representative of the central station to superintend the development and furnish the prospective user with vehicle information. This suggestion, however, may not be practicable in the larger cities.

Another plan would be to follow out this idea through a combination of several lighting companies operating within a comparatively small area or a section of one state; or in the case of a holding company, to employ a man to supervise the development of all its properties from the home office. Where the conditions warrant the employment of such a specialist to develop the vehicle business, it would be superfluous to suggest any method of procedure, as the man himself would be competent to plan and execute his own program, the qualification for which is essential to justify his employment at all. For cities where the engagement of such a man is impracticable the central station must rely upon the vehicle manufacturers for this service, most of whom will gladly give all the co-operation required, particularly if assured that they themselves will be the principal beneficiaries through the sale of the machines.

A PLAN OF PROCEDURE.

Where the conditions do not warrant the services of the specialist the following plan for developing the power wagon field might be advantageously carried out at small expense and with a promise of satisfactory results. In fact, this same plan in a similar development is now in progress.

First, the power representative should collect from the operators of horse-drawn vehicles a statement of their equipment, showing the number of horses used, the number and type of wagons, the extent of their delivery territory and general operating conditions, and where possible the cost of the service and capital invested in the equipment. Experience has shown that when the object of the census is explained and the use to which the information will be put is clearly defined, the merchant is very willing to cooperate with the central station, and in many instances is impatient to know what vehicles will accomplish in this particular service.

With the tabulation of the data obtained through the census, the probable vehicle users can readily be determined and the possible number and size of machines required quite closely estimated.

The next step in the program is to enlist the services of the vehicle manufacturer's representative.
TABLE I—ELECTRIC VEHICLE CENSUS IN TWO SMALL CITIES

<table>
<thead>
<tr>
<th>Business</th>
<th>No. of Firms</th>
<th>No. of Vehicles Required</th>
<th>Population 20,000</th>
<th>Population 50,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef Packers</td>
<td>4</td>
<td>24</td>
<td>8</td>
<td>67</td>
</tr>
<tr>
<td>Bakers</td>
<td>18</td>
<td>11</td>
<td>6</td>
<td>40</td>
</tr>
<tr>
<td>Brewers and Distillers</td>
<td>14</td>
<td>150</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Building Material</td>
<td>3</td>
<td>5</td>
<td>15</td>
<td>162</td>
</tr>
<tr>
<td>Coal and Wood</td>
<td>7</td>
<td>53</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Department Stores</td>
<td>6</td>
<td>154</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Express and Transfer Cos.</td>
<td>9</td>
<td>8</td>
<td>6</td>
<td>60</td>
</tr>
<tr>
<td>Fertilizer Manufacturers</td>
<td>1</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flour, Feed and Grain</td>
<td>7</td>
<td>74</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Food Products</td>
<td>2</td>
<td>10</td>
<td></td>
<td>51</td>
</tr>
<tr>
<td>Furniture Dealers</td>
<td>5</td>
<td>8</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Grocers</td>
<td>9</td>
<td>38</td>
<td>10</td>
<td>80</td>
</tr>
<tr>
<td>Hardware Supplies</td>
<td>8</td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ice Cream Manufacturers</td>
<td>1</td>
<td>27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Livery Stables</td>
<td>3</td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lumber</td>
<td>8</td>
<td>32</td>
<td>7</td>
<td>26</td>
</tr>
<tr>
<td>Liquors and Mineral Waters</td>
<td></td>
<td></td>
<td>2</td>
<td>23</td>
</tr>
<tr>
<td>Laundry</td>
<td>9</td>
<td>21</td>
<td></td>
<td>27</td>
</tr>
<tr>
<td>Masons’ Materials</td>
<td>8</td>
<td>21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milk Dealers</td>
<td>2</td>
<td>41</td>
<td>6</td>
<td>90</td>
</tr>
<tr>
<td>Oils and Paints</td>
<td>6</td>
<td>33</td>
<td>6</td>
<td>27</td>
</tr>
<tr>
<td>Storage and Trucking</td>
<td>11</td>
<td>81</td>
<td>13</td>
<td>82</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>14</td>
<td>33</td>
<td>23</td>
<td>106</td>
</tr>
<tr>
<td>Totals</td>
<td>153</td>
<td>1,097</td>
<td>137</td>
<td>911</td>
</tr>
</tbody>
</table>

TABLE II—POSSIBLE VEHICLE MARKET AND INCOME TO CENTRAL STATIONS IN SMALL CITIES

<table>
<thead>
<tr>
<th>Population</th>
<th>No. of Cities</th>
<th>No. of Machines*</th>
<th>Annual Income at $1000</th>
<th>Will Pay 4% Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>75,000—100,000</td>
<td>22</td>
<td>220</td>
<td>$22,000</td>
<td>$550,000</td>
</tr>
<tr>
<td>100,000—125,000</td>
<td>10</td>
<td>300</td>
<td>30,000</td>
<td>750,000</td>
</tr>
<tr>
<td>125,000—150,000</td>
<td>9</td>
<td>370</td>
<td>37,000</td>
<td>925,000</td>
</tr>
<tr>
<td>150,000—200,000</td>
<td>3</td>
<td>441</td>
<td>44,100</td>
<td>1,102,500</td>
</tr>
<tr>
<td>200,000—250,000</td>
<td>9</td>
<td>600</td>
<td>60,000</td>
<td>1,500,000</td>
</tr>
<tr>
<td>250,000—300,000</td>
<td>1</td>
<td>735</td>
<td>73,500</td>
<td>1,837,500</td>
</tr>
<tr>
<td>300,000—350,000</td>
<td>5</td>
<td>882</td>
<td>88,200</td>
<td>2,205,000</td>
</tr>
<tr>
<td>350,000—400,000</td>
<td>2</td>
<td>1,029</td>
<td>102,900</td>
<td>2,572,500</td>
</tr>
<tr>
<td>400,000—500,000</td>
<td>3</td>
<td>1,177</td>
<td>117,700</td>
<td>2,942,500</td>
</tr>
<tr>
<td>500,000—600,000</td>
<td>3</td>
<td>1,471</td>
<td>147,100</td>
<td>3,677,500</td>
</tr>
<tr>
<td>600,000 and over</td>
<td>5</td>
<td>1,765</td>
<td>176,500</td>
<td>4,412,500</td>
</tr>
</tbody>
</table>

*Based on minimum population given.

TABLE III—CURRENT CONSUMPTION CHARACTERISTICS FOR POWER WAGONS

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>700</td>
<td>1,000</td>
<td>2,000</td>
<td>4,000</td>
<td>7,000</td>
<td>10,000</td>
<td></td>
</tr>
<tr>
<td>11.3</td>
<td>15.1</td>
<td>17.7</td>
<td>23.7</td>
<td>30.5</td>
<td>35.6</td>
<td></td>
</tr>
<tr>
<td>Annual K. W. H.</td>
<td>3,526</td>
<td>4,711</td>
<td>5,522</td>
<td>7,394</td>
<td>9,516</td>
<td>11,107</td>
</tr>
<tr>
<td>Annual Income at 3¢ per K.W.H.</td>
<td>$105.78</td>
<td>$141.33</td>
<td>$165.66</td>
<td>$221.82</td>
<td>$285.48</td>
<td>$333.21</td>
</tr>
<tr>
<td>H. P. Connected</td>
<td>4.4</td>
<td>4.4</td>
<td>5.3</td>
<td>7.2</td>
<td>7.2</td>
<td></td>
</tr>
<tr>
<td>Income per H. P. of Connected</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

...and with his assistance prepare a series of literature for periodical distribution. Assuming a campaign extending over one year is contemplated, at least 25 pamphlets or advertising pieces should be arranged for, which provides for mailing one piece every two weeks, this distribution to be followed up by a personal canvass by the power representatives. Coincident with the day of mailing the power solicitor should meet with the vehicle manufacturer's representative and thoroughly discuss the subject matter of the literature about to be mailed, and obtain such general information as to performance, prices, etc., as will enable him to present the electric vehicle intelligently to his prospective customer. As each piece of advertising is sent out, similar meetings should be held to discuss not only the text of that particular pamphlet, but the questions and problems which the power solicitor has encountered during the preceding two weeks. In this way the latter will soon gain an adequate knowledge of electric vehicles, and as the prospects develop will be so closely in touch with the situation that he will know just when to call on the vehicle representative for assistance in closing the deal.

Of course, this is a mere skeleton of one plan which might be advantageously carried out, but it might develop into quite a comprehensive program having undreamed-of ramifications if subjected to treatment in the hands of a resourceful electric vehicle advertiser.

Factory Guarantee and Free Service

Paper Read Before the Motor Truck Convention at Detroit—Continued from March

IF dealers can successfully impress upon the manufacturers the feeling that is bound to arise between customers and themselves, because of this unsatisfactory guarantee, I do believe they could readily see where it would be to their interest to co-operate with the dealer and submit a guarantee that would receive the support of their representatives.

Service and free service, the bug-a-boo of the industry, is the rock on which many well-meaning motor truck manufacturers and dealers have periled or wrecked their futures by putting too liberal an interpretation on this much abused term.

Service, as applied to the moral obligations of the manufacturer, dealer and to purchasers of motor trucks should consist solely in the willingness and ability to supply renewals and parts at a fair price and without delay, and also in acting in an advisory capacity regarding the care and proper application of motor truck equipment. In special cases service may also include the hire, at standard price, of one or more dealers' demonstrating or service trucks that he may keep for use in his own business, or for renting purposes, so that his customers will not suffer unduly while their motor trucks are laid up for overhaul or repair. This, however, is a business accommodation, and should be paid for as such, at prevailing prices. It is not service that is included in the purchase price of motor trucks the dealer has for sale. Service does not include free renewals of worn out or broken parts, except as provided for in the manufacturer's guarantee. Reckless promises of free service is bad business from every standpoint. It not only puts a premium on abuse, but it is a well lubricated path to bankruptcy proceedings and receivership sales, which is almost as
bad for the customer as it is for the dealer. If dealers are in position to give the proper kind of service, customers as a rule are willing to pay a reasonable charge for it.

In order to give manufacturers the proper kind of representation, it is absolutely necessary for dealers to carry a stock of parts, as you are well aware of the inconvenience customers have to contend with when it is necessary to lay up their truck to await the arrival of certain parts from the factory.

Looking into the service end of the motor truck business, we find that the reputable dealer who places himself in a position to render good service is confronted with inducements by his competitors, such as free service, which he is unable to compete with. Free service to purchasers of motor trucks has never been successfully handled by any reputable truck dealer.

Conditions that enter into the operation of a motor truck are such that they place the dealer in a position where the carelessness of the customers' drivers may at any time exact of him the replacement of parts and labor due entirely to the negligence or ignorance on the part of the drivers. I have talked to a good many truck dealers located in some of the larger cities throughout the country, and I find that most of them are using free service as an inducement to make their initial sale. Some dealers are running day and night service at no cost to the owners; also furnishing substitute trucks at any time at no charge, should the customer's truck be out of commission through defects in material, workmanship or accident, and a great many of them are garaging their customer's trucks at a price far below the amount it is worth. All of these terms are being made by some of the dealers. Practically all of the better and more business like dealers have a scale of prices for such work, and their success in making sales is usually in direct proportion to the firmness with which they hold out for a reasonable return on all expenditures of money, time, wear and tear and everything else of value involved. No one expects something for nothing from a real business man, and it is easier to convince a purchaser he is getting value for his money when he is once assured that a motor truck is not like a prize package with something thrown in as a premium to induce him to buy.

The purchaser of a motor truck has the bulk of his trouble within three months from the date of delivery due to incompetent drivers, together with no knowledge of a motor truck and its operation. If any free service is to be given on the part of the dealer, here is where it should come in, and the largest per cent of our troubles are derived from ignorance displayed by some of the drivers of our motor trucks.

If we can furnish our customers with drivers who have a sense of responsibility in conserving the valuable piece of property they handle, and the ability to obtain as much work out of the machine as possible in a given time, we will be giving customers free service that will save them money; hold up the reputation of the truck, and be money in the dealer's pockets in the end. The customers are almost in declaring that because of their previous experiences in the road transportation details of his firm's business, the old horse drawn driver makes the best truck driver. Successful truck dealers have made a practice of recognizing this fact to the extent of conducting regular classes and road demonstrations for their customers' horse drivers, and the time and energy thus expended have been extremely profitable to all concerned.

Truck dealers have not developed their business to the extent where they could carry out this plan on a large scale, but it is possible for them to teach the drivers, through means of working them in their stations and factories until such time as they are competent to handle the truck with intelligence. The only other item of free service that is necessary is that of free inspection. It is a known fact that the average business man who buys a motor truck for his business places it in the hands of practically the poorest paid man in his employ, and entrusts in his care an asset of considerable value. I am not referring to the large fleet owners, but to the owners of one or two motor vehicles. The owner of the truck himself may not have the knowledge of truck operations or care, and it is the duty of the dealer to look out for his customer's interest. This can be done by the method of weekly inspection. The truck may be inspected either at the dealer's service station, or at the customer's place of business, and a copy of the inspection report should be sent to the owner of the truck and not to the driver.

With this method, minor adjustments can be made before serious trouble arises from neglect. In this way dealers can also acquaint the customer with the manner in which his driver is caring for his truck.

In a great many cases drivers of trucks are not allowed sufficient time to devote to the care of the truck. It is of vital importance that the driver be given enough time during his working hours to give his motor truck half of the time and attention that would be necessary for horse drawn equipment.

We must always bear in mind that a truck driver is not financially interested in the truck he operates, and every inducement the dealer can make to the driver to give the truck the proper care is going to benefit him in the end.

Storage Battery Cable Puller

The Edison Electric Illuminating Company, Brooklyn employs a battery operated cable puller which is a specially constructed electric truck with the motor supported so it can be employed to propel the vehicle or to operate the drum drawing the cable through the duct.

The parallel steel bars stand vertically in the manhole at the end of the truck to support pulleys for guiding the drawing-in rope. One pulley is installed opposite the duct outlet and another is placed just above the level of the truck platform. To permit placing the pulleys in the correct positions holes for the pins have been drilled about 6 inches apart in each bar. The truck wheels do not have to be blocked when installing cable, as the cable puller is prevented from moving by allowing it to press against the vertical steel bars supporting the pulleys.

From actual test with this equipment it has been found that about 3 h. p. is required to pull cable through a 227-foot duct at the rate of 1 foot per second. As many as 2,497 feet of cable have been pulled with the machine in a day. The longest piece of cable which has so far been pulled was 430 feet in length. The vehicle is equipped with a 5 h. p. motor.

Announcement is made by the Woods Motor Vehicle Company at Chicago that it has appointed Harry K. Stormont of the North Side Garage, Central avenue at Thirtieth street, as Indianapolis distributor.
Relationship Between Factory and Dealer

Advertising and Selling Plans Should Result in Sales, Through the Dealer and Not to the Dealer

By R. P. Spencer

The attitude of manufacturers some years ago was to force a demand for their product on the dealer through advertising to the consumer, but this method has gradually changed because there has come to the manufacturer the realization that the true spirit of merchandising is to help the dealer, not to force him.

The manufacturer has at his command resources for the securing of definite information in regard to the selling of motor trucks in all parts of the country. Resources which the individual dealer does not have at his command, when applied by the data that the manufacturer can furnish, will tend to make a comprehensive campaign for the locality in which the dealer is located.

The tendency of all motor truck advertising is to dwell chiefly upon the mechanical perfection which is being advertised, and while the prospective purchaser is, of course, desirous of knowing that the truck offered him is a perfect piece of mechanism, he is more interested from the standpoint of economy of operation and real utility as concerns his haulage problem.

Manufacturers can be more alert to the study of the peculiar conditions which confront dealers in the different localities. Advertising and salesmanship are so correlated that it is impossible to divorce them, and no advertising campaign for the dealer should be attempted until a thorough and exhaustive investigation has been made of the dealers' possible market and the particular style and kind of advertising best suited to the solving of the problem. An advertising campaign that will produce results for a dealer in Pittsburgh will not necessarily produce results for a dealer in Boston. It is not a question of how much the dealer is willing to spend for advertising, but how can the manufacturer assist him to spend it wisely. Each dealer has peculiar ideas of his own as to the sort of advertising best adapted for bringing results, and it is all going to at all times be thoroughly in accord with any cut and dried plan which the manufacturer may have prepared for co-operation with the dealer.

Dealers have said, "Advertising does not pay. I placed a few advertisement in the daily papers and nobody has come in and bought a truck." There must be a full realization of the fact that advertising does not push, but that it pulls steadily and that the better it is planned and the more persistently it is carried out, the stronger and steadier will be the pull. The usual forms of advertising indulged in by dealers consist of letters, printed broadsides, and newspaper advertising, and a great many of them seem to feel that the advertising is simply a necessary evil. They appropriate a certain sum of money and parcel it out to the men who put up the strongest solicitation for the business, rather than on the basis of thorough investigation of the possibilities and adaptation of the form of advertising best suited to produce results under the circumstances. Understand me, this is not unfavorable criticism of the dealers' advertising methods. It is more an unfavorable criticism of manufacturers, for they have not been of as much assistance to the dealer as they could be.

A thorough study of marketing possibilities is necessary before an advertising campaign for any particular city can be planned, and the quantity of any particular type of trucks that can be sold in a given community is not necessarily in proportion to the population. Talks with various territorial managers of truck manufacturers in regard to the sales possibilities in their territories develop almost invariably the tendency to enumerate the different cities in the territory according to population and estimate that a city of large population should sell the largest number of trucks, and a city of smaller population a proportionately smaller number of trucks. This is, of course, one angle to figure from, but opposed to that line of reasoning we are confronted with the fact that very often a dealer in a town of 50,000 will sell twice as many trucks as a dealer in a town of 250,000. This would indicate undoubtedly that the dealer in the smaller town is more alive to his possibilities, perhaps, but at the same time there may not be any more actual prospects in the larger city for the purchase of that particular type of truck.

All manufacturers in the motor truck industry have planned and carried out more or less successful advertising campaigns for the securing of dealers, but very few manufacturers have put into effect an energetic and carefully thought out plan of helping the dealer to advertise in the community in which he is doing business. For examples of the effectiveness of this kind of work we do not have to go outside of the industries which are closely allied with the motor truck industry. Take the tire manufacturers, for instance, some of them have successfully carried out merchandising and advertising campaigns which have enabled their dealers to find their markets and supply its needs.

Truck manufacturers should ever bear in mind that they are dealing in big units and that the dealers' advertising must be proportionately broad-gauged in conception and execution. Real salesmanship or advertising is the art of securing an increasing number of pleased, permanent patrons at a decreasing ratio of expense, and manufacturers should be in position to work with the dealer on his advertising and merchandising problems in such a way as to prove the truth of the foregoing statement. The manufacturer, then, should plan his merchandising and advertising to sell trucks through the dealer, and not to the dealer.

In its efforts to develop a suitable type of electric vehicle for cab service in connection with the Grand Central terminal in New York city, the combined New York Central railway and terminal interests have met with considerable success and it is anticipated that equipment orders may be forthcoming before very long. Service tests in which various electrics have been operated in parallel with gasoline cabs have been going on since early last summer, with results that have proved encouraging, particularly with respect to the attitude of patrons.

While no information is forthcoming from the railroad management as to the outcome of the tests, the practical completion by the Rauch & Lang taxi of its second period of successful operation is the cause of considerable gratification.

The machine was first put in operation on June 19 and continued up to September 4, a period of seventy-seven days' uninterrupted service.
“Pros and Cons” for Tire Inflation

The Value of Oversize Tires Inflated According to Standard Rules*

The pneumatic tire has made possible the present-day automobile. Without it the automobile would not have come into as general use as it has.

A pneumatic tire is a cylindrical ring of air surrounded by a covering of canvas and rubber designed to carry a load and to absorb shocks. If the cylindrical ring of air is not of sufficient volume, it cannot do the work for which it is designed. The cylindrical ring of air should be under such a pressure as to permit the tire to carry the load and to absorb the shock. If the pressure of air used in a tire is too great, its service will be similar to that of a solid tire, transmitting the shocks in greater volume, thus shortening the life of the car; while a pneumatic tire of proper size and inflation will prolong the life of a car.

The subjects of proper tire sizes and tire inflation are so closely identified that they will have to be discussed together. The variables to be considered in tire pressures are service, economy and comfort. The nature and construction of the tire cover or shoe should be flexible and yielding, so that it may transmit quickly the shock to the cylindrical ring of air. The heat generated within the tire has much to do with the air-pressure used—the faster the speed, the greater the heat. The greater the heat the greater the strain, on account of the expansion of air within the tire. Continuous driving generates excessive heat, as well as driving in hot weather. Excessive heat is very injurious to the shoe and causes rapid deterioration. If there is not sufficient volume of compressed air within the tire, due to using an improper size, to absorb all of the shock and vibration, the surplus shock and vibration is transmitted to the car and, therefore, shortens the life of the car. The greater the volume of air in a tire, the less the increase of heat and strain when driving under climatic conditions which produce excessive heat, as well as when driving at great speed or doing heavy work.

A tire should be sufficiently large not to flatten at the point of road contact more than 14 per cent of its sectional diameter or on an average 12 per cent, to give good service. A tire of sufficient volume to properly carry a load with proper tire pressure will, if not properly inflated, deteriorate much more rapidly from excessive flexing; causing the fabric to break down quickly, and is much more liable to puncture. Still the user closes his eyes to these facts, when he considers only the personal comfort of the occupants of the car, for he well knows that an under-inflated tire will give greater riding comfort as it absorbs the vibration and shocks more quickly and thoroughly. After he has driven his tire under-inflated and received a much less than normal mileage from it he is brought face to face with the increase in tire expense which he has brought upon himself.

The personal equation of the driver has to be considered; the tendency not to see that the tires are properly inflated: the manner in which he drives. The service of the car, whether for light or heavy work, the climate and seasons, the geographical location, the type of road-bed, the use of shock absorbers, spring equipment and distribution of the load, are also factors. Some automobile manufacturers are inclined to equip their cars arbitrarily with tires not sufficiently large to perform the required service, unless inflated to a pressure making them so rigid as to cause the cars to ride as though equipped with solid tires. This is a short-sighted practice, for the reason that if the user keeps his tires inflated excessively, he shortens the life of his car and increases his car repair bill, and the car maker does not retain the good will of his customer, as he would by putting on tires of sufficient cubic content. This condition caused the tire manufacturers to design what is commonly known as the “oversize tire,” which was first purchased by the car user after he found out that his car was under-tired, and has since been adopted by many automobile manufacturers.

It has been stated that an oversize tire properly inflated will not last longer than a regular size tire pumped up to its rated inflation pressure. The oversize tires with their larger cubic content will perform a greater amount of work, because there is less heat developed in them. They will pass over stones and receive the shocks of the road with far less liability of fabric breaks, because of the additional amount of cushion in the air to distribute the strain throughout the greater area. They are less liable to puncture because of their additional strength and carrying capacity, which not only increase the life but afford much easier riding.

Tire manufacturers have found from years of experience that tires inflated to a pressure of 20 pounds per cross-sectional inch will give the longest life when driven under normal conditions. For example:

<table>
<thead>
<tr>
<th>Tire Size</th>
<th>Pressure (Pounds)</th>
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</thead>
<tbody>
<tr>
<td>2 1/2</td>
<td>50</td>
</tr>
<tr>
<td>3</td>
<td>50</td>
</tr>
<tr>
<td>3 1/2</td>
<td>50</td>
</tr>
<tr>
<td>4</td>
<td>80</td>
</tr>
<tr>
<td>4 1/2</td>
<td>50</td>
</tr>
<tr>
<td>5</td>
<td>100</td>
</tr>
<tr>
<td>5 1/2</td>
<td>110</td>
</tr>
</tbody>
</table>

They are trying to educate the user to see that his tires are kept inflated to this pressure by taking readings with a tire pressure gauge, of which there are several reliable makes on the market at a moderate price. Adjustments are being made on this basis. As in years gone by, many tire users do not have a pressure gauge, but judge the proper inflation by kicking the tire to see whether it is hard enough. In most cases where this crude method is used and a tire gauge is afterwards applied, it is found that the tires were from 30 to 50 per cent under-inflated. There is, however, a great reduction in the number of complaints along this line to-day.

Practically all the tire manufacturers use a nearly uniform table, giving the weight the different sized tires are designed to carry at a stated inflation pressure.

If tires were used in accordance with this table, the “pros and cons” of tire inflation would be reduced to a minimum.

The following is a list of the loads (cars to be weighed without passengers or luggage) which tires
of the different sizes are designed to carry, sufficient allowance being made for the usual number of passengers:

<table>
<thead>
<tr>
<th>Size</th>
<th>Rear Weight</th>
<th>Front Weight</th>
<th>Rear Weight</th>
<th>Front Weight</th>
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<tbody>
<tr>
<td>28x2½</td>
<td>225 lbs.</td>
<td>275 lbs.</td>
<td>40x4</td>
<td>850 lbs.</td>
</tr>
<tr>
<td>28x3</td>
<td>350 lbs.</td>
<td>425 lbs.</td>
<td>42x4</td>
<td>900 lbs.</td>
</tr>
<tr>
<td>30x2</td>
<td>375 lbs.</td>
<td>450 lbs.</td>
<td>32x4½</td>
<td>750 lbs.</td>
</tr>
<tr>
<td>32x2</td>
<td>375 lbs.</td>
<td>450 lbs.</td>
<td>34x4½</td>
<td>900 lbs.</td>
</tr>
<tr>
<td>28x3½</td>
<td>425 lbs.</td>
<td>500 lbs.</td>
<td>35x4½</td>
<td>935 lbs.</td>
</tr>
<tr>
<td>30x3½</td>
<td>430 lbs.</td>
<td>550 lbs.</td>
<td>36x4½</td>
<td>975 lbs.</td>
</tr>
<tr>
<td>31x3½</td>
<td>475 lbs.</td>
<td>575 lbs.</td>
<td>37x4½</td>
<td>1010 lbs.</td>
</tr>
<tr>
<td>32x3½</td>
<td>500 lbs.</td>
<td>600 lbs.</td>
<td>38x4½</td>
<td>1030 lbs.</td>
</tr>
<tr>
<td>33x3½</td>
<td>525 lbs.</td>
<td>625 lbs.</td>
<td>42x4½</td>
<td>1200 lbs.</td>
</tr>
<tr>
<td>34x3½</td>
<td>550 lbs.</td>
<td>650 lbs.</td>
<td>34x5</td>
<td>950 lbs.</td>
</tr>
<tr>
<td>36x3½</td>
<td>600 lbs.</td>
<td>700 lbs.</td>
<td>35x5</td>
<td>1000 lbs.</td>
</tr>
<tr>
<td>38x4</td>
<td>625 lbs.</td>
<td>750 lbs.</td>
<td>36x5</td>
<td>1050 lbs.</td>
</tr>
<tr>
<td>31x4</td>
<td>635 lbs.</td>
<td>775 lbs.</td>
<td>37x5</td>
<td>1100 lbs.</td>
</tr>
<tr>
<td>32x4</td>
<td>650 lbs.</td>
<td>800 lbs.</td>
<td>39x5</td>
<td>1200 lbs.</td>
</tr>
<tr>
<td>33x4</td>
<td>675 lbs.</td>
<td>850 lbs.</td>
<td>43x5</td>
<td>1400 lbs.</td>
</tr>
<tr>
<td>34x4</td>
<td>700 lbs.</td>
<td>875 lbs.</td>
<td>37x3½</td>
<td>1130 lbs.</td>
</tr>
<tr>
<td>35x4</td>
<td>735 lbs.</td>
<td>885 lbs.</td>
<td>38x3½</td>
<td>1200 lbs.</td>
</tr>
<tr>
<td>36x4</td>
<td>750 lbs.</td>
<td>900 lbs.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Constant Potential-Charging System Shows Saving**

Electrical energy consumption in the White Garage, at 918 Sheridan road, Chicago, shows from records that since constant-potential charging apparatus has been installed the energy cost per car per month has dropped from $14.73 to $9.49. The original installation at this garage consisted of seven 30-amp mercury-arc rectifiers and a 12.5 kw. motor-generator set with a five-circuit charging panel. This combination of charging apparatus served from fifteen to eighteen cars, and together with a 10 H.-P. elevator motor, a small motor-generator and a tire-pump, consumed 9628 kw.-hr. per month. A detailed statement of the energy consumption with the old equipment is given in Table I.

**Table I—Detailed Statement of Energy Used with Former Equipment**

<table>
<thead>
<tr>
<th>Description</th>
<th>kw-hr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small motor-generator set for charging</td>
<td>224</td>
</tr>
<tr>
<td>ignition batteries and tire pump</td>
<td></td>
</tr>
<tr>
<td>Seven 30-amp rectifiers, kw-hr</td>
<td>4820</td>
</tr>
<tr>
<td>Elevator motor ([bamp]), kw-hr</td>
<td>81</td>
</tr>
<tr>
<td>Motor-generator for battery charging</td>
<td>4143</td>
</tr>
<tr>
<td>(12.5 kw.), kw-hr.</td>
<td></td>
</tr>
<tr>
<td>Total kw-hr.</td>
<td>9206</td>
</tr>
</tbody>
</table>

When this apparatus proved inadequate it was removed and replaced by two rotary converters made by the Northwestern Electric Company of Chicago. With these new machines, rated at 35 kw. and 10 kw. respectively, and a charging panel with twenty-five stations, an average of twenty-eight and one-half cars a night have been charged during a month just past. The energy consumption during the same month, including that used by the auxiliaries listed in Table I, was 9800 kw.-hr. Table II gives the comparative costs of operating the two installations on the limited-hour alternating-current schedule under which the garage is taking service from the Commonwealth Edison Company.

**Table II—Energy Cost Under Old and New System**

<table>
<thead>
<tr>
<th>Description</th>
<th>Old Installation</th>
<th>New Installation</th>
</tr>
</thead>
<tbody>
<tr>
<td>First 1000 kw-hr. at 5 cents</td>
<td>$50.00</td>
<td>$50.00</td>
</tr>
<tr>
<td>Next 4000 kw-hr. at 3 cents</td>
<td>120.00</td>
<td>120.00</td>
</tr>
<tr>
<td>Remainder at 1.1 cents (4268 and 4800 kw-hr)</td>
<td>46.95</td>
<td>52.80</td>
</tr>
<tr>
<td>Ten per cent discount deducted</td>
<td>21.69</td>
<td>22.28</td>
</tr>
<tr>
<td>Net energy charge</td>
<td>$195.26</td>
<td>$200.52</td>
</tr>
<tr>
<td>Demand charge for 50 kw</td>
<td>70.00</td>
<td>70.00</td>
</tr>
<tr>
<td>Total electricity bill</td>
<td>$265.26</td>
<td>$270.52</td>
</tr>
<tr>
<td>Number of cars charged</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Cost per car per month for electricity</td>
<td>$14.73</td>
<td>$9.49</td>
</tr>
<tr>
<td>Net saving per car</td>
<td>$5.24</td>
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</tr>
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</table>

Inquiries regarding the satisfaction to customers resulting from the adoption of the constant-potential system of charging brought out the fact that the garage has received but one complaint and that this came over the telephone from a man who had driven his car 70 miles on a single charge and was unable to return to the garage.

**Outlook Promising**

Day Baker, district manager of the electric division of the General Vehicle Company, Inc., who has been spending considerable time investigating the progress of electric vehicles throughout the whole of the United States, says that he considers the outlook for the electric vehicle better today than at any previous year of its existence.

The batteries have been greatly improved in the last few years. The mileage of the vehicles has been increased, the mechanical construction has been greatly simplified and improved in many respects, and, what is more, the users of electric vehicles and the public in general have commenced to realize the great economical features of teaming with electricity.

"The great electrical institutions of the country," says Mr. Baker, "have never until the present time realized the value of an electric truck as an economical factor in transportation, nor have they realized its value as a profit-maker until the present time.

"Now that they do realize the value of the electric vehicle to the community and the central station, they are preparing to bend all their efforts in the line of recommending to their customers the general adoption of electricity for teaming.

"I believe that the true era of the electric vehicle and the use of electricity for teaming is just about to become a realization, and in the next few years we may expect to see hundreds of thousands of electric commercial wagons adopted by the merchant and manufacturer."
A Compensating Spring Suspension

A Paper Presented Before the Society of Automobile Engineers

BY ERNEST E. WEMP

when a given force is considered, it is evident that the ratio of the ratio of the unsprung mass of the axle to the mass supported by it should be as small as possible. From this the second fundamental may be expressed. Other things being equal, passenger comfort is inversely proportional to the ratio of the unsprung to the sprung weight of the vehicle. The qualification, "other things being equal," is inserted because many other conditions affect passenger comfort, the principal ones being:

- Length and periodicity of springs; diameter of wheels; size and degree of inflation of tires; wheelbase of vehicles.

While the last-named factors influence road performance to a large extent, these remarks are based upon the first two fundamentals, and in any comparison between the compensating suspension and those of conventional design it is to be understood that as regards wheelbase, diameter of wheel, size of tires and period of spring vibration the vehicles are similar.

An analysis of the roadway over which a vehicle travels may also assist in giving a clearer understanding of the fundamentals of the suspension itself. A roadway consists of an equal number of elevations and depressions relative to a mean roadway. These may be termed positive and negative obstructions, since they induce axle accelerations opposite in sign. It is evident from the law of average that 50 per cent. of the obstructions, simultaneously encountered by the axle systems must be opposite in sign, and, therefore, induce in the axle systems forces opposite in direction. The platform mass must absorb these. Why not arrange the suspension system so that the opposing forces can be made to counteract each other and thus reduce the resulting effect on the platform? Fig. 1 is a side elevation of a chassis embodying the Wemp compensating spring suspension. The front and rear springs are of the half-elliptic cantilever type, pivoted intermediately to the platform M at the pivot points C and C'. The outer ends of the springs are connected to the front and rear axles respectively, and the inner ends are linked together by the tie-rod E. P and

IT is a well-known fact that the human organism is very susceptible to vibration of any character, larly when the period of the vibration is high. Vibration due to road inequalities, is both the principal cause of passenger discomfort and the agent of destruction to the entire mechanism, and is the primal reason for the spring suspension of vehicles. It is reasonable to consider that passenger comfort is the true criterion for judging the road performance of a suspension system.

The movements of the axle systems of a vehicle must conform closely to the contour of the roadway they are traversing, thereby setting up rapid accelerations and retardations of the masses in the axle systems. In fact, it can be shown readily that in cars of standard design, disregarding the shock- absorbing effect of the tires, a vertical acceleration of the axle system of 550 feet per second may be easily obtained, and it is by no means certain that under conditions where the tire is releasing previously stored energy at the instant the shock occurs the vertical acceleration may not reach the above given figure even with the use of pneumatic tires. An acceleration of 550 feet per second is 17 times that of gravity and it is evident that if it occurred in the passenger-carrying platform the effect would be intolerable.

While it is obvious that the ideal conditions for passenger comfort would be obtained by maintaining a constant platform level, it is likewise an established fact that platform movements do of themselves not necessarily mean passenger discomfort. It is only when these movements become rapid in period, causing sudden changes in direction and consequently rapid platform accelerations, that the action becomes uncomfortable to the passenger and racking to the entire mechanism. The ultimate object, then, of a successful suspension, regardless of the means employed, is to maintain platform vibrations of low period and consequently low accelerations and retardations.

Passenger comfort in spring-suspended vehicles is inversely proportional to the vertical accelerations and retardations of the passenger-carrying platform. The

accelerating force of the mass of the axle system must be absorbed by the mass of the platform supported by it. Since acceleration is proportional to the mass,

\[ F = m \cdot a \]

\[ m = \frac{F}{a} \]

\[ a = \frac{F}{m} \]

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\[ F = m \cdot a \]

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$P'$ represent the load or force in pounds applied at the points $C$ and $C'$, due to the weight of the platform and its load. $P$ and $P'$ likewise represent the vertical reactions at the front and rear-axle systems respectively.

Considering the points $C$ and $C'$ to be the pivots of the link work, then the force $P$ creates a turning moment about $C$ equal to $P X$ and an unbalanced force at $H$ equal to $\frac{h}{h'}$, where $X$ is the moment of the force $P$ and $h$ the perpendicular distance from $C$ to a plane passing through $H$ and $H'$. Likewise $P'$ creates a turning moment about $C'$ equal to $P' X'$ and an unbalanced force at $H'$ equal to $\frac{h'}{h}$.

The unbalanced forces at $H$ and $H'$ are opposing, and equilibrium of the system can be produced by connecting the opposing forces through the medium of the tie-rod $E$, when the force at $H$ equals the force at $H'$.

The condition for static equilibrium may, then, be expressed algebraically by the equation

$$\frac{P X}{h} = \frac{P' X'}{h'}$$

An analysis of the system shows that the springs, together with the tie-rod $E$, form a draglink system in which a constant angular velocity of bellcrank $A C H$ will produce a variable angular velocity of bellcrank $A' C' H'$, and vice versa. Likewise the leverage-ratio of $P : P'$ will vary with the angular movement of the bellcranks; for example, as (upper) bellcrank $A C H$ is rotated about $C$, the value of $h$ is increased and the value of $h'$ at the same time decreased, until they are in the ratio of $2 : 1$ or $h = 2 h'$. The equation for momentary equilibrium then becomes

$$\frac{P X}{h'} = \frac{P' X'}{h'},$$

and, since the values of $X$ and $X'$ vary with the cosine of small angles and therefore but little, they may be neglected without serious error and the equation becomes

$$\frac{P}{2 h'} = \frac{P'}{h'}$$

That is to say, in the new position, the load at $P$ must be twice as large as the load at $P'$, in order to maintain equilibrium. The system, then, is capable of automatically accommodating itself to changes of load, applied at any point on the passenger-carrying platform.

Any spring suspension depends upon the inertia of the platform mass for its action. The inertia of the mass has the identical effect of increasing or decreasing the weightup on the springs, and if this fact is borne in mind the action of the compensating suspension under road shocks is very readily understood.

There are three important conditions of road shock:

First, a shock, either positive or negative, occurring at one axle only.

Second, shocks, either positive or negative, occurring simultaneously at both axles, the shocks both being of like sign.

Third, shocks simultaneously occurring at both axles, of opposite sign.

As an example of the first condition, consider a positive shock as occurring at the front axle system. Since the shock is positive, the vertical accelerating force is upward and a downwardly resisting force is induced by the inertia of the mass of the platform supported by the front axle. This is the equivalent of suddenly increasing the load at $C$ from $P$ to $P_2$ lbs. The equilibrium is thereby disturbed, causing the bellcranks $A C H$ and $A' C' H'$ to rotate until the equation

$$h = \frac{P X}{P' X'}$$

satisfies and momentary equilibrium is restored. It will be noticed that in order to make the force $P'$ balance the increased force $P_2$, it is necessary that $h$ shall increase and $h'$ decrease in value. As $h'$ decreases in value, the point $A'$ would tend to move downwardly, but since $A'$ is in contact with the ground, the pivot point $C'$ will be raised instead, thus raising the platform at the rear. If the shock force at $A$ is greater than the inertia resistance of the platform at $C$, the front end of the platform will likewise be raised.

The total effect, then, of the shock force occurring at one axle system only is to raise the whole mass of the platform.

If the shock were negative the effect would be similar, but opposite in direction and both ends of the platform would be lowered.

As an example of the second condition, consider positive shocks occurring at both axles, the greater of the two at the rear. As a positive shock has the effect of increasing the platform load, both $P$ and $P'$ are increased to $P_2$ and $P_2'$. As before, the equilibrium is disturbed with a consequent raising of the platform at the end of the lesser resistance, in this case the front end of the platform.

If both of the shock forces are large enough to overcome the inertia resistance of the platform, the resulting action will be a raising of the rear end of the platform by the action of the larger force and a raising of the front end by the combined action of the smaller force and the action of the equilibrium means. If the forces were both negative, the platform action will be similar but opposite in direction.

As an example of the third condition, consider a negative shock occurring at the front axle and a positive shock simultaneously at the rear axle, the positive shock being the greater of the two. The action in this case will be easier to follow, if the forces are considered separately and the results combined. The negative force occurring at the front axle system would cause a lowering of both ends of the platform, since this is the action resulting from a shock of the first condition. The positive force at the rear axle system would cause a raising of both ends of the platform, as it is also the effect of a shock of the first condition. Since these positive and negative forces occur simultaneously, the resulting
force tending to accelerate the platform is the algebraic sum of the two opposing forces.

In order to show mathematically the division of the work done upon the platform under shock conditions, it will be necessary to use another method of reasoning than the one given above. Fig. 2 shows diagrammatically the front axle system encountering a positive obstruction \( F \) which is \( S \) inches in height. \( T \) represents the time in seconds required for the wheel to mount the obstruction, or to travel through distance \( L \) inches. The vertical component of the shock forces in a variable maximum in value at the moment of impact and decreasing to zero as the obstacle is surmounted. Its mean value may be represented by the force \( F \), which acts through \( S \) inches in \( T \) seconds.

The inertia of the platform induces a resisting force acting downwardly which is likewise variable and may be represented by a mean force \( R \), opposite in sign to \( F \), and also acting through \( T \) seconds or the time required to surmount the obstacle. Both of the forces \( F \) and \( R \) are known forces (that is, they are measurable, if elasticity is considered lacking in the wheels), and of them it is known that they both act through the same length of time—\( T \) seconds—and that the force \( F \) acts through a space of \( S \) inches. Since the space through which the force \( R \) acts is not known, it is evident that, with the kinetic relations given, no direct expression of work between the two can be made. The force \( F \) may be considered as consisting of two components \( R' \), opposite in sign to the known force \( R \), and \( O \), where \( O \) is the algebraic difference between \( F \) and \( R' \). This relation may be expressed by the equation

\[
F = R' + (± O).
\]

Since the time and space through which \( F \) acts is known, the impulse and the work done by \( F \) are known; and it is necessary to assign to the components \( R' \) and \( O \) the same values of time and space, so that all of the kinetic relations of the force \( F \) and the sum of its components will be equal. These are expressed by the equations:

1. \[ \text{Force } F = R' + (± O) \]
2. \[ \text{Impulse } F T = R' T + (± O T) \]
3. \[ \text{Work } FS = R'S + (± O S) \]

Of the two forces \( R \) and \( R' \), it is known that they both act through \( T \) seconds and are opposite in direction, and \( R' \) is now assumed to be equal to \( R \) in magnitude.

It will now be well to eliminate the force \( F \) and substitute its components, considering each one as acting individually and combining the results. Consider, first, the component \( R' \) acting at \( A \). It is resisted by an equal force \( R \) acting at \( C \) and produces a couple, whose arm is \( X \). The moment of the couple is \( R' X \), and an unbalanced force at \( H \) equal to \( \frac{R' X}{h} \) is created. This unbalanced force is transmitted through the medium of the tie-rods to the rear bellcrank (rear-spring) and expended in acting upon the mass of the platform opposite the shock. It is seen that the force \( R \) becomes the vertical resistant to the force \( R' \) during the \( T \) seconds it acts, and is totally expended at the instant \( R' \) is expended. Therefore, there is no vertical movement of the pivot \( C \) from the force \( R' \). All of the force \( R' \) is thus seen to be transmitted and expended in acting upon the end of the platform opposite the shock.

Now \( R' \) is \( R' \) parts of \( F \); therefore that portion of the shock force that is transmitted to the end of the platform opposite the shock is expressed by the equation:

\[
\frac{R'}{F} = \frac{\text{ratio}}{\text{ratio}} \]

The component \( R' \) being totally expended (likewise the resistant \( R \)) the component \( ± O \) may now be considered. The component \( ± O \) assumes at \( A \) to find no resisting force at \( C \) (since the total resistance possible has been expended). Therefore, there is no turning moment about \( C \) and all of the component \( ± O \) is expended in acting upon the mass of the platform supported at \( C \), or the end adjacent to the shock.

\[
± O = ± O \text{ parts of } F; \text{ therefore that portion of the shock force acting upon the end of the platform adjacent to the shock is expressed by the ratio } \frac{O}{F} = \frac{R'}{R'} = \frac{O}{O} \text{. Since } \frac{O}{F} \text{ and } \frac{R'}{F} \text{ are the ratios of the division of the shock force } F \text{ to the ends of the platform opposite to and adjacent to the shock, it is seen that by multiplying the ratios by the common space factor } S \]

\[
\frac{R'}{S} \frac{R'}{S} = \frac{O}{O} \frac{F-R'}{F-R'} = \frac{F}{F} \frac{F}{F} = \frac{\text{ratio}}{\text{ratio}} \frac{\text{of work done at the end opposite to the shock and}}{\text{of work done at the end adjacent to the shock.}}
\]

Numerically speaking, the forces \( R' \) and \( R \) are equal, \( R \) and so, neglecting the direction of the forces, \( \frac{O}{F} = \frac{R}{F} \) ratio of work done at the end opposite the shock.

\[
\frac{O}{F} = \frac{F-R}{F} = \frac{\text{ratio}}{\text{ratio}} \frac{\text{of work done at the end opposite the shock.}}{\text{of work done at the end adjacent to the shock.}}
\]
The action of the system is thus seen to depend upon the value of \( R \), that is, upon the inertia of the platform at the end receiving the shock.

In encountering a series of obstructions, it is evident that \( R \) may have a value due to a previous shock. Likewise its value may be positive or negative. If the value of \( R' \) in the equation is made of opposite sign to that of \( R \), the equation \( F = R' \pm (\pm O) \) will satisfy.

From the above explanation shocks occurring separately or simultaneously may be analyzed, remembering to treat the shocks as occurring individually and combining the results.

In all of the explanations of the system the element of friction has been neglected. It was found during the experimental work that this element affected the working of the system to a marked degree. This fact led to the development of a type of bearing which has proved very satisfactory. It has merits worthy of a detailed explanation. Fig. 3 shows in detail the rear pivot bearing of the suspension. It will be noticed that the bearing bracket \( B \), attached to frame \( F \), is finished with a bell-mouth hole of at least 1.5 times the diameter of pivot pin \( C \), which in turn is secured to the rear spring by means of the spring plate \( D \) and clips \( G \). A force diagram of the suspension will show a resultant bearing force in the plane \( A B \), and the pivot pin will always ride in substantially this position. The action of the suspension is such that this force never reverses, thus permitting the use of a bearing of this type. The angular movement of the pivot pin never exceeds 15 degrees, and through this angle perfect rolling contact is secured. With rolling contact no lubrication is needed. One of the bugbears of spring suspensions is thus eliminated.

The tie-rod bearings at \( H \) and \( H' \) are of the same construction. Lubrication is eliminated from the entire system.

By making the frame bracket bell-mouthed and the pivot pin concave, another important constructional feature is obtained. Referring to Fig. 4 it will be noticed that the line of action of the suspension is on straight lines joining the spring center distance of the rear axle with that of the front axle. This, of course, makes the spring mounting at an oblique angle to the axles. With rigid pivot bearings lateral stresses and twisting of the springs would result when the axles play up and down. The rolling-contact type obviates this difficulty and permits the application of the suspension to practically any type of frame, while the straight line action of the suspension introduces no thrust forces.

It will be noticed that in all of the analyses given, the vertical component of the road shock alone has been considered. It is very important, however, that the horizontal component of the shock force receive consideration, and since in a vehicle using the cantilever type of suspension the leaves of the front springs must resist the horizontal component of the road shock by stresses of compression, it will be well to consider the action of the front axle system from the standpoint of horizontal stress alone. With reference to Fig. 5, the front wheel is encountering a positive obstruction \( V \), and in surmounting it the axle system must rise \( S \) inches. The time required will be that necessary for the wheel to travel through space \( L \). For the sake of simplicity it will be granted that the center of gravity of the platform mass lies in the horizontal plane of the pivot point \( C \). Therefore, it is possible to measure the horizontal component of the energy lost in shock in terms of the total kinetic energy of the platform. When the obstruction \( V \) is encountered it is evident that the front wheel will tend to revolve about \( D \) as a center, and considering elasticity as lacking, the movement of \( A \) will be in the arc \( A O \), having a radius \( A D \) equal to the radius of the wheel.

It may be shown from Fig. 5 that \( P N \) is the true horizontal component of the shock force. It may also be shown that if \( K E \) is the kinetic energy of the platform at the moment of impact, the proportion of the energy destroyed by the horizontal resistance may be expressed by the equation \( P N = \frac{KE \cos \alpha}{2} \).

It will be noticed that the horizontal plane of the pivot \( C \) is below the plane of the wheel center \( A \). The resistant to horizontal action is applied at \( A \) and the possible movement of the pivot \( C \) with respect to \( A \) will be in the arc \( C C' \). When \( C \) reaches the position \( C' \) the horizontal projection \( X \) of \( A C \) will be shortened by the distance \( U \). The decrease in the length of \( A C \) has a distinct shock-absorbing effect, as it may be considered identical to the action of a spring working through a space \( U \).

Having considered the action of the compensating suspension system under different load and shock conditions, the advantages, both functional and structural, claimed for a system of this character, remain to be enumerated.

First, any shock force is divided and absorbed by the whole suspended mass, and the platform acceleration is thereby reduced. In comparison to this, in any conventional spring system, a shock force is absorbed by the mass of the platform supported by the axle receiving the shock. A simple relation between the two may be shown if it be considered that in both systems the mass of the platform is supported equally by both axles. Then if \( M \) is the mass resisting the shock in the conventional suspension, that is, the mass supported by the axle receiving the shock, a force \( F \) will produce an acceleration \( A \), the value of which is expressed by \( A = \frac{F}{M} \) while in the compensating system the force \( F \) is resisted by double the mass or \( 2M \), and the acceleration \( A = \frac{F}{2M} \). The accelerations are, therefore, in the ratio of 2:1.

Second, road shocks of opposite sign occurring simultaneously are caused to counteract each other, thereby reducing the forces tending to accelerate the mass of the platform, and consequently reducing the platform acceleration and increasing the passenger comfort.

Third, vehicle springs in any suspension must be designed to carry a maximum load determined by the carrying-capacity of the vehicle. Passenger comfort increases as this maximum load is approached and decreases as the load diminishes. In the compensating suspension, as the passenger load is decreased and the spring action becomes rougher, the pivotal action of the mechanism increases, offsetting the stiffer spring action, passenger comfort being maintained to a marked degree.

Fourth, it is a well-known fact that leaf springs are comparatively slow in action and incapable of absorbing rapidly occurring shocks. This is evidenced by the increasing use of auxiliary springs, whose function is to absorb the minute vibrations due to small obstructions encountered at high speed. In the compensating suspension these vibrations are absorbed by rapid pivotal move-
ments of the springs rather than by spring flexions. This action is very noticeable in traveling over brick pavements or roads of like character at high speeds.

Fifth, a study of the force diagram of the compensating suspension will show that the forces applied tend to hold the wheels against the roadway at all times. This results in better steering-action and improved traction, with a saving of tires on all the wheels. These constitute the more important functional advantages of the system.

Among the structural advantages may be mentioned, maximum wheelbase for any given frame length; low platform with a consequent low center of gravity; minimum amount of unsprung weight on the axle system (since the thick portion of the springs is secured to the platform); a suspension system that is lubricationless, that cannot rattle and takes up wear in the pivot bearings automatically.

The advantage of the absence of non-adjustable bushings in a suspension system cannot be over-estimated.

With springs attached rigidly to both the axle and the frame, side shocks are transmitted with almost their entire intensity from the wheels to the platform.

The reaction to the tension of the tie-rod places the frame in compression between the pivot brackets, and since the compression forces act below the lower web of the frame the result is a trussing effect to the frame, which opposes the bending action due to the loads upon the platform.

If the drive is taken through the rear springs the shock of sudden accelerations and retardations, due to starting and braking, is reduced by converting a part of the energy, longitudinal in direction, into work in a vertical plane by the pivotal action of the springs.

Hertner Charging Apparatus Promising

The Hertner Electric & Manufacturing Company, Cleveland, Ohio, is putting on the market a charging outfit which furnishes many new features.

Being a motor generator, it does not stop operating during the night, should the line voltage drop or cut off for an interval, which often occurs with the mercury rectifier. Instead of this, the outfit continues to run, the generator acting as a motor with a slight draught of current from the battery until the line voltage again comes on when the machine resumes its work.

In producing this charger, it is aimed to build a machine that would have capacity enough to charge the average vehicle battery in about half the time usually required by many other outfits.

This machine is rugged and foolproof mechanically and electrically and has an efficiency comparable with that of the mercury rectifier. Naturally the builders have had to use about 50 per cent more material than is found in other rotary plants, so weights and cost are correspondingly greater.

A fan mounted in the middle of the machine causes a draught of air, which with its cooling effects more than offsets the power used to run it, on account of the reduced copper losses due to running at low temperature.

During the first two hours of charge, 50 per cent of the capacity of the average size 40-cell battery is restored; hence it is capable of giving a fair boost to a fully depleted vehicle.

It gives, in short, the same characteristics of charging which are obtained by the constant potential system with this difference: that the battery rate is limited to that which the lines usually run into the premises of the car owner will stand, as well as by the fact that a heavier start would mean a larger and costlier outfit which would likewise be inefficient at the lower rate near the finish.

As a result the battery is filled without heating or gassing and in the minimum time with prolonged battery life and better mileage; all with the least amount of worry and trouble.

The generator design precludes commutator trouble and overheating with resulting short life or burning out of windings.

The rotor windings are made without any joints, eliminating the one great source of trouble in the induction motor. The plant as shown, is vertical, permitting it to be located in places where a horizontal outfit would be out of the question on account of limited floor space.

To produce a machine that will be as well balanced as possible, run smoothly and be readily dismantled, the rotor and generator shafts are separate units and are connected by a coupling. A ball-bearing is mounted immediately below this coupling supporting both shafts at practically midway between the top and bottom of the machine.

This construction is far in advance of that of the two bearing machine and results in quieter running with freedom from vibration and consequent commutator trouble.

The base contains a thrust bearing as well as a radial and thus with a complement of four in place of the usual two bearings, we aim to produce results which never can be looked for where there is but one bearing at each end of a long shaft, and where an annular takes both radial and thrust loads. The design throughout is special with a view of eliminating noise and we have reached a point that leaves nothing to be desired in that direction.

The same care used in the design of the unit is followed in the equipment accompanying it. The switches are of a heavy type, rated by the underwriters for at least twice the current that they will be called upon to carry.

English Committee Meets

A meeting of the English Electric Vehicle Committee was held in London, England, March 9. The standardization of metal-filament glow lamps for use on electric vehicles was taken up. The committee had before it samples of fittings made by several manufacturers. In view of the restricted amount of room inside these fittings, the committee decided to recommend, as standard for electric vehicles, the lamps of the size and voltage recommended by the Engineering Standards Committee. These lamps are for a pressure of 12 volts. On account of the small energy consumption and the comparatively short hours of use, the committee recommend that, for the present, the lamps be connected across such a number of cells in the vehicle as will give the required voltage, and that a special extra terminal be provided on the cells for this purpose. As to the methods of charging and standardization of charging equipments, the technical sub-committee is still engaged in drawing up a report.

As to tariffs or rates the secretary was directed to write to those London municipal and company electricity-supply undertakings charging more than two cents per kilowatt-hour for off-peak supply, expressing the hope that they will reconsider this matter and come into line with the large number of supply undertakings which have already adopted the committee's standard tariff.
**Driver's Relation to Successful Truck Operation**

*The Motor Truck Operator a 60 Percent Factor in Efficiency or Non-Efficiency*

The driver of a motor truck is one of the most important factors of the motor truck industry, and at least a sixty per cent factor in the efficiency or non-efficiency of motor trucks, and am satisfied that any corporation or individual, owning and operating motor trucks, thoroughly realizes that no matter how high class his trucks may be, the driver is, to a large extent, responsible for the success or non-success of his delivery problems.

It is particularly difficult to get good, efficient, careful drivers—men who take an interest in their truck; who keep it looking as well as possible; who keep their motor clean, and keep the truck thoroughly greased and oiled, with plenty of water in the radiator. A large percentage of drivers really pay very little attention to the truck, outside of giving it oil, gas and water, and let the balance of the mechanism practically take care of itself.

A good illustration along this line is the case of a foundry company in Chicago, they put a driver on this truck, who knew little about a motor truck and who cared less, with the result that the truck had to be shipped back to the factory within six months to be rebuilt; when it was returned to Chicago they hired a first-class truck driver—a man who had pride in the appearance of his truck, looked after oiling and greasing, took good care of his motor, with the result that this particular truck is now four and one-half years old—this man is still driving it and the truck is in perfect condition.

The driver is one of the most serious problems which the truck owner has to contend with, and we have had innumerable inquiries, from owners of motor vehicles, asking for our help in procuring a first-class driver. We are very careful regarding applicants for driving positions, and when a man comes to our sales room and asks for a position as driver, we first find out whether he has ever driven a pleasure car—if he has, we immediately turn him down—if, however, he states that he has only driven trucks, and gives one or more representative business houses as reference, and can prove that he has held one or more positions, for a reasonable length of time, we look up his references and if they prove satisfactory we keep his name on file. In this manner we have been able to place a large number of really first class drivers, some of whom have been driving the same truck for from two to two and one-half years with entire satisfaction to the owner of the truck.

I have thought many times that there should be some kind of a clearing house for truck drivers, so that motor truck owners could get some protection against carelessness and inefficiency. It would seem that if the motor truck dealers and branch managers would write to all their owners and ask them to send in the name and address of their drivers; the length of time they had been on the job; whether they are good, fair or poor; and have these names listed at some clearing house, agreed upon by the trade; and furnish the users of trucks with cards to be filled in when a man is let out, or a new man taken on, giving the reason for the driver's discharge, and further, notifying the owners of trucks that such a clearing house does exist and that it will take great pleasure in helping them get first class, efficient men, when they are in need of a driver, and request them to call up the clearing house and find out what data is registered regarding a man, who has made application for a position; I feel satisfied that if this plan were put into operation it would not take long for the chauffeurs to realize that unless they gave proper service, took good care of their trucks, and attended strictly to business, that they would be classed as poor; and if they were discharged, would have great difficulty in procuring a new situation, that it would have the effect of stimulating them to give better service, so that they would not lose their jobs a second time through care.

By adopting a system along the lines set forth, with the co-operation of the owners of trucks, if the man was incapable or careless he would be unable to get a position excepting at a much lower scale of wages, and would be put on his metal to hold a second job. If he was found inefficient and careless by his second employer and was let out for care, and the second employer notified the clearing house of the fact, we do not think that any other auto truck owner, who made use of the clearing house, would have this chauffeur inflicted upon him.

We have a number of vehicle users who have told the writer that if they could get two or three first class chauffeurs they would buy additional trucks, but that they have so much trouble with the men driving their trucks that they will not put on additional motor truck equipment unless they are absolutely driven to it.

I feel that there is a bureau of this kind to draw upon, for efficient chauffeurs, and the motor truck using public made aware of the fact, that it was possible for them to receive good drivers within a reasonable time, that a large number of present motor truck owners would add to their equipment, and others, who are at present frightened by the expense of maintenance due principally to the carelessness on the part of drivers, would put on at least one truck as an experiment and later equip entirely with motor trucks.

We have found that companies, who had a large number of two-horse drivers, and who took these men and put them on trucks, have in most instances been more successful in getting good chauffeurs than firms who picked up drivers who had been driving pleasure cars, and who had acquired the speed mania—the first thing these men do is to disconnect the governor, so that they can run a truck twenty or thirty miles an hour, over rough roads, with no regard whatever for the truck.

We have one user at Joliet who has three trucks—two he has had for the past two and one-half years and one for the past six months. He has two drivers operating these three trucks and he made the statement to the writer, less than a month ago, that outside of tires the maintenance on his trucks, for the
entire time that he had them, did not amount to $70.00. His truck drivers are men who had worked for him and had driven his horse-drawn vehicles for from ten to fifteen years.

We have another instance, of a large glass concern, who purchased one of our trucks and put a driver on it, who had never been on a truck or a pleasure car in his life, and was badly frightened when he was put on the seat with our instructor. It took over two weeks of coaching, every day, to get this man so that he could drive at all, and after he was able to handle the truck it took him from eight in the morning until ten at night to do a half day's work, but when he did get confidence in himself, his manager told the writer that he was satisfied he had the best truck driver in Chicago, as he was very careful of his load, took absolutely no chances of having an accident, went over his truck every night, very carefully, kept his motor as clean as a whistle and his truck thoroughly well washed and oiled. This truck very seldom comes to our garage for any adjustments, but another truck, owned by the same company, which has had three or four drivers of the ordinary kind, is in trouble of some kind more or less half the time.

I would suggest, therefore, where it is found practical, to have motor truck agents and branch managers get together on some kind of a clearing house basis for truck drivers—have each driver listed, notify the owners of the plan, tell them where they can get information regarding drivers, ask them to list their drivers and to notify the clearing house, by card, immediately, when they have a trucker out, and state just why he was discharged, and I feel satisfied that if this plan can be worked out, or a plan along somewhat similar lines, that it will not only be a tremendous help to the owners of motor trucks, but will eliminate quickly a large number of careless, inefficient drivers who are at present preying upon the truck owners of the country.

Two Percent of Trips Over Sixty Miles

One of the points made by the sales manager for Woods Electrics in favor of the use of the electric car for city use is that statistics prove that 98 per cent of all motor trips fall within a radius of sixty miles.

Men buy gasoline cars thinking they will make a great long country run. But few of them keep this up to any great extent after the first few weeks, or until the novelty wears off.

Following up the point, Mr. Simonson, of the Woods Company, asked the question, "Why pay extravagantly for something you will not use?" He points out the fact that an electric will run from 70 to 90 miles on a single battery charge. That it will go as fast as is ever safe—20 miles per hour. Further, he says you will use an electric twice as often as you could use a touring car. He gives as the reasons the greater convenience and instant readiness of the electric; the fact that it protects the driver from wind and wet and it can be used practically every day in the year. Mr. Simonson states enthusiastically that more men and women are daily adopting the electric as their personal car. And he says most of them have been owners of other types of automobiles.

As explained by Mr. Simonson, a notable feature of the 1915 Woods electric is the unique method of securing exceptional riding qualities in the way the rear springs are mounted. Instead of having these springs rest on the rear axle, as is usual, they are mounted on I-beam radius rods, forward of the rear axle. This construction is said to reduce by at least 30 per cent the road shock which the rear springs are required to absorb. Full elliptic springs in front as well as in the rear is a feature of 1915 Woods electrics which is said to be exclusive and which, of course, must have a very great effect on the easy riding qualities of the Woods car.

The appearance of the Woods car as a whole has been still further improved by building the bodies with long, graceful lines. The doors are beautifully arched without spoiling the graceful sweep of the roof line. All windows have gracefully rounded corners which seem to add very materially to the attractive appearance of the car. Three five-passenger models and one four-passenger model are listed in the 1915 line.

Firestone Revises Prices

Firestone is vigorously behind the general tendency to popularize automobile travel by trucks and so-called "jitney" busses.

Their latest move has eliminated complex discount on solid truck tires and put prices on the same net list basis as pneumatic tires. These new prices are figured on actual cost, size for size, and not from the usual obsolete standard list established many years ago when truck and tire making were crude and unrefined.

These new prices are lower—made possible by their rapid strides in perfecting their facilities for making and marketing truck tires. The present low price of crude rubber was also a factor in giving truck owners the benefit of these lower prices.

It is interesting to note the many improvements that Firestone has given the truck industry.

Their first step was the building of their own rim plant to insure prompt deliveries and perfect rims. Firestone removable rim equipment offered to truck users and it is the only quick changing rim device that has passed the experimental stage.

Next came the establishing of complete service stations in all trucking centers to insure truck operators uninterrupted delivery service.

This service is valuable as shown by the appreciation of the many truck users.

Firestone also maintains a force of transportation experts who are at the beck and call of truck owners to help them determine correct type of tire and fastening device for individual conditions. The variety in the Firestone truck tire line—both removable and non-removable—contains a tire for every road, load and condition of service so that their experts advise with an unprejudiced mind.

This Firestone policy of helping to build up the entire truck industry has had much to do with making the truck an indispensable part in widening the business horizons of both big and little concerns.

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Man power, animal power, water power, steam power, gas power—Electric power. Thus has the old world moved. To team with Electricity (in the proper field) is just as logical as to drive an entire plant thereby.

Keep your eye on the Electric Truck! It has smashed more precedents in the last three years than a million horses. Teaming with Electricity involves a principle which touches the very roots of trackless transportation. Do you realize this or are you looking at the storage battery through 1905 glasses?

Buy one Electric Truck! Hook it up with your other Electrical equipment. Extend your Electrical economies as the others have who use 9,000 Electric Trucks. We will gladly help. Just write.

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How Electric Car Values Were Proved in Chicago

Who is better qualified to know electric car values than the electric garage man?

His judgment is worth everything to you. It is based on the actual known performance of electric cars long after they have left the show rooms. And he has no cars or "promises" to sell.

So we had a prospective electric car purchaser learn for himself what electric garage men had to say of electrics. This investigation was especially significant because Chicago is the world's greatest electric car city. In all, thirty-two of the largest electric garages were called on.

The result surprised even us. We did look for a 90% Rauch & Lang preference. Eighty per cent would have been a splendid showing.

But in every instance the Rauch & Lang was acclaimed as "The Best Electric on the Market," or words to that effect. The investigation was impartial, being conducted by a third party who had no other motive than to find out just what electric car stood highest with the electric garage men of Chicago—and why.

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CLEVELAND, OHIO

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If you are contemplating the purchase of an electric car, your first consideration should be in choosing a car which will best meet your requirements.

Electrics are now being built in open and closed models, fast and slow in speed, heavy and light in weight, standard and special battery equipped; all ranging from $750 to $5,500 in price. Low initial price and the persuasions of keen competition often mislead many into the purchase of the wrong car for their requirements.

Your final decision should be based on a comparison of the materials which enter into the construction of the particular cars from which you are about to choose; the advantages of particular arrangements; and the service which the manufacturer has established as a reputation in past years.

Argo, Borland and Broc models, manufactured by the American Electric Car Company, will, without a doubt, meet your particular requirements, both in price, (because of quantity production), efficiency and economy, (as shown by past records), and service which is cheerfully granted to every owner.

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**The Walker "Adaptable" Chassis** — Our twelve years of varied experience with many makes of commercial vehicles taught us that every use to which a truck is put requires a chassis and body adapted to that use. The Walker Drive, being self-contained, permits us to vary the wheel base and thus produce trucks of correct proportions throughout—to meet your needs—without extra cost.

**The Walker Balance Drive** has a high and permanent efficiency due to its correctness of principle—its simple, practical design, the accurate and permanent alignment and balance of its ten simple working parts:

- **One Electric Motor** — Located in the hollow, torpedo-shaped rear axle.
- **One Differential** — Direct connected to one end of the hollow armature shaft.
- **Two Drive Shafts** — Extending from the differential sockets into the center of each hollow rear wheel—with a pinion on the wheel end of each shaft.
- **Four Idler Gears** — Two in each rear wheel, mounted on the axle yokes.
- **Two Rim Gears** — Fastened to the inside of the tire rims.

**Walker Vehicle Co.**
CHICAGO

Electric Trucks have an established reputation

In every use the Electric Vehicle has overcome delivery problems. Backed by its recommendations the Electric Vehicles are the choice of transportation experts—they produce the results required. Their value is seen in their efficient service. Competition in business demands the best in service—the record of the Electric Vehicle is your standby in deciding on the transportation method for your business.

**The Electric—The Vehicle to inquire about**

Because you need uninterrupted, dependable, delivery service at all times, you should know the Electric Vehicle. Their superiority has been proven. Our vehicle expert is at your service for information on any phase of the electric vehicle situation.

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**Commonwealth Edison Company**
120 West Adams Street Chicago
One Out of Every Three

Every third Electric Automobile built and sold is a DETROIT

WORLD’S LEADER

Anderson Electric Car Co.
Direct Factory Branch
2416 Michigan Avenue
Chicago, Ill.

Baker Electrics

‘No Other Electric Requires So Little Attention As a Baker’

Garage men the country over will tell you that the Baker gives them less trouble than any other car. The new light Baker is a full half ton lighter than the big, heavy electrics, affording all the advantages of light weight (easy steering, easy handling, low upkeep) plus full speed, full mileage, full power and full strength.

BAKER ELECTRIC SALES COMPANY

2530 Michigan Boulevard
Telephone Calumet 5630
The Evolution of the Electric Wheel Chair

Characteristic Simplicity of the Electric Vehicle Displayed in the Modern Battery Propelled Wheel Chair

In 1882, thirty-three years ago, a clerk in the United States patent office at Washington wrote his chief a letter of resignation, explaining that since inventions had all been made, the patent office must close its doors within a year and he was leaving when he could step into another position.

Had all men possessed this barren outlook, ingenuity would have been long dead and inventions never have passed the stone ax stage. But aside from the continual flow of new ideas there is the fact that the first conception of an idea and the first model by no means finishes an invention, for there is an unending evolution of models that tends toward the perfection of a machine. To trace this evolution of a machine is to follow the growth of ingenuity and to lead back farther than the existence of patent offices. Take such a simple thing as the wheel chair, for instance.

Infinite mutations took place ere there was produced the electrically propelled wheel chair of today, but our friend of the patent office would have considered the doors closed on the roller chair while it was yet a wheelbarrow.

Indeed, when the wheelbarrow came into general use in Europe in the middle of the thirteenth century, it was described as being, among other things, "a comfortable means of transporting invalids and other persons," and we see in an early print taken from a sixteenth century manuscript, what may, perhaps, be a prototype of that wheeled conveyance, manipulated, seen on the Atlantic City board walk today!

Long antedating the awkward wheeled conveyance of the thirteenth century, "invalids and other persons" including the dark-eyed beauties of the Orient, travelled more or less elegantly in litters slung on poles and carried by four bearers. These litters or palanquins, of Eastern countries were about eight feet long and four feet wide and deep, heavily curtained and often very sumptuous. Because of, no doubt, the lack of dignity in barrow riding, (since we are assured of its comfort) the use of the hand pushed wheeled vehicle of the sixteenth century did not become popular, and we find a reversion to the old time palanquin in that the typical light vehicle of the eighteenth century is the sedan chair.

This chair was a portable box with side windows and a roof which opened to allow the occupant to stand when entering. It was entered by a hinged doorway in front, between the two poles by which a pair of chairmen carried it. These chairs were often beautifully decorated, some of the greatest French pastoralists embellishing the panels with the most exquisite paintings. In the following passage from Cranford we are given a very intimate picture of what a ride in one of these chairs was like to some early Victorian ladies:

"It was suggested that perhaps one of us would not object to take the sedan, and that the others, by walking briskly, might keep up with the long trot of the chairman, and so we might all arrive safely at Over Place, a suburb of town. (No, that is too large an expression for a small cluster of houses separated from Cranford by about two hundred yards of dark and lonely lane.) When evening came, Miss Matty, for it was she who was voted into the chair as she had a cold, before being shut down in the sedan, like a jack-in-the-box, implored the chairman, whatever might befall, not to run away and leave her fastened up there to be murdered; and even after they had promised I saw her tighten her features into the stern determination of a martyr and she gave me a melancholy and ominous shake of the head through the glass. However, we got there safely, only rather out of breath, for it was who could trot hardest through darkness-lane and I am afraid poor
Miss Matty was sadly jolted before arriving.”

Sedan chairs, with the poles so arranged that the chair was not tilted, were also used to carry invalids up and down stairs from their beds to mineral baths, and in connection with various baths and health resorts the use of the wheeled bath chair resulted.

One can readily understand how being trundled around in a bath chair would fail to satisfy a craving for locomotion, for the development of the motor chair seems to have come about not solely as an expedient for moving invalids, but also from the desire for the pleasure of speed without exertion. And so, mankind having at length grown dissatisfied with palanquins, wheelbarrows, sedan and bath chairs, we find an article in the Journal de Paris for July 27, 1779, announcing the invention of the first velocipede.

This swift and fearful vehicle consisted of a wooden bar rigidly connecting two wheels placed one before the other, propelled by the rider seated astride the bar and pushing against the ground with his feet. This rare machine was called the “Gentleman’s Hobby-Horse” and immediately became so popular that it was followed by a “Ladies’ Hobby-Horse” which was built with a neat seat like a lunch counter stool resting from a low bar near the ground so that the lady might shuffle the path in a seemly manner. The hobby-horse, however, was halted in his wild career by the melancholy accusation that, “This form of exercise gives rise to a disease of the legs.” Thereupon an arrangement was developed whereby the front wheel was rotated by a hand-cranks, for strange to say, a gearing for foot power was not thought of until considerably later. An odd type of old hand-driven wheel chair appears in a German print in Feldhaus’ Die Technik which shows an enterprising gentleman evidently using all his energy to push himself along.

With the first pedal machine, called by enthusiasts “celerifier” and by tart skeptics, “bone-shaker” there began the direct descent of the modern bicycles. The motor chair seems to have come into existence in connection with the bicycle from the cyclist’s desire to take along as a companion a lady or invalid who could not do a share in the propulsion, for we find this pleasant pastime advocated in La Bicyclette (1899) wherein is described a two-wheeled wicker chair attached to a bicycle. The French text assures us that “thanks to the flexible connection shaft, the balance of the cycle is in no way affected and the cyclist is only aware of the presence of the chair by the work of pedalling.” One is tempted to believe that even thus the cyclist would rarely succeed in utterly forgetting his companion’s presence.

A different aspect of chair cycling appears in the December issue of London Work for 1890, which emphasizes the pleasure of the occupant of the chair rather than that of the cyclist, and marks the development of the chair as an independent vehicle rather than as a mere adjunct. This magazine describes what was known as the “Coventry Chair,” a spacious tricycle with wicker body, behind which a man sat on a sort of footman’s seat and pedalled, steering by means of a handle running under the chair body from the small wheel in front. This elegant vehicle, the magazine declares, “fully meets the requirements of those who move in the inner circles of society.” His Grace, the Duke of Argyll writes: ‘Your Coventry chair has been used by the Duchess. She found it most comfortable.’ * * * One likes to imagine His Grace puffing and pedalling behind her most comfortable highness. The enthusiastic manufacturers of this chair issued a circular letter stating that: ‘A gentleman, by no means a strong man, was able to work one of these chairs laden with a lady weighing over nine stone, and half a hundred weight of luggage, himself riding behind and acting as motive power, at an average of forty miles a day without fatigue or undue exertion.’ From these facts, powerful arguments can be drawn in favor of its adoption in towns and health resorts as a substitute for the old bath chair and as a means of conveyance, certainly preferable in cases of ladies either unable or unwilling to do a share of the propulsion.”

Thus we see the inception of the actual motor chair, and it is only a natural sequence that four years later there appears in the August issue of the same magazine the following query in the “question box”: “Will you please give full instructions as to how to drive an invalid chair by electricity?” This question was answered by one who was doubtless kin to our clerk of the patent office, for the reply is:

“To do this a motor that would develop about a quarter horsepower would be required, and this would have to be driven by means of accumulators. You would, I am afraid, find that the accumulators would take up a lot of room in the chair, and if you had no means of recharging them, you would require an engine and dynamo. I think that you will find the cheapest and most satisfactory way is to hire a boy to push the chair.”

This is a forerunner of the present day electric wheel chair, which, however primitive it may appear a century hence, is certainly a marvel of ingenuity beside the hobby-horse of the past, and would have seemed a piece of witchcraft in the days of the early
wheelbarrow and the "Gentleman's Hobby Horse."

This unique vehicle is attracting much attention just now at the San Francisco, San Diego and Panama-Pacific Expositions where several hundred are in operation and where these are, in fact, the only conveyances permitted on the grounds. The battery-driven chair is becoming very popular at Palm Beach and other resorts, where at present it "fully meets the requirements of those who move in the inner circles of society." But not only Duchesses find this "most comfortable," for "electricquettes" are at the disposal of all visitors who enjoy gliding about in self-propelled chairs without a pushing, panting, prattling porter. The electric is an exclusive chair in that two passengers can enjoy independence and luxury together with complete privacy from a porter's listening ears.

Contrary to the unprogressive assertion in the "question box" of 1894, 1915 sees a chair driven by a compact storage battery out of the way under a neat wicker dash, and recharged about as simply as turning on an electric light. The machine has a normal speed of four miles an hour,—just about a walking gait, but some are built with different reductions, giving speeds ranging from one to ten miles an hour with a battery capacity sufficient to run them for eight hours on good streets.

The body is of rattan, very comfortable, and roomy enough "for two stout adult persons." This three-eighths horsepower machine is becoming so much more popular than the one-man-power type that already several models are in use. Each has a frame of steel tubing such as is used in bicycle construction and is equipped with bicycle wheels and pneumatic tires. The motor, gears and other mechanisms, are entirely hidden by the willow body of the chair. One model is provided with an attractive sunshade, giving the appearance of a trig little phaeton. Others are built with low, open bodies, without the sunshade. All are two-passenger types, light little vehicles of neat and trim appearance, yet built as rugged as miniature trucks, so that they are by no means flimsy toys.

The chief feature of this motor chair lies in the utter simplicity of its operation and the complete control under which the driver has it at all times. Anyone can step into the chair and drive off without any preliminary lessons or possibility of accident, which makes it particularly adapted for amusement parks and the like. This is made possible by a peculiar construction of the mechanism. Power is controlled by two convenient pedals: One of these releases the brake and at the same time closes the circuit, thus starting the car; the other pedal opens the circuit and simultaneously applies the brake, stopping the chair. Thus only a simple move of the foot is required to run it. Steering is by means of a long handle like a child's tricycle. Only one gentle speed is provided, so no harm can come from collision with pedestrians or other objects, although the ease of control practically eliminates collision and other difficulties. As an additional protection for the occupant as well as for pedestrians, however, some chairs are furnished with a guard rail in front, like the "bumper" on an automobile. When this rail comes in contact with any obstruction, the current is immediately cut off and the brakes are automatically set. With the brakes set the chair cannot travel more than a few inches, and these brakes are put on when the car is stopped, remain set while standing idle, and cannot be released until the pedal is operated. The chair will not run away on grades, for no matter how steep the incline, the chair's speed cannot exceed that for which it is geared for as soon as speed is increased by an incline, the motor starts to pull back. Chairs for board walks, expositions, and other places where there are crowds, are geared to run slowly—three or four miles an hour. Those intended for use in parks or on streets, have speeds ranging to ten miles an hour. They are not of course, intended for country roads or hill climbing. The characteristic simplicity of the electric vehicle is conspicuous in this wheel chair which permits operation by the uninitiated and makes it "fool-proof," for even when operated by unskilled and nervously inclined persons in crowded places the prompt control protects road rights and makes for "safety first."

This, then, is the latest development of the wheel chair, which appears so perfect in its construction now that one wonders what can possibly develop to improve upon it, or whether the present model will ever look antiquated beside future models in the patent office.

Popularizing the Electric Vehicle

John F. Gilchrist, vice-president of the Commonwealth Edison Company, Chicago, and president of the Electric Vehicle Association of America, addressed a joint meeting of the Electric Club of Chicago, the Chicago section of the Electric Vehicle Association and the Chicago Jovian League on April 22, on the subject of "The Electric Vehicle." The main argument at present used against electric cars, said Mr. Gilchrist, is that they will not go fast enough or far enough. The public hearkens to this argument because automobiles at present are used mainly for pleasure. They are the playthings of "joy riders." Within the next ten years, predicted the speaker, horses will have entirely disappeared from the city streets, and then the electric car, which can go far enough and fast enough for all commercial purposes, will come into its own. The present income to central stations from electric-vehicle business is not larger, declared Mr. Gilchrist, only because central stations have not elected to assume their share of the expense of introducing the vehicles. Stations in smaller cities, although perhaps the most vitally interested, have neglected the vehicle business even more than the larger plants. In consequence vehicle manufacturers have made no money and probably will make none until selling costs are reduced. As a method of popularizing the "electric" Mr. Gilchrist suggested that snappy stories, such as are told about Ford cars, be circulated regarding electric vehicles. To give this story campaign a start he told of a friend who had dabbled his electric car a "deaf and dumb wagon," to convey the idea of its silent operation.

On all streets having double car tracks, vehicles proceeding to the right of the street car must come to a stop when said street car is stopping on the near side of the street intersection, and remain at a standstill until said car is started (except where the traffic officer directs otherwise).

No vehicle will be allowed to pass to the left of a street car on streets having double tracks.
S ECURING comparative costs of garage service for gas cars equivalent to standard garage service for electrics, is a task exceedingly difficult and even if successful to any extent produces data purely on untried approximations.

Practically every one is acquainted with the cost of standard garage service for electrics. Equivalent standard garage service for gas cars, which service does not exist at present, would naturally have to be approximated in accordance with those similar factors and conditions common as nearly as possible to both types; electric and gas.

In drawing a comparison, such cost data might be divided into the following sub-heads:

1. Cost per month for storage.
2. Cost per month for washing and polishing.
3. Cost per month for gasoline (on a basis of 10 miles per gallon at 14 cents per gallon).
4. Cost per month for lubrication (on a basis of 300 miles per gallon at 12 cents per gallon).
5. Cost per month for inspection, oiling and minor adjustments.
6. Cost per month for hiker service (haul and delivery).

These constitute practically the elements which the electric garageman includes in his monthly standard flat rate charge.

In Chicago a committee, under the chairmanship of F. B. Schafer, editor of Electric Vehicles, visited 12 prominent garages catering to gas cars and in the majority of instances to those catering to both gas and electric automobiles.

None of these garages have ever attempted to offer service to gas cars on a flat rate basis principally because of the many elements so unappropiate to this type which would make such an experiment almost impossible.

In the first place an electric can be driven by almost anyone, but the gas car is purely its owner’s car.

The decided difference in the mechanical features of operation would alone make it impossible for what we generally consider as a hiker, to be found who could properly drive each different type and model of car.

Then again, the difference in the cost of gasoline and lubricating oil together with the cost of electricity for charging, all taken into consideration with mileage and speed makes a comparative figure far from accurate.

However, the committee after conference with many garage men came to the decision that a Cadillac coupe should be chosen as a standard on which to base comparative costs. After visiting twelve garages located North, South and West, the committee came to the realization that practically none of such garage men would consider taking the gas car on a flat rate basis.

In the aforementioned table of cost data these garage owners all agreed on the item of storage at a monthly cost of $35.00; washing and polishing once a week at $4.00 monthly; inspection service gratis ranging from $1.50 to $3.00 monthly.

As to the items of gasoline, lubrication and hiker service, data is merely estimated. For instance it was claimed by one garage man that the average Cadillac coupe in his garage could not be operated on a flat rate basis equivalent to service given to electrics for less than $100 a month, stating that storage, washing, polishing and gasoline alone would average from $70 to $80 monthly.

Practically every one of these garage men agreed that from $65 to $80 for these items would be a very conservative figure. As to the matter of hiker service this factor could never be standard. A number of gas car owners stated that a hiker for a gas car would mean a thoroughly experienced driver capable of driving any type and any model. Such an attendant could demand from $125 to $200 monthly. This item, of course, would differ, depending upon the sincerity of the garage hiring such an attendant.

In practically no instance could the committee find that the garage man would consider the gas car on less than a $100 monthly charge; in most instances not less than $150 monthly.

Therefore, from the results of this investigation it can generally be accepted that the present standard cost for garage service of electrics is very reasonable for the vehicle owner and represents practically a 60 per cent economy for the same service over a gas car, if such service were actually possible to obtain in existing garages.

Big Attendance at Detroit Truck Convention

A large attendance of motor-truck manufacturers, engineers and sales managers opened the motor-truck convention held at the Statler Hotel, Detroit, Mich., May 5 and 6, under the auspices of the National Automobile Chamber of Commerce.

The program was arranged under the direction of the commercial vehicle committee, consisting of W. T. White, chairman, and Messrs. Alvan Maceaulay, P. D. Wagoner, H. Kerr Thomas and M. L. Pulcher.

Among the papers of particular interest to electric-vehicle men was one on “Why Service Conditions Should Be Investigated and Recommendations Made Before Seling a Customer,” by Vernon Munroe, president International Motor Company. Discussion on this paper was to be led by W. F. Kennedy, consulting engineer, New York City; F. C. Lindoerfer, Atterbury Motor Car Company, and H. H. Rice, vice-president Waverley Motor Car Company. At the Thursday afternoon session P. D. Wagoner, president of the General Vehicle Company, Long Island City, N. Y., presented a paper on “The Future of the Electric Truck.”

A. C. Downing, sales manager of the Anderson Electric Car Company, Detroit, was to lead the discussion, followed by E. J. Bartlett, manager of the truck department of the Baker Motor Vehicle Company, Cleveland, Ohio.
Can Manufacturers Have a Standard Policy?

A Paper Read Before the Detroit Motor Truck Convention, May 5 and 6

The term service was adopted by motor car companies in the early imperfect days of motor car development, when we were all exceedingly sensitive on the subject of repairs. So we have universally used the word service with the thought that it would disguise the existence of our repair departments, and give a beneficent aspect to those necessary evils. I believe that our subterfuge has reacted upon us many times, and in many ways. It would have been better, I feel sure, to have handled the situation straight out from the shoulder, calling repair departments by their right name. Then our good patrons would have expected them to take care of repairs. Their functions and activities would have been held within reasonable limits.

My dictionary gives seven different definitions of the word “service,” ranging all the way from “spiritual worship and obedience” to “the act of serving: occupation of a servant.”

It is but natural that under so loose and indeterminate a name, the public should come to expect almost anything in the way of service from motor car manufacturers. And hence the abuses and misunderstandings that have grown up, harmful alike to manufacturers and owners.

The term “service” as it is used in the business in which we are all engaged covers three branches of work, as I see it:

First, the correction, at the manufacturers’ expense, of defects in material or workmanship, for which the manufacturer is properly held accountable.

Second, the repair of vehicles that have deteriorated through use or abuse.

Third, an indefinite something beyond legitimate repair work, which is performed gratis for the purpose of showing the broad-gauged goodwill of the motor car manufacturer toward the owners of his vehicles.

The good-will element of service varies widely with different manufacturers, and even with the different dealers of the same manufacturer. It is supposed to cover a multitude of things that the manufacturer will do gratis for anyone who purchases his vehicles, and which he is under no obligation morally or otherwise to perform, but which he does or agrees to do because it will make his patrons talk of his liberality; in other words, it is good advertising.

I think it is correct to say, therefore, that service consists essentially of repair work and advertising.

In the absence of specific promises to his patrons, the manufacturer’s obligation extends only to the point of delivering to his patrons cars or trucks of his standard of material and workmanship. There is no obligation upon him to deliver a perfect vehicle, especially since such a vehicle has probably not yet been devised. But there is a strong obligation upon all of us to deliver to our patrons that quality of material and workmanship which we have previously established as our standard of excellence. If a particular vehicle falls below that standard, we must make good without expense, if the flaw develops and is brought

the dealer who actually does the most for his patrons is the one who has the most satisfied owners. The fact seems clearly to be that that dealer has the greatest proportion of pleased users who, at the time of making his sales, explicitly and carefully makes it unmistakably known to his patrons exactly what they will receive in the way of free service, and just what they will be charged for, and who thereafter promptly and efficiently makes good his promises, even though they are definitely limited in scope.

It is a truism that cannot be denied that in the long run patrons are better satisfied to pay a fair price for service work, if it is done immediately and the need develops, and if it is thoroughly well done at the first effort, than with careless, slipshod repair work, for which no charge is made.

No other branch of industry with which I am familiar gives, as a general proposition, so much in
the way of free service as our own automobile business. The existence of this liberality of free service is undoubtedly due to the fact that as soon as the automobile business was born, scores of manufacturers took it up simultaneously, and from the very outset there was the very keenest competition, which patrons availed themselves of to extract from motor car manufacturers most lavish promises, either expressed or implied, as to what would be done for them without charge. In nearly every other line of business, history shows usually some one pioneer who developed it to the point of success, and who established precedents as to repair work and service before he had serious competition, and, under these circumstances, the pioneer manufacturer did not make extravagant promises of free service, and later manufacturers who came into his field usually fell in with the precedents he had established.

What kind of service is promised you when you buy a yacht, or a gun, or a locomotive, an installation for your power-plant, machine tools, an elevator, or what not? In all of these lines we expect the manufacturer to make good if he sells us an article that is below his established standard of excellence. Also, we know perfectly well that if we ask him to do anything more, we shall expect to pay the bill for time and materials, and a reasonable profit. Custom has educated us what to expect, and we accept the result without any feeling but that it is only fair and right to pay the bill. The public generally is willing to pay what it thinks is fair, but what it thinks is fair depends entirely upon its education, and I feel that we have all failed in our duty towards our patrons and our dealers in not educating them as to what is right and economically possible in the way of service. We have either left them in an indefinite frame of mind, or worse, we have led them to believe that we are willing to give more than we should give, and are able to give.

The public naturally will take all the free service it can get, and whatever is given is accepted as a matter of right. Some dealers in an excess of zeal, arranged to give a day-and-night service, whereby if a truck was incapacitated during the day’s business, it could be repaired over night and ready for use again in the morning. The public was perfectly willing to accept that service without thinking very much about it, and without properly appreciating it. But the dealers found that it was impossible to meet expenses with a twenty-four hour service, or to secure thoroughly competent repair men who would work in a night shift month in and month out. So the dealers have, in every case so far as I know, been obliged to give up the night service. And then you may be sure a howl went up from the public, who from having the privilege of night service came quickly to esteem it an inalienable right. The owners had been educated in a wrong direction. So long as they had never been given night service they arranged their affairs so as to get along without it.

Now, there is no denying the value of night service to truck owners. So would a Sunday service be valuable to them, but there are practical limitations that ordinarily prevent a satisfactory service except during the usual times of business.

I cite this merely to illustrate the degree to which satisfactory service depends upon how an owner has been educated. The same principle applies to almost everything we are asked to do for him.

Some of the troubles connected with service grow out of the difficulty of maintaining uniformity in the various dealers’ establishments and among the various manufacturers. The case is found frequently in every city, where a new dealer locates and starts in to create a clientele. In order to quickly secure a following, he makes large promises as to the liberality of this service, and for a time at any rate, he does give more than other established dealers can afford to give. He does this, of course, by way of advertising solely, and ultimately he falls back more or less to the level of the other established dealers in his town.

But, in the meanwhile, the pressure is very strong upon the established dealers to meet the attractive service conditions detailed before the public eye by the newcomer. Most dealers fall for it rather than risk losing their customers. So temporarily, in that town, a new standard of service is established, which cannot be permanent because the margins of the business will not allow it. It is economically bad, and the final workout of the situation is disastrous to all the dealers, including the newcomer.

If that newcomer had been educated by experience to the point where he could see the ultimate development of his advertising service, he would not have made the mistake of establishing it upon a plane that he could not permanently maintain. And if the established dealers had been sufficiently educated by experience, they would not have allowed themselves to follow the bad example of the newcomer.

Another condition that makes against uniform service is the almost irresistible temptation of the dealer to favor the influential owner. As a matter of right principle, the humblest citizen should be given exactly the same treatment as the President of the United States.

It takes education along the broadest lines, repeated and reiterated, to hold dealers level when these not unusual conditions present themselves to him. It takes valuable time to resist the demands of a shrewd owner, who is bent upon getting something for nothing, or something that wouldn’t be given his neighbor. But, in the long run, it pays well to sit down with him and reason him out of his unfair demands, or failing that, to refuse them point-blank, because, after all, an owner doesn’t appreciate a concession that he extorts, and when he comes back to the dealer a second time, he will have the same concession or a better one, or he will take his patronage elsewhere.

Education is what is badly needed—education along broad lines of fair and uniform dealing, untainted by influence or pressure.

Now, we have sincerely endeavored to work out our service problems along the right lines I have described. At the beginning of our business existence, we were very liberal indeed. I could cite you many instances of free repairs after three or four years use of the car, but gradually it became born in upon us that what was given for nothing was not appreciated, and only whetted the appetite for more. The gratuitous element of service work in a large measure, lost its advertising value, because many others promised a great deal more than we could possibly perform. The secondhand trading problem loomed large on the horizon, margins narrowed, and we realized that it was time to reform our service policy upon a business basis, under which we would fully and completely discharge all of our moral obligations to our patrons, and even go somewhat beyond that for good measure, but also, on the other hand, to definitely limit the gratis
work expected of us by owners of our vehicles. The basis of our new policy was a complete, thorough advance underpinnings with our owners as to just what we would and would not do. We have not restricted our written service policy over what it was before. As a matter of fact we have enlarged it. The essential difference is that we have cut out indefinite- ness by a clear, concise definition of what we will do gratis and what we will charge for. And the new policy we have proven will, if firmly adhered to, hold all our friends, and, at the same time, put our service departments on the right side of the ledger.

We finally arrived at a service policy for passenger cars and trucks, because we found that the conditions were so varying that, while the same principles apply to both, the details should be different. Both policies are alike in that they are based upon assisting owners to keep their vehicles in best operating condition, rather than assuming the responsibility for so doing. Nine-tenths of that is, and must be, upon the owner and his driver. And it can be placed there too, if our dealers have a just, clean-cut service policy, and stand by it.

As this is a convention of truck manufacturers, we will confine our talk to our trucks. This consists of two parts—the warranty of the manufacturer and, supplementing it, the dealers' service policy.

The warranty is not essentially different from the standard warranty adopted by the Chamber of Commerce. It is our dealers' service policy that is new.

Under the dealers' policy, provision is made for giving the owner absolutely first-class service, no matter what happens to his truck. If he provides himself with competent drivers, or if he will arrange to have his vehicles delivered to the dealer's establishment, service should cost him nothing all during the first year, in the absence of accidents. But if, for any reason, he insists upon inspection being made away from the dealer's service department, then he has to pay a very reasonable sum for the luxury.

The underlying idea is that we provide the facilities enabling the owner to get a year's service at no cost, but if he will not bring his vehicles to the dealer's establishment, then he must pay according to the distance the dealer has to send his inspector. The essential particulars of our dealer's service policy can be summarized as follows:

(a) For one year, the dealer will inspect monthly the truck he has sold, and make minor adjustments gratis, if the truck is delivered for attention to his service department.
(b) If not delivered to him, and he is obliged to send a workman to wherever the truck may be located, he will inspect and adjust monthly for a year, doing whatever work can be completed within three hours at each visit, for a schedule of charges as follows:

<table>
<thead>
<tr>
<th>Distance</th>
<th>Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within a 10 mile radius</td>
<td>$1.50</td>
</tr>
<tr>
<td>Within a 20 mile radius</td>
<td>$2.50</td>
</tr>
<tr>
<td>Within a 30 mile radius</td>
<td>$3.00</td>
</tr>
</tbody>
</table>

Beyond thirty miles, a special arrangement is to be made based upon the distance the workman has to travel.

(c) The dealer will make all adjustments as often as the owner may desire within the first month after delivery, if the truck is brought to him. After that, the dealer charges his standard rates, except for monthly inspection at his service station, and except that during the first 90 days after delivery he will replace gratis parts that may be furnished without charge by the company. All gratis work is to be done at the dealer's service station. If a workman has to be sent out to replace the free parts, a charge is made to cover any expenses of the workman.

(d) If the truck is delivered within 100 miles of the dealer's store, an instructor will be supplied gratis for a period of three days, which is believed to be sufficient time in which to break in the driver, and teach him to handle the truck properly.

(e) After each inspection, the dealer sends to the owner of the truck and to the company a report covering the results of the inspection, but also the condition in which he found the vehicle, together with any evidences of neglect or abuse.

Our dealers who are making the most satisfactory and successful use of this new policy are, of course, those who enforce it tactfully but firmly. They print it up on the back of their order forms and upon all invoices rendered to their patrons for work done, whether the work be gratis or charged for. In this way, from the very beginning of their relations with the owner, the latter buys the truck knowing exactly what he will and will not have to pay for. He can secure the assistance of the dealer to whatever extent he desires in taking care of his truck, but there is a proper limitation to the work that will be done for him gratis. He is not allowed to impose upon the dealer.

We have not forced this service policy upon our dealers. We worked it out with their assistance, and they adopted it, for the most part enthusiastically, as being an arrangement that offered the owner all possible facilities for having his truck properly taken care of, if he would avail himself of them in the way most economical to the dealer. But if, on the other hand, the owner requires special service then he has to pay for it, a sufficient amount to give the dealer a chance to live.

Can manufacturers adopt a standard service policy? Of course, they can, but they won't probably until the absolute necessity is brought home to them through the financial showing of their dealers. It will come in time as a matter of self-preservation. I hope it will come soon, because the margin of profit from the manufacture and sale of gasoline vehicles is narrowing rapidly under the intensive competition.

I believe all of our members are ready to adopt a standard service policy as soon as they are shown one that is in successful operation, and which is fair to owners and possible of being carried out by the dealers. Our experience with our new dealers' policy indicates that we have taken a long step in advance. It is showing excellent results, and after six months' experience with it, we have not found that we want to change it. I don't mean that we have had no trouble in introducing it. Any change brings complications, but the difficulties have not been serious, and the policy has been successful in every case where the dealer has really tried to establish it.

Fritche Opens Chicago Branch

The latest announcement of interest in the electric vehicle field comes in the shape of a new agency for Chicago representing the Denver product known as the Fritche 100-Mile Electric.

The Chicago agency is a direct factory branch under the management of Lee Steavenson who formerly directed the sales of the Fritche company in Denver.

Mr. Steavenson has already placed one of the latest Fritche brougham models on exhibition for the Chicago public. It is stated that the Fritche company because of its rapid growth in Denver and environs contemplates further extending the representation of their product to include practically all of the electric vehicle centers throughout the country.

Although the Chicago branch agency will devote its efforts exclusively to the sale of passenger cars, at present, commercial vehicles will be represented later.
Charging Stations in Philadelphia and Environ

Eastern Charging Facilities Well Distributed, Offer Excellent Opportunity for Touring

Pennsylvania can very well boast of its enthusiasm for the electric battery propelled vehicle. Philadelphia, one of our most progressive electric vehicle centers, is a fire of enthusiasm and promotion of this type.

The nearby cities likewise are well represented by many electricities and in fact the entire state is dotted with many charging stations with excellent charging facilities.

The accompanying map clearly indicates (by the dark circles) the many stations systematically located on principal highways.

From the map it can quite readily be seen that touring in the electric for even long distances is but a matter of as little worry as the owner of a gas car gives to his source of supply for more gasoline.

The progressiveness of the Philadelphia Light and Power Company has been instrumental in establishing these efficient charging stations which are listed as follows:

**Philadelphia.**

<table>
<thead>
<tr>
<th>Address</th>
<th>Streets</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Barlett Garage</em></td>
<td>17 North 21st St.</td>
</tr>
<tr>
<td><em>Borland Electric Garage</em></td>
<td>619 North 35th St.</td>
</tr>
<tr>
<td><em>Commercial Truck Co.</em></td>
<td>933 North 27th St.</td>
</tr>
<tr>
<td><em>Electric Garage</em></td>
<td>4538 Baltimore Ave.</td>
</tr>
<tr>
<td><em>Park Garage</em></td>
<td>36 Spring Garden St.</td>
</tr>
<tr>
<td><em>Diamond Garage</em></td>
<td>218 North 15th St.</td>
</tr>
<tr>
<td><em>Atlantic Garage</em></td>
<td>3501 Atlantic St., Tioga</td>
</tr>
<tr>
<td><em>Tioga Garage</em></td>
<td>3431 North Broad St.</td>
</tr>
<tr>
<td><em>Charles Merkel</em></td>
<td>3314 North Broad St.</td>
</tr>
<tr>
<td><em>Mercury Machine Co.</em></td>
<td>219 North Broad St.</td>
</tr>
<tr>
<td>Y. W. Ralph</td>
<td>Northeast 19th and Norris Sts.</td>
</tr>
<tr>
<td><em>Wanamaker Garage</em></td>
<td>214 South 23rd St.</td>
</tr>
<tr>
<td><em>Powelton Garage</em></td>
<td>34th and Lancaster Ave.</td>
</tr>
<tr>
<td><em>Washington Lane Garage</em></td>
<td>60 West Washington Lane</td>
</tr>
<tr>
<td><em>Delmar Garage</em></td>
<td>300 amperes—6c per kilowatt hour, 9c minimum</td>
</tr>
<tr>
<td><em>The Phila. Electric Co.</em></td>
<td>100 amperes—6c per kilowatt hour, 9c minimum</td>
</tr>
<tr>
<td><em>Delmar Garage</em></td>
<td>Morris and Price Sts.</td>
</tr>
<tr>
<td><em>The Phila. Electric Co.</em></td>
<td>350 amperes—6c per kilowatt hour, 9c minimum</td>
</tr>
<tr>
<td>50 amperes</td>
<td>— 45 hours</td>
</tr>
</tbody>
</table>

(The following private electric vehicle charging stations are willing to assist in cases of emergency.)

Henry Hess
1510 Allegheny Ave.
30 amperes

Electric Storage Battery Co.
19th & Allegheny Ave.,
Dellwood
20 amperes

Dr. E. T. Schreiner
90 Maplewood Ave., C. H.
30 amperes

Philadelphia Storage Battery Co.
Ontario & C Sts.
40 amperes

U. G. I. Co. (before 4 p. m.)
4427 Frankford Ave.
20 amperes

Horace Linton
6404 North 7th St., Oak Lane
30 amperes

Klumy's Service Co.
8th and Callowhill Sts.
30 amperes

Henry Rohner (day only)
5th and Race Sts.
40 amperes

C. H. Chandler
30 amperes

*Member of the Electric Vehicle Association. See page 371.*

**Pennsylvania.**

<table>
<thead>
<tr>
<th>Address</th>
<th>Streets</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Lehigh Valley Light &amp; Power Co.</em></td>
<td>542 Hamilton St.</td>
</tr>
<tr>
<td><em>Lawyer Automobile Co.</em></td>
<td>12th and Hamilton Sts.</td>
</tr>
<tr>
<td><em>Bethlehem Electric Light Co.</em></td>
<td>217 South New St.</td>
</tr>
<tr>
<td><em>Brynn Maw Garage</em></td>
<td>4139 Lancaster Ave.</td>
</tr>
<tr>
<td><em>Bryn Maw Garage</em></td>
<td>All hours—100 amperes—6c per kilowatt hour—1c minimum</td>
</tr>
<tr>
<td><em>Chester. Bacon Light Co., Power House</em></td>
<td>21 West 2d St.</td>
</tr>
<tr>
<td><em>Chester. Chestnut Hill Garage</em></td>
<td>Bethlehem Pike and Chestnut Ave.</td>
</tr>
<tr>
<td><em>Devon. Devon Garage</em></td>
<td>Lancaster Pike and Chestnut Ave.</td>
</tr>
<tr>
<td><em>Devon. Doylestown Garage</em></td>
<td>57 West Court St.</td>
</tr>
<tr>
<td><em>Easton. Easton Auto Co.</em></td>
<td>Snyder St., bet. Bank and Third St.</td>
</tr>
<tr>
<td><em>Folsom. Delaware County Electric Co., Power House</em></td>
<td>Parker Ave below Lincoln Ave.</td>
</tr>
<tr>
<td><em>Gettysburg Light Co.</em></td>
<td>All hours—100 amperes—6c per kilowatt hour—1c minimum</td>
</tr>
<tr>
<td><em>Harrisburg. The City Auto Garage</em></td>
<td>116 Strawberry St.</td>
</tr>
<tr>
<td><em>Jenkintown. Phila. Suburban Gas &amp; Electric Co.</em></td>
<td>Electric Ave. near Railroad Station</td>
</tr>
</tbody>
</table>

100 amperes

30 amperes

Union Transfer Co. Juniper and Appletree Sts.
75 amperes

J. D. Johnson Co. 114 North 7th St.
50 amperes

Phillip Klein
2309 Fairmount Ave.
30 amperes

American Brewing Co.
31st and Master Sts.
30 amperes

F. A. Poith & Sons
31st and Jefferson Sts.
30 amperes

George H. Grote
2208 North 51st St.
30 amperes

John C. Wilson
1137 North 63d St.
30 amperes

John F. Betz Brewing Co.
415 Callowhill St.
30 amperes

Curtis Publishing Co.
1016 Kimball St.
600 amperes

Curtis Publishing Co.
6th and Sanson Sts.
30 amperes

General Electric Co.
11th and Washington Ave.
30 amperes

Penna. S. P. C. A.
1626 Rastead Ave.
50 amperes

Dr. J. E. Wallis
2642 Richmond St.
30 amperes

*Member of the Electric Vehicle Association. See page 371.*
ELECTRIC VEHICLES

NEW BRUNSWICK

Johnson & Johnson.................Factory Office of Mr. Manley
All hours—unlimited current, $6.00 minimum charge—accommodation only

PLAINFIELD

Public Service Gas Co..................Power House, 4th St.
Day time accommodation only—6c per kilowatt hour

Laird Avenue Garage.............410 Sycamore Ave.
All hours—30 amperes—10c per kilowatt hour

PRINCETON

Princeton Motor Car & Supply Co.........24 Chambers St.
All hours—30 amperes—$1.50 per boost

SPRING LAKE

Clark Clayton Auto Co.............All hours—100 amperes—$2.00 per boost

TOMS RIVER


TRENTO

Brook's Garage, Inc..........Canal St. at State St.
All hours—100 amperes—6c per kilowatt hour

VINELAND

W. S. Cramer..................418 South East Ave.
30 amperes—private residence—accommodation only

WILMINGTON

West Jersey Electric Co.
All hours—accommodation only—6c per kilowatt hour

Wildwood Garage & Machine Co........East Ave.
All hours—10c per kilowatt hour

WOODBURY

Hutchinson Motor Co...............217 South Broad St.
All hours—30 amperes—10c per kilowatt hour

DELWARE

REHOBOTH BEACH

Electrical Light Plant, W. S. Truitt.
Accommodation only

WILMINGTON

Wilmington & Phila. Traction Co...........5th and Tatnall Sts.
All hours—100 amperes

MARYLAND

BALTMOIE

Consolidated Gas, Electric Light & Power Co. of Baltimore, 30 South Eutaw St.
All hours—unlimited—5c per kilowatt hour—35c minimum
Zell Motor Car Co..................Mount Royal Ave., East Palace Garage, Ditch, Bowers & Taylor,
Phone, Mt. Vernon, 3080

BEL AIR

Bel-Air Electric Co,..............State Road and Winters Run
Day until 10 P.M.—60 amperes—accommodation only

FREDERICK

By communication and previous arrangement with M. A.
Poolet, general manager of the Hagerstown and Frederick
Railway Company, facilities can be secured for charging cars at
a nominal rate.

HAY DE GRACE

The Havre de Grace Electric Co.
All hours—100 amperes—10c per kilowatt hour—accommodation only

ROLAND PARK

The Roland Park Co..................Rear, 410 Roland Ave.

WASHINGTON, D. C.

The Keiser Electric Garage...........1429 L St., N. W.
All hours—2s amperes—$1.25 per charge

John M. Doyle..................322 Pennsylvania Ave.
All hours—2s amperes—$1.25 per charge

Emerson & Orme Garage.............1407 H St., N. W.
All hours—50 amperes—8c per kilowatt hour—50c minimum

Bartram Electric Garage........1204 New Hampshire Ave., N. W.
All hours—30 amperes—$1.50 minimum

Dupont Garage..................2020 M St., N. W.
All hours—30 amperes—$1.50 to $2.00 per charge

Potomac Motor Car Co.............1226 Connecticut Ave., N. W.

Imperial Garage..................1214 V St., N. W.

Vermont Garage..................1122 Vermont Court, N. W.

Eidlitz Electric Garage............1420 U St., N. W.

The Union Garage..............G St., N. W., between 6th and 7th Sts.
All hours—60 amperes

LAUGHTER

Samuel K. Landis.................Rear, 126 East Orange St.
8c per kilowatt hour—garage

Lancaster Automobile Co..............236 West King St.
8c per kilowatt hour—garage

LANTHORE

Langhorne Electric & Power Co.,
All hours—50 amperes—6c per kilowatt hour

LARDSOWN

Delaware County Electric Co.,
Power House, Bartram Ave. near Union Ave.
All hours—40 amperes—6c per kilowatt hour—50c minimum

MEDIA

Delaware County Electric Co.,
Power House, Parker Ave. near Railroad
All hours—40 amperes—6c per kilowatt hour—50c minimum—accommodation only

NORRISTOWN

Norris City Garage.............Main and Chain Sts.
All hours

OAK LANE

Philadelphia Electric Co.,
All hours—100 amperes—6c per kilowatt hour—50c minimum

READING

Metropolitan Electric Co.,........723 Franklin St.
Apply at office—125 South 7th Street
7 A.M. to 9 P.M.—30 amperes—5c per kilowatt hour

TACONY

The Philadelphia Electric Co.,
Power House, Delaware Ave. and Robbins St.
All hours—100 amperes—6c per kilowatt hour—50c minimum—accommodation only

WEST CHESTER

Chester County Garage..............19 West Miner St.
All hours—6c per kilowatt hour

YORK

All hours—10c per kilowatt hour—accommodation only

York

Sommerville Garage.............116 East Market St.
7c minimum

York Railways Co...............27 West Market St.
Accommodation only

Snyder Auto Co.............229 West Market St.
30 amperes—75c minimum

J. W. Leeper............120 North Howard Avenue
All hours—50 amperes—75c minimum

NEW JERSEY

ASBURY PARK

Zacharias Garage..................Main St. and Sewall Ave.
All hours—85 amperes—$1.50 per boost

ATLANTIC CITY

Chelsea and Ventnor Garage........8 North Baton Rouge Ave.
All hours—50 amperes—10c per kilowatt hour

Pant Garage..................3711 Ventnor Ave.
All hours—30 amperes—8c per kilowatt hour

Woods Electric Garage..............1010 Arctic Ave.
All hours—100 amperes—10c per kilowatt hour

CAMDEN

Camden Coke Co..................Front and Chestnut Sts.
Accommodation only—all hours—100 amperes—10c per kilowatt hour

CAPE MAY

The Cape May Light & Power Co..................Main Plant
All hours—100 amperes—10c per kilowatt hour

EGG HARBOR CITY

Aurora Hotel, Fred Lott..............Liverpool Ave.
Accommodation only—charge per boost

ELIZABETH

Price's Garage..................14 Westfield St.
All hours—50 amperes—$1.25 per kilowatt hour

JERSEY CITY

E. B. Ryder..................2563 Boulevard
All hours—40 amperes—6c per kilowatt hour

LAKewood

J. G. Holman's Garage...........Near Railroad Depot
All hours—30 amperes—10c per kilowatt hour

MAY'S LANDING

Henry Birch..................Court House Square
Accommodation only—30 amperes

NEVARK

Electric Vehicle Garage..............123 Washington St.
All hours—150 amperes—6c per kilowatt hour—50c minimum
SALES TACTICS

A WIDE awake trade journal which covers its field entirely has an excellent opportunity to study the various methods and tactics employed in the manufacture and sale of electric vehicles.

In the electric vehicle industry, the methods of selling electric passenger cars have caused considerable comment among dealers and prospective purchasers.

The following letter came to our office and is here set forth in order to prove the serious results of a sales policy founded on insincerity:

For two years I have been a subscriber to your publication. During each month during this period I have found valuable information which every electric vehicle owner should know. In spite of your brilliant journal and its ever instructive effort I wish to discontinue my subscription for the following reasons:

I wrote a letter to — September, 1912, to a salesman. My first attempt was with the — company. After stating my desire to make an exchange, I was referred to the salesman who referred to a small book and quoted me a very unreasonable exchange allowance. I immediately refused, whereupon he informed me that none of the other fellows in the combination could make me a better proposition, nevertheless he agreed to the terms of the deal.

In each case I found the same story with the exception that in the case of the — company I was accosted on the street by one who said he was manager of the used car department and thought he could find me a buyer who would make a better proposition. I was not in a mood to consider such "on the street talk" and drove home. For a week or so I had the idea of a proposition possible made to me. One representative offered to take a new car off the floor, run it around the block a few times and sell it to me as a demonstrator at a ridiculously low price. I finally got so discouraged that yesterday I purchased a new gas car at the regular price, which I know is standard to one and all because I couldn't even get them to knock off the two dollar charge for a monogram. I am sending you this information because I have always appreciated the sincerity which your journal has exhibited in its editorial columns and I hope that you will take steps to eliminate such treacherous and illegitimate sales methods.

This is a mill through which the gas car salesmen passed years ago. Maybe it is a necessary part of evolution. Possibly it works out all right in the majority of cases; but it certainly does not in all. If our correspondent seems too severe in her arraignment of the conditions she met, remember that she could only win by impressions, and the one she got was not conducive to a high degree of respect for the integrity of the industry.

No one who has three thousand dollars to spend for an electric got that money by simple-mindedness or disregard for values. The average purchaser who is financially able to buy an electric attained his position by shrewd common sense and a lively appreciation of what money will do. For a salesman to under-estimate that quality of shrewdness and alert consciousness of values is disastrous to the industry.

We are not arguing against the establishment of a standard valuation for used cars but we cannot see that our correspondent is taking that attitude either. She only rebels against the subterfuges and transparent evolutions that she met with in her unfortunate experience. The suspicion that some one else is able to get a better price or more liberal treatment is the most exasperating of thoughts.

A number of factors are operating to keep down the natural development of the electric vehicle, and not the least of them is the brand of sales tactics used by at least a few of the salesmen at present employed. It is a fact that many manufacturers are not making a profit on the part of ambitions manufacturers, who surely have enough business sense to realize that only the square, open, straightforward policy can hope to win.

CHICAGO, MAY 1915

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WANTED—A COMPETITOR.

MONOPOLY is not always an advantage. We sometimes feel that we would be better off if Electric Vehicles had a competitor, instead of being the only publication in the field. Then there would be opportunity for comparison; the trade would recognize that we are making Electric Vehicles about as good as a magazine can be made without advertising support.

We wonder how many realize that in all the world there is no other source of electric vehicle information, no other place to go for knowledge of electric vehicle matters, than the pages of this magazine?

We have here the one and only representative of all the trade; the lonely exponent of a big industry. We have a monopoly of all the bona fide publishing business there is in the electric vehicle field. And far from exhibiting the greedy and grasping attributes commonly supposed to be characteristic of monopolies, we actually invite competition. Who will be bold enough to invade the field? The territory is practically virgin soil. We have plowed it and sowed much good seed, but nothing has come up. A lavish use of some well known brand of fertilizer might work wonders.

This is the place where electric vehicle information is concentrated for public use. Those who refuse to see any value in that situation must be advocates of secrecy and mystery in the trade. If so, our readers do not agree with them; and we venture to say those same readers know a good deal more about electrics than they did before we gave them information. They will know still more about the business before they stop reading Electric Vehicles.

Under the circumstances of this monopoly of ours, it is unnecessary to explain to an intelligent trade that we have some readers; because they must come to us if they are interested in electrics. They do come, and we are telling them things that will make the buyer of electrics a few years from now a very different individual from the buyer of today and yesterday. He will know what he is buying, and why it is better than another kind, and whether he should buy it at all or not.

So, in the absence of any competition, we are going right on acting as the exclusive interpreter of electric vehicle knowledge, educating the public and telling the truth as we find it without fear or favor. But if anyone cares to start another paper in the field, we bid him welcome.

WHEEL TAX.

NOTWITHSTANDING that the courts of Illinois have declared void the wheel tax formerly imposed upon motor vehicles, a great many car owners are continuing to pay the tax voluntarily. A Chicago automobile society has even gone so far as to take active steps looking to the reinstatement of the wheel tax law in legally unassailable form. This is a praiseworthy spirit to show at a time when many of our best citizens are supposed to be under official suspicion of tax-dodging.

It has been argued that the rubber tires of motor vehicles are responsible for much less wear upon our pavements than the steel tires and iron shoes of horse-drawn vehicles and their motive power, and that therefore little or no wheel tax should be levied on the motor vehicle. It is said, too, that the motor car is the more desirable from a sanitary standpoint, and should be encouraged by a minimum tax—granting that the effect of taxation is to discourage the subject of the tax.

But while these theories are good as far as they go, it must be remembered that the funds created by the wheel tax go toward the maintenance and construction of roads. And the one great essential to motor car efficiency and enjoyment is good roads. Better a poor car on a good road than a good car on a poor road.

The electric is especially a good road car; not because it will not negotiate any road that will carry a gas car, but because good roads encourage the purchase of electrics. We can almost promise that the electric vehicle business will grow as the good roads movement grows.

For these reasons let us, by all means, retain the wheel tax.

THE JITNEY BUS.

The "jitney bus" has evidently come to stay. Its very coming announces a new era—a wonderful opportunity for the electric battery propelled vehicle. The "jitney bus," without a doubt, will have a tremendous effect on the transportation problems confronting the populace of every large metropolis. Even with the present methods of transit by street cars, steam roads, electrics, railways and the multitude of privately driven vehicles, still there is a wide and profitable field for the "jitney bus." The trade has long been interested in districts unreached by our present systems of transit.

The very nature of the duty which the "jitney bus" must perform demands that it be a well built vehicle, free from noise and dirt, of reasonable speed, reliability and economy. The electric, the car for hauls of reasonable distance with many stops, is exactly the type which has these many various demanded characteristics. Yet in as large a city as Chicago, where the "jitney bus" is the latest subject of interest, the new venture is being systematically promoted exclusively by gas car owners. The electric jitney would furnish the best possible opportunity to educate the public, the everyday rider, in the advantages of the electric. Many who have never ridden in an electric and who probably never entertained the desire to do so would unconsciously find themselves being carried by the storage battery propelled vehicle. Constant service and reliability and the many excellent features so natural to the electric would soon be convincing of its value and the result gained could never be equalled by all the advertising and salesmanship schemes ever promoted. Many would investigate the electric when desiring to purchase a privately driven vehicle and this type would automatically be brought to the minds of the vast multitude of those who are seeking the purchase of a real car.

Statement of the ownership, management, circulation, etc., of ELECTRIC VEHICLES, published monthly, at Chicago, Ill., required by the Act of August 24, 1912.

NAME OF PUBLISHER, ELECTRICITY MAGAZINE CORPORATION, 1222-1226 Monadnock Bldg., Chicago, Ill.

MANAGEMENT, Paul H. WOODRUFF, 1102 Yale Ave., Chicago, Ill.

EDITORIAL OFFICER, Paul H. Woodruff, 1102 Yale Ave., Chicago, Ill.


NAMES AND ADDRESS OF known bondholders, mortgagees, and other security holders, holding 1 per cent or more of total amount of stock—

Ed J. MOORE—6549 Harvard Ave., Chicago, Ill.

A. C. Samsorns—Blue Island, Ill.

John G. Grimes—Marion, Ill.

Known bondholders, mortgagees, and other security holders, holding 1 per cent or more of total amount of bonds, mortgages or other securities:

There are no bonds, mortgages or other securities outstanding against ELECTRIC VEHICLES.

ELECTRICITY MAGAZINE CORPORATION, Per Ed J. MOORE, President.

Sworn to and subscribed before me this 1st day of April, 1913.

(Signed) LIONA J. ECKSTROM.

My commission expires Aug. 17, 1918.
Electric Vehicle Association Developments

Sectional Development Work Reports of Committees and New Announcements

The following reviews the activities of the Electric Vehicle Association of America from March 25, 1915:

Cincinnati Section.—Upon call by C. E. Ogden, the Cincinnati section met on April 20 in the offices of the Union Gas & Electric Company for the purpose of reorganization and election of officers and directors.

The following officers were elected: J. W. Schrantz, chairman; Fred E. Schornstein, vice-chairman; C. E. Ogden, secretary. Seven directors were elected, as follows: H. J. Hoover, F. E. Schornstein, C. E. Ogden, L. F. Ballman, W. A. Wadsworth, T. F. Kelly, J. M. Briceland.

It was proposed that the association have a short noonday meeting at the lunch hour every two weeks. In accordance with this suggestion, Thursday was designated as the day.

Very considerable credit is due C. E. Ogden for the renewed interest which he has succeeded in creating in the Electric Vehicle Association in Cincinnati, receiving the valued and hearty co-operation of the Union Gas & Electric Company. It is expected that the rejuvenated Cincinnati section will rapidly establish itself as one of the most active and successful sections included in the association.

Four membership applications have already been received as a result of recent activity in Cincinnati, and Secretary Ogden reports that four more are pending and are likely to be obtained within the next few days.

New York Section.—The New York section held a meeting on March 24 in the auditorium of the Consolidated Gas Company, Chairman Harvey Robinson presiding.

The paper of the evening, entitled “The Development of the Electric Vehicle Market through the Power Solicitor,” was read by S. G. Thompson, the vehicle representative of the Public Service Electric Company, Newark, N. J. This paper appeared in full in the April issue of Electric Vehicles.


Los Angeles Section.—On April 13 the Los Angeles section held a meeting in the Jonathan Club, with J. Harry Pieper, chairman, as presiding officer.

The opening address was made by City Councilman J. S. Conwell, who has been identified with the automobile industry for a great many years, and in consequence is particularly well fitted to talk on his subject, which was “Traffic Condition.” He briefly outlined the plan of the city’s needs and showed the necessity of subdivisions to eliminate the congestion of the streets.

The second address was made by A. Carman Smith, president and general manager of the Newitt Advertising Agency, whose wide experience enabled him to give the members some valuable information on “Judicious Advertising.” He strongly advocated the free use of newspaper space, but advised the use of educational matter, for the reason that the public at large had much to learn of the economies and pleasures of the electric vehicle.

Chairman J. Harry Pieper tendered his resignation to the section, as, owing to the pressure of business, he found it quite impossible to give the required attention to this important position. The resignation was accepted after considerable discussion, as the members were reluctant to allow him to retire at this time.

Vice-Chairman Harry W. Harrison, southern California representative of the General Vehicle Company, was elected chairman to succeed Mr. Pieper, and R. R. Thomas, general manager of the Electric Equipment Company, was elected vice-chairman to succeed Mr. Harrison.

A telegram from Secretary A. Jackson Marshall was read, congratulating Los Angeles section on its electric vehicle double-page spread which appeared in the Los Angeles Times. The section has a standing committee to perpetuate this electric vehicle page, and at this meeting a committee was appointed to formulate plans to have the electric vehicle featured in all the fiesta parades, of which there are to be many during 1915.

The meeting adjourned and it was announced that the next meeting of the section will be held Tuesday, May 11.

Philadelphia Section.—The April meeting of the Philadelphia section was held on April 14 at the Colonnade hotel.

B. D. Gray, vice-president and general manager of the Hess-Bright Manufacturing Company, delivered an address on “Ball Bearings” which was well received and particularly interesting because of Mr. Gray’s long acquaintance with the subject and his achievements in that line.

Mr. Gray’s paper was excellent and complete, and without being too technical, gave a very detailed account of the progress made in the ball bearing industry. He called attention to the application of ball bearings in the construction of electric vehicles, told how and why they were used, and what to avoid in the case of improper lubricants.

A complete record of tests and a table of “don’ts” were also given. The paper was illustrated with charts, blue prints, models and specimens, which were passed among those present.

The membership committee reported one new member.

The Hammonton charging station committee reported progress, negotiations being still under way with the service company and owners of the garage at that point.

The traffic committee reported that they had negotiations with other similar bodies, and that they were preparing, in conjunction with these other bodies, some recommendations which they hope will be adopted for the improvement of traffic conditions.

The papers committee, A. W. Young, chairman, reported that they have arranged to have a representative of the N. W. Ayer & Son Company, national advertisers, read a paper at the next meeting.

F. E. Whitney, chairman of the garage committee, reported that the list of charging stations in Philadelphia is now ready for distribution. The list is being printed by the courtesy of the Philadelphia Electric Company,
and copies may be had upon request to the association.

Motion was made by A. W. Young, vice-chairman of the section, that the secretary be instructed to address a communication to Charles W. Roney, 605 Lincoln building, Philadelphia, with a copy of the following resolution:

That house bills Number 322 and 325 in the Pennsylvania Legislature give power to individual towns to make an additional tax on motor truck users, and that the Philadelphia section of the Electric Vehicle Association wishes to be put on record as opposed to the passage of said bills.

The motion was unanimously passed.

R. L. Lloyd, chairman of the section called attention to the coming convention of the National Electric Light Association, to be held in June in San Francisco, and read a letter from the general secretary, A. Jackson Marshall, in which it was suggested that the manufacturers of electric vehicles, batteries and accessories have representatives in attendance at the convention, and to be prepared to discuss the very complete paper on the subject of "Electric Vehicles," which is being prepared by President Gilchrist and the secretary for presentation at the convention.

Announcement was also made that the South Side Garage, at Fortieth and Ludlow streets, in West Philadelphia, was installing charging apparatus and would in the future be prepared to take care of electric vehicles at the usual rate of 6 cents per kwh.

The souvenir which was promised to each person attending this meeting proved to be the Smith & Cushing Handbook on "Electric Vehicles," which had an insert of sixteen pages and a map applying particularly to Philadelphia. A vote of thanks was tendered to the Philadelphia Electric Company through the chairman, R. L. Lloyd, for this generosity.

Denver Section:—The regular monthly meeting of the Denver section was held Tuesday evening, April 20, at the Colorado Electric Club, where dinner was served at 7 P. M.

The program of the evening was as follows:

Ross C. Brown, the Ohio electric sales engineer, reviewed a paper written and presented by David F. Tobias at the national convention, entitled "The Electric Vehicle in Department Store Service."

Frank A. Pim of the Beardsley Electric Company delivered "Electric Vehicle Conditions along the Pacific Coast."

James R. Strugnell, vice-chairman of the section, concluded the program by reviewing a paper written and presented by F. Nelson Caree of the General Vehicle Company, entitled "The Merchant, the Central Station and the Electric Truck."

St. Louis Section:—It is our very great pleasure to report that we have received advices from Milton B. Sherm, chairman, that the St. Louis section at their executive committee meeting of April 9 received many valuable and interesting reports from the various local committees. It is especially noteworthy to indicate that a local advertising campaign will be conducted under the auspices of the St. Louis section, in which the vehicle, battery, accessory, garage and other interests will cooperate. A. E. Archer, the chairman of the advertising committee, is rapidly developing plans for what promises to be a highly profitable campaign, which undoubtedly will be followed with interest by the entire electric vehicle industry.

It is expected that we will be enabled to report more fully as regards this development in the next section's report.

Mention at least, at this time, should be made of the fact that the membership committee of the St. Louis section, R. W. Leach, chairman, is about to institute an aggressive campaign for new members, and judging from advance reports, it is more than likely that the membership of the St. Louis section will be very considerably increased. This is work of the utmost importance and it is to be hoped that all other sections may institute successful membership campaigns.

ANNOUNCEMENT OF PAPERS

The National Electric Light Association will hold its thirty-ninth convention at San Francisco June 8-12, 1915.

Among a great wealth of papers scheduled for presentation at the convention, there will be a paper, "The Electric Vehicle and the Central Station," by John F. Gilchrist, president, and A. Jackson Marshall, secretary, Electric Vehicle Association of America, which is calculated to effectively place this highly important subject before the electrical industry in a forcible and convincing manner.

Table of contents of this paper follows:

PREFACE.

Part I. Introduction.

Part II. Central station styles of electric vehicles illustrated.

Part III. Some data on the cost of operating electric vehicles and notes on garaging.

Part IV. Value of electric vehicle charging load.

Part V. Relative importance of electric vehicle charging as compared with other classes of central station business.

Part VI. Possible electric vehicle market and income to central stations in comparative small cities.

Part VII. Solicitation—electric vehicle bureaus.

Part VIII. A creed.

President Gilchrist will present the paper, and it is expected that his message will be received by the central station executives, as well as other influential and active representatives of these organization, and thereby insure the subject that careful attention which will likely lead to desired results.

It is suggested that the manufacturers of electric vehicles, batteries and accessories have representatives in attendance at the convention, and be prepared to follow up and take full advantage of whatever impetus the paper may lend to the electric vehicle industry.

Chicago Meeting:—On April 22, at the Hotel Sherman, there was a big voltage put into the circuit of electric vehicles at the joint meeting of the Electric Vehicle Association and the Jovian Order, when John F. Gilchrist, president of this association, addressed some enthusiastic electric vehicle men on the subject "Electric Vehicles."
Electric Taxicabs for Principal Cities

Detroit, Chicago and New York Tests Prove Electric Logical Type

The fitness of electric taxicabs for city traffic is fast establishing itself in the minds of many taxi and rental service owners. One of the foremost advantages that recommends it so strongly is its low operating cost. That it is cheaper to run than either gasoline or horse-drawn vehicles, has been proved beyond a doubt. Electric current is cheap, while the modern powerful storage battery is wonderfully efficient. Tire expense of an electric is reduced to a minimum and its simplicity of mechanism eliminates heavy repair bills. This is of the utmost importance in a business based wholly upon running vehicles for profit and where economy is of more importance than running a private pleasure car as a luxury.

The most extensive application of electric to taxicab service at present occurs in Berlin, where about six hundred electric taxicabs are in use. An ordinance has been passed by the Berlin municipal authorities, limiting the number of gasoline driven cabs in order to prevent introduction into circulation of a number of gas cars in excess of public necessity. "This will eventually help the introduction of electric cabs in this city," states the director of police at Berlin.

The Germans have approached the subject of transportation and traffic with the same scientific skill that characterizes all their organizations of worldwide industries and the electric vehicle has been favored by the Germans only after it has been put to the test and answered most thorough requirements.

Probably the best example of electric taxi development in the United States, strange to say, is in Detroit—the home of the gasoline car. The Detroit Taxicab & Transfer Company, which is one of the oldest gas taxicab companies in America, is now operating a fleet of 10 electric, which is being increased to 70 or more. It was only after much experimentation that this company became convinced that the old style cab had grave faults, and began a campaign for better taxis. The first electric with which this company experimented showed a mileage of 1,375 miles in one month, and by the time it had run 12,000 miles it had proved itself beyond a doubt. In all this time, this car had not had any accidents or repairs, and had gone through mud and high snow banks, and over the roughest kind of pavements. That it was the most popular taxi in the service and was always in demand, proved that the public wanted electric taxis, and they got them.

It was felt that the general efficacy of the electric taxicab would force recognition in the near future, and there is now concrete evidence that the next few months will witness an initial installation of electric taxis on a large scale in New York. The company responsible for this introduction will shortly thereafter extend its service on a large scale in all the principal cities in this country and it would appear that the specially high grade electric taxi service will rapidly attract the cream of the taxi and rental service in the cities in which these electrics are introduced.

It probably would be of interest at this point to report an interview with E. P. McDowell, of New York, former president of the Renault Taxi Service Company, and later president of the Motor Taximeter Company. Mr. McDowell has been identified with the rental of cabs for many years and has had experience with both gasoline and horsedrawn vehicles. According to Mr. McDowell the first taxicabs were introduced into the United States from Paris and London about 9 years ago, and at the beginning were a great success. They were such a novelty and the rates seemed so low that it was almost impossible to supply the demand. This resulted in the formation of numerous taxicab companies. Very naturally competition became keener and profits smaller, due chiefly to the fact that dead mileage increased. The public had learned gradually to hire a taxi to go from point to point, knowing that after paying and dismissing the chauffeur, another cab could easily be procured if desired. They had learned not to pay for waiting time, which had usually been done before.

A great many taxi companies of the get-rich-quick type sprang up with alluring prospectuses to entice investors and very soon over 40 companies were operating in New York City. However, they existed for only a short time, ending in bankruptcy and losing all the investors' money. The legitimate taxicab companies greatly suffered during this time of instability and speculation, and by 1913 only eight companies were operating out of nearly 50 that were in business in 1911.

In 1913 the public agitated a movement for cheaper rates and one of the New York papers started a campaign for low rates and abolishment of private taxicab stands in front of hotels and clubs, etc. This was finally accomplished about August 1, 1913, and former private stands were thrown open to the individual or public chauffeur, and the rates were reduced. After one year's trial, the result of this at the present time is evident.

It has been indeed a decided failure. In the first place many chauffeurs had been discharged from various companies for dishonesty and bad conduct,
and after the city's ordinance had been passed, these
men bought cheap second-hand cars and started in
business. These very men are today a constant menace
to the safety of the public. Not only are the lives of
their passengers often endangered—as the police court
records will show—but pedestrians are in just as great
danger from the incompetent and reckless driving of
many taxicab chauffeurs.

The rates having been arbitrarily reduced, it was
impossible for the taxicab companies to renew their
equipments and keep up to their former standards of
high-class service, which cost 32 cents per mile. This
figure is entirely accurate as I know from my own
experience, having owned and operated the best for-
ign and domestic gasoline cars for several years.

One of the most uncertain expenses in operating
the gasoline taxicab is the cost of damage and accident
claims. The use of excessive speed by chauffeurs, in
streets where traffic is congested, coupled with the
carelessness of pedestrians, is a source of bad accidents
in New York.

A short time ago Mr. Scriminger, owner of
the Detroit Taxicab and Transfer Company, perhaps the
oldest taxicab operator in this country, was fast dis-
carding his gasoline taxis for electric taxis. This event
created a great impression on me, particularly as it
happened in Detroit, the home of gasoline cars in
America! I at once started a quiet investigation with
the following results: I became convinced that the
only safe and sane cab for city use is the electric tax-
cab. Its advantages are so numerous that it is almost
impossible to cite them in such a limited space. In
the first place, I have observed that the electric has by
far the lowest operating cost. The cost of current is
low, repair expense is marvelously low and the life of
an electric is from 10 to 15 years or more. The elec-
tric taxicab maintains a good average speed, run-
ning smoothly and silently without the sudden spurts
caused by the whimsical chauffeur. Simplicity and
positiveness of control insure instant stopping, and
there is no lost time in traffic on account of changing
gears. The electric starts as quietly as it stops and
is well under way before the other cars have picked up.

Another advantage which should appeal especially
to the patrons of taxicabs is the absolute cleanliness
of the electric in every detail. There is no oil, no engine
dirt which soon produces a grimy, unsightly operator.
There is none of that obnoxious and penetrating gaso-
line odor and smoke. The passenger is able to sit
back comfortably and enjoy his ride without nerve-

racking exhaust explosions or grinding of gears. He
can converse easily in ordinary conversational tones
without continuously straining his voice to a high pitch
in order to overcome the noise of the gasoline engine.

Not one of the least advantages is to the chauffeur
himself. Any operator who has driven a gasoline
taxicab, through the crowded congested streets of
New York, will tell you that it is like getting a vacation
to drive an electric taxi. The importance of this ease
of operation has a direct bearing on accidents. The
over-
strained and tired-out chauffeur is much more likely
to be involved in accidents than the operator who has
not been overtaxed.

With several months of tests over stiff hills and
in city traffic the electric has maintained an average
of 39 miles on a single charge. Experience has shown
that the average daily mileage of an active taxicab
for a 10-hour day is about 35 miles, well within the
capacity of one battery charge. With the charging
facilities now available, the electric taxi may be
boosted at relatively high current while waiting at
stands for calls which enable the electric to obtain
almost unlimited daily mileage.

It is interesting to note that some of the large
gasoline taxi fleets have only about 65 per cent of
their entire equipment, including taxis waiting at stands, in
operation at any one time, while the remaining 35
percent are either inactive or in the repair shop. Add
to this the fact that gasoline taxis are usually operated
only 11 or 12 hours a day, and it will be realized that
there is a large amount of inactive investment which
naturally influence the operating costs considerably.

It is quite possible to operate the electric taxicab
20 or more hours a day with two shifts of chauffeurs.
But this method, although tried in the operation of
gasoline taxicabs, has never proved successful. The
Economy of long hour operation of electric vehicles is
at once evident.

After experimenting with several makes of electric
vehicles for the past few months it is found that they
can be operated for something in excess of 20 per cent
less cost than a gasoline car. They are well con-
structed, and there is continuous improvement in
design and speed. They are much lighter in weight
than formerly. A lower rate of insurance is a thing
that will further reflect the economy of operation.
Owing to the positiveness of control of the electric,
collisions are reduced to a minimum and insurance
companies will be compelled to give justifialbe rates.
Ball Bearings for Motor Vehicles

Hess-Bright Ball Bearing Construction, Testing and Assembling

BY B. G. GRAY

ANTIFRICTION qualities of ball bearings have long been known. Until recent years, however, the ball bearings actually devised have been unreliable. While they lasted, they ran well, but they broke down too easily, the principal reasons being: faulty design; the use of steels insufficiently hard and not uniform; and inaccuracies of size and form, which resulted in unequal loading of the balls and the consequent destruction of those overloaded.

Very little reliable information of value on ball bearings is to be found in the usual engineering and textbooks even today. Seventeen years ago there was little of any kind extant. About that time (1898) Professor Striebeck, the well-known head of the Technical Laboratories at Neubabelsburg, near Berlin, was commissioned by one of Germany's leading industrial establishments to make an investigation of sliding, roller and ball bearings. Having taken up the manufacture of balls and ball bearings, this firm, the German Small Arms and Ammunition Works, of Berlin, very soon felt the imperative need for a scientific basis, if the manufacture were to be removed from the domain of haphazard blind working, resulting one time in success and another time in failure—one quite as much the result of pure chance as the other.

With characteristic thoroughness, Striebeck began with first principles, starting from the investigations of such authorities as Hertz and Auerbach on the deformation of elastic bodies. (See Hertz "On the Contact of Elastic Bodies" and "Ball Bearings," a paper by Henry Hess before the A. S. M. E., at Indianapolis, Ind., May, 1907, and contained in Volume 29 of the Transactions, which contains a translation of Professor Striebeck's report.) Exhaustive tests served to fix the physical constants of the steels that might be suitable. Then followed a series of investigations into the conditions of correct relative motion of the bearing elements. Finally a long and patiently conducted series of observations of many types and sizes of bearings rounded out the whole.

Various tentative designs were thus tested out at every point and, more important, practical working data for the use of the designer and the engineer were authoritatively obtained. As a result, the following requirements of ball bearing construction were formulated:

2. Use of alloy steels of much more than ordinary toughness and hardness.
3. Microscopic accuracy of size and form, down to a small fraction of a thousandth of an inch, in order that each ball may bear its share of load.
4. Uniform hardness from surface to center of both balls and races.
5. A mirror-like polish as a final touch to perfectly ground surfaces.

Difficult as the production of a perfect ball is under ordinary shop conditions, specialists can now manufacture balls that are true spheres to within one ten-thousandth part of an inch, at relatively small cost. This led to numerous attempts to employ a series of rows of balls instead of rollers, in none of which was proper provision made for taking care of the deflection of the shaft and box under load. After an endless number of expedients to provide for proper load distribution had been tried without success, the simple plan of using a single row of balls and that of suitable proportion for the load was adopted. This resulted in a journal having no appreciable length and according the free from trouble caused by deflection. (Hess-Bright
annular bearings will permit tilting the inner race, with respect to the outer race, approximately \( \frac{3}{8}" \) to \( \frac{1}{4}" \) in 12", this being dependent upon ball size, groove radius, and clearance between ball and grooves.) The problem was then to proportion the diameter and the number of balls to the load to be carried. As the number of balls in a single circle was necessarily limited and as the journal diameter could not be indefinitely increased, it became important to develop the carrying capacities as affected by the shape of the ball tracks and the nature of the materials. The necessary design data were found to exist in the observation and experiments conducted by Stribeck.

It was found that the frictional resistance was least for balls rolling between straight line sections, or perfectly flat surfaces, giving two points of contact. Increasing the points of contact to three and four produced higher frictional resistance without materially affecting the carrying capacity. Curving the race resulted in an important increase in carrying capacity with a barely measurable increase in friction. This greater carrying capacity is accounted for by the fact that in a rolling bearing, in the absence of grit, there is no wear as in a sliding bearing, but a destruction by crushing of the surfaces in actual contact. This point in the race, when overloaded, is flaked out. If, in a ball bearing, the race is curved, the stressed particle cannot be flaked or pushed out, being confined and supported by the wedges of material on either side. The resistance to crushing is thus greatly increased by curving the race.

From his experiments, Stribeck developed the following equation for the carrying capacity of an annular or radial bearing:

\[
P = k d^2 n \text{ in which}
\]

\[
P = \text{carrying capacity of bearing in pounds.}
\]

\[
d = \text{ball diameter in eighths of an inch. e. g. } \frac{3}{8} \text{" diameter ball, } d = 4.
\]

\[
k = \text{a constant dependent upon the material, the shape of the ball supporting surface, and the speed.}
\]

This is the commonly accepted equation for determining the carrying capacity of a radial bearing and one much made use of by those exponent of the theory that the carrying capacity of a bearing is directly proportional to the number of balls contained. Other things being equal, this would be true, but it must be borne in mind that the race cross section plays a vital part also in determining the carrying capacity of a bearing. Any device may be employed for the insertion of a larger number of balls than can be gotten into the bearing by eccentric displacement, such as filling slots, making one side of the race groove shallow, etc., weakens the race and hence results in a decreased carrying capacity. A bearing with continuous rings, deep ball grooves, and as many balls as can be inserted without forcing, makes the best bearing. These stiff rings are susceptible of extreme accuracy of manufacture, and maintained accuracy in service, even though mounted in slightly out of round housings.

A few tests of deep groove bearings and other makes with larger number of balls will, I believe, prove interesting and at the same time bring out clearly the point which I wish to make. In these tests bearings corresponding to D.W.F. No. 308 were tested under a radial load of 2500 pounds at 1445 R.P.M. The rated steady load carrying capacity of a No. 308 bearing at 1445 R.P.M. is approximately 775 pounds. The radial load of 2500 pounds was selected in order to bring about quick results, since the number of hours run before failure occurs is all that is needed for comparative purposes, and gives a true indication of the relative endurance of the bearings.

<table>
<thead>
<tr>
<th>Bearing Size</th>
<th>Run Before Failure</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>H.B. No. 6308</td>
<td>8 - 8&quot;</td>
<td>1863 ft</td>
</tr>
<tr>
<td>H.B. No. 6308</td>
<td>8 - 8&quot;</td>
<td>1763 ft</td>
</tr>
<tr>
<td>&quot;A&quot;</td>
<td>13 - 8&quot;</td>
<td>874 ft</td>
</tr>
<tr>
<td>&quot;B&quot;</td>
<td>13 - 8&quot;</td>
<td>79 ft</td>
</tr>
<tr>
<td>&quot;B&quot;</td>
<td>8 - 8&quot;</td>
<td>584 ft</td>
</tr>
<tr>
<td>&quot;C&quot;</td>
<td>11 - 8&quot;</td>
<td>32 ft</td>
</tr>
<tr>
<td>&quot;C&quot;</td>
<td>10 - 8&quot;</td>
<td>46 ft</td>
</tr>
<tr>
<td>&quot;D&quot;</td>
<td>10 - 8&quot;</td>
<td>91 ft</td>
</tr>
<tr>
<td>&quot;D&quot;</td>
<td>10 - 8&quot;</td>
<td>26 ft</td>
</tr>
<tr>
<td>&quot;E&quot;</td>
<td>13 - 8&quot;</td>
<td>475 ft</td>
</tr>
<tr>
<td>&quot;F&quot;</td>
<td>12 - 6.610&quot;</td>
<td>634 ft</td>
</tr>
</tbody>
</table>

To assemble balls into a bearing having flat races is simple enough, but when the race is curved some provision must be made for inserting balls in excess of those introduced by eccentric displacement. The obvious thing is to cut a narrow cross channel, known as a "side filling opening." But as the carrying capacity of a ball bearing with uninterrupted race section is greater, it follows that any opening for the side filling of the balls, which would break such section, would correspondingly locally reduce the capacity.

Such an opening would have to be kept on the unloaded side of the bearing, or avoided altogether. Riebe's design, our first development and the predecessor of the present annular ball bearing was of this kind. The balls were introduced through a cut in one race at the side, the continuity of the race being restored by a "filling in piece." Still the cut constituted a weak point, and a screwhead was utilized to keep this joint at the unloaded side.

To Conrad belongs the merit of eliminating the filling opening and providing an annular bearing of continuous race and uninterrupted groove. Incidentally, also, all of the troubles due to interference between balls and filling opening edges were done away with.

To assemble this bearing, now generally known as "Hess-Bright," "HB" or "DVF," the inner race is placed eccentrically with the outer, the balls are filled into the crescent-shaped space between, the races are centered, the balls are distributed and a cage is provided to maintain the proper distribution, to prevent the balls from rubbing against each other, and incidentally forming a unitary device.

The problem of producing a successful ball bearing was not solved with the adoption of the proper cross section and form. It has already been pointed out that truth of shape is necessary to true rolling and the avoidance of sliding. Loading must inevitably cause some distortion and so introduce sliding action. This sliding action must be minimized by using materials sufficiently elastic to avoid permanent deformation.

This demands steels of the very highest grade, most carefully hardened, and eliminates all case-hardened materials. These demands made on the ball ma-
terial are made on the race materials in even higher degree. In time, the entire surface of the ball is presented to the load, vibration or change of load, either in amount or direction, sufficing to frequently bring in a new axis of rotation. As one of the races is usually fixed, it harks back to the same point to the action of the load. It may safely be said that only the advent of high-grade alloy steels has made the ball bearing possible as a heavy load-bearing machine element. They are being used with satisfaction in automobiles, electrical, flour and woodworking machinery, in street railroad motors, on street and steam railway main journals, in line shaft hangers, and in countless other applications where power economy and freedom from wear are desired.

Naturally, satisfactory service from a ball bearing can only be secured when the bearing is designed to conform to the service for which it is intended. The elements entering into such design are the direction of the load, whether at right angles (radial) to the shaft, parallel with it (thrust), or acting at an angle. Within each type, sizes are affected by the loads and by the speeds. Bearings are further affected in their relative arrangement by varying combinations of load, direction, load and speed.

Bearings for carrying radial loads are commonly known as “radial” or “annular” bearings. Resistance to the shock of a given load is greater, the greater the ball diameter. When shock is present, of two bearings having the same carrying capacity, that having the larger balls should be used. Radial bearings, as commercially manufactured, are made up in three series—light, medium, and heavy weight series. Thus for a given bearing bore, a choice between three sizes of bearings of increasing capacity and ball diameter is afforded.

Bearings for carrying thrust, that is, load parallel to the axis of the shaft, are commonly known as “thrust” bearings. In these, the ball tracks are arranged in planes at right angles to the shaft axis. To secure the full carrying capacity, the two collars must be in practically absolute parallelism. A deviation of less than one ten thousandth of an inch will concentrate the entire load on a few balls at one side, overload these and reduce the bearing capacity. To secure exact parallelism between the shoulders on a shaft and the housing seat, even under deflection and the small yet important and unavoidable errors of workmanship, one collar is generally given a spherical surface, which permits it to adjust itself in its corresponding cuffed seat and thus secure the parallelism required.

Radial bearings are capable of carrying considerable thrust load, amounting in the deep groove or Monarch type to about 25 per cent of their rated radial capacity. Where it seems desirable to subject radial bearings to thrust load, it is advisable to consult with the bearing manufacturer.

Angular loads may be carried on our 2RO bearing. By a suitable combination of radial and thrust bearings, since all angular loads may be resolved into radial and thrust components.

Mention has been made before of the necessity for precision in manufacture, and it may be stated as an axiom in ball bearing manufacture that “the value of a ball bearing is in direct ratio to the accuracy attained in the manufacture of its component parts, and the suitability of the material entering into them.” The limits of tolerance are much smaller than are generally considered feasible. The finish of the working surfaces of the balls and races must be of the highest. Grinding or polishing marks that may be detected, by the naked eye, condemn balls and the ball tracks utterly. Oft-repeated endurance tests under conditions where the finish was the only variable, abundantly proved this, at first unsuspected, fact. The higher the finish, the better the endurance of the bearing. Micro-photographs of ball surfaces reveal what appears to be an absolutely flawless surface in reality composed of fine scratches, pittings and even gash-like defects, according to the care devoted to the final operation. More polish alone will not do; the polish must be the final touch applied to truly ground surfaces.

The balls must represent as close an approach to true spheres as it is possible to realize. Moreover, all of the balls in a bearing must be closely alike in size, the allowable variation being extremely small. It is evident that a ball larger than its fellows must receive more than its share of the load and therefore transmit a correspondingly greater pressure to the race, resulting in excessive and unsafe loading for both elements. On the other hand, an undersized ball will be under-loaded, or not loaded at all, its fellows, having to take its share of the burden, must correspondingly carry more than their proportion. Variations from truth of outline have effects locally similar to size variations. To secure the necessary even division of load, the balls in a bearing may not vary more than one ten-thousandth of an inch from one another and from truth of shape. That this demands the most painstaking accuracy of manufacture and rigid inspection is clear.

To insure interchangeability of the bearings, the bore of the inner race and the outside diameter of the outer race are held to within a few ten-thousandths of standard size, the former being determined by proper plug gauges, the latter by snap gauges. By means of special fixtures, the eccentricity of the inner and outer races can be accurately determined. The eccentricity of the inner race is that lack of running truth noticed upon the stationary outer race when rotating the inner race and balls upon true centers. The eccentricity of the outer race is that lack of running truth shown upon a suitable indicator during the rotation of the outer race and balls upon the inner race fixed upon a stationary arbor.

But not only is accuracy in shape essential; a similarly high degree of precision in the physical characteristics of the steels is quite as essential. While the determination of uniformity of dimension is a matter of accurate measurement by methods highly refined yet familiar to many, the measurement of material quality, particularly of hardened steel, is by no means simple. Very little is, in fact, really known about the qualities of hardened steel. Ask half a dozen men, good mechanics, engineers, metallurgists or scientific investigators, what constitutes hardness (from an absolute standpoint)—they will not agree on a definition. Hardness is comparative, only. Various methods of determining comparative hardness are used, the two most commonly employed being the Brinell and Scleroscope tests.

The Brinell test is founded upon the effect produced on a substance by a known load pressing through a spherical ball into the surface of the material to be tested. The method of working is as follows: The weight or load given in kilograms is generally
3,000 for iron and steel and 500 for softer metals and alloys. The pressure is applied hydraulically by means of an oil pump and is transmitted through the plunger to a hardened steel ball 10 mm. in diameter, which makes a cup shaped impression on the test piece. From the capacities of this impression, the diameter of the ball and the load a formula has been developed and a table of hardness numerals computed. From this table you can readily read off the Brinell hardness numeral, knowing the load and the diameter of the indentation. This test is not very suitable for hardened rings, since having the same degree of hardness as the ball used, the indentation is small, difficult to measure, and likely to introduce error.

In Shore's Scleroscope a small cylinder of steel, with a diamond point, enclosed in a glass tube with graduations of arbitrary units, is allowed to fall upon the smooth surface of the material to be tested. The hardness number is the height of the rebound of the hammer. The hammer weighs slightly over two and one-half grammes. The height of the rebound from hardened steel is in the neighborhood of 100 on the scale, or about 180 mm., while the total fall is about 10 inches, or 254 mm.

After all, the final test is the finished bearing. At frequent intervals completed bearings from regular lots passing through the shops are subjected to tests for load to failure, and for endurance by running them under various conditions of load and speed in special testing machines built for this purpose.

Ball bearings do not differ from other elements of mechanism, in that they must be used in conformity with their individual characteristics.

Directions for correct mounting that are hereafter cited must be absolutely adhered to under penalty of failure.

A strict adherence to all of the directions—and there are neither many nor troublesome—will result in a reliability as near to absolute as even the most exacting can expect—a reliability far beyond that of any other form of journal—and such reliability is gained with the advantages of a practical absence of friction, small space occupied, and the minimum of attendance. Surely these are advantages enough to make a careful study and following of the directions worth while.

1. The proper size selection for the load must be made. Ratings of loads and speeds are generally published for steel loads and speeds. Variations from these conditions demand recognition by corresponding variations of the listed capacity.

2. Bearings must be lubricated. The oft repeated statement that ball bearings can be run without lubricant is pernicious.

3. Bearings must be kept free of grit, moisture and acid. This prohibits the use of lubricants that contain or develop free acids. It is entirely practicable, by very simple means, to follow injunctions 2 and 3.

4. The inner race must be always clamped solidly to the shaft, so that no vibration can cause it to turn. This requires that the shaft be ground perfectly true, in order that it may make contact with the race all around, not merely at a few points. Unless this is done, a peening action will start, resulting in looseness. The race itself should be secured with a light press fit, and very solidly clamped between a nut and shoulder.

5. The outer race must be mounted in such a manner as to permit free endwise movement. This has two beneficial effects. First, it avoids any possibility of an undesired endwise cramping of the balls in the race; second, such minute wear as occurs in the ball path is distributed around the entire circumference of the latter. To accomplish these results the housing must be accurately bored to such a diameter that the outer race will be a sucking fit in it, and the race is either left entirely endwise or is confined between shoulders which give it a slight endwise freedom amounting to 1/64-inch or less. Only one bearing on a shaft may be confined endwise in this manner, since otherwise expansion or errors in machinery or workmanship would produce undesirable axial or endwise cramping.

6. The bearing enclosures must retain oil or grease, while excluding dust, wind and water. Finally, after having observed the above precautions, submit your design to the bearing manufacturer and get the benefit of his experience. By so doing, many little things which you, from your experience may consider of minor importance, but which he, from his broader experience knows are pernicious, may be avoided.

One of Stribeck's findings that completely reversed previously established theory was the relatively high carrying capacity and low friction of the ball bearing as compared with the roller. Prior to the knowledge gained from these tests, differences in the two were predicated upon the theory of a line and a point contact, assuming that there was a pure rolling action in both cases. But pure rolling is a theoretical possibility merely, requiring for its realization absolutely true shapes initially, and inelastic materials that will not change shape under load. For example, to produce a series of rollers truly cylindrical and alike as to diameter, also a perfectly cylindrical shaft, and a truly cylindrical box, within the requisite small limits of error necessary to produce pure rolling motion with point line contact, is difficult and commercially not realizable. The taper roller bearing presents still greater difficulties. Under heavy loads such accuracy as may be obtained is largely defeated by deflections of the machine framing or shafting. This causes the rollers to skew more or less, and it follows that the theoretical long line contact of the roller does not exist in fact, but is limited to a small fraction of the roll length.

One of our customers who has also used taper roller bearings and who has a well-equipped physical laboratory in which he has made numerous careful bearing tests, informs us that the co-efficient of friction of our bearings is one-fourth that of taper roller bearings even when the latter are tested under the most favorable conditions—more favorable than are frequently obtained in actual service.

The co-efficient of friction for properly made ball bearings will average about 0.0015, while based upon the above mentioned tests, the co-efficient of friction for taper roller bearings would average about 0.006.


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<th>Bearing</th>
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It will be noted that the coefficients of friction, for all three types of bearing, decrease with increase of bearing temperature and load (for loads and temperatures given).

This same customer mentioned before as having experimentally determined that the co-efficient of friction of our bearings was one-fourth that of taper roller bearings, also states that a decided difference may be observed in the coasting properties of their automobiles.

In any tests of this nature, the taper roller bearings are likely to be adjusted to a nicety. In actual service and in the hands of the layman or a careless chauffeur, or repairman, they may be adjusted so as to cause a tremendous increase in friction. As many of us know from experience, a taper roller bearing makes a fine clutch when set up endwise tightly with a nut.

The much vaunted adjustability of the taper roller bearing to compensate for wear is mythical. It is not susceptible of adjustment in the true sense of the word except when it is new and when all parts have been accurately made. If the cup or the cone has worn out of round, or if any of the rolls have been unevenly worn, it is an absolute impossibility to adjust the bearing so that the rolls bear evenly all around and any attempt to adjust it results in misalignment, undue stress and strains, and probable early destruction of the bearing or correlated parts. The non-adjustable annular bearing mounted in such a way that an inexperienced or careless person in removing it cannot replace it in any but the correct manner, has a decided advantage over any bearing which may be adjusted.

Annular ball bearings, if properly selected as to size, properly mounted and enclosed, are quite as reliable and durable as any other part of an automobile. Several years ago there arose in this country a feeling that annular ball bearings were not suitable for mountings where they would be subjected to considerable end thrust and especially end shock as in front hubs. The reason for this was due more to improper selection and mounting, supplemented by extensive advertising of roller bearings, than to inherent fault in the ball bearings. A number of automobile manufacturers have retained annular bearings in the front hubs of their cars with most satisfactory results. Abroad practically no roller bearings are used in automobiles in any location. The annular bearing is almost universally used throughout the car and has not been a source of trouble in hubs as was claimed for it in this country. It is said by some that the excellent roads in Europe do not impose such severe service on wheel bearings as the poor roads in this country. From personal experience in driving 16,000 miles in five countries on the continent, I am convinced that hub bearings on European cars do not have an easier time of it than those in the hubs of cars used in this country.

As I have already pointed out, the theoretical line contact of roller bearings is only rarely obtained, since it depends upon extreme accuracy of manufacture of the cup, cone and rolls, upon perfect alignment and upon keeping the rolls in their proper position. In the ball bearing we have not a point contact as many suppose, but a substantial area due partly to deformation and partly to the shape of the parts in contact: I refer to the concavity of the ball path or grooves whose radius in one direction very nearly coincides with that of the ball.

This was very clearly brought out in a test which we made a short time ago. One and one-half inch diameter balls in contact with a “flat” disc, a “grooved” disc, and a “cupped” disc, were subjected to a load of 10,000 pounds in our testing machine. “Vitriol” was applied around the contact points and allowed to etch the exposed surfaces, i.e., those which were not actually in contact. Then the load was relieved and the contact diameter was measured by means of a micro-meter microscope. In the cases of the “flat” and “cupped” discs, the areas of contact were circular, but in the case of the “grooved” disc, the area of contact was elongated resembling an ellipse. The pressure per unit area was computed and found to be:

- “Flat” surface: 181,395 lbs. per sq. in.
- “Grooved” surface: 212,766 lbs. per sq. in.
- “Cupped” surface: 146,413 lbs. per sq. in.

This test shows clearly the reason for the increased carrying capacity of the curved (grooved) ball track type of bearing as against that type with flat or practically flat tracks. It is self-evident that the more closely the groove envelopes the ball, the lower will be the pressure per unit area and hence the greater will be the ability to carry load.

As an indication of the capacity and durability of ball bearings, I will give you the results of a test recently completed. A No. 6407 bearing was subjected to a radial load of 3,500 pounds thrust load of 1,750 pounds and run continuously at 1,445 R. P. M. for 531/4 hours before failure occurred.

This bearing has a bore of 35 mm. (1.3780") outside diameter of 100 mm. (3.9370") and a width of 25 mm. (0.9843")

To get an idea of what the above radial and thrust load figures would be the equivalent of in automobile front hub service, let us assume a 36-inch wheel running at 1,445 R. P. M. This would mean a speed of 154.6 miles per hour. A run of 531/4 hours would be the equivalent of 154.6x531/25 or 82,141 miles.

Also assume that two bearings are used to a hub, one carrying 3,500 pounds radial load and 1,750 pounds thrust, while the other carries 3,500 pounds radial load only. The total radial load per hub would then amount to 7,000 pounds per hub, and with four hubs (assuming the rear hubs carry the same load as the front hubs—in the average car they carry more) the total load would be approximately 28,000 pounds.

Based on the above, conservatively, this would be the equivalent of 82,141 miles in the front hub of a car weighing (with live load) 7,000 pounds and running continuously at 154.6 miles per hour (allowing a factor of 4 for shock).

Of course, in the final analysis, relative capacities of ball and roller bearings can best be determined by test, but we do not fear any comparative test made without prejudice.

The question of lubrication is a matter of such vital importance to the satisfactory operation of ball bearings that a paper of this character would hardly be complete without some reference to it. Several years ago one of our representatives, W. L. Batt, covered the subject very fully, and I herewith give extracts from his paper:

Oil is essential for the operation of plain bearings, but it is not so well known that ball bearings likewise require a certain amount of lubrication; it is all too frequently assumed that the latter may run entirely dry.
Contrary to this assumption lubrication has a very positive effect in reducing friction. In this bearing many small, existing both between the ball and the path upon which it rolls and between the ball and the separator. Though the principle of the ball bearing is a rolling one, there is in the most perfectly designed bearing a sliding action which, however slight, must yet be provided for. If balls and raceways were absolutely incompressible there would in practice be solely point contact and, therefore, a pure rolling action, but as far as present mechanical processes go every material, perfect of materials are somewhat elastic and there is an actual area of deformation between the ball and the raceway under pressure, which, whose diameter is, of course, very small, sliding must exist, but the presence of a lubricant at this point renders what small amount of friction there is almost negligible. Improvable as it may seem, there is an actual film of lubricant maintained between these surfaces of contact, however minute they are, providing the lubricant be one of sufficient viscosity.

Aside from its lubricating quality, oil or grease acts as a protecting agent for the ball bearing. The finely polished surfaces of balls and raceways are subject to attack by rust through atmospheric action and may be damaged by the entrance of foreign matter from the outside, such as grit and dust. Just as acid is a thing to be guarded against in oils, so is free alkali the most common enemy to ball bearings, among the greases. The familiar yellow cup grease is usually a combination of a mineral oil and some vegetable or mineral oil, which is a mixture of free acid and the alkali. The result is a lubricant having body and stiffness. The saponifying material should be small in quantity and very carefully added, and the alkali, having saponified the film on the steel may result. The action of an alkali, as of an acid, is to pit or etch the surfaces upon which it is deposited.

The addition of mica, ground cork, wood and such substances, frequently added to overcome noise in gear cases of automobiles, is a positive menace to the ball bearing, since this foreign matter opposes free ball rotation; if it be present in large enough amount, the result may easily be that the balls are wedged between the raceways and actual fracture may result. Certainly the free rolling quality of the ball bearings will be lost.

The question of the beneficial effect of graphite in ball bearing lubrication is one often asked. The answer is simply that graphite in any shape or form that will settle and pack with a film will have quiescent cannot be of assistance to the ball bearing itself.

Parenthetically:—Some time ago we made a few tests of graphite oils and greases as ball bearing lubricants. We tested a No. 308 bearing running under 100 per cent overload and using a graphite oil as the lubricant. The test was normal in every way and nothing unusual was noticed. After a run of 337 hours the bearing was removed and examined and it was noticed that a considerable amount of wear had occurred—much more than was the case in similar tests where only a pure oil or light grease was used. The only conclusion we can draw from this is that the graphite in the oil, in spite of its being extremely finely divided and practically imidental, had a slight action, that the bearings developed similar qualities of the bearing. On the contrary, it is slightly injurious and tends to increase the friction slightly over that when oil alone is used.

Another test was conducted with a graphite grease which the manufacturers recommend for the lubrication of ball and roller bearings. It was a heavy grease with finely pulverized graphite. A trial was made of this by putting a quantity into the thrust bearings of one of the “heads” of our endurance testing machine. After a run of a few days the head became very noisy and finally “locked” the shaft. Examination of the bearings disclosed very distinct and somewhat irregular markings in the ball tracks—something like long chatter marks—as if the graphite had caused each ball to slide a short distance, thus slightly abrading the surface of the steel, until a little mound of the graphite had packed so hard under the ball that it was forced to roll over, only to repeat the sliding until another mound of graphite had packed under it.

These results show clearly that graphite has no value in so far as reduction of ball bearing friction is concerned, and while it may be of considerable value to the other elements of the bearing, it has little bearing on itself and the bearing box as a whole—such as transmission gears, etc., the possible source of damage to the ball bearings cannot be overlooked.

The effect of speed upon the choice of lubricants should also be considered. As a general statement, greases are suitable for low speeds, while oils are preferable for high speeds. Oil is really the better all around lubricant. It should be of sufficient viscosity to maintain a film between the surfaces and the quantity used should only be enough to cover the surfaces—at high speed—the less, the better. Oil is more difficult to retain in the bearing box than grease. This, however, is merely a detail of design since it is an easy matter to design a box that will not leak oil and then it is simply a question of good workmanship to make sure that the joints are tight.

Quoting again from Mr. Batt’s paper:

In order that the lubricant may be effectively retained, various arrangements are used, depending upon the conditions surrounding the bearing. In the simplest sort of mountings for a radial bearing the shaft projects through the casing, and the casing itself is provided with two lips, between which is a space for lubricant. If the conditions be such that additional protection is needed, one additional groove is provided and this may be fitted with a cup of some sort from which grease will be steadily fed to the groove to keep that filled. This makes a definite frictionless packing. For will more severe conditions a third groove is added; in the latter groove felt is occasionally placed, whose adherence to the shaft is guaranteed by some sort of spring tension. Unfortunately, this is subject to drying out and thus loses its efficiency; when that occurs it is a positive detriment.

The single or multiple groove arrangement empty or with only grease filling is the most effective; but it is essential that the bore of the lips be not more than 1/64-inch larger than the shaft in diameter, that the lips be be sharp instead of rounded over, and that the lips be at least 3/32-inch wide. The grooves may also be cut in the shaft, leaving bands between with sharp edges. The only objection to this is the weakness of the shaft.

In view of the fact that you are all primarily interested in electric vehicles, it has occurred to me that it might be well to specify where ball bearings are used on “electronics.” Doubtless many of you already possess this information, but for those who do not, it will prove interesting.

On all types of electric vehicles, whether “chain.”
“bevel”-shaft or “worm” shaft drive, ball bearings are used in the wheel hubs, on the armature shaft of the motor, and on the differential.

On the “chain” drive, they are used on the jack-shaft alongside of, or directly under the driving sprockets.

On the “bevel” shaft drive cars, ball bearings are used back of the bevel pinion, and on each side of the bevel gear on the differential.

On the “worm” shaft drive cars, ball bearings are used on the worm shaft and on each side of the worm wheel on the differential.

It is hardly necessary for me to point out how important ball bearings are in the operation of an electric vehicle. They reduce the friction at all bearing points to a minimum and allow maximum mileage to be secured from the battery capacity available.

Chicago Fashion Garage Has Electric “Jitney”

The Fashion Automobile Stations, 51st street and Cottage Grove avenue, and 5130 Lake Park avenue, Chicago, managed by Harry Salvat, are offering free rides in a private electric “jitney” bus to all patrons of the two stations.

Red tickets are presented to the patrons and read as follows:

This card will entitle you and your family to ride free in our red electric bus, running from Grand Boulevard to Lake Park Avenue through Hyde Park Boulevard, from 6:30 a.m. to 10 a.m., and from 4 p.m. to 7 p.m., every 20 minutes.

This is only for the convenience of our patrons so that they can reach the elevated and Illinois Central railroads.

Other people who desire to make use of this boulevard transportation service can do so at the rate of a nickel per ride. As the route traversed is not convenient to any parallel street car line but passes through a first-class residence district, Mr. Salvat must be credited with having afforded the neighborhood, as well as his patrons, a decided convenience.

Among the features of the service which the Fashion Garages give their customers is the use of a new downtown station where cars may be kept free of charge while the owners are shopping. This is of real value, especially now that the city ordinances limit the time that a vehicle may stand in the downtown district to thirty minutes. This downtown station is at Tebbett & Garland's store, 16 North Michigan avenue. Also included in the service is the revanishing of hoods of cars whenever they become dull, if the car can be spared for 24 hours. This keeps the cars looking new and attractive.

In their station No. 2, at 5130 Lake Park avenue, they have just installed ten new circuits for constant potential charging, a new method for which is claimed the advantage of completing the charge in faster time; it is also a very safe method as the batteries can not overheat; further, it is the most economical method because the current from the motor generator is varied in accordance with the number of batteries on charge, and no outside resistance is required to secure the proper current. In this system all the batteries on charge at one time have the same number of cells. This is the first installation of this kind in the city.

In addition to the incidentals mentioned above, the expert care given the batteries of cars in these garages secures the most satisfactory results at the lowest cost.

Ohio Announces New Officials

New officials of the Ohio Electric Car Company, Toledo, were recently elected. M. V. Barbour, of the Barbour & Star Lumber Company, was elected president. C. M. Foster, for some time an executive official of the company, was elected vice-president and general manager; Herman H. Brand, secretary-treasurer. Directors are M. V. Barbour, C. M. Foster, H. H. Brand, J. F. Vogel, who is associated with the Hendron Wheel Company; A. E. Baker, of Baker Brothers; Attorney Rath- bun Fuller and H. E. Marvin.

James A. Kellam, sales manager, carries the responsibility of advertising and marketing the products. Mr. Kellam believes business conditions are gradually improving throughout the country and predicts there will be very good demand for the Ohio electric during 1915.

C. E. Duncan assists in the sales department and gives particular attention to the advertising.

W. H. Farrington and E. M. Farrington, who formerly represented the Ohio electric in Chicago, under the firm name of the Farrington Automobile Company, are now associated with the Continental Sales Company.

The Continental Sales Company already has a stock of the very latest Ohio electric models.

“Whys” of Users of Electric Trucks

The following cogent reasons for purchasing electric trucks are given in an advertisement of the United Electric Light Company, Springfield, Mass., in a local newspaper:

“High-grade electric trucks are 100 per cent faster than horses.”

“From 25 to 50 per cent cheaper to operate.”

“Require 75 per cent less space than horses.”

“Free from war prices, disease and broken limbs.”

“Sanitary, odorless, practically noiseless.”

“Require minimum reserve equipment to give uninterrupted service.”

“Long lived; interchangeable parts; minimum repairs; ex-teamster drivers; easy on tires.”

“Efficient because representing a high grade engineering product, built specially for a given task.”
Electric Fills Every Practical Need in Motoring

A Car of Utility and Safety,—Powerful, Speedier, Economical and Reliable

BY D. W. WHIPPLE*

FOR several years it has been recognized that a good electric pleasure car is the most economical type of automobile from the standpoint of operation cost. The simplicity of the electric and the fact that it can be driven with safety not only by men but also by women and even children, have also been established. Within the past year or two the electric pleasure car has forged its way to the front and has demanded consideration also because of the fact that it has proven itself a practical car for motoring needs. It is only natural therefore that objections formerly raised against an electric have all been swept away.

In what ways is the electric car the logical vehicle for practically every motoring need of a family? In the first place it is a car of utility. Its field of usefulness really knows no limits. There was a time when men hesitated at buying an electric because they felt that the zone of operation was too restricted. Today, statistics prove that 98 per cent of all automobile trips do not exceed a total of 60 miles at an average speed of 20 to 25 miles an hour, which means that 98 per cent of all trips are within easy radius of a good electric car. And for this 98 per cent of trips the electric is considerably less expensive to run, so that, everything considered, it is a wise investment.

Another reason why a good electric today is a practical car is based on the reason that an electric has ample power and hill climbing ability to go anywhere. This is proven by the fact that in hilly cities the streets are dotted with electrics, where as a few years ago they were comparatively little seen. In our experience we have equipped our cars with larger battery and oversized motor connected directly to the driving shaft, thus giving from 15 per cent to 20 per cent more power.

Still another reason why the electric car is so practical is the fact that it is a speedier car than ever before. The new electrics for instance can make 30 miles an hour, a rate that is faster than any city ordinance allows. This speed is in marked contrast to what electrics a few years ago were capable of. And the fact that electrics today can travel faster is an important reason why more people than ever before are buying and using electrics.

These three things—the wider range of usefulness, the greater speed in traveling, and much increased power—are attributes which account for the popularity of electric pleasure cars today.

We can go down the list and show how electric pleasure cars have been improved in every detail where improvement was possible. A good modern electric runs with absolute silence. It is safer to drive and easier to handle than ever before. Its economy is greater, its appearance more handsome and its luxuries more complete.

In the winter time the owner of an electric appreciates his car because of the troubles it never has, such as a cold carbureter, frozen cylinders and other difficulties that are frequently experienced in other types.

Owners of electrics tell us that their cars appeal to them from a practical standpoint because of the freedom from trouble and repair expense, the low tire bills, and the satisfaction of having a definite monthly cost.

Along with the marvelous advance which the electric car has made, one point stands out clearly and that is the desirability of the manufactured electric over the one that is merely assembled. The best results can be obtained by the manufacturer who actually builds the parts that go into the car itself. This means, of course, that a large investment in machinery is necessary and a large investment in turn is practical only when the volume of business is also great.

The factory of the Anderson Electric Car Company where the Detroit Electric is built is said to be the largest electric pleasure car factory in the world. It is equipped with all the most modern machinery and devices, much of it automatic. In it the Detroit electric is actually manufactured and not merely assembled from miscellaneous parts purchased in the open market. Thus we are able to assure the absolute accuracy every one desires in a motor car.

The reason that the wonderful equipment in this great factory has been made both possible and practical is large production which, as everyone knows, cuts down both the manufacturing and selling cost per car. It enables the builders to supply near accurate handwork by absolutely accurate machine work.

Many people do not realize today just how important is the advantage to them of buying a manufactured electric car. Parts makers have not gone into the building of parts and materials specifically for electric cars. Therefore, unless a manufacturer actually has his own machinery and actually builds his own product, there is only one other alternative open. That alternative is to buy parts that were intended for gasoline cars and must be adapted in the best way possible to electrics.

"Jitneys" Refuse to Carry Insurance

Jitney drivers of Los Angeles, Cal., are forcing a referendum vote at a special election for the purpose of squelching the recently passed regulating ordinance and also for the purpose of putting into force an ordinance gotten up by themselves.

The jitney drivers refuse to carry any insurance and will not confine themselves to any definite route and also insist on carrying people on the running board. The city council, the merchants and civic organizations say they will not tolerate this.

The ordinance passed by the council is intended to regulate properly the jitney buses, confining them to definite routes so that they will be under police supervision and force them to carry adequate insurance to protect life and limb and not permit overcrowding or riding on the running board.

The reason for the measure passed by the council is that of all the accidents and deaths caused to date by jitney buses, it appears that there has not been found one instance where anyone has been able to recover a cent of damages.

*Manager Chicago Branch, "Detroit" Electric.
Recent Decisions Affecting Automobile Owners

**Illinois**

As a result of a decision handed down by the Supreme court in Springfield, Ill., motorists of Chicago will not be compelled to pay a wheel tax to the municipal authorities hereafter, in addition to a fee for license and registration to the state treasury.

In the test case brought by Joseph Dehner against the City of Lincoln, Ill., the Supreme Court decided that the wheel tax was invalid. Judge Craig, who handed down the decision, held that the annual license fee which motor car owners are required to pay to the state is a tax, and that double taxation exists when motorists are required to pay a municipal tax also. This was the contention of the attorneys of the Lincoln resident, who sought to have the city ordinance declared unconstitutional.

The opinion applies to passenger vehicles alone, and does not declare invalid the state wheel tax law. Motor trucks, and horse drawn vehicles are not mentioned in the decision, and apparently are not affected. Dehner refused to pay a wheel tax imposed by the ordinance, and was fined $25 by a local justice of the peace. The Circuit Court reversed the decision. The case was then taken to the Supreme Court and the action of the lower tribunal was sustained.

In sustaining the action of the lower court, however, the Supreme Court says: "The ordinance in question is in square conflict with Section 12 of Motor Vehicle Action of 1911, which prohibits the imposition of local licenses on vehicles of certain types. The ordinance in question is against both spirit and letter of the law."

As the result of this decision, Chicago will be deprived of more than $500,000 annual revenue, which has been used to pay the expenses of street repairs, and hundreds of men will be thrown out of work in the street repair department until provision can be found for an appropriation to carry on this work.

Tentative limits have been drawn up here for an ordinance to restrict truck sizes and weights. Originally, this bill specified 28,000 pounds as the maximum gross weight and 24 feet as the maximum length. Since then, however, the restrictions have been changed to 40 feet in length and 1,000 pounds per inch width of tire, with a maximum allowable load per axle of 12 tons. Aldermen W. J. Healy, G. E. Trebing and H. P. Bergen are the council committee in trusted with the drafting of the ordinance and J. D. Hittle and Mr. Robinson are the engineers who have been appointed to confer with this committee. The first draft has been passed upon for legality by Leon Hornstein of the corporation counsel's office. The bill is to go to the council for passage at an early date.

**New York**

Hereafter motor trucks will have to pay the same registration fee as passenger cars, provided Governor Whitman signs the Hewitt bill, which has passed the legislature.

There also was little opposition to the Sullivan bill, which provides that, regardless of the age of the car, the same fee must be paid. Heretofore cars 4 years old have been given a half rate.

The Sullivan-Hewitt bill, which would double the fee on passenger cars, was killed through the efforts of the Automobile Trade Association of New York State.

On April 21 the Wicks bill was passed through the legislature. This measure provides that all vehicles shall carry lights from one hour after sunset to one hour before sunrise and is a law that will aid materially in reducing the number of accidents. The bill will become effective July 1 and will force all vehicles to carry lights or subject the offender to a fine of $10 upon arrest by police officers in any part of the state. New York City is not affected, however.

The second hearing of the Mayor's Committee on Street Traffic & Safety regarding its proposed restrictions of motor trucks and horse vehicles in New York City, has been called by Secretary S. W. Taylor for Monday, May 19, at 2:00 p.m., at police headquarters. The committee will be prepared to hear further arguments in behalf of motor truck and horse hale in interests as to why business vehicles should not be restricted to 24 feet in length, 7 feet 6 inches in width, 12 feet 6 inches in height, 8 miles per hour in speed and 14 tons in total weight.

The first hearing was held in the rooms of the Safety First Society, at the Craftsman building, 6 East Thirty-ninth street, and, at the request of the Motor Truck Club, a second hearing was granted after preliminary arguments from the M. T. C. and N. A. C. C., and others had been heard.

The directors of the Safety First Society of New York met April 22 to elect officers and outline a campaign. C. L. Bernheimer was elected president, and vice-presidents were chosen as follows: Jefferson De Mont Thompson, Chief Magistrate McAdoo, T. W. Churchill, Police Commissioner Woods, Fire Commissioner Adamson and W. R. Wilcox. F. H. Elliott was elected general secretary.

**Iowa**

The thirty-sixth general assembly of Iowa has just ended its session with a record of legislation on good roads and motor vehicles which is popular among the motorists and good roads enthusiasts of the state.

Changes in the law governing the registration of automobiles are especially approved by motorists. The new law provides that number plates shall be issued only every three years instead of every year as at present. This will save the motorists the annual worry over new number plates. The fees shall be a lien upon the motor vehicles and penalties shall be collected for delinquency. Under the new law the plates may be made at state institutions. The new law provides also that the state automobile department shall charge 50 cents instead of $1, as at present, for extra number plates. All new provisions will go into effect July 1, 1915.
It imposes a registration fee of 35 cents per horsepower on all automobiles, a graduated license scale for commercial vehicles and a $5 fee for all electric vehicles not used for commercial purposes.

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Changes in the law governing the registration of motor cars are especially approved by motorists. The new law provides that number plates shall be issued only every three years instead of every year as at present. This will save the motorist the annual worry over new number plates. County attorneys are responsible for the collection of license fees, the amount of which remains unchanged. The fees shall be a lien upon the motor vehicles and penalties shall be collected for delinquency. Under the new law the plates may be made at state institutions. The new type of plate will be heavier than that now in use. The new law provides also that the state motor car department shall charge 50 cents, instead of $1 as at present, for extra number plates. All new provisions will go into effect July 1, 1915.

Attempts to abolish the state highway commission were defeated by the legislature after a hard fight against the reactionaries who tried to break down the present system for better roads. The commission is retained with undiminished powers. A change provides for 90 per cent of the motor tax to be returned to the counties instead of 85 per cent as at present. The remaining 10 per cent is to be used for the state motor vehicle department and state highway commission expenses. This tax amounts to more than $1,000,000 annually. A new law provides that township trustees and county supervisors may raise or lower highways to avoid dangerous railroad crossings.

Ohio

The bill reducing automobile dealers' licenses from $20 to $10 has been passed by both houses of the assembly and is now up to Governor Willis for signature. Little opposition was offered to the bill, which was supported by automobile clubs and the Ohio Automobile Association.

The senate unanimously passed the bill providing for the transfer of license tags from one car to another, by the same owner, by making a payment of $1 for re-registration.

A bill was introduced in the senate last week providing that headlights on automobiles shall not shine higher than 3 feet from the roadway for a distance of 75 feet in front of the car. Steps were taken at once to kill the measure because it got to the floor of the senate. In the bill, the question of judgment was left entirely to the justice of the peace, the mayor or other peace officer before whom the charge was brought.

Practically all cities in the state have dimming ordinances, and motorists generally do not believe it is wise to enact a dimming law to cover the highways of the state.

Pennsylvania

A bill has been introduced by Representative Lipschutz, Philadelphia, which will double automobile license fees.

For solid tire vehicles, excepting traction engines, the proposed and present rates are:

<table>
<thead>
<tr>
<th>Weight Range</th>
<th>Proposed</th>
<th>Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 4,000 pounds</td>
<td>$10</td>
<td>$5</td>
</tr>
<tr>
<td>More than 4,000 but less than 5,000</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>From 5,000 to 10,000 pounds</td>
<td>30</td>
<td>15</td>
</tr>
<tr>
<td>From 10,000 to 15,000 pounds</td>
<td>40</td>
<td>20</td>
</tr>
<tr>
<td>From 15,000 to 24,000 pounds</td>
<td>50</td>
<td>25</td>
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</table>

On vehicles weighing less than 10,000 pounds trailing after an automobile or solid tire vehicle a fee of $6 is proposed by the bill against $3 under the present act. Trailers weighing between 10,000 and 24,000 pounds must pay a fee of $10 against the present fee of $5.

The cost of dealers' tags is doubled to $20.

Senator Mills introduced another bill in the senate which provides that in any civil proceeding for injury done by an automobile the register number displayed on the vehicle shall be prima facie evidence that the owner was operating it.

If he shall prove at the hearing that he was not operating it and reveal the name of the person actually operating it, then the register number evidence is removed and the burden of proof shifted.

The House of Representatives went on record overwhelmingly against a bill to require lights on all vehicles after dark.

Michigan

The latest proposed new tax bill provides for the doubling of the automobile tax fees, and does not exempt automobiles from local taxation. The license fee for automobiles would thereby be $6 instead of $3; chauffeurs' licenses would be $3 instead of $2; manufacturers' licenses are to be sold at $20 instead of $10 and for duplicate licenses the charge is to be $3 instead of $2.

The bill is to replace the Smith bill which provided for a state license tax according to weight and horsepower, but exempted automobiles from local taxation. Owing to the strong opposition from the representatives of Wayne county, the bill has been introduced to take its place.

California

The scheme to place a special license tax on motor trucks as a means of accumulating additional funds for the upkeep of the city streets, has been killed. At a meeting of the public safety committee the councilmen put the measure under, by a vote of 2 to 1, maintaining that the plan was unjustifiable.

Representatives of various organizations of business men appeared before the committee and presented the views of Los Angeles merchants and manufacturers. They declared that the merchants are subject to taxes and calls for donations from many sources and that further impositions of motor taxes would be unjustifiable.

In answer to the charges that the vehicles operated by commercial houses and manufacturers were responsible for the dilapidation of the city streets, the secretary of the Merchants' and Manufacturers' Association declared that the fault lay in the method of construction and improvement of the streets rather than the detrimental effect from heavy vehicles.
THE electric vehicle division of the Society of Automobile Engineers has made the following recommendations to offer the standards committee for adoption:

**SPEED AND MILEAGE RATINGS**

Electric vehicle speed ratings shall be based on continuous operation with one-half load over hard, smooth and level roads or pavements at the actual average battery voltage.

Electric vehicle mileage ratings shall be based on the rated five-hour discharge capacity of the battery and a continuous run with one-half load over hard, smooth, and level roads or pavements.

These recommendations were adopted at the standards committee's last meeting, but were incorporated in this report so they could go before the society.

F. A. Whitten:—Of course, we realize that it is not possible to make a vehicle take the exact battery discharge rate, but the assumption is that the battery will be proportioned nearly to the vehicle. The idea was to get some common standard because the batteries vary so in capacity.

R. MCA. Lloyd:—But all electric vehicles are almost all run six or seven hours with the batteries that are in them.

F. A. Whitten:—Not necessarily with continuous operation. It is for the manufacturer's electric vehicles to run continuously six or seven hours without stops.

R. MCA. Lloyd:—But if you are going to test them on asphalt with their standard battery equipment, most of them are going to run six or seven hours.

A. J. Slade:—This recommendation is not intended to describe a particular test which will be made of a vehicle; it is a means of defining what the mileage capacity of the vehicle is. The rating can be made on certain predetermined assumptions.

F. A. Whitten:—While the mileage will vary a great deal with the rate at which the battery discharges, this is a matter for the manufacturer to settle when he makes his machine. He has to have a certain factor of safety. One may figure on a greater factor of safety than another, so the individual manufacturer has the right to make his rating anything he pleases, knowing what the efficiency of his particular vehicle may be.

Chairman Wall:—I think, as Mr. Slade says, that while the recommended specification may not constitute an exact test of any kind, as a comparison it is as good as naming any other length of time. All that is wanted is a standard of comparison. For instance, if a battery were capable of running seven or eight hours, the vehicle speed would be greater at the end of five hours than would be the case if the battery were capable of running only five hours. If all were tested on the same basis, would it not be possible to get very good comparative results?

F. A. Whitten:—It seems to me that would show in the manufacturer's guarantee of mileage. In other words, if a man has a machine which will run a great deal further on a certain power consumption, he can guarantee more mileage and will have just as good a safety factor of reserve as the other man who has a machine that is not as efficient.

A. J. Slade:—Each manufacturer will guarantee whatever total mileage he chooses. But when a comparison is made it seems necessary to have some discharge rate in order that we may define what these mileage ratings mean and make them comparable between different trucks.

F. A. Whitten:—Just what it is attempted to cover is—What is the battery rating? For instance, it is well known that with some batteries, if given a long overcharge, you might get as much as 25 per cent greater capacity than if charged in the normal way, but only at a rate greater than the discharge rate. Now, the question is, how is the mileage to be rated: on the rated capacity of the battery, or are you going to squeeze all you can out of it and utilize the extra 25 per cent? If one manufacturer bases his mileage on normal capacity and the other on the extra 25 per cent, we have no common basis for rating. It is, therefore, necessary to specify a definite basis of rating the battery for capacity.

A. J. Slade:—This definition does not in any way prevent the manufacturer or designer from providing for any total mileage he may see fit.

R. MCA. Lloyd:—Yes, but what is the object of the rating?

A. J. Slade:—To give a basis for comparison. As a matter of fact, consideration has been given to this subject by all the members of the division, which is composed of the executives, chief engineers or designers of all the manufacturers of electric vehicles, both commercial and pleasure, that are represented in the society, and also representatives of the battery companies, and motor manufacturers. They all took part in the discussion, extending over a period of several hours, previous to our last standards committee meeting, and this was the net result of the deliberations. It was the consensus of opinion that this method of rating mileage gave a fairer basis of comparison than anything else that was proposed.

R. MCA. Lloyd:—Did they all agree to the forty-two cell equipment for the lead battery? This is not going to be the practice of some manufacturers.

J. G. Perkins:—Would the standards vary according to the weight of the vehicles? Some of the lighter vehicles would certainly have different motor voltages and number of cells than the heavier ones.

A. J. Slade:—There are really two standards at present. One of the leading manufacturers builds a line of motors rated at 80 volts for use with lead batteries. Another manufacturer makes practically the same motor, as far as its construction, capacity and fuel consumption are concerned, and rates it at 85 volts. Now the engineers of both of those manufacturers, who are members of our division, can compromise on the dual motor voltages and recommend in order that several motors made by different manufacturers but of practically the same characteristics, will have their characteristic curves laid out so that the manufacturer of electric vehicles can take either one and determine the motor characteristics without making tests and researches of each individual motor. Dual voltage ratings do not affect the size of the motor; the capacity of the motor would vary, of course, in building a line of vehicles from small to large, but not the voltage.

J. G. Perkins:—What I referred to more was, would you have the same standard for a thousand-pound delivery wagon as for a five-ton truck?

A. J. Slade:—Yes, the same voltage. That is the practice now. A thousand-pound delivery wagon, with a small battery, would be equipped with an 85-volt motor, if the General Electric Company built it; and an 80-volt motor if the Westinghouse Company built it; and something else if the Crocker Wheeler Company built it. A five-ton truck would have a larger battery and motor but the voltage rating would not be affected. This is merely in the direction of the manufacturers of motors furnishing information which the electric vehicle manufacturers can utilize more advantageously than under the present method, in which there is no uniformity.

R. MCA. Lloyd:—I want to point out what this really means as to rating. There would be a sort of S. A. E. rating for the mileage of a wagon. As an illustration, a truck with a 200-amper-hour battery, discharging at 40 amperes for 5 hours, might be credited with an S. A. E. rating of 40 miles, whereas it might actually go 60 miles.

A. J. Slade:—Yes, just exactly as we say in our certain sized gasoline engine has 40 horsepower, A. L. A. M. or N. A. C. C. rating. On the block one will give considerably more, or another considerably less.

R. MCA. Lloyd:—The only question in my mind is whether it is not work disadvantageously to somebody who is required by the Government or some other purchaser to furnish a certain mileage. This is all the rating he would get credit for.

A. J. Slade:—No, not at all. That depends on the skill of the manufacturer. In fact, it would work to the advantage of the manufacturer. He could get greater than the S. A. E. mile and with the same equipment. That would be a tribute to his ability.

R. MCA. Lloyd:—Yes, but it would help a small manufacturer get a good mileage out of a well built wagon, as it does not take the full four rating of the battery. That is the principal objection I have. A. J. Slade:—I know of instances in which the current was high about a certain percentage.
The recommendations made by the electric vehicle division at the last meeting of the society with regard to motor voltage, motor name plates and the number of cells in standard battery equipment were resubmitted and approved by the committee. The adoption of two classes of motors for use upon electric vehicles, one designed for 80 to 85 volt operation and another for 60 to 66 volt operation, characteristic curves for all of the voltages to be furnished by the manufacturers, is under contemplation. It is thought that there should be on each motor a name-plate setting forth the manufacturer's name and address, the type of the motor, the frame size, its voltage and ampere output at specified speed, both high and low figures being given for the high and low limits of voltage recommended. The number of cells in standard battery equipment recommended by the division is as follows: Lead acid type, 42; nickel iron alkaline type, 60. The recommendations as to motor voltage, name-plates and number of cells will be considered at the meeting of the society to be held in June.

**Leaf Springs**

The springs division has had before the society for some time for approval a report which has not yet been considered owing to lack of time. The report of the division made last week was concerned largely with making more clear its recommendations as to the intricate subjects involved, proposed tolerances of bolts for hushed and unhushed eyes of leaf springs and modifications of previous recommendations as to diameter of head of center bolts for pleasure car leaf springs 2 1/4 inches and 2 1/2 inches wide and commercial car leaf springs 2 1/4 inches, 2 1/2 inches and 3 inches wide. The division has been considering the formulation of a recommendation as to the concavity of leaf spring material, but no decision has been arrived at.

**Tire Dimensions**

The society has standardized the fundamental dimensions involved in the mounting of solid tires, thereby securing interchangeability of the same, and has recommended concentration upon only three diameters of tire with a view to reducing tire costs and bringing about the carrying of tires in stock at all necessary places. The said three diameters are 32 inches, 36 inches and 40 inches. A clear majority of American truck manufacturers are now using these three diameters of tire exclusively. Tires of these three diameters are, of course, made in several widths, but probably 85 per cent of the production being in 3 1/2, 4, 5 and 6 inch widths.

The S. A. E. committee is in conference with European societies and associations as to the feasibility of standardizing the described characteristics of solid tires internationally.

**Steels**

The iron and steel division announced that it proposed to submit to the members thereof for letter ballot, several questions under consideration, as follows:

That the lower limit of vanadium in the chromium vanadium steels be raised from the present minimum of 0.12 per cent to a minimum of 0.15 per cent.

That an additional nickel chromium steel containing 0.05 per cent nickel and 0.25 to 0.35 carbon be added to the S. A. E. steel specifications to fill out the gap between the present 3320 and 3340 steels.

That the curve sheets giving physical properties of S. A. E. carbon steels when heat treated be incorporated, together with tabulations giving identical information, in the S. A. E. notes and instructions on steel. That curve sheets and tabulations of the S. A. E. alloy steels be likewise prepared.

That the present S. A. E. specifications for steel castings be eliminated and the following inserted:

"Where it is desirable to buy steel castings under specifications, the use of the complete detail standard specifications for steel castings, class B, as issued by the American Society for Testing Materials, serial designation A27, is recommended."

**Vehicle Taxation Formula**

Relative to the investigation involving the development of a vehicle taxation formula, based upon the destructive effect upon the road, the research division of the society has been in consultation with the highway commissions of the states of the Union, in an endeavor to obtain information relative to the quantity and quality of not only vehicles but the traffic and roads as well. The United States and certain foreign governments have been asked for assistance and in every case evidence of a desire to co-operate has been expressed. A chaotic condition of affairs, however, exists relating to the classification of vehicles, the nature of the traffic, the amount of new roads being built, the repair and maintenance of existing roads, and other closely identified facts. It has been felt that a formula if proposed would of necessity be as simple as possible, with not over two or three variables at the most, in order to be workable. Otherwise the clerical work involved in its application would be of sufficient magnitude to condemn it from the start. How a formula which possesses all of the attributes incident to a strictly engineering principle, is fair and equitable and does not contain over two or three variables, can be developed is not known. In the construction of such a formula, the following would have to be considered as factors: Horsepower of the vehicle (if motor driven); total weight of vehicle; weight of driving wheel; size of wheels, type of tire, gear ratio; speed of vehicle; total time in service and class of service.

The members of the research division present at its last meeting held in Detroit stated that they saw no way of pursuing adequately the investigation proposed originally, with a view to developing a formula for application in connection with the taxation by States of the various vehicles using the road, such formula to be based upon strictly engineering principles and to have as its keynote the destructive effect of a vehicle upon the road.

Every operator of a motor vehicle shall sound his horn when overtaking any person, horse, vehicle or other animal thereon upon a highway, and also shall sound his horn when approaching a street crossing, when rounding a curve or corner, or places where any sign appears, such as "Danger—blow your horn."

The drivers of all vehicles must look out for and give right of way to vehicles approaching from their right at street intersections.
Central Station Possibilities of the Electric
Simple Reasons Why the Electric Deserves Central Station Consideration

CENTRAL stations are, through neglect of the electric truck possibilities, losing vast opportunities for building up the load factors of their plants, thus allowing efficient organizations and machinery to work on half or three-quarter load or capacity.

The era of the mechanically operated vehicle for freight transportation and delivery purposes is rapidly gaining headway throughout the world and this type of equipment is gradually being applied to every commercial purpose. In fact, the automobile has long been applied to commercial purposes where business demanded faster operation and greater endurance than could be secured with the horse.

The transition from pleasure vehicle to commercial truck is simple with, perhaps, the question arising, "What agency or prime mover is best adapted to the application of commercial trucking?"

Because of varying circumstances and conditions, we can lay no hard and fast rule but it is a matter of realized the advantage to be derived by the change from the old systems in use. Then comes the question, "Why, if the electric has its economic field, has it not taken its part in this change, and established its merits more generally?" There are several reasons why it has not done so, which will be brought forward as follows:

In all commercial lines, it is absolutely essential to success that an article of sale has its points thoroughly and properly presented to the consumer over an extended period of time. The gasoline truck was an off-spring of the pleasure vehicle, and the sales forces that placed these trucks before the public, were men who had followed this particular line of sales work for years. In other words, they have had and still have an organization and system of sales that was perfected years ago.

The history of the electric truck is not similar. It was probably evolved from the pleasure vehicle, but unlike the gasoline car and due to peculiar conditions that limit the electric car for pleasure riding, it has been forced to make a new beginning under a less highly developed sales organization, and in the face of much prejudice. There are few users of the electric vehicle in comparison with thousands of owners of gasoline machines.

I only make this point to bring out the moral effect of the overwhelming numbers that do not understand the electric vehicle. Does anyone think that the gasoline owner or salesman is waiting for the opportunity to endorse the electric, something he knows very little about?

These combined forces, owners and salesmen of gasoline machines, serve to make more difficult the cause of the electric. Their views serve to establish prejudice against the electric and their numbers serve to defeat reasonable and conclusive arguments from those of us who have thoroughly investigated the merits and endorse this type of vehicle in its particular field of commercial trucking and freight handling.

The electric truck has already solved complicated transportation and delivery problems in the congested traffic areas of large cities and freight terminals. It has furnished a means of mechanically handling freight where fire hazards prohibit other forms of prime movers being employed, and has offered the sphere of
business in general, a more efficient, economical and cleanly means of handling freight than has hereto-
fore existed. In their many forms of application, the
various units provide and create a new form of busi-
ness which accumulates and adds to the load of the
power plant.

Central stations desire to increase the load of
their plants. No doubt, they are familiar with the
character of "off-peak" load that electric truck service
will bring them. But as a matter of comparison, one
might ask, "Does the business of sign lighting, ap-
pliances and motor loads come into the office without
any effort on the part of the commercial department
to show prospective customers the advantage of using
electricity?" If not, then there is no reason to believe
that a customer will adopt the electric truck if he
knows nothing of its merits.

If central stations desire such business, it means
that their commercial departments, and in fact, every
man in their entire sales organization should be able
to inform the public of the uses and merits of the elec-
tric truck. Furthermore, it depends largely upon the
central station in a locality as to how rapidly the
electric truck becomes generally applied, and whether
that particular plant applied such equipment to its
own demands and requirements.

There are transportation and freight handling
problems of magnitude and importance which require
attention in every city, and these could often be solved
by the application of the electric. It largely depends
upon the central stations and their organizations as to
whether or not they secure this character of business.
I shall endeavor to point out in another letter how this
has been and can be done.

The Time-Study Watch

The modern management of automobile and
garage shops finds frequent need for the use of a stop
watch in determining the time necessary for the dif-
f erent operations involved in the manufacturing
process. When an ordinary stop watch is used to
determine the time of an operation, an arithmetical
 calculation is necessary to translate this into terms
of output per hour or per day. The time-study watch,
shown in the accompanying illustration, has been
devised to eliminate this computation and enable the
observer to read directly from the dial the quantity
desired.

In order to accomplish this purpose, the circum-
ference of the dial is divided into 100 parts, as in the
well known decimal dial, but instead of these divisions
being numbered in the ordinary way, they are marked
with figures which indicate the number of operations
made per hour, when the time of a single operation is
represented by the elapsed time. Thus, in the illustra-
tion, the second hand is on the sixteenth division,
representing 0.16 minute as the time of a single opera-
tion. In this case 375 operations can be made per
hour, and the division is consequently numbered 375.
The convenience of this can only be appreciated by
one who has used the watch. In the case of very
short operations, 10 operations instead of one can be
timed, and the figure read off the dial is then multi-
plied by ten.

This watch contains another feature which is very
useful. Time can be taken out in case of the interrup-
tion of the operation. By pushing the slide on the side
of the case, the hand is stopped, while reversing the position
of this slide starts it again. To bring the hands back to
zero, the crown is given a push.

A similar dial can be provided without the latter
feature when this is desired.

The exclusive selling rights for this watch are held
by Mortimer J. Silberberg, 755 Peoples Gas Building,
Chicago, Ill.

E. V. A. Guarantees Used Cars

Members of the New York Electric Vehicle Asso-
ciation have decided that one of the best advertisemen-
ts of an electric automobile is its constant use and that
slightly used cars on dead storage retard the sale of new
ones. The association has in its garage, Central Park
West and Sixty-second street, a number of used electric
pleasure vehicles which have been turned in in exchange
for new cars by members of the association and which
are now to be sold at reasonable prices. All of these
cars have been taken apart and every detail of their
construction examined by an expert engineer so that
the association will give a guarantee with every car sold.
The adoption of this extraordinary principle of the
seller standing back of a used car speaks for itself of the
confidence which the electric vehicle people have in their
product and the certainty which they feel in the ability
of the electric to last and to stand up. The association
expects soon to acquire a number of used electric trucks
and will adopt the same policy with these as with the
pleasure vehicles. Members of the association believe
that the sale of these used cars is merely the broadest
possible kind of a sales campaign on new cars.

Suggests Municipal Garage for Detroit

As a solution to the problem of relieving the con-
tegestion of automobiles at the Detroit curbs the De-
 troit Automobile Dealers' Association has suggested
a municipal garage, to be erected in Cadillac Square.
The matter was discussed at the annual meeting of
the association, and a committee appointed to work on
the project. Officers of the association were elected
as follows: President, Frank N. Sealand; vice-presi-
dent, George Reason; secretary, William F. Tract;
treasurer, W. J. Gordon. Walter J. Bemp was elected
to the board of directors.
Analyzing the “Jitney” Bus
A Comprehensive Report Made by the Oakland Chamber of Commerce

The jitney from the community standpoint: its origin and reason for being; how it operates; present effect; probable future; and a complete survey of the community’s interest in this new transportation scheme, is covered by an exhaustive report of a special transportation committee which has just been approved by the board of directors of the Oakland Chamber of Commerce and Commercial Club consolidated. This committee made inquiries and an investigation throughout all the principal cities in the United States. The report is based upon that investigation.

The investigation was undertaken because it was believed that the dominant party at interest in any change of transportation units is the community, and that is covered by the opening paragraphs in which the committee says that in all of the present controversies and investigations over the jitney bus problem thus far, in the press and before legislative bodies, the positions taken and the views expressed have very naturally been those of the interested parties from their immediate viewpoint—on the part of the street railways to protect their income and investment; on the part of the jitney owners to establish a business; and on the part of the traveling public to consult only its own temporary fancy, prejudices or convenience.

In another paragraph the committee asks: “Have we now reached the point where the electric trolley car is to be rendered obsolete and be superseded by the independently owned and operated small transportation unit traveling on ‘rubber and air’ and propelled by its own power plant? Is this a scientific advance in urban transportation, and an economic necessity demanded by the people? Will it result in still further increasing traffic range and the economic residence limit from the business centers, or if not extending these limits will it add to the speed, comfort or safety of the service within the present limits?"

The committee calls attention to the fact that in looking over the history of urban transportation we find the horse car giving way to the cable car, and the cable car—except under very special conditions—to the electric trolley car. There was an economic justification for each change which made it necessary and unavoidable. The wiping out of investments in the horse car, cable car, and earlier electric car lines and equipment, and replacement with the efficient and expensive modern equipment, had its justification in the accompanying social, physical and financial development and improvement of the people and communities affected. It was reflected in an increase in property values which greatly overshadowed the immediate investment in the transportation system destroyed.

Will the jitney do this?

It is quite conclusive that if the motor bus comes to stay, it will not be in the shape of the present jitney, and if the motor bus is to be the transportation unit of the future, it will supersede the electric car because it is economically right, and in doing so, it would justify the replacement of the present investments by enhancing the property values of the community.

This is the key note from the standpoint of the report. Will the jitney relieve congestion in apartment or tenement sections in the way that every city in America is striving to solve that problem, or will it only aggravate and increase the present difficulties? If it does not, what will become of the values beyond the 2½ mile limit which the committee finds to be the ultimate range of service of the jitneys? If the jitney weakens the present transportation systems which draw the support for unprofitable lines serving the outlying districts from the section where traffic is densest, what does it mean to the property owner and the home owner in the suburbs of Oakland, and the American city?

The committee believes that the jitney bus in a large measure is due to poor business, hard times, and the impossibility of men obtaining work of any kind. Many of these men already own small autos, or have saved enough money to buy an automobile, and in this way they went into the jitney bus business. . . . For the present they are doing something for themselves and their families, their time is occupied and the nickels they take in enable them to eat at the expense of their auto bus. In other words, the jitney driver is living upon his capital, or the capital of some one else, because the income is not sufficient to provide for his living and the necessary operating expenses, plus fixed charges and depreciation.

The Cost of Operation:—Extended investigations of the committee showed them that the average jitney travels 137 miles per day with a car mile income of 5½ cents. Considering depreciation and cost of operation and allowing $3.00 to the driver, it was found that even the smallest jitney could not run for less than 7 cents per mile. This emphasizes the fact that most drivers are living at the expense of their auto bus and on their capital rather than on their income.

Effect Upon Securities:—Investigation of certain standard traction bonds in California with a par value of $60,422,000 showed a shrinkage from December 1914 to March 1915 of $8,861,000, or about 8½ per cent.

The ultimate effect of this is appreciated by anyone who considers that over $600,000,000 worth of California electric railway bonds are held by savings banks and local investors in California, or in other words, by home people. $430,767,705 in outstanding stocks and bonds was the total for thirty street railroads on June 30, 1913.

Effect Upon the State and Municipalities:—The state receives 5½ per cent of the gross income of street railways, and the total tax paid on gross income amounts to about 12 per cent. This means a total loss to the public on principal lines of the state of $300,000 per annum, aside from the other form of taxation placed by the public upon street railways in the building and maintenance of that portion of the street occupied by the roadbed.

Effect Upon Streets:—It was found that in London where the motor bus has attained its greatest prominence, the fact was brought out in a hearing before Parliament that whereas the cost of maintaining a certain road surface prior to the advent of the motor bus was 12.966 cents per square yard, it was increased to 26.806 cents after one year of bus traffic, or slightly over 100 per cent. In this case it was the public—or in other words, the Middlesex County Council—appearing in its own

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ELECTRIC VEHICLES

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behalf to demand relief from a new burden of taxes imposed by the bus traffic.

Congestion in Streets:—During the rush hour from 5 to 6 p. m., the average number of passengers transported in the 3-cent limit from the business center of Oakland (a length of 3 blocks on Broadway) is 113,000. Approximately 13 jitneys would be required to give the same carrying capacity as one street car. In Oakland, to handle the above traffic requires 234 cars with a headway of 15 seconds. To move the same traffic with jitneys at 13 to 1 would require 3,000 cars.

No further argumentneed be advanced as to the necessity for fewer and larger transportation units in the congested districts during rush hours or normal hours of large traffic.

The logical conclusion from the committee’s report is that if the public continues to support the jitney, and thereby weakens the street railways and ultimately puts them out of business, they must expect a zone system of fares, because the small jitney cannot operate over a much longer route than three miles at a profit. The American cities have religiously fought the zone system on account of the destruction of property values and the congestion of population.

A New Era in the Motor Truck World

The Advantage of Motor Truck Renting by Small Users

CLOSER observers of the motor truck situation in this country have been noting several tendencies of late which seem to portend an entirely new epoch in this industry—one that seems destined to have a far-reaching effect on the whole system of manufacture, sale, and maintenance of commercial motor vehicles. This change is being brought about entirely through economic causes, apparently, and will do much, it is believed, to offset some of the unsound conditions which have been more or less of a disturbing factor to the best growth of the industry ever since its inception.

To realize fully just what this change is and what its causes are, one must go back and note how the commercial motor vehicle business actually began and how it has developed through its short span of years.

The motor truck industry really had its beginning as a sort of sideline to the pleasure car business. The early manufacturers found that there was a demand for light commercial vehicles which they could readily supply by merely fitting their standard chassis with lower gear ratios and putting on special commercial types of bodies. In consequence of this development from the touring car, the same salesmen usually served for both lines, and not until very recent years has the commercial end been thoroughly divorced from the pleasure vehicle line.

Pleasure car salesmen naturally did not probe very deeply into the traffic problems of their prospects. They were chiefly interested in getting sales regardless of whether or not their customers could properly care for and maintain their trucks after purchase. Even with the later system of selling through trained salesmen who make a more careful analysis of each customer’s requirements and particular transportation problems, there is still a tendency to “load up” merchants with motor vehicles, who, economically speaking, cannot use or maintain them advantageously. The successful maintenance and use of commercial vehicles calls for skillful handling, proper repairs and upkeep, and careful, systematic management. A thorough observance of these requirements can only be secured by employing competent, skilled drivers and mechanics as well as providing a proper equipment for the maintenance and repairing of the vehicle. Failure to carry out these obligations often makes the otherwise most useful motor truck a veritable “white elephant” on its owner’s hands.

Now, in order to successfully meet these necessary qualifications, the small motor truck owner (who has one or two vehicles only) must do one of two things. He must either employ one good driver-mechanic to care for his machine and also own or rent proper garage facilities, or he must pay some garage for its repairs, storage, and maintenance. In either instance his expenses are likely to be considerably out of proportion to the trucking facilities received, for in one case he really maintains equipment and skilled labor sufficient for a much larger number of vehicles than he actually uses, and in the other he must pay regular garage rates with the repairman’s profit added.

The question therefore naturally arises, would it not be better for the small motor truck user, if, instead of attempting to purchase and maintain vehicles of his own, he rent them from a trucking company either regularly or by the trip? Wouldn’t he really save money, to say nothing of escaping the worries and troubles of trying to maintain one’s own transportation equipment? There are indications that not only the small users, but also the manufacturers themselves are beginning to see the light and are rapidly coming to an affirmative conclusion in the matter.

From the manufacturer’s standpoint, there is no question but that the present system of marketing commercial vehicles and keeping their owners satisfied is both wasteful and detrimental to the best development of the industry. The very fact that the small truck user will not, because economically he really cannot, properly maintain his vehicles, has forced the manufacturers to provide expensive free repair service, through branches and traveling representatives, at ruinous cost.

The large user can afford to own his trucks outright and properly maintain them because the necessary equipment and skilled labor cost is divided over several vehicles. Therefore, the free inspection and service of the manufacturer was not created primarily for him, but for the small user, but he naturally takes advantage of it just the same, to the further discomfort of the manufacturer. If this expensive feature of the manufacturer were to be cut off entirely, the big user would not give up his trucks, because to him they are not only economically practical, but well-nigh indispensable to his business. The small user is, therefore, the thorn in the flesh that is driving the manufacturer to tackle the problem from another angle, i. e., on the rental basis.

Theoretically, the advantages of the rental system
appear very attractive both for the small user and the manufacturer. As far as the former is concerned, he should receive adequate motor-trucking facilities at a considerably less cost than at present. His time and attention could be devoted strictly to his business, aside from the regular oversight of his traffic, schedules, routes, etc. He could secure a truck of proper capacity for each particular load instead of, for instance, trying to make a three-ton truck carry a five-ton load, as is likely to be the temptation under the present conditions, and he would be saved a considerable investment in rapidly depreciating equipment.

On the manufacturer's side there should be a lessening of the free service cost, for large centralized trucking companies would be fully as capable of caring for themselves as large private owners. The selling cost would be reduced because of the narrowing of the prospect field. At first, doubtless the more effective use of all vehicles under centralized trucking management might reduce the total sales somewhat, but the lower costs which such a system would make available should bring more customers, and consequently more demand for trucks.

Whether this development along rental lines will come as a further factor of subsidiary companies or branches of the manufacturers themselves or as separate organizations is of minor importance compared with the sound economic features of the movement in general. That it is destined to play an important part in the future of the motor truck business seems evident, and it would appear to be slowly evolving as a necessary step in the advancement of this important industry toward a firmer and broader foundation.

Novel Advertising for Electric Vehicles

It is obvious from many viewpoints that a large percentage of the automobile buying public is unfamiliar or unmindful of the many attractive features of the electric. The advertising of electric vehicles being conducted principally by the manufacturers in behalf of their own products, exploits mainly the advantages of one make of electric over another. The literature and other forms of sales publicity prepared by electric vehicle manufacturers are usually of the highest type, and of great selling value in approaching the man who is sufficiently familiar with the construction and operation of electric cars to be interested in them.

On the other hand, the average layman has not been educated up to the principles of the electric enough to be interested. He is unmindful of the many features in which the electric excels other types of cars for his particular requirements. For example, the number of electric in use by physicians, clergymen, salesmen, architects, etc., is far less than it should be, considering the adaptability of the electric to their requirements. Many of them, to be sure, have never given thought to the electric as the most dependable car for their hurry calls, or as the least complicated machine for the amateur mechanic.

The Electric Vehicle Association of America has prepared a series of attractive advertising folders for distribution by central stations and manufacturers, for the purpose of promoting greater popularity for the electric passenger vehicle.

These pamphlets are issued in a series of six pieces, called "Features of the Electric," each piece dealing with a separate subject, namely, dependability, simplicity, usage, economy, appointment, and popularity. They are written for the layman and are void of technicality, bringing out in plain, simple style the superiority of the electric in each feature discussed. They have been made up in large quantities, inexpensively, for general distribution.

The mailing are intended for a selected list in each territory, and are to be sent out separately at regular intervals with correspondence or regular mailing.

The use of this unique literature will no doubt fill a long felt want, in bringing to the minds of electricity users.

New Woods Agency for Kansas City

The Woods Motor Vehicle Company announce a change in distributors at Kansas City. The Russell Electric Garage, located at 3212 Troost avenue, will handle the Woods car in that city of hills. E. P. Russell of the new company has been in the employ of the Woods company for some years, and until recently was assistant superintendent of service at the Woods factory in Chicago. The new Woods distributors in Kansas City are expected to do much to make the electric car more popular in that section, and to add many more to the already large number of Woods electrics operating successfully in the Missouri river valley.

Battery-Charging Equipment in Private Garage

In the accompanying illustrations is shown battery-charging apparatus recently installed in the garage of A. B. Hastings & Son, Campello, Mass. Energy is obtained from a single-phase alternating-current circuit, and for changing the alternating current to direct current use is made of two Wagner rotary converters and sectional or unit-type charging rheostats made by the Cutler-Hammer Manufacturing Company, Milwaukee. In Fig. 1 are shown four sectional charging units mounted on the middle frame with a Wagner rotary-converter panel on each side. The rheostat handles are so arranged that a number of vehicles can be charged at the same time from one location. Fig. 2 illustrates the rotary converters and the rear of the charging panel. The rheostat units and panels were completely wired before being installed.
“Ward Special” Efficiency Test

Announcement is made by the Ward Motor Vehicle Company, Mt. Vernon, N. Y., that its “Ward Specials,” sold in New York City, operate under a five-year maintenance guarantee, whereby the customer is absolutely assured that his average annual maintenance expense over the entire five-year period will not exceed $300 annually. This is based on an average daily mileage of 25 miles and accordingly works out at the rate of 4 cents per car mile maximum.

As to the efficiency of this type the following table is presented showing the results of a 30-day test:

<table>
<thead>
<tr>
<th>ANALYSIS OF PERFORMANCE FOR THIRTY WORKING DAYS OF “WARD SPECIAL.”</th>
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<tbody>
<tr>
<td>Days operated</td>
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<td>--------------</td>
</tr>
<tr>
<td>30</td>
</tr>
<tr>
<td>Average run</td>
</tr>
<tr>
<td>Current cost per car mile @ 3c per K.W.H.</td>
</tr>
</tbody>
</table>

*The rated merchandise load capacity of this car is 750 lbs. The above performance was therefore accomplished with an average overload of 250 lbs. of merchandise and in no instance was the car run with less than 500 lbs. of merchandise on the springs.

American Electric Carries Unit Charger

The American Electric Car Company announces a new apparatus, known as the Ellington Unit Charger, as regular equipment on all Brooklyn, Broc and Argo electrics.

The Ellington unit Charger is said to be simple, convenient, economical, long-lasting, and gives batteries more power and more miles per charge, makes the electric car easier to handle and more comfortable, and enables one to extend the length of trips without danger of power loss.

By its use batteries can be charged direct from any electric circuit of 110 or 220 volts, 60 cycles, alternating current (the current almost universally used on lighting systems), at a tapering or graduated rate, without switchboard automatic controls or other costly appliances, and without danger of overheating the batteries.

Roy Harrington, president of the American Company, has thoroughly tested the new apparatus and claims it is the answer to the “charging problem.”

Massachusetts Taxes Solid Tired Vehicles

A bill designed to place a tax on motor vehicles fitted, with solid tires has been introduced into the Massachusetts Legislature by Senator E. S. Birdsall. It is proposed to place a tax, in addition to the regular horsepower tax, amounting to $5 for vehicles of less than 4000 pounds capacity; $10 for those having from 4000 to 6000 pounds capacity, and $15 for solid tired motor propelled vehicles having a carrying capacity of more than 6000 pounds.

A bill which practically doubles the tax rate upon motor trucks has been introduced into the New York Legislature by Senator Hewitt. Among the provisions is one that would add $10 extra to the regular registration fee for commercial motor trucks weighing over 4000 pounds. Another provides an extra assessment for buses at the rate of $5 for each passenger seat and $25 for each ton of baggage or freight carrying capacity.

Debut of Dudley Electric

The first Dudley electric cabriolet which is to sell at $985 is to be sent to Chicago from Detroit for demonstration purposes. If the new car finds favor the Dudley Tool Company and the Menominee Electric Company, both of Menominee, Mich., and interested in the matter, will be reorganized and the Dudley company, which heretofore has made cyclecars, will devote all its attention to the construction of electrics.

The Dudley, it is claimed, will be the lightest electric car made, weighing only 1600 pounds. The wheelbase is 100 inches; tread standard; the artillery wheels are 30 by 3/8.

Charging Control

The private installation as a rule produces excellent results in maintaining constant operation of the vehicles. However the industry is so comparatively young that a standard brand or in fact type has not as yet been accepted as proper apparatus. Many private installations are equipped with apparatus which although perfectly correct for certain conditions are nevertheless inefficient either in size or capacity to perform successfully under their present conditions. Correct charging equipment comes only after a thorough analysis of the installation’s demands and guaranteed by a company which can offer the best possible service in experts and inspectors.

Driver Responsible for Guest’s Injuries

In Maryland recently a man sued a friend with whom he had been out motoring and recovered a judgment against him. While on the trip the owner drove negligently, smashing into a telephone pole and overturning the car. The guest suffered a broken arm and numerous sprains and bruises. When he brought suit, the court held that the suit was proper and rendered judgment in favor of plaintiff for $1,750.—(Fitzgerald vs. Boyd, 91 Atlantic (New York) 347.)

Houk Buys American Spoke & Nipple

George W. Houk, head of the Geo. W. Houk Company, Buffalo, has purchased the American Spoke & Nipple Company, Detroit. The plant has been inactive for some time, but it is Houk’s intention to reopen it, using it to make parts for the Houk detachable wire wheels.

Announces New Beardsley Electric Roadster

Volney Beardsley, manufacturer of the California-made Beardsley electric, has put a new roadster model on the market. The car has a long hood with imitation radiator, glass front and wire wheels and is good for 30 miles an hour.
Making It Easy to Own and Operate an Electric

A Paper Presented Before the New York Section, Electric Vehicle Association

MAKE it as easy as possible to own and operate an electric passenger car. To popularize any movement you must make it easy. Our baseball games of today would not be successful were it not possible for the spectators to instantly know by the electric board what battery is at work, what pitcher walks to the box, and whether the different balls pitched are strikes, balls or otherwise.

Our moving picture theaters today are leaders in making education easy. They show the pictures and in our best movie house a lecturer will, by a few short sentences, greatly add to the interest of the pictures and make it easy to understand them.

In our great motor races in Indianapolis the greatest problem the management has to contend with is to make it easy for the spectators to follow the race, to know what cars are leading, just how much they are leading, and to keep them instantly advised of the various aspects of the gigantic struggle for speed supremacy. Just in proportion as these spectators are kept almost constantly advised of the progress of the race are they interested and satisfied with it as a pastime. Neglect this and the interest dwindles, pointing to eventual failure.

Turning now to our subject, let us ask ourselves the question: Have we made it easy enough to operate the electric passenger car in our great cities, and are we doing our part today in this role?

Without fear of general contradiction we do not hesitate to state that it is not as easy to operate an electric car in New York and a score of our other great cities today as it should be. Our central station interests who furnish the electric current are away behind.

They are not keeping step with the pace that the electric industry should be setting today. Let them stop theorizing on questions of manufacture, sale and operation of electric vehicles and get down to practical facts. These people, the central station interests, are not one-half so practiced today in the promotion of the electric passenger vehicle in our cities and suburban sections, as are the large concerns manufacturing and selling gasoline in their respective car fields.

Your central station companies talk about cutting the price of electric current, you show your curves of decreasing current cost, but these figures and charts are not the last word in the practical gamut of selling electric vehicles. True, they make it a few dollars per month perhaps cheaper to own and operate an electric, but that is a small factor in making it easier for the average owner to operate one.

Become practical. Go out in the highways and byways and make it easy to operate an electric. Take the electric current to the car owner as a gasoline man has taken the gasoline to his owners. Today our main city streets that are outgoing thoroughfares for vehicular traffic are literally dotted with curbside gasoline stations where fuel is sold in any quantities at the lowest figure. The pumps are located so that

It is easy for the driver and easy for the owner at any time to take on supplies. Go further into our country roads, 50 and 100 miles around our large cities, and there we see the curbside gasoline depot, brightly painted so that you can readily see it by day and illuminated with colored lights and signs so that you cannot miss it by night. Each one of these stations you pass, and you literally pass hundreds of them in a day, is an unmistakable advertisement of the great sub-conscious motto, "It Is Easy to Own and Operate a Gasoline Car."

But our big gasoline interests are going further and have gone further for several years. They make it easy and economical for the owner living in the small village with his private garage. They will sell and deliver gasoline to him at any time and in small quantities and charge him not more than one cent per gallon advance on the lowest rate that our big metropolitan garage men can purchase it at. For years some of our largest gasoline supplying companies have been working assiduously to develop this field. Today, the gasoline service to the private garage is as easy as the service of purchasing groceries over the telephone and having them delivered a little later at your kitchen door. Today, it is no trouble to buy gasoline practically anywhere.

There were times when the tourist traveling from New York to Chicago encountered difficulties. He had to purchase different grades of gasoline in different cities. There was not a standard gravity. This was an obstacle. It made touring a little difficult rather than easy. It is years, however, since this difficulty has been overcome and now you can secure the same gravity of gasoline along three different highways from New York to the Pacific Coast.

It is difficult to see that our central station people have been so active, and that they are doing anything like their share in the great problem of making it easier to own an electric car. They are not bringing the electric current to your door, as is the gasoline man. True, we have our ideal electric garages, but this is little credit. We cannot run the electric car to the garage every time we need a charge in order to get all of the desired mileage. We must bring the electric current to the places our electric cars frequent, and if we are to develop the electric car business as it should be, then we must bring the electric current to the many places that our electric cars should frequent.

There are literally hundreds of such places within the confines of our greater cities. Our suburban golf clubs should all have charging facilities for perhaps a dozen or more electrics. There are over a score of such clubs around each of our large cities, but if you go to these you find the gasoline car the dominating vehicle. Our country clubs must have charging stations, so must our suburban hotels, so must our suburban social centers, our polo fields, our great tennis courts, our seashore resorts with their boardwalks, our race tracks for society gathers for the fashionable week-end matinee, our fashionable bathing resorts.
our baseball parks and a score of other social and amusement centers scattered within the boundaries of our larger center of population.

An example from our own city will serve to demonstrate how at the present time it is not easy to operate an electric car in greater New York and get from it that total degree of pleasure and utility which should be at your command by such a vehicle. I arranged to spend an afternoon playing golf on a course within the zone of greater New York, a location well within the reach of the electric vehicle. The gentleman with whom I was to play owns an electric which is extensively used by his family. On the date in question we stopped at his residence for lunch with the hope of going in the electric to the golf course. The car had been used late the night before and had done considerable mileage during the forenoon so that the battery was not in a well charged condition. The course to the club was over rough roads with several hills. The owner was afraid that before he returned from the club and made an additional trip to bring me home he would be short of current. He did not feel entirely confident that the vehicle was equal to the mileage. The result was that a taxi was hired and the electric left in front of his apartment building. And now for the application: Had this car been equipped with several charging plugs there would not have been a moment’s hesitation with that man as to whether he would have used the electric or not. Had he established the habit of using his electric for his club work, knowing that at every club he frequented there were charging plugs, he would have been a complete convert to the electric vehicle. Instead, today he is considering a gasoline coupe. There is a strong possibility he will buy one. He will purchase such a vehicle not because he anticipates making long distance trips which may be beyond the limits of his battery but because you electric people with your great central station interests have not made it easy enough for him to operate an electric. Take a chapter from the book of practice in the gasoline field, and bring your electric current to the consumer, so that it will be possible to use the electric in all places and secure a boosting charge while the vehicle waits. Make it easy to operate an electric, but it will not be so until you have sown your charging facilities broadcast in those places that our electric vehicles should frequent.

How this benefit does your much-heralded price reduction do for the man who cannot get extra charges at his golf course? What good does your boosted garage service do the man who wants to use his electric to go to the fashionable seaside resort with its boardwalks? What good does it do those who want to spend the afternoon and evening at the bathing resort? He wants convenient current. He wants charging facilities that make him positively settled and content in his own mind that he can, if necessary, use his electric for 24 hours of the day and still be well charged up, still ready for more miles, more hills, more speed, and more service to him. Make it easy for him.

Your central station interests must awaken to this situation of inconvenience which today confronts the owner of the electric vehicle. For the present let them forget the manufacturer of cheaper electric vehicles with millions of sales and make it easy for those who have cars today to utilize them to the fullest extent. This make-it-easy argument was forcibly impressed on me over a year ago during the occasion of the National Convention of Piano Manufacturers. The piano makers were concerned over the reduction in business and the poor gains in business over a 10-year period, as compared with gains in other industries. In these days of increasing leaning to the fine arts it was difficult to appreciate why piano sales were not increasing as were the sales of mechanical musical goods which were going ahead by leaps and bounds. It was all the more difficult to understand the condition as the sale of operative selections for these instruments, a condition representing an increasing desire for the classics, was rapidly increasing. The condition was difficult to understand and attendance at grand opera is showing a steady increase. In short, the piano manufacturers were confronted with a musical paradox.

The thought was suggested that piano advertisements were not magnetic. They were such as not to give the impression that it was easy to become accomplished at the piano. Piano advertisements were illustrated with photographic reproductions of our greatest musical artists. Other advertisements illustrated the finest grand pianos in palatial drawing rooms and on state occasions. It was advertising for the classes and not for the masses. In reading these advertisements you unconsciously gain the thought that to play the piano you must be a great artist, otherwise your performance became mediocre, bordering on boredom. In a word, it was not easy to become accomplished at the piano, rather it was a life-long art. It was the consensus of opinion, as I later learned, by many at the convention, that the piano industry had suffered because of this general impression that had been created with the public, an impression which could not be overcome by one dollar a week installment payment plans.

Would Henry Ford have made such a success in increasing the sale of his cars if he had illustrated in his advertisements his cars driven by such speed kings as Oldfield, De Palma or Moffatt, or by such technical experts as captured all of the long distance reliability and touring contests a few years ago? No, such illustrations would have scattered; while they may create wonder and may be shrouded in more or less mystery, do not appeal to the masses and do not contribute to the great dominant thought that it is easy to operate a Ford car.

Let our central station people and our electric industry at large take this lesson to heart, and stop imagining that they have carried on their shoulders the entire load of developing the electric passenger business. Let them awaken to the fact that they are far behind the gasoline makers in this great problem of making it easy to operate a motor vehicle.

It has been asked of me what the gasoline companies have done to push their product and I might state that the Standard Oil Company of Indiana introduced pressure distillation at considerable expense but which finally produced twice as much gasoline for the same amount of crude oil.

Secondly: It is not easy for the motor car dealer to sell electricity today in many of our large cities and particularly difficult to sell them in the smaller cities. Take an example from New York City: Until recently there were no charging facilities in the region of River-side Drive and 157th street, and owners of electrics in this vicinity had to garage them several miles from their homes. How this lack of garages worked a hardship in making sales is well demonstrated by a Broad-
way dealer, who before selling to a prospect living in this section, had to induce the garageman to install a charging outfit. The garageman refused to do this unless the dealer would agree to secure for him a certain number of customers with electric cars and further required that these customers would pay their monthly bills in advance. This prospect and some others living in that section owning electrics, and lay this proposition before them. So anxious were they that they agreed to pay in advance and the prospect was sold his electric as a result of this garage installing the charging outfit. Here the work of the dealer is not completed. He had to get in touch with the manufacturer of the charging apparatus and make certain arrangements for the installation of the outfit. After having done this work the dealer made his sale but his profit was largely eaten up. I know the dealer and the man that bought the car. He thinks it is hard work to sell an electric vehicle in New York.

Missionary work of this nature should not all come on the shoulders of the dealer, it should not all come on the shoulders of the car manufacturer, perhaps it should not all come on the shoulders of the central station people, on the shoulders of the garage men or on the shoulders of the concern manufacturing charging apparatus, but one thing is certain, that by some method conditions of this method must be remedied before it must be possible for the electric passenger car to get well started on its route of progress.

It does seem that our central station people who profit directly by the sale of current should take up the leadership and setting theory aside for a short time, get down to practical facts and so assist our dealers, manufacturers, owners and operators. By scattering charging stations more generally over our great city areas let them carry on a work similar to what our gasoline merchants are doing in their field. Why should not there be in every city some committee organization which charts the entire city and suburbs and sees to it that charging facilities are adequately distributed in our garages and that other electric facilities are fitted at clubs and other places where motor vehicles of all types most frequent.

Third: There are certain abuses in connection with our garaging arrangements that tend to make it difficult to own an electric rather than easy. This echo of trouble comes rather from the ranks of gasoline dealers in more than a dozen cities between the Rocky Mountains and the Atlantic Ocean. This may be a side line observation, perhaps you may call it a condition which is working against the better interests of electricity. It is as follows:

The electric owner, like the gasoline owner, has his difficulties, but unfortunately there appear to be three different sources of trouble, the car itself, referring particularly to the motor, running gear, etc., then the battery, and lastly the tires. If the owner is not getting sufficient mileage in a charge and he takes it up with the dealer who sold it, the blame is placed upon the battery, or perhaps the tires. When the problem is taken up at the battery service depot, the blame is shifted to the car or the tires. When the trouble is taken up with the tire makers, the blame is shifted to the battery of the car. One passes the butt to the other and all the owner gets is a cycle of disappointment and difficulty. Instead of it being easy to remedy these troubles, it is difficult. One dealer in gasoline cars reported making thirty sales of coupes this season in which electrics were taken in exchange in every case and in all of the thirty instances he reports the dissatisfaction with the electric largely due to the "passing of the buck," this failure is to get redress without traveling around the work to secure it.

This is a condition that can be remedied. It may call for closer co-operation among car dealers, battery repair depots and tire dealer. The initiative should be taken by the electric car dealer. He is the one to profit first, but there is no reason why central station interests should not lend their influence in solving these problems.

Fourth: The problem of the electric passenger car is quite largely determined by the characteristics of the city in which it is sold. Some cities more readily adapt themselves to the general conception of the electric than others. Thus Chicago is a city of great distances but fortunately, level streets and with a complete boulevard system reaching all quarters of the city, and thus making it convenient for the use of electrics. The use of the electric in the Windy City is further accentuated by the fact that this boulevard system from which freight vehicles are barred comes practically into the heart of the great shopping district so that women can drive their vehicles practically to the doors of the department store, the theater, or the shopping centers without meeting the problem of traffic.

Compared with Chicago, we have other cities that present different problems, such as Philadelphia with its great distances, its circle of suburban home sections and its hills in certain sections. Then, too, there is Kansas City with its hills and long distances.

New York has its long distances between Manhattan Island and its suburban satellites. It also has its terrific traffic congestions before reaching the shopping, theatrical, or hotel districts. Many sales in this city are stopped because the women who abnormally drive do not believe they can navigate these traffic zones. Boston with its narrow streets, its heavy traffic and regulation making it difficult to leave the vehicle by the curb.

Because of these varying conditions the progress of electric vehicles has been generally hampered. Some cities by the very nature of their streets, or their location, believe they are not suited for electric use and have accepted this as a verdict. This was demonstrated to me last February in Omaha, Nebraska, while investigating general motor conditions in the great Mississippi Valley, Several local dealers described Omaha as a poor electric town, too many hills for the electric, and all of the good residences located on these hills. Omaha is apparently barred to electrics. It was a case of self-condemnation.

The next day, while investigating in Kansas City, I was impressed with the fact that here was a great electric headquarters. Kansas City has greater hills than Omaha. In Omaha the hills were said to hinder the electric, but a night's ride away in Kansas City greater hills and greater distances were no barrier to the electric. In Kansas City, unquestionably owing to its larger population, the electric has been introduced and developed into a success in spite of handicaps which were keeping it out of other growing centers. This example but serves to impress the thought that our electric dealers, our electric car makers, our battery makers, and last, but not least, our central station dealers must grasp the thought that each city has its own problem to wrestle with in
the introduction of the electric. The solution of this problem must not be left entirely to the local dealer in electrics. It is too big a proposition and costs too much money to load entirely on his shoulders. These are problems that call for co-operation. Problems that call for careful analysis of conditions, and they are problems that the electric vehicle industry of today cannot afford to overlook.

It is short-sighted policy to localize the selling of electric passenger vehicles too much in large centres of population. It is but natural that this policy should be followed because it is the easiest one. It has been the easiest in the short run, but the hundreds of smaller cities and towns before the people had even been taught to think of electric vehicles.

Again, let us look to the gasoline field: One of our largest manufacturers laid down as one of his basic principles that he must have a selling agency in every state in the Union. His selling activities must not be confined to large cities or to small cities, but wherever there were counties without cities these had to have representation. Three or four of our most successful merchandizers of gasoline vehicles have followed this policy. At first it was expensive, but in the long run it has proven the cheapest policy. It gets possession of the people in every section of the country. It insured against leaving virgin territory open as the camping ground for your business rival.

In this matter of wide selling possibilities the electric industry has been deficient. People who might have wanted electrics saw no possible means of using them. While in Kansas City in February, I talked with a dealer who had sold an electric to an aged lady living on a country estate eight miles out of Kansas City. She had no facilities on her estate for charging the battery, but was willing to have an electric even if she had to ship the battery by train to a town to have it charged. This was not necessary, as the argument was advanced that she could purchase a lighting battery for her home and then invest in a battery charging outfit, which she could use to keep her vehicle and home lighting battery charged. This actually happened. This is proof of the unlimited field of possibilities with the electric. It shows what can be done when we endeavor to make it easy to own and operate such a vehicle.

There are hundreds of people in all of our smaller cities and towns who would like to own an electric if they were convinced that it would be easy to do so. In these centers the central station interests have been asleep to their possibilities. In the majority of them they have done nothing to assist in this work. The promulgation of this doctrine of making it easy to own an electric is a national problem. It is too big a problem for the makers of electrics, it is too big a problem for the battery makers, but it is not too big a problem for your great chain of central station people. Cooperation of all three interests is the key to the solution. It is a conquest that cannot be obtained in a year.

Too often our electric dealers go forth in a defeated state of mind to sell their vehicles, and this is based on conversations with New York dealers. Before leaving their sales rooms they are convinced in their own mind that the cheaper gasoline coupé is going to defeat them. Too often they are defeated by the traffic argument before reaching their prospect. "A faint heart never won fair lady," and a salesman so defeated in his own mind can never be expected to make a sale. This is not a condition local to the electric field, but permeated the various ramifications of the gasoline field. This must be overcome. Each city may call for a different solution. Education is the keynote to the solution. The dealer may have to sell his own salesman to the fact that his electric is a better vehicle than a gasoline coupe for threading the mazes of traffic, and for generally serving the metropolitan areas. This can be done by actual demonstrations, official tests being preferred. Why should not there be tests in which the electric coupe is pitted against the gasoline coupe in making such series of tests. Such demonstration would prove that the women can operate the electric in traffic and operate it safely.

Manufacturers and dealers in electric vehicles have always been averse to competitive tests. Eight years ago when the gasoline makers were meeting every week in reliability contests, hill climbs, economy tests, track races and road races, the electric makers were quarreling among themselves and could not get together on scarcely a single contest. They doubted the veracity of one another. They were afraid of the competitive tests lest one maker would put in a non-stock battery or a different motor winding to meet conditions. These were very damaging moments for the electric industry. These home quarrels of the electric people were readily seized upon by the gasoline car dealer.

Who turned them to his own profit?

This is based on conditions which occurred in Chicago. The tests had great advertising value, as the newspapers ran front page stories about them, but of course, as the electric people never got together for any tests, they did not get the advertising.

Perhaps our electric makers are still averse to contests on the ground that they may prove little and that only the winner profits by the test. This is not true. One of the greatest assets accruing from competitive tests is the wide general publicity given through the technical daily and weekly press. The gasoline industry has thrived on this publicity for ten years, the electric industry has gone wanting. It is not too late today to revive the competitive tests. It will prove a great means of valuable publicity. It will get our masses thinking of the electric vehicle so that instead of selling only to the classes there will be a possible field in the masses.

There is a general feeling among many dealers in electrics today that the price is too high, particularly in view of the electrical equipment on the gasoline car which makes it possible for women to operate them, and further because closed types of these cars can be secured at much lower figures than the electric. This is true, and the gasoline car dealer is pushing the argument with renewed effort. The enclosed type of gasoline car is being pushed today in a hundred cities where it was deemed impossible to sell it eighteen months ago. This is true to a very great extent in the West, in fact, a great many manufacturers have required their dealers to take a certain number of enclosed cars. The habit of using the enclosed car in a town of 5000 or under is being built up by the gasoline people today. They are getting the edge on the electric dealers in this respect.

A vehicle waiting at the curb shall promptly give way to another about to take on or let off passengers or merchandise.
Cautions Limiting Size of Motor Trucks

Before the Citizens' street traffic committee of Greater New York, William P. Kennedy, consulting engineer, urged the necessity of caution in limiting the size of motor vehicles to be used in the city streets, as proposed in several ordinances now under consideration. Mr. Kennedy stated that the proposition should be properly analyzed before any action is taken. The largest loads practicable to haul through the streets are the most economical for those interested in the cost of transportation. Many classes of heavy hauling, where the delays are frequent and the daily mileage small, as exemplified along the waterfront and other congested districts, are very largely done by horses, and motor vehicles cannot hope to compete unless they can carry loads considerably heavier than horses can haul. This necessarily calls for large vehicles.

It is desirable, of course, to get rid of horses in city traffic. There are many obvious and well-known arguments to support this statement, including the reduction in number of the vehicles upon the streets; two heavy motor trucks will supplant, at least, three heavy horse trucks; the light motor truck will supplant, at least, two light horse vehicles; less wear upon pavements; less real estate occupied, the stable, which is more objectionable than the garage, eliminated; the elimination of street litter with heavy cost of removal; the obvious consequent sanitary advantage on the street and at stable locations; quicker movement of vehicular street traffic; reduction of fire risk, due to the better control and storage of motor than of hay and straw in stable; reduction of dust nuisance, and the well-organized reduction of transportation expense.

Therefore any restrictions tending to retard the elimination of the horse should be carefully considered. Such restrictions may seriously interfere with logical and economical employment of large horse vehicles, which must and will be used for some time to come. Certain of the horse trucks now in use exceed the proposed dimensions by several feet. There are now in operation a number of six-foot, three-inch per REGISTER-near length, nineteen of which have removed over 250 horses from the city streets in one installation.

Two or more vehicles within the proposed limits of size, either horse or motor propelled, will take up much more room in the streets than a large one necessary to carry the same load. For instance, assume a motor outfit to carry ten or twelve tons is twenty-eight feet overall, and to carry the same load two-horse trucks, each twenty-five feet long, or two motor trucks, each twenty feet long, are required. It is obvious that the smaller vehicles would occupy much more space in the street and cause more impediment to traffic than the single large one.

The larger the vehicles are the fewer of them are required to perform any given volume of transportation, and in the case of motor vehicles their speed will be lower, hence there is less likelihood of accident and a reduction of street surface wear. Possibly there might be some good reasons for restrictions on very large vehicles in certain streets, or localities, or during certain hours of the day, but there should be no general restriction to the dimensions proposed.

All modern transportation tends toward the employment of large units to secure the most economical results; large steamships, large railway freight cars, large street railway cars, and the largest motor trucks, practicable for the service intended, are equally desirable.

Beardsley Displayed at Exposition

Any who visit the San Diego exposition during 1915, will probably be interested in seeing the Beardsley Electric Los Angeles-built cars very much in evidence there. The manufacturer of this popular car is maintaining a large exhibit covering 2,000 feet of floor space in the Varied Industries Building, and its booth is finished in attractive style, having hardwood polished floor, mahogany columns, extending around the exhibit, connected at the top with white and gold sections, and the furnishings are in mahogany with rose-colored rugs, and plush seats around the three columns in the center of the exhibit.

In addition to exhibiting one of each model car produced there is also a stripped chassis and many of the parts entering into the construction of their cars, so that the exhibit as a whole is not only attractive, but is very interesting to any owner or prospective buyer of electric cars.

In addition to the exhibit the Beardsley Electric Company secured orders for the following cars, which are used on the exposition grounds:

Beardsley Electric ambulance, which is the first electric ambulance used in California, and this car is doing most excellent work, answering any emergency calls on the exposition grounds.

Treasury car, which gathers the coin from the various gate entrances and concessions on the exposition grounds, taking the money to the bank, and many other trips for work around the Administration Building.

Also two parcel delivery trucks, which distribute the parcel and freight packages from the entrances to the various exhibits.

Charging Apparatus for Country Clubs

A movement for the installation at the country clubs near St. Louis of charging apparatus for electric cars has been started by the St. Louis section of the Electric Vehicle Association of America. At a recent meeting of the St. Louis section a committee, with Milton B. Strauss as chairman, was named to confer with officials of the country clubs to induce them to install the charging facilities. The section's membership includes most of the dealers in electric cars in the St. Louis district as well as the St. Louis representatives of battery manufacturers and the electric car representative of the Union Electric Light and Power Company.

The movement has arisen, not because the usual electric cannot make the trip to and from the country clubs on a single charge, but because St. Louisans, after they have used their cars during the day in running about town, sometimes doubt the ability of their cars to run to and from the clubs without recharging. The charging apparatus at the club would remove their unfounded apprehensions.

If charging apparatus were provided at the clubs these members would run out in their electric cars and while they took dinner or amused themselves at the club their cars might be at the charging apparatus. It would make them undertake what is really a simple journey, without apprehension as to their return.
Electric Truck Efficiency

It so happens that the Electric truck comes nearer to being a perfect unit in a scientifically built-up delivery system than any other type. It is a direct competitor of the horse—not of the suburban express train. It fits in its field and supplements existing electrical equipment.

G. V. Electric trucks are 100 per cent. faster than horses; from 25 per cent. to 60 per cent. cheaper to operate than horses; require 75 per cent. less space than horses. Free from war prices; disease; broken limbs. Sanitary, odorless, practically noiseless.

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So we had a prospective electric car purchaser learn for himself what electric garage men had to say of electrics. This investigation was especially significant because Chicago is the world's greatest electric car city. In all, thirty-two of the largest electric garages were called on.

The result surprised even us. We did look for a 90% Rauch & Lang preference. Eighty per cent would have been a splendid showing.

But in every instance the Rauch & Lang was acclaimed as "The Best Electric on the Market," or words to that effect.

The investigation was impartial, being conducted by a third party who had no other motive than to find out just what electric car stood highest with the electric garage men of Chicago—and why.

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The Electric Storage Battery Stevedore

Industrial Electric Trucks for Solving the Problem of Congested Freight and Baggage

THAT anything as distinctly modern and prosaic as an industrial truck could have a very interesting history seems rather unlikely, yet it is recorded that even the Egyptians and Assyrians had their industrial trucks—of a very primitive type to be sure—but efficient enough to carry some of the great blocks of stone used in building the pyramids. These early conveyances were nothing more than sledges which were dragged along roads smoothed and hardened especially to lessen the friction. Sometimes merely a forked tree limb with boards placed across it for a platform was used as a drag. Later friction was lessened by small rollers used on the sledge runners which in time developed into the wheel and axle—one of man's greatest contributions to world progress. This greatest of all mechanical devices was first used on one of these small vehicles by the Assyrians and soon developed the wheelbarrow and cart.

In America the genesis of the modern electric industrial truck is found in the necessity for an automatic device efficient enough to cope with the ever increasing transportation of baggage and freight and with growing commercial industries. As terminals became larger and baggage rooms, postoffices and express depots became longer, a quicker and more capacious truck was demanded, and so one railroad, the Pennsylvania, engaged a mechanical engineer to design an electric hand truck, as it was then called. So successful was this application of the first "electric stevedore" that it was shortly applied to other operations.

When any mechanical device proves itself a labor and a time saver, combining both efficiency and economy, it is only a short time before it becomes popularized, and beginning in 1911—only four years ago—various developments of the electric industrial truck followed each other very rapidly. Today over 1,000 of these modern carriers are used in the United States and Canada. The average layman has but a small conception of the tremendous amount of work being done on piers, in railroad terminals, in industrial plants by these powerful little storage battery trucks.

It is estimated that in the United States alone there is a grand total of 720,000 tons of goods every year which passes through the railroad freight and transfer stations. The present lack of system in handling this freight and the tremendous amount of lost time involved represents a yearly loss of more than $80,000,000. With the existing antiquated and inefficient methods there is constant confusion and delay where thousands of conveyances endeavor to get served within a few hours. This causes the transfer mediums to be held up for several hours inactive with resulting losses. As the use of the electric stevedore increases, it is to be hoped that this will influence a further systematized manner of delivery. As their work becomes more thoroughly unified, the freight sheds and docks in many cases will operate on a 24-hour schedule. With the virtual freedom of city streets great electric commercial vehicles operating silently, will transport the goods by night to well located centers from which goods may be distributed the following day and delivered when business houses are prepared for their receipt. This seems to be the only way to solve the problem of congested freight piers in cities where increase in size of the terminals is rendered impracticable for physical reasons, the cities in most cases having steadily built up around them. Today the only hope for decreased congestion is increased efficiency such as will enable street vehicles to discharge or receive their loads with celerity, and this must be effected by speeding up the movement of freight over the platforms, in using more efficient transit means between the vessel holds or freight cars and the vehicle railboards, and in organizing a system of distributing centers to supplement the cramped terminals.

In railway terminals alone where these modern...
ELECTRIC VEHICLES

Vol. VI. No. 6.

Electric carriers have supplanted the hand trucks it is estimated that there is a total saving of 66 per cent. The electrically propelled baggage truck has proved itself a fixed necessity. We have ceased to marvel at the speed, ease and efficiency with which these trucks piled high with trunks, bags and boxes deftly wind their way along congested station platforms from train to baggage room, doing the work that formerly required four times as much labor and twice as many trucks. In fact, we have almost forgotten the antiquated old hand truck clumsily pushing its way about congested areas with more strength than system or efficiency. A short description of the operation of an electric industrial truck will show its simplicity and safety. The controller is inclosed and an automatic cut-off switch minimizes accidents. One handle is used as a controller lever, and the other handle for steering. The controller returns to neutral as the hand is removed from the lever. The cut-off switch cuts off the power when the foot is removed from the brake pedal. In other words, the driver applies the brake simply by releasing the pedal with his foot, and as he releases the pedal, the power is cut off automatically.

The driver, standing erect on the end of the truck, with hands on the controller and steering lever, respectively, and foot on the brake pedal, is in the best possible position to guide and control his load. The simplicity of operation does away with the necessity for having expensive operators, the average freight handler being taught to successfully operate a truck, even in congested plants or terminals, in about 48 hours. The ordinary baggage truck has a capacity of 2,000 lbs., and is used for carrying both baggage and mail. The immense increase in baggage, express and mail matter being moved by our railroads demanded proportionate increase of efficiency in its handling, and slow moving man-powered hand trucks have gradually given way to the modern electric stevedore.

Time studies made in manufacturing plants and at the great piers in seaport cities indicate beyond a question that electric industrial trucks will supplant the hand truck wherever operating conditions warrant. More than this, the shipping platforms and piers of the future will be designed especially for the more efficient operations of these electrics. They already have a tremendous influence on the short haul.

Down in Savannah you may see cotton moved across great piers by electric trucks equipped with hoists and cranes, carrying it directly into the holds of the steamers which bring it North. Two of these little electrics would handle more cotton in one day than twenty freight handlers. At the Bush Docks in Brooklyn you can see the same cotton placed in cars by battery truck cranes, the cars first being “spotted” by the electric. It is taken out of the cars at the mill by the industrial trucks and moved to storage and then to the spinning room by them. Later the bobbins, dye tubs, and beams are moved from mill to mill by small electric shop trucks.

In testimony submitted for the information of the Interstate Commerce Commission, a report of the operation of an electric industrial truck at the Cunard pier, New York City, showed that in handling macaroni in boxes, six electric industrial trucks did the work in nine hours, that would have required 24 hand trucks. The cost of labor with the electric vehicles was $21, while at current longshoremen’s rates it would have cost for labor, $87.60, if hand trucks had been relied upon.

In handling grapes in barrels at the same dock, two industrial trucks did the work of 21 hand trucks. In handling mackerel in barrels, two electric industrial trucks did the work of 19 hand trucks. In handling casks of wine, seven electric industrial vehicles with thirteen men, did the work of 36 men rolling the casks from one man to the other.

Under the old method of hand truck operation, the cost per ton of handling freight at railroad terminals and steamship piers was twenty-five cents, while the cost per ton for performing the same work with electric industrial trucks is but 101.3 cents. From a socialistic view, too, investigations show an important feature which particularly commends the electric truck to the operator as well as to his employer. Under the old plan the men received a wage of $2 per day, while under the truck operating system, where men are paid on a tonnage basis, their compensation amounted to $2.40 per day, or an increase of 20 per cent.

While the largest field for the electric truck is in handling baggage and freight at terminals and piers, they are being used to a great extent, however, in factories and industrial plants, and more and larger installations are being made continually. In shop and mill transportation, in storage warehouses, in freight transfer stations, in supply and provisioning work for railroads, steamships, etc., in brick and lumber yards, in stoking in power plants, in wholesale and retail packing, shipping and receiving, and even in building operations, the electric industrial truck finds extensive application. A valuable application of this type, equipped with a crane, is in laying street curb stones. In warehouses they are used for hoisting, in packing motors, etc. Motor car and other manufacturers are beginning to regard the electric shop truck as indispensable. Warehouses and mills are constantly finding new uses for them as the number of different types increase. The Government has adopted them for its arsenals, and a recent special application is found in the new buildings of the Boston Children’s Hospital. It is being employed to do the work formerly performed by four men. “During its nine months of
service, not one dollar has been spent for repairs on this useful vehicle," states the Electrical World. "The truck is used for the transportation of food from the kitchen to the elevators, for collecting and distributing washing, and for other odd jobs, and is operated in all about 20 miles per day. It is geared to run at six miles per hour, and is charged every other day with energy supplied for the central power plant of the Harvard Medical School."

According as necessity has created the demand, various types of these trucks have been developed. They are made small enough to operate in the aisles of factories, and storage warehouses, to run on elevators and into freight cars, motor trucks and horse wagons, yet they carry from one to two tons, the latter being standard capacity. They possess sufficient power to haul trains of trailers, and they can climb grades that would tax the power of mules, and would be impracticable for hand trucks. Elevating transfer trucks have been developed by which it is possible to pick up, carry away, and set down, interchangeable false platforms with piles of goods on them by automatic means, thus eliminating the last item of hand labor, the loading and unloading of the trucks.

It should not be overlooked that this small truck has many of the fundamental advantages of its larger brother in the street, namely: it is clean, odorless, and practically silent, its simplicity of construction is a great aid in operation and maintenance, and its freedom from fire and explosion commends it to fire commissioners and underwriters.

It is obviously too early to determine to the last cent just how much can be saved by the adoption and use of these small trucks. The labor item is the most important one, and it has been found that where the trucks can be kept busy and the hauls average 200 to 800 feet, that each truck will displace at least 4, and often 5 and 6 men each. They can make from 20 to 30 miles on a single charge, while boosting during noon hour will increase this mileage one-third. Although the initial cost of the electric industrial truck, which is $1,000 to $3,500, looms large when compared to the cost of hand-powered equipment, it will save its first cost in 4½ months with careful operation, and if a machine will pay for itself in this short time, what does it matter whether it costs $1,000 or $5,000? With enough work to keep it busy, and with careful operation, the economy and capacity of the electric stevedore is little short of amazing.

National Electric Light Association Convention

Electricity has done more to make the Panamapacific International Exposition great than any other factor. Recognizing the possibilities residing in this wonderful power the exposition bent every energy toward specializing in electricity and making of the lighting effects a feature such as never has been seen before. The Panamapacific Exposition has made electricity the soul of the Jewel City, the one awe-inspiring feature that will live in the memory all one’s life.

Significant also is the fact that during the "Electric Period," ranging from July 19 to October 23, almost every branch of the electrical world will be represented in eleven conventions, under the auspices of the exposition, when the delegates will convene with surroundings eminently suited to their great work.

Coming earlier in the season is the convention of the National Electric Light Association, which occurs June 7, 8, 9, 10 and 11. Splendid opportunities are afforded the delegate and his friends in being able to attend this important gathering under most favorable circumstances.

The San Francisco headquarters of the convention will be in Native Sons’ Hall, 414 Mason street, which building contains 14 halls and several other meeting rooms. The association office and registration headquarters will be in the ground floor lobby. On this floor is the auditorium. The social hall, which is in the basement, will accommodate 700 or 800 people. The general, technical and commercial sessions will be divided between these two halls under such arrangement as is best in accordance with the program. The balcony will seat about 1,500 people. The sessions of the accounting section will be held in a large room on the fourth floor. A room will be reserved as a place for local committees and for a general lounging room. A room on the fifth floor will be reserved for the convention daily and the association stenographic staff.

The tentative program is substantially as follows:

June 8, 10 A. M.—First general session, including an address of welcome by Mayor Rolph and one by John A. Britton, address by President Scott and committee reports. At 2:30 P. M.—The first technical session, first accounting session and first commercial session.

It is expected that an interesting feature will mark the sessions, when John F. Gilchrist will deliver an address on "The Electric Vehicle and the Central Station."

The exhibition has spent many fortunes in combining the world for the best music known to men. During the period that the convention will be held there will be heard Cassata’s official band of forty men; also the great exposition orchestra of eighty performers, all of them musicians of wide renown, and led by Max Bendix.

It is expected that the convention will do much to enthrall central stations in the values of the electric. It is believed by experts in the industry that the general discussion relative to the electric coupled with the actual operation of electric in the fair grounds will be instrumental in convincing many that the electric deserves their investigation.

New York Auto Bus Lines Not Under Commission

The New York Public Service Commission has received requests from all quarters of the state for an expression as to the effect and enforcement of the provisions of the so-called jitney bus statute recently approved by the Governor. The following unofficial statement was made at the commission’s offices recently:

It appears that the “auto-bus law,” which has been in effect for the last two years, has been repealed by the enactment of the jitney bus law, and that it is no longer necessary for persons and corporations desiring to operate auto bus lines on state highways to come to the commission for certificates of approval.

It will be necessary, however, for all persons and corporations owning or operating stage routes, bus lines or motor vehicles carrying passengers for a fare of fifteen cents or less upon any street, avenue or public place in any city of the state, except the city of New York, to procure first the consent of the local authorities and next a certificate of convenience from the commission. The commission is not prepared to announce any general policy in considering such applications in advance thereof.
A few electric car owners have ventured in a haphazard way on touring trips, but not of any great length on account of lack of information as to locations of charging stations and the knowledge of the proper itineraries to follow.

The Goodrich National Touring Bureau, realizing this condition, has prepared a very unique and complete route book of all of the territory east of the Hudson River, covering the Harlem Valley of New York and all of the New England States. This book is called "Electric Motor Car Tours of New England," and in addition to detailed route descriptions showing the best highways and the proper turns to make, it lists the locations of each charging station. This information is also shown by diagram map incorporated in the tour book. In addition there is a very complete alphabetical list of charging stations compiled by the Electric Motor Car Club of Boston, which not only gives the name and address, but the classification of the stations into three divisions: one showing service of a large capacity and a full knowledge of electric vehicles, another showing good service, and another showing good emergency stations only.

It is possible for the electric car owner to take extended tours not only through Connecticut, Rhode Island, Massachusetts and New York, but into the popular resort districts of Vermont, New Hampshire and Maine. He can prepare his itinerary and night stops, using the diagram map for such purpose, so as to end each day's trip at a city or town having a charging station.
Charging Stations in the New England States

Eastern Charging Facilities Well Distributed Offer Excellent Opportunity for Touring

MASSACHUSETTS

Ampères

The Braintree Co., 61 Braintree Rd., Allston
Ampères

Amesbury Elec. Lt. Co., Amesbury
100

S. R. Bailey & Co. Inc., Amesbury
100

Arlington Auto Co., 23 Massachusetts Ave., Arlington
30

Ivers L. Webster, 480 Massachusetts St., Watertown
60

Athal Gas & Electric Co., Athol

Amsbury Car Co., 74 Union St., Attleboro
40

Aberdeen Street Garage, 28 Aberdeen St., Boston
50

Atlantic Avenue Electric Garage, 474 Atlantic Ave., Boston
100

Dodge Motor Vehicle Co., 21 Irvington St., Boston
40

Frederick E. Edwards, 530 Columbus Ave., Boston
50

Fenway Garage Co., 173 Ipswich St., Boston
75

Regent Garage, 27 Lansdowne St., Boston
50

K. Rommelinger, 410 Newbury St., Boston
75

D. C. Tiffany Co., 136 Chestnut St., Boston
40

Rambler Garage, Bradford

Edison Electric Helg., Co. of Brockton, Brockton
100

Beaconfield Garage, 1725 Beacon St., Brookline

Bowdoin Garage, Peter Uttsch, 29 Webster St., Brookline
30

Louis A. Vachon, 645 Washington St., Brookline
40

Auto Windfield Co., University Rd., Cambridge
60

Cambridge Electric Light Co., 4 Blackstone St., Cambridge
130

Hastings Bakery, Campello

Nathanial N. Wentworth, 391 Washington St., Canton
50

Charlemont Electric Light & Power Co., Charlemont

Fall River Electric Light Co., 14 Bedford, Fall River
100

E. B. Newton, 165 Bedford St., Fall River

Robert W. Powers, 133 Pochester St., Fall River

Fitchburg & Electric Light Co., Fitchburg
300

Middle Town of Fram. Gar., 2 Central Sq., Framingham

Edw. C. Webster, 8 Sanger St., So. F., Framingham
50

Gardner Electric Light Co., 265 Central St., Gardner

Gloucester Electric Co., Gloucester

Great Barrington Electric Light Co., Gt. Barrington

Greenfield Electric Light & Power Co., Greenfield
90

Haverhill Electric Co., 140 Merrimack St., Haverhill
30

Municipal Gas & Electric Light Plant, Holyoke
200

Magna Auto Co., 2 Division St., Holyoke
40

Hull Electric Light Co., 17 Electric Ave., Hull
60

Hyannis Auto Co., Hyannis

Hyde Park Auto Station, 1215 Hyde Park Ave., Hyde Park
50

Norfork Garage, Hyde Park

Lawrence Gas & Electric Co., Lawrence
200

Lee Electric Co., Lee

Morse Garage, Church St., Lenox

Colonial Garage, 34 Bedford St., Lexington
40

Longfellow Electric Co., Longfellow St., Livestock
30

Ludlow Mfg. Assoc., Ludlow

E. F. Bacceller, 49 Broad St., Lynn

Lyman Gas & Electric Co., Lynn
30

Moulton's Garage, Raynham

Malden Electric Co., 139 Pleasant St., Malden
100

Perkins & Corliss, 19 Beach St., Manchester

Regent Garage, Manchester

Municipal Electric Light & Power Co., Mansfield

Municipal Electric Light Plant, Marblehead
50

Hillier's Garage, Marblehead
50

Marlboro Electric Co., Marlboro

Pine River, Southwick
50

New Bedford Gas & Electric Lt. Co., 125 Middle St., New Bedford
300

P. S. Bradford's Garage, Market Square, Newburyport
30

Chesnut Hill Garage, 529 Commanche Ave., Newton
30

Newton Center Garage, 792 Beacon St., Newton
30

Newton Garage & Auto Co., 24 Brook St., Newton
112

El. Lt. & Power Co. of Abington & Rockland, Charlestown
39


Munic, Elec. Light & Water Plant, 86 High St., N. Attleboro
125

Northampton Elec. Lighting Co., 189 Main St., Northampton
150

Nunzi & Co., 227 Main St., Springfield
30

Vineyard Lighting Co., Oak Bluffs

Central Mass. Electric Co., 422 Main St., Palmer

Municipal Electric Light Plant, Peabody
150

Pittsfield Auto Gar. Co., 328 North St., Pittsfield
35

Pittsfield Electric Co., Pittsfield
150

Plymouth Garage & Machine Shop, Sandwich St., Plymouth
40

Walter Packard, 14 Charles Estabrook St., Quincy

Municipal Electric Light Plant, Reading

Suburban Gas & Electric Co., 130 Beach St., Revere
125

Salem Electric Lighting Co., 89 Lafayette St., Salem
330

Nellis & Doreste & Son, 60 Dover St., W. S., Somerville
50

Albert W. Dow & Co., 12 Newbury St., W. S., Somerville
50

Spencer Gas Co., Spencer

Electric Vehicle Co., 54 Dwight St., Springfield
100

Morse-Readio Auto Co., 32 Sanford St., Springfield

Norcross Cameron Co., 157 Bridge St., Springfield
60

Springfield Auto Co., 40 Liberty St., Springfield

Swampscott Auto Co., 39 New Ocean St., Swampscott
75

Franklin Elec. Lt. Co., Turners Falls

MacGregor Garage, 735 Main St., Waltham
50

Webster & Stoughton Gas & Elec. Co., 65 Main St., Waltham

I. J. Clark Nat. Fireworks Co., King St., W., Hanover

Williams Auto Co., 37 Francis St., Westfield

Albert Weatherby, 111 South Ave., Weston

Mystic Valley Gas & Electric Co., Main St., Winchester
50

John H. Bates & Son, 30 Montvale Ave., Woburn
50

Wollaston Centre Gar., Wollaston Sta., Wollaston
50

Worcester El. Lt. Co., 375 Main St., Worcester
450

MAINE

Ashland Elec. Co., Ashland

Bangor Ry. & El. Co., Bangor

F. B. Hayes, Bar Harbor

Hains Wachburn, 44 Bath St., Bath

Merrill-Springer Co., Bethesda

York County Power Co., Biddeford

Bridgton Water & Ele. Co., Bidgton

Balt. & Brunswick L. & Pwr. Co., Brunswick

Caribou Water L. & Pwr. Co., Caribou

Ray & Scott, Dexter

Dixfield L. & Improvement Co., Dixfield

Piscataquis Woolen, Co., Clinton

Houlton Mills & L. Co., Houlton

Leatheroid Mfg. Co., Kennebunk
150

Joseph P. Bell, Kennebunk Beach

The Lewiston & Auburn Ele. Co., Lewiston

Mechanic Falls Ele. Lt. Co., Mechanics Falls

Milo Ele. Lt. & Pwr. Co., Milo

Norwalk & Paris R. Co., Milo


Central Maine Power Co., Pittsfield

Cumberland County Pwr. & Lt. Co., Portland

Harmon Auto Co., 20 Forest Ave., Portland

The Portland Co., 38 Fore St., Portland

Rumford Falls L. & Water Co., 111 Knox St., Rumford

Central Maine Pwr. Co., Skowhegan

Central Maine Pwr. Co., Waterville

Presumpscot Elec. Co., Westbrook

ELECTRIC VEHICLES

Waverley Electrics Make Sociability Run

For a 40-mile run in the country, would you choose an electric?

It may seem incredible, yet more than a score of otherwise sane and sensible people dwelling in Indianapolis, Ind., did that very thing the other day and lived to tell the tale.

Half a score of Waverley electrics, driven by their owners, gathered in front of the Waverley salesroom on Meridian street, and faced the camera before starting on their unheard-of expedition.

The goal of the expedition was Mooresville, a thriving little city some 20 miles southwest of the Hoosier capital, and the idea of it originated with the Waverley management as a part of their new policy of educating Waverley owners to make wider and more general use of their cars.

The use of electrics on country roads has been restricted by a certain timidity on the part of owners who have accepted the designation of the electric as a town car too literally and regarded it as an actual limitation of its usefulness to city streets.

For this reason the new Waverley management has inaugurated a series of sociability runs to various popular motorists' resorts within easy reach of Indianapolis.

This first round trip of 40 miles was made without a hitch in the schedule. The cars were driven on third speed—a comfortable jog of about 15 miles an hour. No provision was made for charging on the way and none was needed, as all the cars returned with ample current in their batteries for a much longer trip.
Relative Efficiency of Batteries

Tests Prove Full Advantages from 40 to 44 Cells for Larger Number of Cells; 20 to 24 for Smaller

By D. M. SIMPSON

ONE of the ever recurring questions in connection with electric vehicles is the best number of cells to use in the battery. Most of the selections are good, some are better, but it could hardly be said that there is any one absolute “best” number of cells to use. I will therefore outline a few points showing why one number of cells may be better than another when used under a given condition.

One of the principal points which seems to hold the attention of those interested in the subject is the efficiency of charging the battery from 110 volts direct current, which is approximately the standard lighting voltage in the direct current districts and the line voltage of public garages. The accompanying chart shows graphically the relative efficiency of batteries having different numbers of cells but with equal watt-hour output when charged from 110 volts direct current.

No mention is made here of the voltage during charge or the voltage at end of charge. However, 44 cells is the maximum number which can be charged to advantage from 110 volts under average conditions. The charging voltage is considered to be the same in charging from 110 volts. D. C.—D. M. Simpson.

Therefore the line voltage \( A \), multiplied by the charging current \( B \) equals the watt-hours taken from the line to charge that particular battery.

The discharge voltage of the batteries in each case is considered to be 1.95 volts per cell so that the average discharge voltage of the battery is represented by the line \( a \). The discharge in ampere-hours is represented by the line \( b \).

Therefore, the average voltage \( a \), multiplied by the ampere-hours output \( b \) equals the watt-hours output of the battery and is represented by the light area.
The difference between the total area within the heavy line and the light portion represents the watt-hours lost and is indicated by the shaded portion.

It should be noted that all of the light sections representing the capacities of the batteries are of the same area, that is, when fewer cells are used reducing the voltage of the battery it is necessary to increase the amper-hour capacity to give the same output in watt-hours. In the illustrations all of the batteries have a capacity of approximately 10,000 watt-hours output which is about the capacity of the average vehicle battery.

A glance at the chart shows the enormous increase in loss of power when charging a small number of cells from 110 volts. This is also given in a comparative tabular form at the bottom of the chart. From the above data it would appear that it should be made a legal offense to make, sell, buy, use, or give away any battery with less than 44 cells. However there are other points to be considered.

Not all electrics are charged from 110 volt direct current because in most of the older cities the direct current district is very limited, with a tendency on the part of the electric light companies to reduce this area, whereas the alternating current district is becoming wider very rapidly; however a large per cent of the owners of electrics who do their own charging live in the alternating district, rectifying the current through mercury arc rectifiers, rotary converters, motor generator sets or commutating devices. Also practically all of the newer towns are supplied with alternating current only. I have therefore drawn two curves showing the comparative efficiency of batteries giving the same watt-hour output but having different numbers of cells when charged from 110 volts direct current and from mercury arc rectifiers. These two curves show the efficiency of charging 44 cells to be greater when charged from 110 volts direct current than when charged from a rectifier. However as the number of cells becomes less the efficiency of the 110 direct current charging drops very rapidly, whereas the efficiency of charging from a rectifier drops less rapidly so that when charging from a rectifier the efficiency is very much in favor of the smaller number of cells.

The lower curve on Chart No. 2 shows the relative cost of batteries of equal capacity in watt-hours but with different number of cells. Taking the extreme ends of this curve based on present prices a 44-cell battery costs approximately 3¾ cents per watt-hour capacity, whereas a 20-cell battery of the same watt-hour capacity costs only 2½ cents per watt-hour capacity.

There is less difficulty in looking after a smaller number of cells. There is a less number to flush; also on account of lower voltage there is less tendency for jars to burn out; also the difference in weight is slightly in favor of the smaller number of cells.

One difficulty in charging batteries heretofore has been in not being able to obtain a sufficiently low current from rectifiers to give the finishing charge without excessive gasing, but with a smaller number of cells of greater amper-hour capacity this difficulty is eliminated as most rectifiers will operate satisfactorily down to 10 or 12 amperes which is sufficiently low for cells of large amper capacity.

Even with the advantages shown in favor of the small number of cells, the data given may still not be entirely fair to the battery with a small number of cells because to make the comparison it was necessary to consider all the batteries as having practically the same watt-hour output, whereas those cars using a small number of cells on account of their lighter weight would not require so much power. So instead of requiring 10,000 watt-hours to give an average mileage a fewer number of cells in a lighter car would probably give the same mileage with only 6,000 or 8,000 watt-hours with a correspondingly reduced initial and operating cost.

As intimated in the beginning there is no attempt to draw any fixed conclusion as to any absolute best number of cells to use but it is suggested that either 40 to 44 cells be used in order to obtain the advantages of the larger number of cells or that 20 to 24 cells be used in order to obtain full advantage of the smaller number of cells. Any intermediate number of cells has hardly any advantages to offer.

Insurance Companies’ Policies

The ruling that automobile insurance companies are responsible for the safety of their policies was upheld by Circuit Judge Cave in St. Louis, Mo., when he quashed the indictments against two men who had been charged with attempting to obtain money by false pretense from the Maryland Motor Car Insurance Company.

The indictments charged that the defendants had placed a valuation of $2,730 on an automobile, which in reality was worth only $1,000, and that they had represented that it was a 1913 model when the machine was a 1911 model. The suit grew out of the automobile owners’ attempt to collect damages from the insurance company after the machine in question had been destroyed by fire.

In announcing his decision Judge Cave ruled that even if the charges in the indictment had been proved they would not constitute a legal offense.
Why Service Conditions Should be Investigated

The Value of Conservative Investigation and Honest Recommendations Before Selling a Customer

EVEN manufacturer should know before he sells his product whether or not it will result in credit to himself and satisfaction to the buyer. In the motor truck business this usually requires some investigation.

We may certainly take it for granted that service conditions under which a truck is to be operated should be known to the manufacturer before the sale of the truck is made, if he is to recommend the particular type of truck suitable for the particular use, or if he is to advise the customer not to buy a truck at all, if that is the proper advice to give.

It is probable that in any new field, in any new industry, it is inevitable that many mistakes in detail should be made, but it would seem as though some of the mistakes made in principle by early truck makers should have been foreseen, as, after all, good business principles are the same in all lines of business, and it should not have taken five or ten years to find out that they applied to the truck business as to any other and in like degree.

One principle applicable to all business is that the interests of the manufacturer and his customers are, in the long run, the same; that to sell a customer a truck which will not do his work, when perhaps no truck will do his work, is like selling a man a fur coat for use in Cuba or a straw hat for the Arctic circle. Too often has a sale been made to keep a competitor's article out of the market, without regard to the best interests either of the customer or the manufacturer, when it should have been realized that to get a competitor's truck into service when it could not operate successfully is less damaging than to put one's own product into such service.

For the purpose of bringing out more clearly the matter to be discussed, the question can be reworded as follows:

"How far should service conditions be investigated before a sale is made to a prospective customer and what should be the nature and extent of the recommendations made?"

Thorough investigation of service conditions should be made to the point that will insure the manufacturer that his truck, when sold, will reflect credit upon him, will result in additional sales to the same or to other customers, and in profit to the particular buyer. It is not conceivable that there can be any marked difference of opinion as to the truth of this statement or as to the wisdom of this policy. Ours is a permanent business and requires for its success a good-will that is founded upon as many years of honest good treatment of customers as is possible. A boiler that will not heat or that will overheat; an egg that

* A paper read before Detroit convention, May 5 and 6.
place of horse equipment—the volume of freight to be handled, the speed required, the road conditions, loading and unloading problems, seasonal conditions, number of working hours, and so on. If the salesman is honest, and we must assume he is, because if he is not we are condemning our own management), if he is reasonably intelligent (which he must be or he will quickly eliminate himself from the business) he should be able to determine with reasonable exactness whether or not a sale is a good one in nine out of ten cases, and in the tenth he should know enough of the situation to be able to determine which particular factor involved is outside his powers and report to the head of his department for advice and assistance.

Now this tenth case, in a very large proportion of cases, should be fairly clear to the head of the department and should require comparatively little further investigation and now too much study on his part. I say should, because I believe that the vast majority of cases will be covered under my claim that investigation is justified and, in fact, necessary to determine the fact that the sale is a good one from the point of view of the maker. We may, therefore, agree that in determining further the point to which investigation is justified, it is certainly justified as long as it can be done by the salesman and by his immediate superior.

There will, however, always be a large class of cases which will require more knowledge than is possessed by the salesman, more time than the department head has to devote to them, which must be studied by what, in our advertising literature, we are pleased to call our traffic departments.

Now, in our traffic departments the commodity most important or all is what is required in every branch of our business; namely, common sense—and then more common-sense—and then still more common-sense. It is a department where, I believe, it is easier to go to extremes than in any other connected with our industry, except publicity. The reason for it is found, I think, in the fact that first the traffic engineer must create a job for himself and unless he is enthusiastic and hard working he will not succeed, and if he is he will likely outrun the safe limits of his duty.

Then too, the demands upon a traffic department made by the sales department will always be heavy and unless the object of investigations is kept clearly in mind, both by the traffic department and the head of the sales department, the same result will be met as has been met so widely in our service department; namely, a heavy expense built up around service for the sake of assisting in the selling, with results of certain injury to the service and doubtful value to the selling. Now, perhaps I will appear to have argued in a circle and to have come back almost to the point of saying that investigation is justifiable only from the necessity of assuring ourselves that our product is sold only where it will do well.

There is, however, a large class of cases which must be treated on their merits from the viewpoint of developing new fields.

A great railroad company with congested terminals is considering the wisdom of delivering freight by motor trucks instead of by the truck men handling freight for the various consignees. Here is a subject for the deepest and most careful study—a study of traffic conditions, of freight conditions, of railroad practice. Should we be assured of the good faith of the railroad company, of its real desire to know the truth, and its willingness to deal with us, should it be proved that a change to motors will save time, money and friction and conduct to more efficient railroading, there can be no doubt of the propriety of careful investigation at almost any reasonable cost, keeping clearly in mind that the problem is first a railroad problem to be investigated by the railroad with our help and not a truck problem to be studied by us with the help of the railroad. The result may prove the wisdom of changing to motors, in which case the company making the study should secure the sale; or it may prove a change to be unwise, in which case we should be the first to admit it.

Similar cases may be suggested without limit. Probable advantages from the establishment of bus lines, or profits to be secured or increased by employing motors for general express service or local deliveries, are fair examples of legitimate prospects where investigation may be extended to great limits, always again keeping in mind that one studying another man's business, as to which he has only a limited experience and insufficient data, must make use of the wider knowledge and experience of the truckman or omnibus man himself.

In summarizing investigation to determine whether or not the truck, when sold, will be reasonably certain to do the work is justified and necessary.

Investigations such as should be made by a salesman under supervision by his department head are also entirely justifiable.

Investigation by a special department for that purpose should be made with great conservatism and then only from the point of view of the customer; in other words, by assisting him to study his own problem and not by studying ourselves—a problem as to which our knowledge of facts must be superficial and our conclusions may be not only biased but unsound.

In carrying out any policy regarding this important matter, let us always remember we are selling machinery. It is often said we are selling transportation and by that is meant that we are agreeing to furnish proper service to customers buying our trucks. This slogan has led to much misunderstanding on the part of our customers: much misleading by short-sighted salesmen who think only of their commission, and that itн a heavy tax upon companies in free repair and guarantee allowances.

We must conduct business along conservative lines, like any other business, and in accordance with general rules applicable to all kinds of business, and take care not to deceive ourselves, for if we do not deceive ourselves there is no likelihood of our deceiving others. Do not let us deceive ourselves into thinking that we are selling anything but a piece of machinery adaptable to various methods of transportation, and if we are sufficiently familiar with the service conditions under which our trucks are to be operated to satisfy ourselves that they will do us credit, we have, in the vast majority of cases, gone far with investigation and recommendations as good business principles will justify.

The Terrell bill pending in the Ohio house of representatives, making the owner of an automobile prima facie responsible for damage caused by accident, no matter who drives the car, was defeated by an overwhelming vote last week. Only 29 votes for the measure were secured.
ELECTRIC VEHICLES

Published Monthly by
ELECTRICITY MAGAZINE CORPORATION
Mogadore Building, Chicago

New York Office, 1023 Longacre Building, 42nd Street and Broadway.

Ed. J. Mock and Paul H. Woodruff, Editors
Fred B. Schafer, Advertising Manager.

Entered as second-class matter January 22, 1912, at the postoffice at Chicago, Illinois, under act of March 3, 1879.

TERMS OF SUBSCRIPTION
United States, Cuba and Mexico............................. Per year, $1.40
Canada ....................................................................... Per year, 1.75
Foreign countries within the Postal Union. ......... Per year, 2.00
Single copy................................................................ 15

NOTICE TO ADVERTISERS
Changes of advertising copy should reach the office of publication not less than ten days in advance of date of issue. Regular date of issue, the first day of each month. New advertisements will be accepted up to within five days of date of issue, but proof of such advertisements can not be shown in advance of publication.

NOTICE TO SUBSCRIBERS
Remittances—Remittances should be made by check, New York draft, or money order, in favor of Electric Vehicles. Foreign subscriptions may be received direct by International Postal Money Order.

CHANGE OF ADDRESS—The old address should be given as well as the new, and notice should be received two weeks in advance of the desired change.

This publication is free and independent of all business or house connections or control. No manufacturer or supply dealer, or their stockholders or representatives, have any financial interest in Electric Vehicles or any voice in its management or policy.

CHICAGO, JUNE, 1915

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HOPES AND PROSPECTS.

Just as this issue goes to press the National Electric Light Association is concluding its thirty-eighth annual convention. Thirty-eight years in the electrical industry covers a multitude of developments; an evolution from the musingly philosophical subject of a third century ago to the popular household topic of this day. Yet even now, startling as the propagation of electrical knowledge has been, not all those engaged in the work are as familiar with all its opportunities as they might be. It is just as necessary as it ever was for a few enthusiasts to labor with applications whose merits should be obvious to all, so that a host of doubting Thomas may be convinced for their own benefit.

Of all modern activities in the application of electricity the central station is the heart and core. Applied science can accomplish almost any miracle now; but it cannot “Do it electrically” without the central station. And so the three great applications of electric current, illumination, power and transportation, are of equal interest to the central stations and their allies who are on their way home from a tremendously big convention.

Of this trio of interests, transportation, as represented by the electric vehicle, is the only one that has not received the amount of applied co-operative effort it deserves. It is, indeed, the only really large consumer of central station current whose recognition has not been universal among those who make and sell that current. Electric light, of course, is the foundation of the electrical industry and the reason for the central station’s existence. Almost equally important is power, the industrial motor installations which keep the lighting plants busy all day and so reduce the cost of current manufacture that it comes to still further and more popular use. The electric vehicle, the locomotive application of power, is just as important as the stationary application, both to the economics of industry and to the efficiency of the central station. For in the use of current it fills the only blank period left in the twenty-four hour cycle; it is an all-night load.

We are optimistic enough to assume that the cause of the electric vehicle has advanced during the convention just held. Doubtless some central stations which have been lukewarm toward the electric now feel enough enthusiasm to turn their hands to the work of co-operation. Probably a number which have known little and cared less about the merits of the electric, even from a selfish standpoint, are now at least casually interested. If there has been any such mental change much of the credit for it can go to the paper entitled, “The Central Station and the Electric Vehicle,” presented by John F. Gilchrist, president of the Electric Vehicle Association of America, and vice-president of the Commonwealth Edison Company of Chicago—one of the most progressive of central stations, which has done an incalculable amount of work in helping the electric vehicle philosophically.

This paper, which is contained in this number, will, without a doubt, have a tremendous effect on the central station men who attended the meeting—calling to their particular attention the importance of the electric vehicle and what it means to them and the public estimated in dollars and cents, as measured in the economy and reliability of a modern method.

Back to the more isolated districts, where hills and unimproved streets are presided over by the gaso-
line types alone, and where the value of the electric flat iron, percolator, washing machine and other electrical contrivances are just beginning to be campaigned, there will return from this electrical meeting many who will install charging apparatus and a demonstrator to be used in their own delivery service, and boost the electric in general.

And when this kind of interest becomes established, then shall the sale of electrics really begin. In its beginning, quite unlike that other beginning of twelve years ago, the improved charging facilities, better vehicles and better batteries, will convince many thousands of new vehicle buyers.

Electric vehicle interests now have their opportunity: and as opportunity calls let the manufacturer, the dealer, and the central station, join in one great effort and preserve this industry, which has a legitimate product ready to take its place as the modern way—the electrical way—the economical way.

ENTERPRISING ENGLAND

ENGLAND has a big war on just now and has had for nearly a year. That is not usually good for home business. And England has always enjoyed the reputation (at least in this country) of being a bit slow in the development of new industries. Yet something is happening to the electric vehicle line in Great Britain which makes us wonder whether this field appeals particularly and peculiarly to the English, or if the electric interests in the United States are especially dilatory and inefficient.

The electric vehicle "movement," if it may be so classed, is practically but a few months old in England. We must agree that it got its starting suggestions from this country, and mostly from the Electric Vehicle Association of America. Yet already it has displayed a higher percentage of enthusiasm and application and what the street calls "pep" than we have been able to arouse here.

In the United States there are a great many central stations; but only comparatively few are displaying any active interest in the welfare of the electric vehicle. In England there is naturally a far smaller number of central stations; but practically all of them are working for the development of the electric. And when we say working we do not mean just talking. They are installing charging stations at convenient points and buying electric trucks for their own use and demonstration for advertising the fact that there is such a thing as an electric motor car, and that it is practical and useful.

We have led England in so many uses of applied science, it would be rather curious to see her lunge ahead of us in the intensive cultivation of the electric vehicle. If she does accomplish that (as she seems in a fair way of doing) it will be not because the English have any special aptitude for the business, but because it has not made the progress in this country that it should have made. If there is a reason for this, we leave it to the professional trade analysts for solution.

TROUBLES OF THE DEMONSTRATOR

IT IS not at all impossible, or even very unusual, for the electric passenger car demonstrator to work so hard for a stubborn prospect that he runs his car out of juice before he gets back to the office. Of course, there are plenty of places for recharging, and the ex-hausted demonstrator runs his car to the nearest one and proceeds to put it on charge. He is a stranger and he is taken in, nine times out of ten, by an enterprising garage man whose only aim is to get as much out of him as possible. Even the severely righteous garage man charges him all of the rate according to schedule—if no more, certainly no less.

The demonstrator working for the sale of his employer's cars, and especially the demonstrator active enough to exhaust a full charge solely because in the pursuit of his duty he drove long and far, is a booster for the electric game. The garage man with charging facilities is supposed to be a booster too. The garage man wants to see more cars in use; the demonstrator is putting more cars in use. Why, then, is it necessary that the one proceed to "stick" the other for all the traffic will bear?

The electric vehicle industry is founded on a cooperative scheme. It is necessary that this same cooperative spirit extend to the farthest corners of the business if a profitable system of universal usefulness is to be built up. Small abuses sometimes do big damage, and it is clearly the proper policy for the efficient garage to help, and not hinder, the work of those who demonstrate and sell electrics, and so make better business for the garages.

JUNKING THE EARLY MODELS

SOMEONE has suggested, "Let's junk the old electrics." Dealers, however, far from taking the recommendation seriously, have refused to forfeit the pitance which the selling price of old cars might bring and the "trade-in," whether it is a 1914 or a 1910, is "fixed up" and again put on the boulevard in running condition. Although the industry is most naturally proud that the electric will run forever, still it is as poor policy to market the dead models as if the best makes of gas cars were to re-sell their early door-in-the-rear specimens.

To the public on the boulevard thoroughfares and to the drivers of gas cars the ancient electric is a constant object of disrespect. The chain driven vehicle with its primitive body, short wheel base and small wheels is well termed a "funny electric": looked at with amusement and minus the refinements of the present day electrics, it is brought to public attention both forcibly and unfavorably.

The radical development in the latest models has come so quickly that many fail to recognize the 1915 model as an electric. And the industry thus loses the prestige of its latest products because they are overshadowed by its earlier efforts.

In the gas car industry manufacturers are quite enthusiastic in eliminating from the streets any early model which might be instrumental in molding public opinion relative to the company's product. In the electric vehicle industry second-hand car selling constitutes a big proportion of the business. But if this part of the trade were eliminated so that the modern models might serve as true examples of the latest electric development, there would result a sale much exceeding that secured by present methods.

Similarly, of the garage man, the ancient model, demanding special and not standard apparatus, offers many problems. To purchasers of such models the early electric fails to carry a fair impression and many further sales are lost because of poor results secured from a product not possessing the features which represent the latest development.
The Electric Vehicle and the Central Station

A Paper Presented Before the Electric Vehicle Association of America

Central stations have exercised considerable influence in the promotion of the electric vehicle, although some of the largest electric vehicle fleets, those of breweries, department stores, express companies, etc., have been installed primarily through the efforts of the manufacturers. These great fleets, unmatched by any competitor—the result of repeat orders extending over a long period of years—conclusively demonstrates the entire practicability of the electric vehicle.

An approximation of the value of some of these large investments is as follows:

- Express and transfer companies: $3,010,000.00
- Public service companies: $2,088,000.00
- Department stores: $5,627,000.00
- Packing house organizations: $609,000.00
- Breweries: $5,350,000.00
- Wholesale merchants and manufacturers: $2,088,000.00
- United States government service: $435,000.00

Although some central stations have effectively co-operated in the exploitation of the electric vehicle, and in a number of instances in a most generous and practical way, yet investigation seems to warrant the statement that comparatively few only appreciate the tremendous opportunities attending the further development of the electric vehicle, nor have they placed their organizations properly behind the movement. As the electric vehicle apparently offers the central station field one of the greatest, if not the greatest development, some plain and pointed remarks apropos of the situation are warranted at this time.

The central station can assist the sale and use of electric vehicles in two principal ways: First, use them; secondly, advocate and otherwise promote their use.

By using electric vehicles the central station not only performs its work satisfactorily, but in addition lends material aid in the further adoption of this modern method of transportation on the part of the public. The central station that advocates the use of electric vehicles and proceeds to use the gas type, when the electric would do the work, is creating confusion and otherwise clogging the wheels of progress.

Furthermore, such a policy is inimical to its own best interest and naturally discourages many manufacturers. The worst offender is the central station that neither uses nor advocates the use of electric vehicles. Such cases are not necessarily hopeless, but require prompt and sustained treatment.

Central stations have use for both the passenger and commercial types of electric vehicles. The passenger type can be used by almost everyone in the organization from the chief executive to the solicitor, and by the intermediate officers and employees. Electric vehicles are available that will meet practically all central station requirements. If special designs be needed, and the central station will definitely indicate what is required, there is reason to believe that manufacturers will endeavor to meet the demand. Before considering special designs however, full and careful investigation should be made of existing models, as it is more than likely that the search will be successfully rewarded.

To be blunt and to the point, possibly the greatest obstacle encountered in the general use of the passenger vehicle by central stations is the “joy-riding” element which, in innumerable instances, has caused the vehicle to be unjustly discriminated against, and it is feared that this will continue until the administrative powers define a policy at least just to the electric, and more particularly to their own best interests.

Experience has shown that where electric vehicles have been intelligently tried out in central station service and in many instances in comparison with the gas car, the glorified claims of the “joy-rider” who for some personal reason usually favors the gas car,
Commonwealth Edison Company, Chicago, Has Used Every Available Method to Boost Electrics in Its Territory. The Accompanying Illustration Shows a Walker Electric Fitted Up with a Very Attractive and Convincing Electric Sign, Exploiting the Electric. This Sign Operates from Power Furnished by Its Own Batteries and Is Driven Through the Streets Each Night.

Progressive Central Stations Employ Electric Trucks in Their Own Service. This Not Only Causes Many Business Men in Their Territory to Note the Service Which the Electric Givers, but Also Is a Special Method to Advertise the Company's Progressiveness as "Doing Everything Electrically," Even Trucking.

Baker Electrics Are Used Quite Extensively in Central Station Construction Service. The Trucks Illustrated Have Been in Operation for Four Years and Are Working Very Satisfactorily with Exceedingly Low Maintenance Expense.

In Denver, Where Hills Are Long and Steep, the Electric Truck Has Proven Absolutely That It Is a Most Logical Type. The Denver Gas & Light Company Has Used This Baker for Three Years and the Economy of This Vehicle Alone Has Caused Many to Investigate the Electric.

Louisville Gas & Light Company Use Electrics and Advertise Them as Most Efficient and Reliable.
have not been substantiated. The electric vehicle, with but few exceptions, will do all the central station work done by any other type of machine. This statement is borne out by the experience of a number of progressive central stations that are in many cases using the electric vehicle exclusively, except for special very long runs at relatively high speeds, although it is remarkable what service can be obtained from certain types of electric vehicles in this particular line of work.

A conveyance of any sort owned by a central station may be considered primarily as a means of serving the interests of the company, and consequently the type selected should fully measure up to this cardinal requirement. If it be the policy of the company to permit the employees to use its property after hours on week days and on Sundays for personal pleasure, those so favored should not attempt to unduly influence the purchase of any particular make or type of car, unless such favored type will first serve, and in the best manner possible, the interests of the company. Unfortunately, in many cases employees are actuated by a personal motive in this matter, and as a result scant consideration is given to what in most instances should be the logical selection—the electric vehicle.

This very serious and unfortunate phase of the electric vehicle situation as related to the central station, was the subject of some pertinent remarks by Frank W. Smith, past-president of the Electric Vehicle Association of America during the convention of the association held in Philadelphia in October, 1914. Mr. Smith said in part:

It seems to me that the "joy-riding" proposition on the part of central station employees is entirely within the control of the administration. I think that when central stations seriously consider the possibility as to revenue resulting from the charging of electric vehicles, they will appreciate the greatly increased revenues that await them. I, for one, sincerely believe that the electric presents for the central station one of the greatest possible futures of any current consuming device.

Now if "joy-riding" is the predominating feature in the minds of the representatives of central station companies, then it is up to the management to remove that "joy-riding" possibility.

Ninety-eight per cent of the automobile requirements of the central station can be taken care of by the electric vehicle, absolutely. In the United Electric Light & Power Company we are using four or five gasoline cars for passenger purposes. We are using these because they were adopted a number of years ago. They have been kept up, but we will never buy another gasoline car if I have anything to say about it.

Now we must recognize that the gas car has its field, not only commercially but as a passenger proposition, and accordingly there are a few applications where gas cars may be needed even in central station companies, but why a sales-man whose full and entire duty is to sell current and otherwise promote electrical applications should be allowed to use a gasoline car if an electric vehicle will do the business, I cannot see. The fact that one can buy a "cheap" gasoline car, and will have to pay more for an electric vehicle which will outlast several Chinese Mercedes does not seem to be a good excuse for buying and using a gas car. Besides this, parading such a choice before the public to whom we are preaching "Do it electrically" seems somewhat ambiguous, to say the least.

It behooves every individual in the electrical industry to use electric vehicles if at all feasible and to urge their use by others.

If central station administrative heads would establish a policy to the effect that no gasoline cars of central station employees are grossly ignorant of charge of their duties, unless it could be conclusively demonstrated that for the same work an electric vehicle was unsuited, the early future would witness the general use of the electric by central station representatives, and a mighty long step would have been made toward further popularizing the electric vehicle.

It is felt that many central station representatives, admittedly unfavorable to the electric, are honest in their belief that it is unsuited to their work. In some relatively few cases this attitude is probably correct, but in the great majority of cases the opinion is based on misunderstanding and general lack of knowledge as to what the modern electric vehicle is capable of. Careful, open-minded investigation will reveal the facts which support the contention of those who have learned to appreciate the electric.

It is unpleasant to record the fact that a majority could be purchased or used by employees in the dis- the merits and capabilities of the electric vehicle, and that their unfavorable attitude, not to mention prevalent destructive opposition, is greatly retarding the introduction of the eventual type of transportation—the electric vehicle.

The sooner this fact is generally realized, the condition obviated, and the real co-operation of all central station men secured, the better it will be for the entire electrical industry. This serious situation merits the full recognition of the "powers that be."
diction is deep-rooted and extended and requires a major operation.

Likewise we see a disposition on the part of many central stations to use the gasoline commercial car, when the experience of other stations unmistakably shows that electric vehicles are better suited to the particular work to be discharged. Why?

In the delivery of meters, appliances and lamps; the transportation of light and heavy miscellaneous storeroom material; the trimming and repairing of arc and street lamps; trucking and pulling cable; transporting cable, splices and material; meter and service work; transporting poles; inspection and emergency work; new business solicitation; adjustments, etc., etc., the electric vehicle has proved its worth to those central stations that have given it a fair trial. Here again, as in all other problems, there are exceptions to the rule, but proper investigation will show that in well over 90 per cent of all cases the electric could be economically and otherwise satisfactorily employed.

Imagine the trials and tribulations of a salesman endeavoring to sell electric vehicles in a community in which the central station by unnecessarily using gasoline cars and thereby placing its stamp of approval on them, sets up an unnatural and unwarranted competition to the electric vehicle. The local merchants are usually disinclined to accept the favorable statements of the electric vehicle salesman as they logically assume that if the statements were truthful the local electricity supply company—"getting current for nothing"—would certainly not be employing gas cars. The argument is difficult to meet and overcome.

The central stations should support the efforts of the electric vehicle salesmen in every possible manner, if for no other reason than because such salesmen are endeavoring to introduce large and profitable current-consuming devices.

It might be interesting to state at this point that in a recent issue of the Power Wagon a statement was made that the electric light and power companies of the United States operate 1,228 electric commercial vehicles and offer a market for 5,000 more—a low estimate. There are 6,000 central stations, but only 292 of them use the electric commercial vehicle, declares this same authority, and it is likely that a still smaller number use the electric passenger vehicle.

It is fair to assume that if the central stations were using their full quota of electrics the number of electric vehicles both passenger and commercial in central station service would about equal the present total of all electric vehicles in use, variously estimated from 30,000 to 72,000. Imagine the influence that such numbers of electric vehicles would exert on the promotion of electrics generally.

Put the burden of proof squarely up to the gasoline car, not on the electric vehicle. Require advocates of the gasoline type to show good and sufficient cause for its purchase, and at the same time give electric vehicle interests an early and full opportunity to indicate the advantages of their types. In this work the Electric Vehicle Association of America would be most happy to co-operate.

One might go a step further and create a policy to the effect that even though the cost of operating a gasoline car for some particular work were slightly less, the electric vehicle should be selected and used. The slight difference in cost in some very few instances might be charged to advertising and co-operation for the good of the cause. With such practical help as this the manufacturers of electric vehicles will
be assisted in effecting material reductions in manufacturing costs due to increased output, the benefits of which the central stations and the purchasing public would naturally participate in.

Central stations should electrify their entire transportation equipment with the least possible delay and see that it is kept exclusively electric in the future; and in addition, they should in every way possible advocate and promote the use of electric vehicles. Furthermore, every central station representative should be taught to appreciate the electric vehicle. He should on all occasions display an attitude favorable to this modern and eventual type of transportation—the electric vehicle.

THE COST OF OPERATING ELECTRIC VEHICLES.

During the year 1914 the Operating Records Committee of the Electric Vehicle Association, William P. Kennedy, chairman, furnished the Electric Vehicle Section for the N. E. L. A. Handbook. The data given there will be found valuable to central station solicitors in promoting the general use of electric vehicles, besides serving the operating departments of public utilities.

From the extensive report referred to the following is taken:

Advantages and Superiorities:—In making comparisons between electric and gasoline types of motor vehicles, it is well to recognize that both have their special fields of application, and that the internal-combustion prime mover is bound to monopolize lines of work entirely beyond any reasonable application of the electric machine.

Little will here be said regarding the advantages of the electric pleasure vehicle since they are well known and many of them are common to the commercial type, which will be more forcibly presented in the subject matter following.

The electric vehicle for the transportation of merchandise has, among others, the following advantages:

Its power equipment may be provided in accordance with the daily work to be performed, and this work can be measured and recorded in advance of the selection or purchase of machines;

Any speed consistent with traffic conditions may be arranged for;

The moving mechanism is all rotary (not reciprocating), and is reduced to the least number of parts practicable in a motor vehicle;

Facility and ease of control in congested traffic districts practically assure automatic adjustment of power to varying load and desirable changes of speed;

Skilled mechanical labor is not required for operation, so that in any change from animal to mechanical transportation the same labor force (accustomed to and willing to continue the routine loading, delivering, etc.) may be retained and employed for machine operation;

One skilled mechanic with the ordinary quality of help can care for a large number of machines, and the maximum economy of any installation will result with the use of the maximum number which he can efficiently care for;

With the proper relaying of batteries, either at the home station or substations, any desired radius of action may be obtained;

The power plant of the machine can be utilized to operate suitable devices for loading and unloading and for the performance of other work;

Electric vehicles may be used on steamship docks and elsewhere, not being restricted by insurance regulations;

When the vehicle stops, its operating cost (except overhead charges) ceases and the power consumed is in direct proportion to the work performed.

One peculiarity of the electric vehicle which should be emphasized in dealing with those who have been accustomed to horse service, is that the consumption of energy, tires, gears and battery material is in direct proportion to the work performed, and that periodical renewal of such consumed material is as much an essential part of the service rendered as is the renewal of horse shoes, wheel tires, feed, blankets or any other similar material requiring constant renewal with horse maintenance. This periodical renewal of consumed material has been regarded by those unaccustomed to analysis, as the gradual breakdown or depreciation of the entire machine, whereas the machine proper undergoes very slight wear, the annual depreciation being somewhere between 3 and 10 per cent.

The user has available in almost any locality one or all of four organizations as sources of assistance and information: the manufacturer of the complete vehicle, the manufacturer of the motor and electrical appliances, the manufacturer of the battery, and the local central station company.

The principal lines upon which central station men can most rationally aid in the introduction of electric vehicles will be:

To bring home to the horse vehicle user the very high cost which he pays for animal transportation, independent of the prevailing prices at which horses, feed and other required materials may be purchased. In other words, horse
transportation costs very much more for the performance of any particular work than the owner of horse equipment usually appreciates. To analyze the performance of the work at present done by horse vehicles so thoroughly that suitable machines may be consistently recommended in any particular case; To bring out for consideration all the advantages which machine operation carries with it in regard to precision, regularity and reliability; To outline the subject to avoid as much as possible diverting the prospective machine user's attention from the real issues to the relatively unimportant details of mechanical equipment;

To deal with him in terms which will enable him to arrive at a true economic value of machine installation, either as to serviceability or as a time or labor saver; To avoid undertakings of a doubtful or experimental nature with regard to the machine's ability;

To induce the prospective user to regard the project in the same manner as he would the installation of a power plant for other purposes;

To render such assistance during the preliminary period of use as will prevent the mis-application or abuse of machines.

In the execution of such a program there is no doubt that the united exertion of the interested parties can bring about such uniformity of action as will have the result of speeding its installation for commercial purposes, in some cases, to a greater extent than any other kind of motor vehicle.

Large installations of such vehicles in all the principal cities of the country and their economical operation have instilled such confidence in those conversant with these capabilities as to put the electric vehicle in the class with all other staple industrial apparatus.

![Diagram](image_url)

Some of the underlying considerations which have developed this confidence are as follows:

The principles of their design are founded on those developed in the street railway industry, the essential component parts of their equipment being made in the same large electrical apparatus manufacturing establishments;

Their reliability and simplicity are on a par with these qualities in the street car, and they have many superior features contributing to a wider range of usefulness without the necessity of employing operators of higher grade than those now used in street railway service;

They are made up of the least number of moving parts of any type of motor vehicle, so designed and applied as to be practically fool-proof;

Their performance is so predetermined that the operator has little to do but apply power and steer the machine;

The working equipment has been so standardized that the renewable wearing parts are readily replaceable at low cost, and are available in all the principal centers of the country;

Wherever they have been installed within the field of rational application they have not only remained, but by the influence of their economy have forced an increase in their number.

There has been considerable demand for reliable information on the cost of operating electric vehicles and as is well understood, the peculiarities of the service in each particular instance may seriously influence the cost, hence, data procured from specific cases may not be applicable elsewhere. It has therefore been considered desirable to work up a table covering the various sizes of machines, in which costs would be based upon actual operating experience covering a great variety of installations in normal city service.

The table shown is therefore intended to give a fair illustration of the cost of operating electric vehicles under normal conditions where the machine service does not exceed the capacity of one battery per day. The figures given in this table may be reduced in many cases where special care is exercised in supervising the equipment and the service rendered, and it naturally follows that there will be other cases where the severity of service or operating condition will necessarily increase these figures. They are intended to indicate those likely to exist in the majority of city installations. For particular or individual cases other figures can of course be substituted for those in the table.

Depreciation of 10 per cent should provide one complete equipment renewal in ten years, which is not figured in maintenance. (See table.) As depreciation gradually reduces the investment, a 3 per cent rate of interest may be considered more equitable.

With an alkaline battery equipment investment and interest will be higher, depreciation and maintenance lower, and power consumption higher than...
shown in the table. However, over any extended period the resultant operating cost will not differ radically from that given in the table.

In a paper by Robert B. Grove, of the United Electric Light & Power Company of New York City entitled "Electric Vehicle Performance in Central Station Service," presented before the fifth convention in Philadelphia, October, 1914, some very interesting operating cost data appear. It might be pointed out that the vehicles referred to are operated on Manhattan Island, portions of which are extremely hilly, the grade of several of the streets being as high as 12 per cent. An idea of the contour of Manhattan Island can be obtained by noting the following elevations:

At southern end .......... 4 feet above sea level
1/2 length northward... 88 feet above sea level
1/2 length northward... 23 feet above sea level
northern end ...........192 feet above sea level

The electrical equipment of the company referred to consists of 27 vehicles.

The United Company maintains two garages for the care of its vehicles, one in the northern and the other in the southern part of the city. The main garage, at which most of the vehicles are cared for is approximately 9 miles from the extreme southern end of Manhattan Island and 3 miles from the northern end. It occupies three floors, with a total of approximately 10,000 square feet devoted exclusively to garage purposes.

In the building is a room 25 by 20 feet which was especially designed and equipped for all kinds of battery work. The floor is acid proof and the room is generously supplied with basins, water taps and drainage facilities. An expert battery man is in charge of all the work done. The garage is also equipped with an automobile lift having a capacity of 15,000 pounds, used to convey the vehicles to the different floors.

Thirty-six charging outlets are distributed throughout the three floors, each containing a separate wattmeter. The charging current is supplied from two 125-kw motor-generator sets (motor—2-phase, 1900-volt, 46-ampere, 900-rpm; generator—125-volt, 1000-ampere, 900-rpm) which are placed in an adjoining sub-station of the company. One of the sets is sufficient to meet the demands of the garage, the other set being reserve capacity. The charging current is controlled from a switchboard 10 feet long and 8 feet high on a mezzanine of the first floor. The remaining equipment consists of the usual appliances found in all modern garages.

The smaller, or auxiliary garage, approximately 6 miles south of the main garage, comprises one floor only, the approximate dimensions being 45 by 95 feet. The charging current is supplied from a 125-kw motor-generator set (motor—2-phase, 1900-volt, 46-ampere, 900-rpm; generator—125-volt, 1000-ampere, 900-rpm) located on the premises. The equipment of this garage is in all respects as modern and complete as that of the main garage.

All vehicles upon being returned to the garage after a day's operation, are, regardless of their condition, thoroughly washed, lubricated, and polished. An inspection is made of each vehicle and minor mechanical repairs made if needed. This inspection frequently reveals slight defects which can be repaired during the night, thus returning the vehicle to service the following day. If however the necessary repair is of such a nature that it cannot be completed during the night by the inspection force, the vehicle is turned over to the repair department of the company, which keeps it until it is restored to first class operating condition. The batteries are examined each night, new parts, solution or water being added when necessary. They are then charged, after which the vehicles are ready for the next day's operation.

At this point it will probably be in order to refer to the two official signs (shown herewith) as developed by the Electric Vehicle Association of America for display by recognized garages and charging stations. These metal signs, size 2 feet high by 2 feet 6 inches wide, are single-faced panels showing white symbols on a blue enameled field. When placed back to back, and bolted together through holes provided for the purpose, a double-faced sign results.

Attention is called to the small number of forms used in the collecting and tabulating the performance data for the United Company. The engineering department has endeavored to minimize the number necessary, and the three forms described herein have been found sufficient to meet all requirements.

During the operation of charging the batteries, a record of the current and voltage employed for the
battery of each vehicle is made by the garage man on a card (Fig. 1, reverse side). At the end of the charge, the card is signed by the person who supervised the charging.

Any repairs made on the battery or vehicle are noted on the card, hours of labor, quantity of material and the name of the workman being tabulated.

The card is then placed in the vehicle in a specially provided holder, and at the end of the following day's operation the driver notes thereon the number of miles traveled during the day, together with any remarks he may deem necessary regarding the operation.

The card is then delivered to the head of the battery department who inspects the record of the charging. If, in his opinion, the battery was not charged properly, he apprises the person who did the work of the error made and instructs him as to the proper method.

The head of the battery department then forwards the card to the garage superintendent, after noting thereon any remarks he considers necessary regarding the charging of the battery.

The garage superintendent at the end of each month summarizes the information which has been collected daily on the cards, fills out a monthly report sheet for each vehicle and sends it to the purchasing department.

Any mechanical repairs made on the vehicle during the month by the repair department are reported to the garage superintendent by the head of that department. They are entered on the monthly report sheet in detail, all material and labor being noted.

The cost of each item noted on the monthly report sheets is placed opposite that item by the purchasing department, and the sheets are then forwarded to the engineering department, where they are further summarized, the items being finally classified and entered on the sheet, shown as Fig. 2.

These sheets are filed in a loose leaf binder and kept in the engineering department file.

At the end of each year, the information that has been entered on another form and such operating costs as amortization, interests on the investment, administration, etc., and a report is prepared by the engineering department similar in appearance to the one contained in this paper, showing in detail the complete performance of each individual vehicle.

A report containing detailed operating statistics of each of the vehicles of the United Company since the date of purchase, up to June 30, 1914, follows, and several graphic representations of portions of the performance data found in the report are given in Figs. 3, 4, 5, and 6.

Although the operating figures contained in this paper are not general, as they represent the performance of the electric vehicle in a specific service, conducted at a certain geographical location, if they are compiled in conjunction with similar operating statistics of other fields of service, such as department stores, breweries, express companies, the combination and use of such data will be one of the most potent factors in bringing to an early and complete realization the object of the Electric Vehicle Association of America, namely, to promote the adoption and use of electric vehicles for business and pleasure purposes.

VALUE OF THE ELECTRIC VEHICLE CHARGING LOAD.

A great deal has been written, and much more could be said, regarding this phase of electric vehicle usage, but as the subject has received very careful attention, and formed an important part of the exceedingly thorough and clear report of the N. E. L. A. Committee on High Load Factor and Non-Peak Business at the 1914 convention in Philadelphia, we have availed ourselves of the privilege of its reproduction in this review. This report coming as it does from a major committee of the association, merits the full respect and careful consideration of all central stations.

No other load that the central station can secure is so essentially off-peak in character as an electric vehicle battery-charging load. Not only is it off-peak, but it occurs almost exactly during what may be called the negative peak period, and on this account is the most effective load possible for straightening out the load curve of our generating equipment.

There is a somewhat general impression in the minds of electric vehicle manufacturers and others that it is only within the last two or three years that central stations have thought of making any special effort to secure a battery-charging load. As there is some excuse for this impression, it may help us to get a better view of the electric vehicle situation as it is
at present, if we consider the cause of what may seem to be a tardy recognition of the importance of the battery-charging load.

When the electric vehicle first made its appearance in the United States and Canada, many of them and their friends invested in electric vehicles, while the whole combination of motors, vehicles and batteries was still in an experimental state and at a time when there was no one to show them how to operate the vehicles, even if the vehicles themselves had been sufficiently developed. Figuratively speaking, they grabbed the chance at the time when it was ripe and so long afterward had that melancholy feeling so well known to the small boy who makes a similar mistake.

Before the reputation of the electric vehicle had time to recover from the effect of these early failures, the gasoline car made its noisy appearance, and in spite of its various odors and other objectionable features soon gained public favor. For a time the general opinion seemed to be that electric vehicles might be left out of consideration, so far as any prospect of their ever taking the place of gasoline or horse-drawn vehicles was concerned.

After years of experience, however, in operating different kinds of vehicles, those who are best qualified to form an opinion of their relative merits are now strongly in favor of the electric, especially for use in city streets. We now know from actual experience that electric vehicles are capable of doing good work even under conditions not particularly favorable to the use of electricity, and also that conditions in none of our cities are yet as favorable as they should be to allow electric vehicles to be used to the best advantage. There is need of better garaging facilities and there is need of more men who know how to operate electric vehicles properly.

The central stations should not hesitate to make a reasonable outlay to improve conditions for the electric vehicle, as the money so spent is sure to return in the form of a valuable off-peak load. Some of us have been inclined to defer taking action in this matter while waiting for a fool-proof vehicle to make its appearance, thereby depriving ourselves of the most valuable class of business that a central station can obtain, and the public of the benefits to be derived from the use of the least objectionable type of vehicle that has been produced up to this time.

Already some of our central stations have a large income from power supplied from electric vehicle charging. The battery-charging load curve of one of these is shown in Fig. 9. From this curve it will be seen that during the small hours after midnight, over 6,000 kilowatts are used for charging vehicle batteries. This load is entirely off-peak and would be practically constant for every month in the year if it were not for the fact that it is constantly getting larger. We may have a better idea of the importance of this load if we stop to think that the combined light, power and railroad load of many of our cities, even those of considerable size, does not amount to much over 6,000 kilowatts.

Fig. 8 is the total load diagram from a large central station. Usually load diagrams representing one day's operation commencing and ending at midnight.
afford to hire competent men to take care of the batteries. To meet this situation a considerable amount of attention has been given of late to the development of a battery-maintenance system whereby the owners can buy trucks without batteries, and so be relieved of all responsibility in the matter of battery maintenance. The plans thus far considered include the furnishing of such battery service by outside parties, customers to be charged a fixed price per month per truck depending upon the size of the truck, plus a mileage charge. There is no doubt at all that the adoption of some such system will be necessary in order to cover the field occupied by the small user. The problem to be worked out is how to economically apply such a system, which would, of course, involve a high investment.

A preliminary survey of this situation would indicate that the most practicable way would be to operate in conjunction with some large public garage. By this plan the overhead expenses would be borne in part by the garage, and then, too, the labor required for exchange of batteries could, during the balance of the day, be used to advantage in general garage work.

By the use of different types of available meters it is within the power of central stations to favor charging done off-peak and to charge relatively higher rates for current used on or near the peak.

**Importance of Electric Vehicle Charging as Compared with Other Classes of Central Station Business.**

This should appeal especially to the new business men. Credit for the data used is due to H. W. Hillman, whose paper on this subject, from which we have freely copied, was presented before the Electric Vehicle Association of America during 1913.

In the early eighties it was quite out of the question to even consider a subject of this kind. Certainly it was too early to think of a street railway load. It was a period long before miscellaneous heating devices and household utensils had been developed, and the splendid, ever increasing industrial motor business was unknown to the central station manager. To-day, however, there are such a variety of electrical devices and so many branches of business that need attention, that it surely becomes interesting to analyze the relative importance of the more prominent classes, and to show where their differences from another class in character and in importance.

What is it that makes one class of business more important than another to the central station? It is difficult to remember a time when central stations did not pursue the familiar policy of favoring long-hour business. No one would think of questioning the policy, and so we are led to reiterate that electric vehicles offer this desirable long-hour business. As we advance with our argument, it will be found that this long-hour feature stamps the electric vehicle branch as of far greater importance than many central stations have begun to realize.

It was the long-hour business which first attracted central stations to the industrial motor load. It was long-hour business which led to such effective organization among the central stations in connection with power bureaus and industrial motor salesmen. It is now a rare occurrence to visit a light and power company that has not vigorously promoted the motor business.

The National Electric Light Association has recently (about 1913) sent out some very interesting data relating to 114 motor installations. These were issued in book form by the commercial section and reflect great credit upon the work and activity of that body. In the motor departments of all central stations they could be made use of daily. It is interesting while carefully studying this compilation to note that out of the 44 installations, the 29 which show load-factor indicate that it is not over 10 per cent. Thus we see that it is not over three hours per day that the 29 installations are in service.

It is common knowledge that electric vehicles are on charge 6 to 8 hours each and every night, and surely we are warranted in claiming a marked advantage for the electric vehicle on account of such long-hour business. The load-factor up to 30 to 35 per cent is uniform. It does not vary with the size of the vehicle nor with the number of batteries on charge, except, as has been forcibly brought out, that in a garage of large size one-half of the installation can be charged the fore part of the night and the balance the latter part. By this practice the central station secures a 12 to 16-hour load of uniform character.

Next your attention is drawn to the low demand of the electric vehicle. For the same amount of plant equipment needed to operate it, the electric vehicle has 8½ times the earning capacity of the electric flat-iron. While it takes 8½ iron to equal the annual income from one 2-ton electric commercial vehicle the average cost of 50,000 kilowatts against 6 kilowatts for the truck.

It is clear that some sales manager may question this comparison of the small electric iron with the large important truck. I have made comparisons with 12 classes of central station business other than the iron; that is, I have marched boldly into his camp with practically every branch of business associated with the electrical industry.

**Annual Income per Kilowatt of Plant Equipment Necessary to Operate 12 Different Classes of Installations.**

<table>
<thead>
<tr>
<th>Installations</th>
<th>Annual Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 One 2-ton truck</td>
<td>$86.00</td>
</tr>
<tr>
<td>2 Residence small</td>
<td>15.22</td>
</tr>
<tr>
<td>3 Retail store small</td>
<td>31.72</td>
</tr>
<tr>
<td>4 Church</td>
<td>32.57</td>
</tr>
<tr>
<td>5 Industrial 1 motor</td>
<td>43.16</td>
</tr>
<tr>
<td>6 Industrial 2 motor</td>
<td>41.18</td>
</tr>
<tr>
<td>7 Industrial 3 motor</td>
<td>19.61</td>
</tr>
<tr>
<td>8 Industrial 8 motor</td>
<td>50.96</td>
</tr>
<tr>
<td>9 Industrial 20 motor</td>
<td>35.11</td>
</tr>
<tr>
<td>10 Residence large</td>
<td>63.04</td>
</tr>
<tr>
<td>11 Drug store</td>
<td>118.40</td>
</tr>
<tr>
<td>12 Saloon</td>
<td>191.53</td>
</tr>
</tbody>
</table>

The above comparison is made from data recently (1913) secured from 30 central stations, showing the average rate per kw-hr, monthly consumption in kilowatt-hours, maximum demand per kw and connected load.

**Size of Cities.**

<table>
<thead>
<tr>
<th>Size of Cities</th>
<th>100,000 Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 in excess of</td>
<td>200,000 and 500,000</td>
</tr>
<tr>
<td>2</td>
<td>50,000 100,000</td>
</tr>
<tr>
<td>3</td>
<td>25,000 50,000</td>
</tr>
<tr>
<td>4 less than</td>
<td>25,000</td>
</tr>
</tbody>
</table>

The above table of comparison brings out clearly that the electric vehicle business stands at the head of the list as an income getter. It stands at the head of the list in respect to the small demand upon the plant equipment, and again it stands at the head of the list for long-hour business. As a matter of fact, it is unique in a great many ways.

While the drug store and the saloon business apparently make the better showing, neither one nor the other possesses the broad, extensive field which the electric vehicle business is bound to enjoy.

Glance for a moment at the five motor installations
in the table. Who would have thought that electric vehicles would make such an excellent showing when compared with the prize branch of the central station business: that branch, the rapid and extensive development of which has astonished the entire industrial world, a business now rich with power bureaus, power engineers, power solicitors and power accomplishments second to none in connection with the history of the electrical industry.

Perhaps some one is wondering if the data are authentic and accurate. Read the note at the bottom of the table. We may surely feel that it is representative and practical, answering the purpose as set forth.

A house wiring campaign is a very common class of business for the central station manager to exploit. In a western city some 1,250 houses were wired during a period of 18 months. Only 67 extensions had to be made “off the lines” and only six solicitors were employed to promote this business. A column of the Electrical World emphasized the splendid work done in that campaign. Many a central station has conducted a similar campaign, and has thus not only prepared the way for a large residence lighting business but likewise arranged so as to easily promote business later covering miscellaneous heating devices and household utensils.

Like the motor business all of this work is admirable. But if the central station sales manager realized that 59 electric trucks only would produce the same annual income that is derived from 1,350 houses, would he start out boldly with six solicitors? Would he adopt an aggressive policy if some one should remind him that all the truck business could be taken on without the purchase of additional plant equipment? Would he put on twice six solicitors if he actually realized the value of long-hour business and the enormous field which is open for promotion and development?

Surely the time will come when house lighting, cooking and baking, and innumerable electrical fields will be thrown open for active exploitation, but to-day the path of least resistance leads to the electric vehicle class of business, and of all branches with which the central station deals there is no other of equal importance. It needs more attention, however, from the sales manager of the central station. It is a selling proposition.

Current in abundance is available. Along with it, electric vehicles are thoroughly developed and successful as a commercial product. What the business needs is the benefit of the sales manager’s experience, his judgment, his approval, his influence with the public, his influence with his own organization. Wherever this policy prevails, there we may look for progress.

An appeal is made for printed matter of the same character as that found in the power bureaus which is described to customers and which reads something like this:

“We will gladly send a motor engineer to your factory. We will make a test of your field plan. We will submit to you a proposition showing the economy by the use of motor service.” That will imply that the vehicle salesmen are available to send out, that they are informed to meet the arguments of competitors, and that they are educated regarding all kinds of batteries and the possible applications of the vehicles. Then will the electric vehicle business commence to boom.

Attention at this time might be directed to Mr. Edison’s prophecy made in 1910 that “In 15 years, more electricity will be sold for electric vehicles than for lighting.” Someone has estimated that the present annual output (1913) for electric lighting plants of this country is about 12,000,000,000 kilowatt-hours. With the prophecy realized, and at a 4-cent rate, it will mean an additional income of $480,000,000 to the central station industry.

Many central stations in promoting the use of electric vehicles are already deriving a very large and profitable income from their sale and from the sale of current for battery-charging.

Are you getting your share of this lucrative business?

POSSIBLE ELECTRIC VEHICLE MARKET AND INCOME IN COMPARATIVE SMALL CITIES.

Here, as in other places in this review, the authors have generously partaken of available data on the various aspects of the electric vehicle as prepared by several authorities, and in this particular chapter are very largely indebted to S. G. Thompson, manager of the automobile department of the Public Service Electric Company, Newark, N. J., whose excellent paper on “The Electric Vehicle in Its Relationship to the Central Station in Small Cities,” presented in the fall of 1914 before the Newark section of the N. E. L. A., is here largely reproduced.

A comprehensive analysis of the status of the electric passenger vehicle industry in its relation to the smaller cities amply refutes the statement that only in the larger communities does the electric vehicle find its field of application. In fact, there are but 72 cities in the United States whose population exceeds 75,000 and of these only five have over 600,000 inhabitants, while a comparison between two cities, where the vehicle development has extended over a period sufficiently long to establish these machines, shows that the ratio of electric passenger vehicles used to the population is materially greater in the smaller community. In Chicago, with a population of approximately 2,200,000, there exists one machine for every 750 inhabitants, while in Cleveland, with but 25 per cent of that population there is one machine for every 340 inhabitants.

An explanation for this condition is that in the larger cities apartment dwellers predominate, who through force of circumstances must depend upon public garages for the care of their machines, while in the smaller cities private garaging is more generally possible. As a matter of fact, the real business in the electric passenger vehicle is to be found among that class of buyers with whom depreciation and economy of operation are important considerations, and it is just that difference between public garage charges and the expense of maintaining a car “on the premises” which deter a majority from purchasing. In other words, the free use of private garages with proper intermittent oversight by experts is essential to an active business, and it is in the smaller communities that the possibilities for such practice exist. Therefore a wide field of application for the electric passenger vehicle is to be found in the smaller communities, which fact has been amply demonstrated in the 13 cities of less than 600,000 inhabitants where the central stations have energetically promoted the use of these machines, and incidentally benefited materially thereby. Dr. Steinmetz says:

The future of automobiling belongs to the electric for the reason that today automobiling is still essentially a sport, and for this purpose to most people the gasoline car appears to have the advantage of being capable of high speed of power and therefore higher speed implies go longer distances in the country without requiring charging stations, since gasoline can be purchased now almost everywhere. Driving an engine through the streets of the city is all right for sport, but it is not feasible.
horses are now employed. Naturally a large volume of business in this direction is to be obtained from the largest cities. However, in communities of from 200,000 to 300,-
000 inhabitants the possible vehicle market is considerably greater than is generally realized, particularly as the de-
velopment of low-priced machines designed to replace the single-horse unit is opening up an extensive market among those who may be classed as doing "a neighbor-
hood business."

As indicating the possible market in small cities, the
following tabulation is taken from the census of two
cities of approximately 350,000 and 260,000 inhabitants.
In compiling this census small tradesmen and business
houses of low commercial rating whose horse-vehicle
equipment was not sufficient to warrant its replacement
by electric machines were eliminated, so that the census
may be taken as a fair indication of the probable market
in communities of the above sizes.

<table>
<thead>
<tr>
<th>TABLE II.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ELECTRIC VEHICLE CENSUS IN TWO SMALL CITIES.</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Business</th>
<th>Population 350,000</th>
<th>Number of Vehicles</th>
<th>Number of Firms Required</th>
<th>Population 260,000</th>
<th>Number of Vehicles</th>
<th>Number of Firms Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef packers</td>
<td>350,000</td>
<td>4</td>
<td>24</td>
<td>260,000</td>
<td>4</td>
<td>24</td>
</tr>
<tr>
<td>Baking</td>
<td>350,000</td>
<td>18</td>
<td>112</td>
<td>260,000</td>
<td>18</td>
<td>112</td>
</tr>
<tr>
<td>Brewers and bottlers</td>
<td>350,000</td>
<td>14</td>
<td>159</td>
<td>260,000</td>
<td>14</td>
<td>159</td>
</tr>
<tr>
<td>Building material</td>
<td>350,000</td>
<td>4</td>
<td>18</td>
<td>260,000</td>
<td>4</td>
<td>18</td>
</tr>
<tr>
<td>Coal and wood</td>
<td>350,000</td>
<td>7</td>
<td>55</td>
<td>260,000</td>
<td>7</td>
<td>55</td>
</tr>
<tr>
<td>Department stores</td>
<td>350,000</td>
<td>6</td>
<td>15</td>
<td>260,000</td>
<td>6</td>
<td>15</td>
</tr>
<tr>
<td>Exported and transferred</td>
<td>350,000</td>
<td>9</td>
<td>90</td>
<td>260,000</td>
<td>9</td>
<td>90</td>
</tr>
<tr>
<td>Manufacturers</td>
<td>350,000</td>
<td>1</td>
<td>10</td>
<td>260,000</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Floor, feed and grain</td>
<td>350,000</td>
<td>7</td>
<td>74</td>
<td>260,000</td>
<td>7</td>
<td>74</td>
</tr>
<tr>
<td>Food products</td>
<td>350,000</td>
<td>5</td>
<td>10</td>
<td>260,000</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Furniture dealers</td>
<td>350,000</td>
<td>4</td>
<td>6</td>
<td>260,000</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Grocers</td>
<td>350,000</td>
<td>9</td>
<td>38</td>
<td>260,000</td>
<td>8</td>
<td>36</td>
</tr>
<tr>
<td>Hardware dealers</td>
<td>350,000</td>
<td>8</td>
<td>10</td>
<td>260,000</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Ice cream manufacturers</td>
<td>350,000</td>
<td>1</td>
<td>2</td>
<td>260,000</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Livery stables</td>
<td>350,000</td>
<td>3</td>
<td>8</td>
<td>260,000</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Lumber</td>
<td>350,000</td>
<td>1</td>
<td>7</td>
<td>260,000</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Liquor and mineral waters</td>
<td>350,000</td>
<td>9</td>
<td>31</td>
<td>260,000</td>
<td>9</td>
<td>31</td>
</tr>
<tr>
<td>Lumber dealers</td>
<td>350,000</td>
<td>8</td>
<td>38</td>
<td>260,000</td>
<td>8</td>
<td>38</td>
</tr>
<tr>
<td>Masons' materials</td>
<td>350,000</td>
<td>2</td>
<td>41</td>
<td>260,000</td>
<td>4</td>
<td>44</td>
</tr>
<tr>
<td>Milk dealers</td>
<td>350,000</td>
<td>6</td>
<td>33</td>
<td>260,000</td>
<td>6</td>
<td>27</td>
</tr>
<tr>
<td>Oils and paints</td>
<td>350,000</td>
<td>4</td>
<td>27</td>
<td>260,000</td>
<td>4</td>
<td>27</td>
</tr>
<tr>
<td>Storage and trucking</td>
<td>350,000</td>
<td>11</td>
<td>11</td>
<td>260,000</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>350,000</td>
<td>14</td>
<td>32</td>
<td>260,000</td>
<td>14</td>
<td>32</td>
</tr>
</tbody>
</table>

| Ratio of vehicles to population | 1 to 319 | 2 to 285 |

Considering the cities for which the above census was compiled, the value of the power vehicle load based on the average current consumption for all sizes of vehicles (see Table III) would be as follows:

<table>
<thead>
<tr>
<th>Population</th>
<th>Kw-Hr. Consumption Income at $6 per Kw-Hr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>260,000</td>
<td>$30,875.26</td>
</tr>
</tbody>
</table>

In Table III are shown the kw-hr. consumption for the various sizes of commercial vehicles, connected load, and income per hp. of connected load, which latter it will be observed compares very favorably with other branches of power business.

<table>
<thead>
<tr>
<th>TABLE III.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CURRENT CONSUMPTION CHARACTERISTICS FOR POWER WAGONS.</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Capacity of vehicle (in pounds)</th>
<th>Kw-hr. capacity</th>
<th>Kw-hr. input (121 days)</th>
<th>Annual income at 3 cents per kw-hr.</th>
<th>Income per hp. of connected load</th>
</tr>
</thead>
<tbody>
<tr>
<td>700</td>
<td>47.71</td>
<td>671.22</td>
<td>$3.16</td>
<td>$3.16</td>
</tr>
<tr>
<td>1,000</td>
<td>47.71</td>
<td>718.23</td>
<td>$6.30</td>
<td>$6.30</td>
</tr>
<tr>
<td>2,000</td>
<td>47.71</td>
<td>1,393.64</td>
<td>$12.60</td>
<td>$12.60</td>
</tr>
<tr>
<td>3,000</td>
<td>47.71</td>
<td>1,955.69</td>
<td>$18.97</td>
<td>$18.97</td>
</tr>
<tr>
<td>4,000</td>
<td>47.71</td>
<td>2,517.73</td>
<td>$25.34</td>
<td>$25.34</td>
</tr>
<tr>
<td>5,000</td>
<td>47.71</td>
<td>3,079.78</td>
<td>$31.71</td>
<td>$31.71</td>
</tr>
<tr>
<td>6,000</td>
<td>47.71</td>
<td>3,641.86</td>
<td>$38.08</td>
<td>$38.08</td>
</tr>
<tr>
<td>7,000</td>
<td>47.71</td>
<td>4,203.94</td>
<td>$44.44</td>
<td>$44.44</td>
</tr>
<tr>
<td>8,000</td>
<td>47.71</td>
<td>4,766.02</td>
<td>$50.80</td>
<td>$50.80</td>
</tr>
</tbody>
</table>

SOLICITATION—ELECTRIC VEHICLE BUREAUS.

The central station can help promote the sale and use of electric vehicles in a number of ways. If the field justifies it an experienced man can be secured to conduct an aggressive campaign, but in a small city, at least...
ELECTRIC VEHICLES

June, 1915.

The work could be delegated to the most logical member of the staff, and he could devote certain days or parts thereof to the work, until results or the outlook warrant the giving of more time.

If the man selected is not experienced, he should immediately get in touch with the Electric Vehicle Association of America; also with the managers of several electric bureaus of the central stations that have such departments, and from these sources obtain outlines of methods to be employed. A visit to one or more central stations doing good electric vehicle promotion work would be a very great help.

When the electric vehicle representative possesses some general knowledge as to the application of electrics, he should approach prospects much in the same manner as if he were endeavoring to get a man interested in a sign, or any other power-consuming device. If, in the judgment of the representative, the prospect could use electric vehicles, and could in some way finance their purchase, the representative could communicate with one or more manufacturers (many central stations issue such “leads” simultaneously to all manufacturers) who would arrange for one of their salesmen or engineers to call. Upon the arrival of the manufacturer’s salesman, the central station representative would introduce him to the prospect and stand by prepared to render any assistance that might be required. By carefully noting the methods employed by the manufacturer’s salesman, the central station representative will find his stock of information liberally increased.

In the event that the central station sells electric vehicles directly, the representative selected should spend at least a week or two at the manufacturer’s plant. Even then he should hesitatingly call for help if the problem appears too difficult for him to solve.

The Electric Vehicle Association of America is prepared to cooperate with central stations, not only in helping to develop their sales force to sell electric vehicles but also to assist in any publicity or advertising campaigns which may be conducted.

Contained in this very interesting and valuable report of our Association Committee on Central Station Co-operation to the 1914 convention, is an outline of the electric vehicle bureau work of several central stations. As indicating methods which central stations might employ in a development of this nature, we reprint at this point a copy of two of the reports from the Commonwealth Edison Company of Chicago, and the New York Edison Company.

REPORT OF THE COMMONWEALTH EDISON COMPANY.

The company has always looked with great favor on the electric vehicle as a very valuable field for central station service and has endeavored to build up this class of business. The work being done by it may be classified under the following general heads:

1. General publicity.
2. Favorable rates for electricity for charging batteries.
3. Personal services of specialists available to users of electric vehicles.
4. Inspection of garages and equipment.
5. Maintenance of emergency charging and boosting stations.

General Publicity.—The subject of electric vehicles has received a great deal of attention in our Electric City magazine not only in the matter of articles appearing from time to time on this subject, but in a number of cases devoting practically the entire issue to electric vehicle propaganda.

The company has used to advantage other mediums for advertising this business, among which may be mentioned special insertions in such trade magazines as the Power Wagon, Electric Vehicles, Garage Efficiency, and advertisements from time to time in the daily papers.

Billboard advertising has also been effectively utilized.

Booklets have been issued giving information in regard to the care and operation of batteries and vehicles. In conjunction with these booklets, record sheets made up so as to enable users to keep track of the operation of their cars, have been furnished.

Folders and maps have been prepared showing the location of the various charging stations, and also the general character of the roads in the city.

In the line of general publicity, use has been made of moving picture films showing the performance of electric vehicles under different conditions of operation.

The latest effort of the company in the line of publicity work is the large monograph sign on the top of a building at the north end of Grant Park. With the sign, in letters twelve feet high, the advantage of the electric vehicle is brought to the attention of thousands of people who traverse Michigan boulevard. This sign can easily be read the entire length of Grant Park.

Favorable Rates for Electricity.—We have proceeded on the theory that the best interests of the electric vehicle can be served by encouraging the building up of large garages which can afford to retain the competent help required. We therefore worked out an off-peak schedule applying to installations having a maximum demand of 50 kilowatts or above, which brings the rate for electricity used by the larger garages, handling from 75 to 150 cars each, down to from 1½ to 2 cents per kw.-hr. This has enabled us to take over practically all the vehicle charging business in Chicago, as evidenced by the fact that over 85 percent of all the charging in the city is done from our circuits. We hope to sign contracts with the remaining garages before the end of the year.

Personal Services of Specialists.—We are convinced of the fact that the successful operation of electric vehicles depends very largely upon the daily care given them. We have therefore devoted a great deal of attention to the bettering of operating conditions. We have advertised the fact that we retain specialists who are at the service of vehicle users for advice and consultation, and the public frequently avails itself of this privilege.

Inspection of Garages and Equipment.—Our representatives periodically visit all the large garages and thus keep in close touch with the operating conditions. They advise with the garage owners and give them the results of the observations they make in the various garages of the city.

A special man is assigned to handle calls from mercury arc rectifier customers, and the necessary minor repairs on this apparatus are made at the company’s expense.

Maintenance of Emergency Charging and Boosting Stations.—We have equipped twenty-one of our substations with apparatus for this work. This equipment generally consists of mercury arc rectifiers, but in a number of the outlying districts, in widely separated parts of the city, we have installed motor-generator sets of ample capacity to give 200-ampere boosting charges to electric trucks. This has been of material service in a number of instances and is appreciated by vehicle owners.
In the way of future activity, a number of plans have been suggested for adoption by central station companies. One is that of co-operative advertising whereby vehicle agencies and the central station combine in the various localities to carry on an advertising campaign. The object would be to strongly emphasize the many advantages of the electric vehicle instead of dwelling on special features of the various cars, as is now the case where each vehicle manufacturer does his own advertising.

Another plan adopted by one company is the paying of commissions to those of its representatives who are instrumental in the selling of electric vehicles. This appears to be a very good idea.

However, before any extensive campaign is entered into for the sale of commercial trucks to small users, much better garaging facilities than now exist must be provided. This in our opinion is very essential and we believe it will be a serious mistake to stimulate the sale of trucks to individuals until means are provided for taking care of them properly.

REPORT OF THE NEW YORK EDISON COMPANY.

Four years ago the New York Edison Company established its automobile bureau, and the man placed in charge was instructed that his duty was to cooperate in every way possible with the electric vehicle manufacturers who were selling in New York territory.

After the bureau became acquainted with all local electric vehicle selling agencies, it set about the task of getting in touch with all local users of electric cars. A list of New York City automobile registrations was obtained from the Secretary of State, the electric vehicle owners selected therefrom and listed on cards. A list of customers taking service from the company for charging purposes was next obtained. Calls were then made on all persons whose names appeared on either list, the preliminary record was checked and a permanent record established. This record is kept on cards which show the name of the owner of the car and his address, the make of the car, where it is garaged and the source of the charging current, whether Edison service or a private plant.

This list of vehicle owners is kept up-to-date by daily reports from the State Automobile Registration Bureau, and whenever a new registration appears the car owner is interviewed, the purpose of the automobile bureau explained and its service offered. The bureau aims to keep in touch with the operation of every electric car in the city and whenever possible, performance and cost data are obtained. A call is made at least once annually on every user in the city.

Owners of cars and electric vehicle manufacturers were advised by letter that the company had established an automobile bureau and stood ready to assist in the care and operation of electric vehicles.

The next very important step was the establishment by the company of twenty-two outlet charging stations throughout the city. This network of emergency charging stations covers the city very completely, and it never happens that a vehicle wanting a boost is too great a distance from the supply of charging current.

A booklet containing a list of all garages and charging stations within a radius of 100 miles of New York City is published annually by the company, and given wide distribution. Electric vehicle and storage battery manufacturers are advised that they may have as many copies as they may want for their own mailing lists or for their showrooms.

The automobile bureau of the New York Edison Company is now composed of eight people, one of the number being a woman, who makes demonstrations and gives driving lessons in any of the cars offered for sale in the city. One of our men is an office engineer, who collects and compiles statistics and all the performance and cost data he can get hold of. He supplies engineering advice to our service men and our salesmen, at times going out on special cases himself. If the electric vehicle purchaser will permit, the bureau will direct the installation of the necessary garage apparatus and give advice as to proper maintenance of the vehicle. If the purchaser does not wish to care for the car himself he is supplied with a list of nearby garages where satisfactory service may be obtained. In this manner the service of the bureau is two-fold: first, by arranging garaging facilities for the new car, and, secondly, by increasing the business of the garage man who is trying to earn a lower rate.

Another duty of the bureau is to select and maintain a list of New York business houses now using horse-drawn vehicles, but whose volume of business handled seems to warrant the adoption of a more economical mode of transfer. This list is circularized at intervals and attention is drawn to the advantages to be derived from the use of electric trucks. A reply to one of the letters being received, a representative immediately calls and determines the requirements of the case, submitting interesting performance data, and figures on cost of operation and maintenance. He also has with him a list of satisfied users of electric vehicles. With the prospective purchaser’s permission his name is sent to the local representatives of the different electric vehicle manufacturers, with the request that descriptive matter be sent and followed by a salesman. The automobile bureau becomes acquainted with the salesmen in the case and keeps in touch with the progress made, giving information where it is wanted on the cost of charging current and the necessary charging apparatus.

The company spends a good part of its advertising appropriation on electric vehicle publicity. Space is purchased in both newspapers and magazines, and each advertisement carries the names and addresses of all electric vehicle selling agencies in the city. Copies of our advertisements are always sent to vehicle manufacturers, irrespective of whether they are represented in the city or not. It is interesting to note that two years ago there were but eight or nine manufacturers represented in New York while at the present writing there are twenty-one agencies or branches.

A CREED.

We believe in the electric vehicle.

We believe that the electric vehicle is destined to supersede other forms of transportation methods at least for city and suburban work.

We believe that the electric vehicle merits the full and hearty recognition and co-operation of the central station and other electrical interests now, in order that the electric vehicle might come into its own with all possible speed.

We believe that the future development of the electric vehicle presents highly profitable new business for the central station.

We believe in the policy of central stations using wherever possible electric vehicles; likewise advocating and otherwise promoting their general use.

(Signed and subscribed to by 30 leading central station companies in United States.)
The Future of the Electric Truck

A Paper Before the Detroit Motor Truck Convention*

BY P. D. WAGNER

P. D. WAGNER, President, General Vehicle Company.

B EFORE discussing the future of the electric truck, something should be said of its operations in the past.

The high grade electric is a good truck and a practical business proposition, both from the manufacturer's angle and the viewpoint of the user. The electric truck is not unlike an oak tree which contrasted with another young sapling appears to grow very slowly. The roots, however, are absorbing most of its sap and while it isn't growing as rapidly, above ground, as the other trees, it will be there long after other trees have gone. And this analogy emphasizes only one phase of the electric truck situation.

The electric truck has suffered and will continue to suffer from being misunderstood. There is always something mysterious about electricity and this combined with national and international ignorance regarding the storage battery plus the now recognized lack of efficiency as applied to motor transportation, tends to throw about the electric truck an atmosphere of uncertainty. To the layman the electric is "different" and that gives it a handicap at the start. You know how it is with the man in business. We concede him the right to be "different" from the rank and file of regular fellows, but at the same time if he doesn't play the game our way we set him down as more of less of a "nut" and unconsciously penalize him to a certain extent accordingly. On better acquaintance he may develop to be the finest fellow in the world and be elected to the head of the table, but for a while at least his brakes drag and we don't put him in the mile a minute class.

It might be surprising to some of us to know how much of a success the electric truck really is. In the first place, it had to bear the brunt of introducing motor trucking, for we must admit that it was the poor old electric which first started competition with the horse in trucking along about 1899 or 1900. About the time electric trucks did demonstrate that they could really truck merchandise, within the limits of early storage battery mileage, the infant industry fell into the hands of the promoter and a truck jobbing era arrived, with the inevitable results. The promoters who put the stock over got all the money and the pioneers the blackeye. Furthermore a big electric taxicab enterprise went on the rocks about this time to cheer up the few friends the electric had left.

But the old veteran trucks of 1901 and 1902 still kept going. They were crude in design, clumsy, unnecessarily heavy, slow, noisy and relatively inefficient as compared with those of today. Some were laid up for two or three years and then put back to work. Some changed hands three or four times. But they nearly all kept moving about the streets. The panic in 1907-8 left its scars but still the industry survived. It began to gather momentum in 1909 and 1911 put it on its feet. It really blazed the path for the motor truck of today.

It set the example of building one-design vehicles. It was the pioneer makers of the electric who first began to sell trucks as they should be sold—trucks adapted to the work and trucks sold for cash.

The phenomenal success of the gasoline pleasure car industry naturally dwarfed the electric vehicle industry. It dwarfs it today to some extent, but that doesn't affect the efficiency of the high grade electric in its field, nor does it indicate that the electric truck will not survive. If anything, the developments of the past five years indicate a greater annual demand for the electric. As a matter of fact, if electric trucks are rightly built and rightly sold, no amount of competition can keep the electric truck out of its own.

One of the greatest handicaps to the larger sale and use of the electric truck has been lack of knowledge on the part of automobile manufacturers and the general public. Gasoline truck makers would have been foolish not to "cash in" on both this ignorance and the resulting prejudice. They have not been foolish in that respect. They have seen to it that they made friends of the disgruntled man who had it in for the electric because the one he bought in 1904 was no good, to his mind. They have seen to it that the merchant with two electrics and ten gasoline cars has not unduly fallen in love with his two electrics. Realizing this, we make the suggestion that it might be better for all if motor truck manufacturers would sell motor trucks on the basis of adaptability to the work, believing that every satisfied customer—satisfied because his machines show high efficiency through specific adaptability—will thus save money and be able to buy still more trucks. As it is, the man who buys a 3-ton gas truck when a 2-ton electric is what he should have, frequently disposes of this big truck and sticks to his horses with a set jaw. More than that, he frequently kills the immediate purchase of any motor trucks on the part of certain of his business friends. Few of us manufacturers can afford to have this situation develop any further than it has, and it is to be hoped that the light may soon be seen by the makers who are blind to everything but "putting over" a sale whenever they can, regardless of how much it hurts the industry at large. Perhaps you think it hasn't taken courage to limit electric truck sales to the field of specific adaptability. To paraphrase an old college saying, this idea is "a pastime with many, a religion with few."

The more scientific motor-trucking becomes, the more electric trucks will be used, at least for city work. Specific adaptability combined with proper

*Read by C. W. Squires, Jr.
routing is the cornerstone of scientific trucking. Within the last two years the experienced user of motor trucks has had a change of viewpoint. Formerly the general attitude in some cities was "never use an electric unless you have to." That is, if there is any possible way that you can do the work with horses or gasoline trucks, do it, even if you don't save any money. Today the merchant or manufacturer who insists on knowing what motor delivery costs him is figuring and figuring to increase, if not the radius of electric delivery, at least his percentage of electric deliveries. He is proceeding on the basis that "the electric for city work—if"—and proceeds to eliminate the "if" as he meets it in his particular problem. This does not mean that the gasoline truck should not have the call, as heretofore, for the long, non-stop suburban runs and where speed is a great consideration, but it does mean that the electric with economic law behind it is becoming firmly entrenched in city service. The future of the electric does not lie in displacing the gas truck as a competitive unit at large, but in displacing the horse in the city.

That the high-grade electric truck has a future all will admit. Some do not see the future for it that we do, and we cannot expect that they will. All gasoline truck makers have not limited their sales to the economic field of their trucks, but we can overlook that, especially as we have not always been there to present our case. We feel that we have contributed our share to scientific motor trucking and that we shall continue to do so.

Some have accused the electric vehicle industry of being too clamorous, and argue that this spirit has hurt them in getting business. If they have stuck together it has been for mutual strength in getting a hearing for the principle underlying electric trucking. If the matter were to go further, which is unlikely, it would be but the result of cause and effect.

If you dam up electricity or any other primal force in one direction it will overflow in some other. The longer you keep it pent up, the more pressure you generate. The principle we have advocated have met with public indifference and prejudice, but this we expected and reformed our front accordingly. By almost imperceptible degrees we have been getting the three billion dollar electrical industry behind the electric vehicle.

Great movements gather momentum slowly, and their significance is often underestimated by the world at large. While the greatest friend of the electric truck is economic law, the electric principle of trucking has many allies.

The future of the electric truck is the future of electricity. Economic law, however, will keep it in the thick of traffic, near the centers of our industrial life. The electrification of our railroads takes place first, where? In and near our great cities, where a dense traffic makes it a success financially. Electric garages and charging stations follow the crowd, so to speak, and like the army which crawls on its belly, the commercial electric must stay near its fuel supply. In its field, however, it is supreme and is rapidly being recognized as supreme.

For the trucking and hauling incidental to the maintenance of a street railway system carrying millions of passengers a year, the New York Railways Company has established a fleet of thirty electric automobiles.

English Electric Vehicle Committee Meets

A meeting of the English Electric Vehicle Committee was held in London under the chairmanship of R. A. Chattock, May 11, 1915.

A. E. Collins, city engineer of Norwich, took his seat upon the committee for the first time as the representative of the Institution of Municipal and County Engineers, while A. de Turckheim took his seat on the committee as the representative, pro tem, of the Tramways & Light Railways Association. G. F. Heath, of Heath's Garage, Ltd., also took his seat upon the committee as the representative of garage interests.

The committee considered and passed the draft for the committee's annual report and accounts. These will be incorporated in the annual report of the I. M. E. A.

The secretary submitted the draft of the report to be submitted for discussion at the annual meeting of the I. M. E. A. on June 17, entitled "The Uses of the Electric Vehicle in Municipal Service." The report was provisionally approved and ordered to be submitted to the council of the I. M. E. A.

Arrangements were discussed for the proposed parade of electric vehicles on June 17. The secretary is now to obtain the permission of the police, because of the parade being held on the embankment.

A number of matters relating to details connected with the publication of the Journal and publicity matters were dealt with. It was reported that, as the result of the circular letter sent to central station companies, a number have purchased publicity material. The secretary, however, reported that he had received several letters which indicated sympathy on the part of some central station companies in regard to the electric vehicle business.

The technical sub-committee has now completed the preparation of the report "Upon Methods of Charging and Charging Equipments," and it is to be circulated to all members of the committee for consideration at the next meeting.

As to further standardizing of details appertaining to lead plate batteries, the committee has decided to ask the accumulator section of the B. E. A. M. A. to consider the desirability of bringing about standardization in regard to:

(A) The clearance for the accumulation of sludge between the lower edge of the plates and the bottom of the cell container.

(B) The size of the filler plug hole and a design of plug for same.

(C) The distance between the top of the lip of the plug hole and the top edges of the plates so that one gauge may always be used in a garage for fixing the proper level of the electrolyte, measuring from the top edge of the filler hole lip.

(D) Details of connectors between cells and method of connecting these to the plate terminals.

The next meeting of the committee was fixed for June 11, 1915.

"Dunkards" Cannot Own Automobiles

Dunkards shall not own or drive motor cars, according to the dictum of the National Conference of Dunkards of the United States and Canada, in session this week at Dayton, O. Nearly 4,000 representatives decided unanimously that a member of this church could not and should not own an automobile.
Chicago Electric Garage and Dealer's Assn.

Electric Vehicle Interests Merge for Greater Developments

Electric car manufacturers, dealers and electric garage men in Chicago have long been in need of and have— -- a staple association which would bind together these closely related interests into an organization of cooperation for the protection of the electric vehicle industry and for further advance and development of the electric.

Numerous attempts to form such an organization have resulted in a loss of enthusiasm; a lack of further activity and a final sliding back to individual tactics and keen competition.

The latest movement predicting at least an unusually enthusiastic beginning is a logical formation of the Electric Garage and Dealers' Association of Chicago. The new organization was formed during a joint meeting of the forty Chicago electric vehicle manufacturers, dealers and electric garage men, who assembled at the Lexington Hotel, May 27, 1915, and elected Charles S. Ross as temporary chairman; H. S. Gilbert, acting secretary.

General discussion followed, covering all points of interest and benefits to be derived in the exploitation of the new organization.

In the discussion a resolution was adopted to disband the last like warm attempt, the Electric Garage Owners' Association of Chicago, in order to make possible the new organization allowing a greater eligibility of membership and a wider scope of development.

It was announced also that the chairman and board of directors of the Chicago Garage Owners' Association, electric vehicle division, had resigned and that they had therefore eliminated all obstacles to a consolidation of that section with the new organization.

Among the resolutions adopted, the most important was as follows:

Resolved, That those in attendance at this meeting, proceed at once to organize the Electrical Garage & Dealers' Association, in order to make possible the new organization allowing a greater eligibility of membership and a wider scope of development.

A vote was taken and after considerable wrangling it was decided to call the organization the Electric Garage & Dealers' Association.

A motion was then made to proceed until the election of officers for the ensuing year, which resulted as follows:

William L. Rudd, vice-presidents; F. E. McCall, secretary; and Harry Salvat, treasurer.

The president appointed Messrs. McNett, Lemon, Buck, Christ, Rhodes, Jr., Higginbotham, Bland Salvat and Wiedmaier, as a committee to carry out the resolution calling this association into existence and draft the constitution and by-laws for its government.

The meeting adjourned subject to call from the president in a short time.

Among those in attendance who pledged themselves to the new organization include the following:

Anderson Electric Car Co., represented by D. E. Whipple, Chicago manager; Rauch & Lang Company, represented by J. R. Buck; Walker Vehicle Company, represented by Gail Reed, Chicago sales manager; Woods Motor Company, represented by Mr. Higginbotham; Waverley Electric Company, represented by sales manager E. Surf; Philadelphia Storage Battery Company was represented by D. C. Arthur; Exide Battery Company by D. B. Parker; Volvo Battery Company by Charles Volker. The electric garages were well represented as follows: Fashion, Harry Solvat; Terminal, Charles Ross; Hollywood, A. C. McNett; Hyde Park, Clarence Christ; Rudd Garage, William L. Rudd; Lille Garage, T. B. Lille; Wiedmaier Garage, Royal Electric Garage, W. C. Nately; R. F. Patterson Garage Company; Grand Boulevard Garage, J. C. Mickel; Bland Electric Garage, W. E. Lemon; Columbia Garage Company, J. R. Anderson, Jr.; Garfield Park Garage, A. Halbert; Jones Garage. Lincoln Auto Station, P. Levey.

Commonwealth Edison Company, Chicago's progressive central station, was represented by Frank E. McCall, from the vehicle bureau.

The new association represents the best opportunity electric vehicle interests have ever had to cooperate with other similar associations, especially gas car organizations, and assist in protecting those matters vitally important to the electric yet unknown and consequently not considered by present gas car garage organizations. Although in the garaging of electrics and gas cars there are many points in common, still the different nature of the duties demanded of electrics causes many serious problems and needs a well organized body to control legislation favorable to further development.

It is expected that the resolution passed will make it possible to join together similar local sections from various electric vehicle centers and thereby bring about a national organization of electric garage and allied industries, extensive, and financially strong to protect the industry.

Every electric garage owner, dealer and vehicle manufacturer, should rally to membership at once in order to promote the greatest possible enthusiasm and cooperation in launching the new organization on a sound basis.

Texas Auction License Numbers

Popular automobile license numbers are to be sold by Texas to the highest bidder, and the money thus taken in will go to various charities.

This is the solution the license clerk has found to the embarrassing problem of how to award much-wanted numbers, such as 1, 100, 9,999 and 10,000. If a man wants a special number, he must bid for it—and the highest bid gets it.
Organization, Journalism and the Motor Wagon

PRESENTED BEFORE THE CHICAGO SECTION, ELECTRIC VEHICLE ASSOCIATION

BY S. A. PHILLIPS

If one were asked to name the single power outside the ranks of the trade which has played the greatest part in developing the present market for motor trucks the answer would unquestionably be "trade journalism."

Were you to ask me to name the single force within the ranks of the trade which has the greatest potential power for aiding in that development, I should unhesitatingly reply "trade organization."

In those two factors lies the future of the power wagon business.

It may truthfully be said that trade journalism has done more than anything else to foster the economy of the motor wagon. At a time when the motor truck factories of this country could be counted on the fingers of one hand, this industry had a journalism. It was a journalism that recognized at the start the waste and expense of horse haulage, and the economy and efficiency of motor transport. And in the face of prejudice and centuries-old conventions it laid the foundations of an industry that will some day astonish the world. How successfully the early work was done may be judged from the fact that in less than ten years it had developed a market which has already absorbed 150,000 industrial motor vehicles!

Yet such is the function of journalism. It is the business of trade journalism to strive for the widespread acceptance of some fundamental idea, to shape and crystallize public opinion, to guide the manufacturer and seller that their interests may be considered and their efforts intelligently expended, and to educate the buyer in the proper use and responsibilities of his investment. Journalism enjoys the confidence of the manufacturer because it has played so great a part in making his business possible. It has the support of the great buying class because it points out the better, bigger and cheaper way without prejudice and without selfish interest.

Journalism, one might say, is the stepping stone between maker and buyer, the middle ground where the two can meet with a common understanding for the ultimate profit of both. Journalism is, in effect, a servant serving two masters, a task that would be utterly impossible were there not a single basic principle and a willingness to work with fidelity to both.

There are some things, however, which journalism cannot do. It can suggest but not compel; it can condemn but not correct; it can admonish but not restrain. These tasks are reserved for trade organization. The force of journalism is the force of logic, but the power of organization is the power of numbers.

I often wonder if manufacturers live as close to their organization as motor wagon journalists to their power ideals? They never see or hear of a haulage problem without thinking of the motor wagon and how it might be applied.

Organization—its ideals and possibilities—should mean just as much to you. You should never have a business problem without considering what organization might do for you or what benefit organization might derive from learning of your experience. The very spirit of organization implies that its beneficiaries shall also be contributors in thought as well as fees. Through organi-

zation the individual experience of one becomes the collective experience of all just as the problems of one are the problems of all. When you view organization in that light you will begin to feel the great power that lies at your command, and you will realize, perhaps for the first time, the relationship that exists between organization and your industry's journalism.

You all know in a general way what your journalism stands for. You know that it has implicit faith in the motor wagon idea, that it preached the economy of the machine when many manufacturers lost confidence in their undertakings and that it will persist as long as machines are used. You know, too, that it has encouraged manufacture, that this has hastened engineering development, and that progress in design is in a large measure responsible for the remarkable economies realized at the present. You know what it has done and you believe it can do a great deal more.

Journalists regard your organization in the same light. They know, so far as you have let them, the kind of work you like to do; they know the evils you seek to correct, they know the things you want to accomplish and they believe you have the power required.

But do not forget that your journalism is a willing and patient worker. It has a wonderful reserve capacity that is waiting to be of assistance if you will but point the way.

Make it the confidential repository of the vital statistics of your industry. It needs them if it is to analyze market intelligently for you.

Make it a greater clearing house of information for the buyer. You serve your own interests best when you enlighten the man to whom you sell.

Supply it with true accounts of what your machines are doing. It requires a few facts to kindle the fires of vivid imagination.

Make it the must court where you can air your own opinions and benefit by others. It leads you to a thousand minds where you might reach but one.

Encourage it when you can; criticize it if you must. Otherwise it is apt to become a one-man journalism.

In short, consider your journalism as an influence for good, very similar to your organization, but much broader in scope and less selfish in interest. Follow it, believe in it, confide in it. Help it, and profit by it just as you would with your organization, remembering always that with a sound journalism strong organization and a good product this industry will never perish.

NEW YORK DEALERS WIN LICENSE TAG TEST

The right of New York automobile dealers to use manufacturers' number plates on their cars when the cars are being used for purposes incidental to the sale of cars, has been decided by the Court of Special Sessions in favor of the Automobile Dealers' Association, which undertook the defense of T. P. Patterson, a chauffeur employed by the A. Elliott Ranney Company, who was arrested some time ago for driving a car bearing a manufacturers' number.
Beardsley Electrics at San Diego Exposition

California Built Electrics Exhibited to Many Visitors Attending the Fair

Those who visit the San Diego exposition will find much to their interest in the Beardsley electric, Los Angeles-built cars which are very much in evidence. The manufacturer of this popular car maintains a large exhibit, covering 2,000 feet of floor space in the Varied Industries Building and a booth is finished in attractive style, having hard wood polished floor, mahogany columns extending around the exhibit, connected at the top with white and gold sections. The furnishings are in mahogany, with rose colored rugs, and plush seats around the three columns in the center of the exhibit.

In addition to exhibiting one car of each model produced by the company, there is also a stripped chassis and many of the parts entering into the construction of the Beardsley cars, so that the exhibit as a whole is not only attractive, but is decidedly interesting to any owner or prospective buyer of electric cars.

In addition to the exhibit proper the Beardsley Electric Company secured orders under the strongest competition for the following cars, which are used on the Exposition grounds:

One Beardsley electric ambulance, which is the first electric ambulance used in California, and this car is doing most excellent work, answering any emergency calls on the exposition grounds.

One treasury car, which gathers the coin from the gate entrances, and concessions on the "Isthmus" and other sections of the grounds, taking the money to the bank, besides performing much other work for the officials in the Administration Building.

Two parcel delivery trucks, which distribute the parcel and freight packages from the entrances to the various exhibits.

One Beardsley electric roadster, which was sold to H. O. Davis, director general, this car being used around the ground as the official car.

It is one of the rules at the exposition to allow no gasoline trucks inside the exposition grounds during the daytime, and for this reason electric trucks were adopted. The Beardsley Electric Company was fortunate in securing this business, and it is a most excellent advertising proposition for its vehicles.

Volney P. Beardsley, manager of the Beardsley Electric Company, reports that the showing his company is making at San Diego is doing a great deal of good for his car, as he finds many people are showing an interest in the California-built car since visiting the exposition. He also reports that during the past month agency contracts were closed for Salt Lake City, Tacoma, and Denver, all the result of prospective buyers visiting the San Diego exposition and becoming interested in Beardsley electrics.

Beardsley electrics designed for pleasure—for the company is also producing commercial cars—are built in three models. The brougham is listed at $3,000 for single drive and $3,100 for duplex drive; the victoria is the only open five-passenger electric car manufactured in duplex drive and with revolving front chairs, enabling all passengers to sit facing forward; the roadster, which is wheel-steered and capable of a maximum speed of 30 miles an hour, is listed at $2,500. The latter is a most beautiful job—just the thing for the doctor or other professional man, the business man whose home is in the suburbs, or the lady with a penchant for a little speed but no love for gasoline car complexities. It is provided with 42 cells, whereas the brougham and the victoria have 36-cell equipment. The speed control of the roadster is by pedal, the same as a gasoline car, and for an additional $100 an extra wire wheel, with tire and attachments, is furnished, the extra wheel being carried behind. Houk wire-wheel equipment is standard on all Beardsley pleasure cars.

The Gould batteries which are used in Beardsley Electrics are guaranteed by the manufacturers for 10,000 miles or two years. Those used in the brougham and the victoria are of the 36-cell, 15-plate type, while in the roadster they are of the 42-cell, 13-plate type—both styles being of 168-ampere hour capacity.

While on the subject of battery capacity, it is pertinent to call attention to a recent test of the traveling radius of Beardsley electric pleasure cars. The makers of the car offered gold medals to all owners who drove their cars 100 miles or over on one charge, and silver medals to those who exceeded 90 miles. Fourteen cars entered the test—and the builders were mulcted to the
tine of fourteen medals. Every car topped 90 miles, and eight of the fourteen exceeded the 100-mile mark on one charge of "juice." All the cars were driven until they were run down, and the average mileage of the fourteen was just over the 100 miles—100.1 miles, to be exact. One of the cars, that had been in constant use for over a year, scored 112.1 miles, another 107 miles plus, and a third a trible over 105 miles. It was the most remarkable mileage demonstration ever recorded in the history of the electric automobile industry.

The Beardsley Company has been featuring a series of monthly outings of its patrons. When these excursions are announced, from a dozen to a score of cars assemble on Saturday morning for a trip over the beautiful roads of this section to some one of the many famous resorts within fifty miles of Los Angeles. One of the most interesting views of these trips is the long line of Beardsley electrics as they climb up the long grade leading into the foothills between Monrovia and Azusa en route to Pomona.

The commercial end of the Beardsley business is growing rapidly. Los Angeles merchants are beginning to realize the advantages of operating electric vehicles which are built at home. Not less than a score of the two models—10-B, 1,000 pounds, and 20-B, 1,500-2,000 pounds—are now in use in the Southern California metropolis. These chasses are listed at $1,900 and $2,350 respectively, and are guaranteed for one year.

An Important Court Decision

A new and interesting ruling has just been made in the Court of Common Pleas of Cuyahoga County, as to the liability of a garage owner because of injury to persons while being driven in their own cars by a driver furnished such persons for hire by the garage owner.

The case was that of Jones against the Baker Motor Vehicle Company, and it appeared from the evidence that Mrs. Jones was the owner of a car, which was kept by the Baker Company in its garage as a "boarder," and that upon her call the Baker Company would furnish her a driver at a fixed charge per hour, and that the drivers were instructed by the Baker Company to drive "as directed by the owner" while out with the car. It appeared further that while an employee of the Baker Company was driving Mrs. Jones one evening, about dark, and through a drizzling rain, the car ran into a dirt wagon standing by the roadside, without any lantern on it. Mrs. Jones, who had been riding backward, in the front seat of the machine, claimed to have been injured as the result of this collision. The court charged the jury that, as a matter of law, the driver of the car was, at the time of the accident, the agent and servant of the Baker Company, and that if the company had not exercised due care in selecting a careful driver, or if the driver was negligent and his negligence caused the accident, the company was liable. This ruling of the court is probably the first of its particular kind and if sustained by the higher court means, as a practical matter, that a garage owner or other person who supplies drivers to the owners of cars, in the manner above described, is absolutely liable not only to the owner of the car but to third parties as well who may be injured through the carelessness of the driver.

Hertner Motor and Generator Charger

Hertner Electric & Mfg. Co., Cleveland, Ohio, is placing on the market a battery charging outfit of the motor and generator type, in which the alternating current of the mains is used to run a motor that runs a generator that turns out direct current for charging. The main feature of the charging set is the use of special windings in the generator, that provide a uniform taper as the charge progresses, giving an automatic regulation of the charging current.

This makes the operation of the set the simplest possible, it being only to insert the charging plug in the car's socket and close the switch of the charging control panel. The car may then be left on charge over night, with the knowledge that when the charge is complete, the amount of current passing into the battery will not be sufficient to cause damage.

Another feature of all-night operation is that temporary breaking of the supply current, or a fall in its voltage, do not mean stopping of charging, as is the case with the mercury rectifier. If the supply current ceases while the Hertner set is on charge, a small amount of current is drawn from the battery by the generator acting as a motor, turning over slowly, so that when the current is on again the set starts off on charge.

During the first two hours of charge, 50 per cent of the battery capacity is delivered, and at a rate that does not overheat or cause the battery to gas.

The rotor windings are without joints, thus eliminating one great source of trouble with the induction motor. The plant, as shown, is vertical, permitting it to be located in places where a horizontal outfit would be impossible on account of space restrictions. A further advantage of the vertical form is that it renders the commutator more accessible for cleaning and inspection.

In order to produce a machine that would be as well balanced as possible, run smoothly, and be easily dismantled, the rotor and generator shafts have been made separate units, connected by a coupling. A ball bearing is mounted immediately below this coupling, supporting both shafts practically midway.
Electric Vehicle Association Developments

Sectional Development Work, Reports of Committees and New Announcements

The following is a review of the activities of the Electric Vehicle Association of America, since the last report appearing in Electric Vehicles for May, 1915.

Chicago Section:—On April 27, a meeting was held at the Motel Metropole at which Chairman McDowell presided. The chairman announced the adoption of the report of the standardization committee, setting forth 42 cells as the standard number for lead batteries. There were two speakers present, Mr. Hebard of the Buda Company and T. H. Smith of the Mercury Manufacturing Company, who gave talks on industrial trucks. Each in turn told of the various features of the apparatus, telling of the design and some of the possibilities to be expected.

At the May 4 meeting, F. J. Pearson, engineer of the Marshall Field Company, was introduced and spoke on “The Electric Vehicle Delivery in Merchandising.” He presented some very valuable and interesting items concerning the cars in service of his company, and a very good idea was given to all present of the extensive part the electric vehicle plays in their delivery system. From figures given out by him, they operate about 75 gasoline trucks, and approximately 225 electric vehicles, making a total of 8,400 miles daily. The equivalent in horses would require from 850 to 900 head. Their delivery system covers about 450 square miles and they believe it has practically reached perfection.

At the May 11 meeting, Fred B. Schafer, associate editor of Electric Vehicles, was introduced. Mr. Schafer presented a report as chairman of the special committee for the investigation of comparative costs of garaging gasoline and electric passenger cars. This report brought forth a considerable amount of discussion and largely proved the great difficulty in making an absolutely accurate comparison on this subject. The very fact that many garages operate both types of vehicles makes it all the more difficult to segregate the actual costs for the two items, as they are more generally overlapping continually.

Pittsburgh Section:—The April meeting of the Pittsburgh section was held in the Fort Pitt Hotel, April 29.

After dinner was served, F. B. Fink of Philadelphia addressed the members and guests on transportation problems and the advantages of the electric vehicle. The star attraction of the evening was the association’s motion picture film “Selling Electric Vehicles.” This meeting was the biggest one yet held by the Pittsburgh section.

Cincinnati Section:—The Cincinnati section met on May 21 at Hotel Gibson, J. W. Schrantz, chairman, presiding.

Dinner was partaken of by the eleven members present, after which Chairman Schrantz opened the meeting with a short talk on co-operation.

A. Jackson Marshall, secretary of the National association, then delivered a very interesting address, which was well received by everyone present. Mr. Marshall’s subject was “What the Electric Vehicle Association Has Accomplished, and Can Accomplish With Co-operation.”

Much interest was manifested in Mr. Marshall’s remarks and, after considerable discussion, the meeting adjourned.

St. Louis Section:—A meeting of the St. Louis section was held on April 12 at the American Hotel Annex, Chairman M. B. Strauss presiding.

A paper was read by J. F. Lincoln of the Lincoln Electric Company, Cleveland, Ohio, describing electric vehicle charging apparatus and considerable discussion took place regarding this equipment.

A. E. Archer, chairman of the advertising committee, outlined the general plans he had in mind regarding a combined advertising campaign to push the electric vehicle industry as a whole in and around St. Louis, through a fund to be raised by subscription from the electric car dealers, light companies, battery manufacturers, tire manufacturers, etc. Six of the car dealers had each agreed to subscribe $200 and certain amounts were specified as being the amounts they felt each of the other companies should subscribe.

Charles Blizzard of the Electric Storage Battery Company was present at this meeting and stated that his company would be glad to go into this fund. Mr. Archer was requested to get all his information to-
together and ideas regarding what should be incorporated in these advertisements.

A meeting on May 10 was held at the American Hotel Annex, M. B. Strauss, chairman, presiding.

J. L. Force of the Shepard-Valentine Company of St. Louis gave a talk regarding the Wotton battery charging apparatus as manufactured by the Electric Products Company, Cleveland, Ohio. At the conclusion of his talk considerable discussion took place on this particular type of equipment and the results which can be obtained from it.

It was moved and seconded that a map be prepared showing the location of the various points in St. Louis and surrounding country where an electric vehicle owner could get his batteries charged. C. E. Michel was appointed a committee of one to get this information in shape so as to present it to the next meeting of the association for final action.

It was suggested that the association have a complete list of all the electric owners in St. Louis, and it was finally moved and carried that Theodore B. Entz should forward the list to H. B. Marshall, the local secretary, after it has been checked up and brought to date.

A. E. Archer, chairman of the local advertising committee, reported that it was impossible to get all the information together on the proposed advertising campaign in order to make it effective before the summer months. It was therefore determined that the efforts toward getting this proposition in shape should not in any way be discontinued, but that everything should be shaped around so that this active advertising campaign can be started in September or October.

The section on May 28 held a meeting at the Jefferson Hotel, at which time A. Jackson Marshall, the national secretary of the association, addressed the meeting. Mr. Marshall outlined the general purpose of the association, stating what work had already been accomplished and what work the association hopes to accomplish in the future. At the conclusion of this talk a vote of thanks was extended to Mr. Marshall for the very interesting information given.

F. E. Stevens, chairman of the garage committee, read a report of his committee, but discussion was withheld until the next meeting, to be held in June, when the matter will come up for decision as to whether this report will be accepted.

A. E. Archer, chairman of the advertising committee, made a report as to the progress which his committee is making regarding the proposed combined advertising campaign to be held in the fall.

R. W. Leach, chairman of the membership committee, presented to the association the sample map which he had prepared showing the location of service charging stations in St. Louis, which will come up for final decision at the next meeting.

Philadelphia Section.—On May 4, the Philadelphia section held an executive committee meeting in the library of the Philadelphia Electric Company, Chairman R. L. Lloyd presiding.

A general discussion took place as to ways and means of promoting interest in the association, and the matter of an electric car run was referred to the passenger car committee, who are in touch with the Public Ledger in an endeavor to have the newspaper stand sponsor for the run.

The matter of delinquent members was taken up, and the secretary was instructed to write Mr. Marshall for a revised list of the delinquents.

A section meeting was held on May 12 at the Colonnade Hotel, Chairman Lloyd presiding.

R. T. Snodgrass of N. W. Ayer & Son, presented a paper on “Advertising.” In opening his remarks, Mr. Snodgrass announced that he had not given the subject of electric vehicle advertising any particular study, but that he would like to touch upon the subject from the point of view of general advertising knowledge, and would probably give the members a few thoughts on the subject from a different angle.

Mr. Snodgrass stated that advertising in general always made more work and not less work for the salesmen, inasmuch as it brought to them a much larger number of possible buyers. He also stated that no article was worthy of conscientious advertising that was not in itself already on a sound, successful basis, that advertising was not intended to make a good proposition out of a poor one,—it was intended to bring increased sales and thereby enhance the value of such an article that had already demonstrated itself as either useful or desirable. Mr. Snodgrass mentioned that he knew, of course, that a large number of dealers were operating from 2 to 24 hours per day, one to eight days in the week, thinking over this question of how to secure increased trade, and that before any advertising agency should undertake to prepare advertisements, the subject should be investigated thoroughly, the market studied, the factories and business carefully gone over, so as to become acquainted with the ability of the manufacturers to supply the required articles to satisfy a possible demand to be created.

The speaker called attention to the success in the field of gasoline car advertising, and stated as his opinion, that imitation among the advertisers and others of the United States was developed to a very high degree, in fact, imitation runs rampant, not only in advertising, but in all things with which the American public is interested. In all the world, the Japanese only are the equals or superiors of Americans in this somewhat questionable trait of character.

Mr. Snodgrass suggested that advertising of electric cars should appeal particularly to women. No details of the mechanical construction should be advertised. In fact, the showrooms of electric cars should be placed in the shopping district, where it would be bound to attract the attention of the women. He called attention to the advisability of women demonstrators, stating that it is his firm belief that no man can as well reach those traits in a woman's character, which it is necessary to reach, to create a desire for a luxurious electric car.

He concluded by stating that for any complete salesmanship enthusiasm of one's product, a quiet confidence in the absolute end, and capacity of his product to fulfill the desires or necessities of the proposition was essential to success.

Cleveland Section.—On Thursday, May 6, President John F. Gilchrist addressed the Electrical League of Cleveland, which is fostering the Cleveland section of the association, and under whose guidance the section is progressing very nicely, the total membership to date being 29 with three new membership applications pending the approval of the council.

New York Section.—An executive committee meeting was held in the New York section on April 28. Eight new membership applications were presented for approval.

The garage committee reported to the secretary
that an application for a garage sign would be submitted in a short time.

Denver Section.—The April meeting of the Denver section was held on the 20th at the Colorado Electric Club, Chairman E. M. Jackson, presiding.

George H. Kelly of the Baker Motor Vehicle Company, Cleveland, Ohio, addressed the section meeting, opening with the question, “Why is the electric vehicle industry not growing in the same measure as the gas car industry?” Mr. Kelly said that the electric vehicle business is increasing and increasing very rapidly, but it must be realized that this particular product is going to the wealthier class, who are the first to feel any congestion in business conditions. The war which commenced last August had a tremendous effect on the electric vehicle business, but when the amount of sales of electrics during that period is compared to the sales of high grade gas cars, the electrics have held their sales in a much larger percentage than have the gas cars, of the Pierce, Packard, Locomobile, etc., types, which is a very favorable indication of the progress of the electric vehicle business.

Mr. Kelly stated that the problem confronting the electric vehicle industry was largely one of education. Most people do not know what an electric car will do, and the best, even though the most expensive way of educating the people is by demonstrations.

After a few more remarks by Mr. Jackson, chairman, Frank A. Pim read his paper on “Electric Vehicle Conditions Along the Pacific Coast.”

Following Mr. Pim’s paper, Ross C. Brown reviewed “The Electric Vehicle in Department Store Service,” by David F. Tobias.

Mr. Jackson requested Mr. Brown to review this paper because one of the largest organizations in Denver will be in need of six commercial vehicles in the very near future, and with a view of ascertaining just what kind of vehicle, whether gas or electric, they would use, they appointed two of their employes to go out and inquire from the people that owned the different cars their opinions of what the cars are doing. Mr. Jackson spoke of the strenuous efforts he was making to “boost” the electric truck in Denver.

Mr. Pim spoke of the manner in which the prevention of thefts of automobiles is taken care of. He said that the Southern California Automobile Club had organized a company which has complete records of every automobile that is owned in Los Angeles County. They continually check it with the county clerk’s records for chattel mortgages, etc. When you purchase an automobile in Los Angeles, you are required to furnish a title. Mortgages must be recorded if it is legal. If a car is sold, the buyer asks for a clear title just the same as if he were buying a piece of property. He is given the number of the car and the license number. He looks it up in the county records to see if it is absolutely free from incumbrance. A continuation of title is issued and delivered to the new owner. Mr. Pim said that such a system ought to be installed all over the country.

Membership Committee.—The membership committee, G. A. Freeman, chairman, in an effort to increase the membership of the association, especially the active members, sent out to the 1,200 member companies of the National Electric Light Association, a letter soliciting their membership, enclosing a copy of the association’s condensed prospectus, an application blank and a table of contents of the paper “The Electric Vehicle and the Central Station,” by President Gilchrist and Secretary Marshall.

The membership report, showing the applications pending since the last council meeting on February 15, is as follows:

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<th>Section</th>
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<tr>
<td>New York</td>
<td>16</td>
<td>215</td>
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<td>253</td>
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Detroit Electric Makes Series of Interurban Runs

Beginning June first, the Anderson Electric Car Company will make a series of twenty interurban runs from Detroit to points of interest about the city. These runs will extend over a period of twenty consecutive days excepting Sundays. Each run will be made by the same Detroit Electric car and on one charge of the batteries. The objective point in each case will be far enough distant to assure a total round trip mileage of at least sixty to seventy-five miles.

The Anderson Electric Car Company has invited any person in the city of Detroit interested in the performance of the modern electric car to accompany them on any of these trips so that they may actually observe the performance of Detroit electric cars on country roads. In some cases where the objective point does not offer attractive facilities for luncheon, arrangements have been made to take basket lunches so that a pleasant luncheon may be enjoyed along the country road at some inviting spot.

The novelty of a series of runs of this type by an electric car is in itself attractive. Of more interest, however, is the fact that the American people are fast losing their desire for fast driving through the country and long distance touring. The result of these runs will therefore be awaited with a great deal of interest by many people who desire a conservative automobile for suburban traveling as well as a car for all around city use.

Weed Chain Wins Patent Case

The E-Z On chain tire protector has been declared an infringement of the Parsons patent No. 723,299 owned by the Weed Chain Tire Grip Company, in a decision handed down by Judge Arthur L. Sanborn in the United States district court in this city. The E-Z On device was manufactured and sold under Framburg and Corrington patent No. 1,001,518 and under a pending application that has since developed into patent No. 2,064,015.

In March, 1913, Judge Carpenter granted a preliminary injunction after a hearing on a full showing by affidavits. The case has now had its final hearing.

In his decision Judge Sanborn states that the E-Z On chain tire protector, made and sold by the defendant, is a substantial reproduction of the Weed chain grips, made by Weed under the Parsons patent. The sole defense, according to the court, is non-infringement and the judge in his decision lays great stress on the fact that the E-Z On device would creep along the surface of the tire when fixed into position. Although affidavits were first made that there was no creep with the E-Z On grip, at the trial this position was decidedly modified and admissions were made that the device would creep to some extent.

The decision called for the usual decree for an injunction and accounting.

Balancer Sets for Battery Charging

The Chicago section of the Electric Vehicle Association of America held a meeting at the Hotel Metropole May 25. W. H. Noble, or the Lincoln Electric Company, gave a talk on “Charging Vehicle Batteries From High-Potential Direct Current.” Mr. Noble introduced the subject by calling attention to the fundamental relations between the voltage, current, resistance and power in a circuit, giving numerical examples to illustrate these. There is usually a great waste of energy in charging small batteries on circuits of 110 volts or higher. One example was given where low-voltage batteries were charged in such a wasteful manner that for 6.7 kilowatt hours actually used in the battery, 32.9 kilowatt hours were wasted in external resistance. In this case only 16.7 per cent of the energy expended was actually used in charging the storage batteries.

There are three methods of avoiding this difficulty of placing excessive resistance in series with the battery. The first is to use enough batteries in series so that the total voltage approaches the voltage of the supply circuit. This is not usually satisfactory because different cells will need different amounts of charge. A second method is to use motor-generator sets to convert the electrical energy to the proper voltage. This method is satisfactory for small batteries and where a single definite voltage is required, but the cost of the machines makes it objectionable for large installations.

A third method is to use a balancer set and this the speaker considered the most satisfactory method where large numbers of batteries have to be charged. This method was explained in detail.

The idea of a balancer set has been used extensively in lighting and for other purposes, but has not come into general use for battery charging, although it is very well adapted for this purpose. In the simplest case two 110-volt machines are mechanically connected together and electrically connected in series across a 220-volt circuit. The voltage of each machine is 110 volts. A middle wire is taken out between the two machines and the batteries to be charged are connected between this middle wire and one of the outside wires.
Central Station Electric Truck Performance

Interesting Operating Data of G. V. Electrics Furnished by the Edison Electric, Boston

The Edison Electric Illuminating Company of Boston has provided the following interesting data on the performance of the two 5-ton General Electric electric trucks which are used for high potential cable testing. The equipment of these trucks has been described in various publications and it is only necessary to mention here that No. 1, called the Transformer Truck, carries an 800 KVA transformer, an 850 KVA reactance two-motor driven blower sets and necessary auxiliary apparatus; while No. 2, the Motor-generator Truck, carries a 100 KVA motor-generator set with starting and other necessary appliances.

The following weights apply to the truck with complete equipment:

- **G. V. No.**: 2,131 lb
- **Truck No. 2**: 2,252 lb
- **Weight on front wheels**: 8,180 lbs
- **Weight on rear wheels**: 13,000 lbs
- **Weight on front and rear right**: 10,755 lbs
- **Weight on front and rear left**: 11,395 lbs
- **Total weight**: 21,435 lbs

The current consumption is:

- **Good roads—level**: 75-100
- **Poor roads—level**: 115-125
- **Boylston Street hill**: 175
- **Beacon Street**: 75
- **Steep hill, poor road**: 200-225
- **Down hill**: 35-50
- **Down hill**: 60-75

The consumption is for No. 1 truck: 1.16 A. H. per ton mile; for No. 2 truck: 1.06 A. H. per ton mile. Each truck has speed of 7½ miles per hour.

Total tests made—one month: 1911, 17; 1912, 179; 1913, 131; 1914 (to Oct. 1), 56.

No. 1 truck went into commission July 19, 1911, but as No. 2 truck did not arrive until November 27 of the same year, very few tests were made in 1911.

**MILEAGE COVERED**

<table>
<thead>
<tr>
<th>Year</th>
<th>Miles Covered</th>
<th>AMPERE HOURS USED TO OCT. 1.</th>
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<tr>
<td>1912</td>
<td>522.0</td>
<td>8705</td>
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<tr>
<td>1913</td>
<td>1390.2</td>
<td>21645</td>
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<tr>
<td>1914</td>
<td>579.6</td>
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**AMPERE HOURS PER MILE**

<table>
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<tr>
<th>Year</th>
<th>Per Mile</th>
<th>Per Mile</th>
<th>Per Mile</th>
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<tr>
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<td>13.7</td>
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</tr>
<tr>
<td>1914</td>
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</table>

Most of the tests are made in the city of Boston, although occasional trips are made to Natick (19 miles), Dedham (12 miles) and to Newton (10 miles). On these trips the trucks are usually driven out in the evening, charged, and the test made early the next morning, after which they are driven back to the service station at Massachusetts avenue.

The actual testing requires from 3 to 4 hours and time taken in traveling to and from tests varies from 1 to 6 hours, the shorter runs being the more common.

This company also has in service at the present time two pump wagons. The pump wagon is a 2,000 lb. electric wagon, which has mounted inside its panel body a motor driven rotary pump. The pump motor is connected to the vehicle battery and the pump drives will lift 90 gallons of water a minute from the manhole. The work was formerly done with hand pumps. Two men with a small hand cart were sent from manhole to manhole and could take out about 5 gallons of water per minute.

The Edison Company has found the greater speed of the outfit not only in pumping, but also in moving from place to place, especially advantageous in the downtown district of Boston, where the traffic conditions are notoriously bad.

On the day the log was taken the G. V. pump wagon actually removed 10,080 gallons from 13 manholes, using 58 amper hour hours from the vehicle battery for the work. So that while the battery discharge was 164 amper hour hours, only 106 were used for driving the vehicle in 16.6 miles. In very weather the consumption for driving vehicle averages 4.7 per mile, while the total consumption (driving and pumping) is about 5.7 amper hour hours per mile.

**Performance data follows:**

**DAILY TRUCK REPORT**

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<tbody>
<tr>
<td>Edison Garage</td>
<td>8:19</td>
<td></td>
<td>587.8</td>
<td></td>
</tr>
<tr>
<td>8:40 Ed.</td>
<td>8:43</td>
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<td>2:41 St.</td>
<td>2:45</td>
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<td>897.7</td>
<td></td>
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<tr>
<td>3:04 Fargo</td>
<td>2:24</td>
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<td>889.6</td>
<td></td>
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<tr>
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<td>Grade Crossing delay.</td>
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<tr>
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Entries with asterisk prefixed show time of starting and stopping pump motor.
While the pump wagons are assigned regular routes, they are also used great deal for emergency work. The drivers have strict orders to telephone headquarters hourly. The accompanying log, for instance, shows that the G. V. pump wagon after pumping out some manholes at the big "L" Street generating station made a number of stops for "Inspection and Test at Manholes." This means that the pump wagon was turned over to an underground trouble gang which made tests at various manholes. Wherever necessary these manholes were depressed. Just as soon as the trouble was cleared the pump wagon again proceeded on its regular work.

The pump wagon averages 20 miles a day of actual travel and during that time will clean out from 15 to 20 manholes.

This figure does not represent the number opened and inspected. During the first ten months of 1914 the crew of the two wagons opened 13,700 manholes, from 9,500 of which was pumped 3,130,000 gallons of water.

<table>
<thead>
<tr>
<th>Hrs.</th>
<th>Min.</th>
<th>Percent. of total time.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Running Time</td>
<td>2</td>
<td>26</td>
</tr>
<tr>
<td>Pumping Time</td>
<td>1</td>
<td>52</td>
</tr>
<tr>
<td>Lunch and other delays</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>31</td>
</tr>
</tbody>
</table>

Capacity and make of truck, 2,000 lb., G. V., 60-A6 Ed. Batt.; in service of Edison Electric Illuminating Co., Boston, Ed. No. 86, G. V. No. 1897; place, Boston, Mass.; weather conditions, rainy; nature of service, pumping out manholes; road conditions, Belgian blocks.

The log following shows the work done by one of the new G. V. 2-ton winch trucks, which is being used by the Maintenance of Lines Department of the Edison Company. While the daily mileage of these trucks is small, the standing time is productive of so much because of the vehicle being a traveling stock room carrying line material, tools and implements of all kinds, as to the fact that the power driven winch is put to such valuable use.

The winch was used at the very start when the truck was driven to the pole storage yard in the rear of the immense service station plant and the 50 foot pole was pulled out into position where it could be placed on the small dinky. The butt was then chained to the rear end of the truck and was then towed to Neposnet avenue and King street.

The work here consisted in the replacing of a decayed pole, which was first cut off at the butt and the end set to one side. After the dirt was partially cleaned from around the butt, the winch was used to give the final pull which brought out the old stump.

The hoisting of the new pole was somewhat of a ticklish operation because of numerous wires overhead, which had to be avoided. But the truck was quickly placed in the best position and the necessary blocks attached to the old pole and up the new pole went—all hoisted in less than two minutes—5 amperes hours being drawn by the winch motor to accomplish the task.

A little later the truck was sent for a load of dirt to fill up around some new poles which had just been installed and as a wind-up the old butt and an old pole which had been taken down during the afternoon were towed to a nearby vacant lot. Then with the dinky and the crew aboard the truck proceeded to the Edison service station.
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