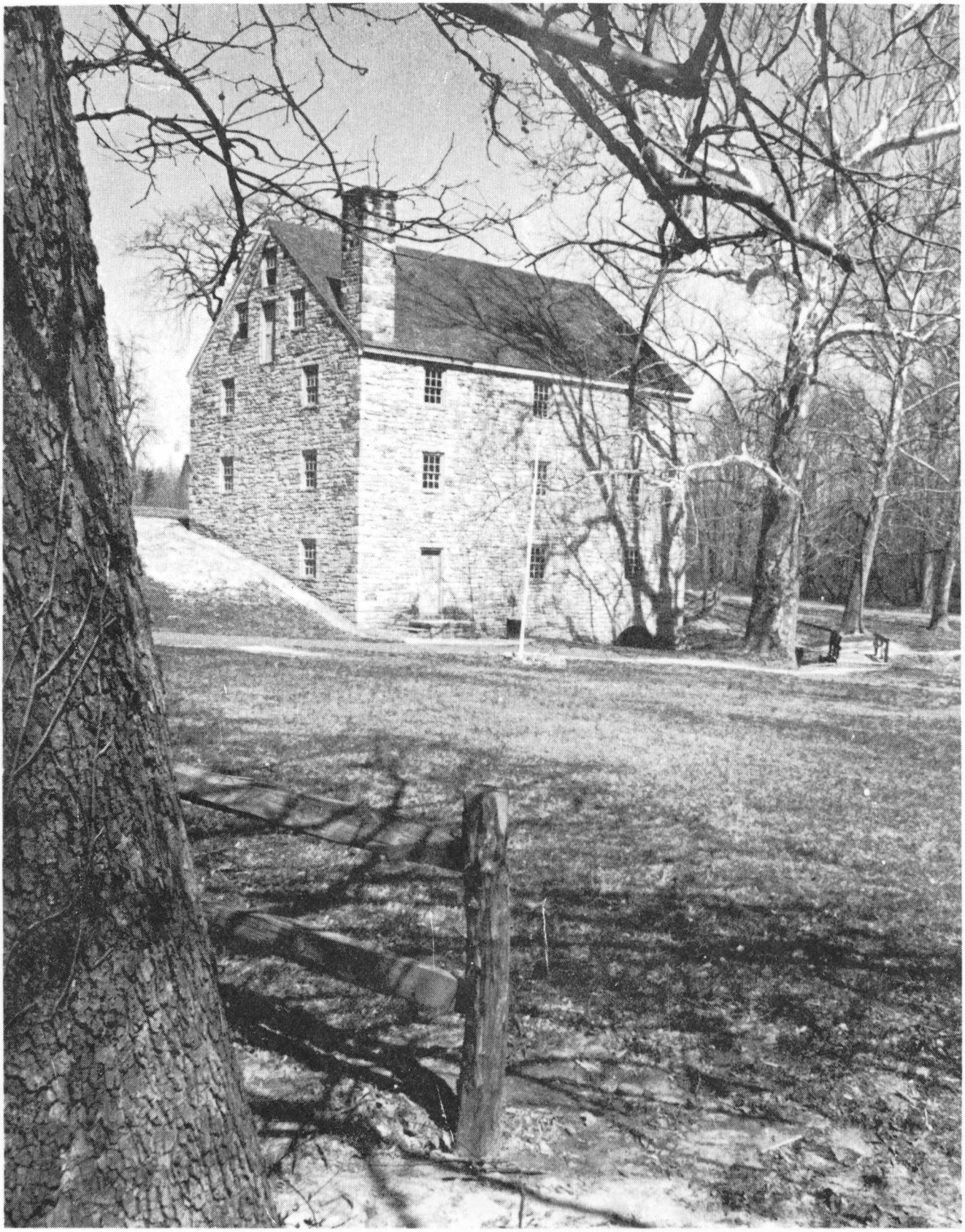
AUTOMOTIVE HISTORY *Review*

SPRING, 1977 ISSUE NO. 6

OLIVER EVANS, 1755 - 1819

The Society of Automotive Historians



AUTOMOTIVE HISTORY Review

A PUBLICATION OF THE SOCIETY OF AUTOMOTIVE HISTORIANS

RICHARD B. BRIGHAM, EDITOR

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AUTOMOTIVE HISTORY REVIEW is printed by BRIGHAM PRESS, Marietta, Georgia. Address all correspondence to the SOCIETY OF AUTOMOTIVE HISTORIANS, P. O. BOX 1306, MARIETTA, GA. 30061.

THE COVERS —

FRONT - Oliver Evans, 1755-1819, American inventor.

BACK - Luck Truck ad of 1912, loaned by D. J. Kava

INSIDE FRONT - The Dogue Creek Mill reconstruction. Original was equipped with Evan's designed apparatus. Photo by John Peckham.

INSIDE BACK - 1905 White Steamer, Model E, 15 hp. Picture taken in England in 1910 by Roy C. Meates, a professional landscape photographer. At the wheel is Mr. Meates' father. Photo courtesy of Harry Pulfer.

EDITORIAL COMMENT

AN OLD CAR HOBBY ANYONE CAN AFFORD

There probably isn't a single member of the Society of Automotive Historians who at some time has not said "I could have bought one of those (insert name of make here) for $75 once (or $50 or $25 or even $5), and now look what they're asking for it!"

But the days of the low–priced, easily obtainable antique cars are gone, never to return. The reasons are evident – a dwindling supply of restorable cars, the necessarily high price of cars already restored, and the phenomenal increase in the number and size of old car auctions which, week by week, drive the prices ever higher. Most of us can no longer afford to start a collection of antique automobiles, or add to existing collections.

There is, however, another kind of collection which just about anyone can afford, and that is the collecting and verifying of automotive history. All that is required are a few books, a file cabinet, and perhaps a camera to start with. A small collection of pictures, and file cards covering various makes and their history, will grow rapidly. No large investment is required, no storage buildings are needed, yet the scope of such a collection is unlimited.

As members of the Society of Automotive Historians we each have a collection of cars which no museum can ever hope to have as real automobiles. We all have a Fey, a Dormandy, a Birmingham – to name only a few of the little makes whose pictures and descriptions have appeared in SAH publications. We have photos of the factories in which some of them were made, and we have pictures of many of the men who made them.

There is a certain undefinable thrill which comes with the finding of an unknown make in some obscure publication. We check the rosters in our collections. Nope, it isn't listed. We write letters to our fellow historians. They never heard of it. We send a question to the SAH publications, and pretty soon a trickle of information begins to come in. The file card on our discovery starts to fill up, and soon we have added a new name to our collection – and perhaps a picture. And the same information is now shared with all other members.

The Society, through exchange and publication, has done much to add to existing records, and to correct errors which have crept into these records over the years. This kind of antique car collecting can be both rewarding and useful – and it doesn't require a huge bankroll with income to match!

CONCERNING ARTICLES WRITTEN OR CONTRIBUTED BY NON-MEMBERS

Every now and then the question comes up as to whether or not articles written by non-members should be included in the SAH publications. The point has again been raised in connection with *The One and Only Frontmobile* item which appeared in Issue No. 5. This article was written by Arthur B. Graisbery, a non-member, who sent it to R. A. Wawrzyniak, a very active member. Mr. Wawrzyniak sent it on to *Automotive History Review* where it was published with only minor editing.

Mr. Graisbery's offering included an account of the background and history of the makers of the *Frontmobile,* plus some interesting reminiscences concerning a car which he thought was the only one ever built. Editorially we suggested that there may have been several such cars produced, and that it was rumored that at least one still existed.

Now, as a direct result of the printing of the Graisbery article, we have a great deal of information on this rare make, including a letter from William J. Lewis, who has done considerable research on the make; Ralph Dunwoodie, who found the identical car which Graisbery described (and who negotiated its purchase by Harrah's Museum) and Dean Batchelor of Harrah's, who has sent a follow-up article plus four excellent photos of the car itself. All of this material is included in this issue.

Had we chosen to reject Mr. Graisbery's article on the grounds that it was not the work of one of our members, few of us would know much of anything about this unusual car other than its name, which appears in numerous rosters.

Also in Issue No. 5 there appears a reprint of an article by non-member Richard Phillipi, which clears up the question of the identity of the "Los Angeles Times Special". Mr. Phillipi's article was originally published in the *Horseless Carriage Gazette* in 1958.

Just these two contributions by non-members accounted for five of the pages in Issue No. 5, and that's nearly 16 per cent. And such contributors can be easily converted into members - members who have already demonstrated their ability and interest in the subject of automotive history.

VIEWPOINT
COMMENTS OF OUR READERS

THOSE PRODUCTION FIGURES (Issue No. 5)
Fred Roe, Holliston, Massachusetts

The production statistics for 1909 provided by Mr. Appelquist make interesting reading while at the same time they raise some interesting questions. A table of production figures was included in the book, *The Automobile Since 1775*, compiled by SAH members Mr. James J. Bradley and Mr. Richard Langworth. Comparisons between these two tables show some remarkable discrepancies as listed below. Since no information is given by either compiler, regarding source of information and whether model year or production year is the basis, I would like to see these authorities account for the differences so that we can give the readers of the Review some assurance of the accuracy of these important statistics. I am sure the differences are not intentional and can be explained by a clearer knowledge of their derivation.

APPELQUIST		*1775*	
1. Buick	14606	1. Ford	17771
2. Ford	10660	2. Buick	14606
3. Maxwell	9050	3. Maxwell	9460
4. Cadillac	7868	4. Stude-EMF	7960
5. Reo	6592	5. Cadillac	7868
6. Olds	6575	6. Reo	6592
7. EMF	6200	7. W-Overland	4860
8. Overland	4860	8. Packard	3106
9. Chalmers-Det.	3100	9. Brush	2000
10. Packard	2699	10. Rambler	1692
11. IHC	2465	11. Olds	1690
12. Franklin	2142	12. Hupmobile	1600
13. Rambler	1692	13. Stoddard-D.	1600
14. Hupmobile	1620	14. White	1377
15. White	1377		

FRONTMOBILE DOES EXIST (Issue No. 5)
Ralph Dunwoodie, Sun Valley, Nevada

A Frontmobile touring does indeed exist. It is a 1918 model which I purchased out of New Jersey in July, 1963, for Harrah's Automobile Collection. Almost a year was spent in the negotiations.

A letter in 1963 from William M. Bateman, son of the builder, states that "two or three cars were completed". He also states that in 1918 the Government told them that if they were going to continue to build vehicles that they'd have to build trucks to help in the war effort.

In 1966 I corresponded with a former Bateman employee, Mr. Hugh Kemp, who had worked for the concern before joining the Army. Mr. Kemp states that "the car never got beyond the experimental stage and there was no production ever attempted beyond two or three touring cars and one or two trucks, all used for testing purposes". Mr. Kemp, upon returning from the Army, was put in charge of the office and was with the company when it decided to give up the ghost.

None of the above mention the roadster of which several photos exist. The most recent to appear is in the July-August 1976 issue of *Special Interest Autos* magazine on page 23.

All 1917 references state that the Le Roi engine was used. The 1918 car that Harrah's have has a Golden, Belknap and Swartz engine and the body has slightly different lines than those of the touring car pictured in the article. The car was in very good original condition and is very probably the same car that Author Graisbery refers to. It has a top resembling the California top but was built as a part of the car — not added later.

The Frontmobile made its debut at the 1917 New York Show (*Motor Age* Jan. 11, 1917, p.8) and changes were made in the design prior to the 1918 New York Show (*Horseless Age* Jan. 1, 1918, p. 44). The *Automobile Trade Journal* of Feb. 1918, p. 232, states that a Golden, Belknap and Swartz engine is used.

The article was very timely as it coincided with the restoration of this very interesting early f.w.d. car.

FRONTMOBILE UPDATE (AHR Issue No. 5)
W. J. Lewis

A minimum of three Frontmobiles were made, and possibly as many as five, with a great deal of differences among them. The "winter or California topped" car described in Mr. Graisbery's article was a Johnney-come-lately of 1918.

The particular car described is, and has been for a number of years, in Harrah's Automobile Collection. SAH member Ralph Dunwoodie was the person who acquired it for the collection and may be able to add some interesting points to the story. About two months ago I examined the car as it was being restored in Harrah's shops. It probably is the "One and Only SURVIVING Frontmobile", and when its restoration is completed, a report of its driving impressions should make interesting reading.

An article in *Automobile Trade Journal* of Feb. 1917 (Pages 195&195a) illustrates both the roadster and touring as well as chassis and engine. Chassis and engine are NOT the same ones shown in the catalogue reproductions illustrated in AHR #5. The ATJ item states "The Safety Motor Co., Grenloch, N. J., exhibited a roadster and touring model of their new front wheel drive car", then follows with a good description of the chassis details.

Horseless Age magazine for Feb. 1, 1917, p. 32, again details the Le Roi engined cars as having 112 in. w.b. The touring and roadster were priced at $1000 each, and the statement was made that "This standard chassis could be supplied with light delivery type body at $900."

It is possible that a chassis might have been actually fitted with commercial body in a local attempt to raise funds, but I rather doubt it. Grenloch and Camden, J. J., newspapers of 1917 might shed more light on this point. It wouldn't be the first time that a local business establishment was supplied with a "specialty vehicle" perhaps in return for investment in an embryo motor car company. To date, I have not found any illustrations of a Frontmobile delivery, or any other make of commercial vehicle, using the Frontmobile chassis.

The Automobile magazine issue, aforementioned, as well as British *Autocar* for Feb. 24, 1917, (page 194) called the cars Bateman. *Horse-*

less Age said "Built by the Bateman Mfg. Co. and marketed by Safety Motor Co. of Grenloch, N. J."

All major motoring journals seem to have given the car a great deal of coverage from January to March of 1917 but I have not seen a word about the subject in 1918 issues of the same journals. The roadster of 1917 was called the Frontmobile "Camden Roadster" in the same context as Cord "Beverly Sedan". This led to at least one erroneous report in print labeling the make of car as "Camden Front Drive".

Chassis and engine pictures of 1917 show the Le Roi engine, with four bladed fan and gear change stanchion at the left forward end of the flywheel housing. The shifting lever extended from this stanchion through the dash somewhat in the manner used by the L-29 Cord.

The 1918 car did not use Le Roi engine nor the same shifting mechanism. Catalogue illustration reproduced in AHR #5 and the surviving car are fitted with G.B.&S. engines and shifting linkage down the center of the steering column thence up and forward from the steering box to the transmission. The surviving car, however, does not have the sophisticated steering hub lever nor the six bladed rimmed cooling fan shown in the catalogue illustration.

I would be interested to learn what makes of front drives Mr. Blomstrom is supposed to have, unsuccessfully, attempted in Michigan and California prior to 1918. The only California one recalled as being developed in 1917 was the Homer-Laughlin. The two-car Hoskins front drive venture was chronologically next for the Los Angeles area in 1920, followed by the single Rosche car of 1925. Charles H. Blomstrom doesn't appear to have been mentioned in connection with any of these cars.

MORE PRE-DURYEA CARS

R. A. Wawrzyniak, Berlin, Wisconsin

In going through more of my collection, I found a couple more items for your pre-Duryea issue. Enclosed is a picture of what is reputed to be Gustave (?) Schloemer's 1889 auto with, presumably, Mr. Schloemer at the tiller. This is from the *Milwaukee Journal*, date unrecorded, but pre-war in the 1937-42 era.

The Schloemer car, of questionable date. Dates of 1889, 1890, and 1892 have been reported.

The other is a picture of what is labeled an 1890 photo of an auto made by a Mr. Earl. It is not in the *A.Q. 1775* book. Believe this to be from the *Milwaukee Sentinel* 1942 Auto Show Section of a Sunday late in November 1941.

I have read that Schloemer's auto is still in existence and is now located in the Milwaukee Public Museum, but I have never seen it.

For further information on these, contact David Lagerman, Newspaper Library, Newspapers, Inc., Journal Square, Milwaukee, Wis. 53201. In 1962 the *Milwaukee Journal* bought the *Milwaukee Sentinel*, and both papers are still published.

ONE OF THE FIRST—Now there's something for you! It is the first automobile in Los Angeles, Calif., the picture having been taken in 1890. The driver, who also was the manufacturer, is a Mr. Earl. The dignified gentleman on the rear bench is W. H. Workman, former mayor of Los Angeles. The thing could be heard for blocks when it was running and who could blame children or horses for being afraid of it? The mayor looks like he might be ready to jump.

EDITOR'S NOTE: The *Milwaukee Sentinel*, in its 1942 Auto Show edition, seems to have neglected to check its facts. At least two other publications (*Road to Yesterday*, December, 1960, and *Westways*, date unknown) have published this same picture, calling the car an Erie, built in 1897. This name, sometimes given as Erie & Sturgis, appears in many rosters, including *American Car Since 1775; MoToR's 1907 Motor Car Directory;* and *A Chronicle of the Automotive Industry in America*. All agree that the date was 1897, not 1890. The car, named for its designer, J. Phillip Erie (not Earl), was an electric, which probably made little if any noise at all.

INDEXED MAGAZINES

Richard Sagall, Toledo, Ohio

For awhile I have been indexing many of the popular old car magazines. This includes *Special Interest Auto, Cars and Parts, Old Car Illustrated, Old Cars, Classic Car,* plus other assorted ones as I get them. I would be glad to share my index with any member who wants a bibliography on any special topic. I will mail to any member a list of references on any topic they may wonder about from these magazines for an S.A.S.E.

Ed.: *If an SAH member does not have Mr. Sagall's address and is interested in his generous offer, send SASE to: Richard J. Sagall, 2633 Parkwood Avenue, Toledo, Ohio 43610.*

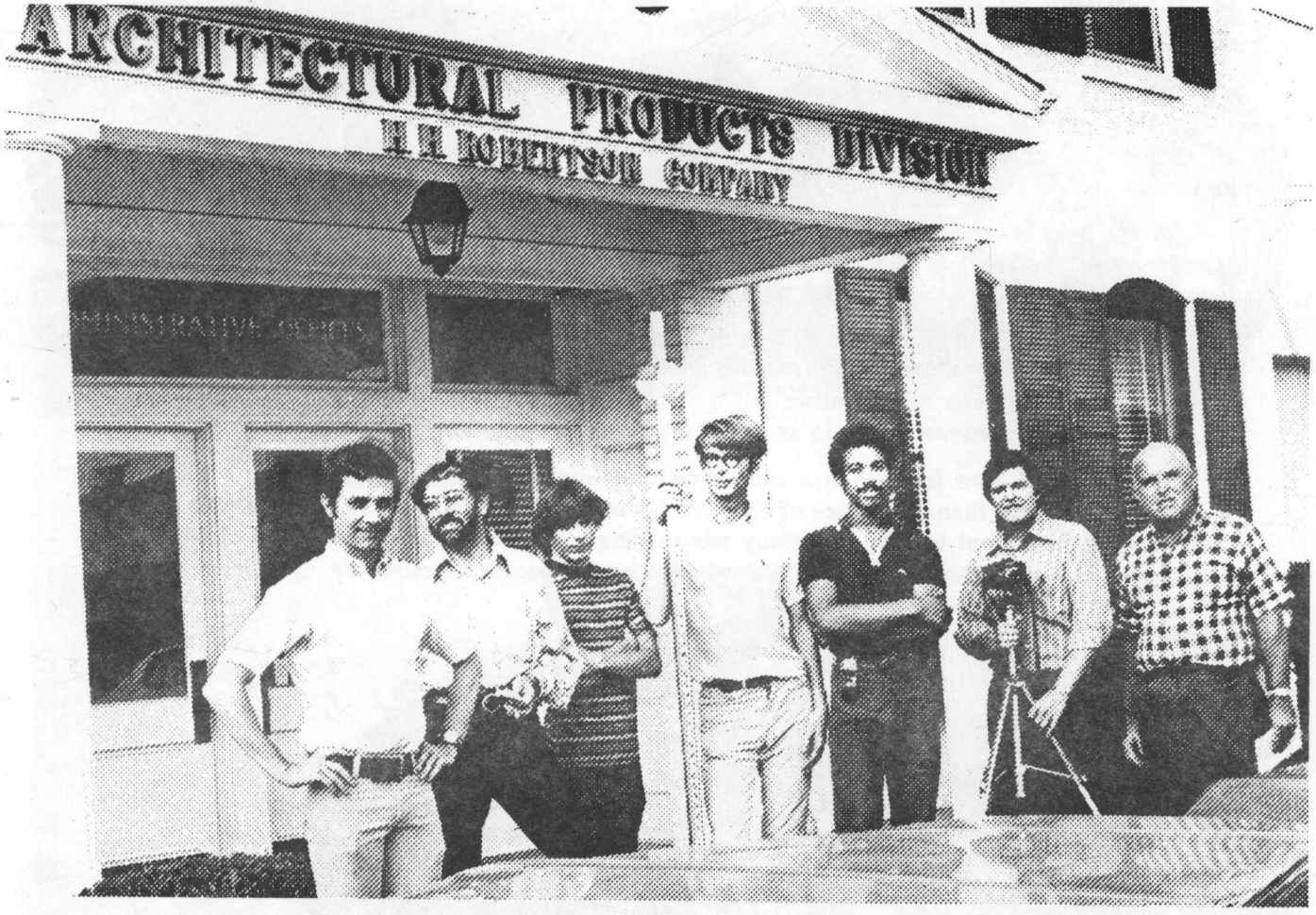
AMERICA'S FORGOTTEN INDUSTRY

Henry H. Blommel, Connersville, Indiana

The article on America's forgotten industry by David L. Lewis was a good one and appeared in the right magazine, as we are all trying to see that the Automobile Industry is properly recorded for all time.

The enclosed picture is taken in front of the office building for The Lexington Motor Car Company, 1910-1927, which covers Lexington 1910-1926, Howard 1914, and Ansted 1927. The Empires were built in this complex during 1912-1915. E. L. Cord purchased the buildings in 1927, and the Auburn 1929-1936 is covered along with Cord 1935 to 1937. The McFarlan Motor Car Company buildings were torn down in 1939 but will be recorded as the entire Industrial Park dating back to 1886 will be included in the study mentioned.

I hope that this is only a beginning and we see the day that America is proud of an Industry that has kept her moving for the past 75 years.



STUDY INDUSTRIES—A group representing the "Historic American Engineering Record," a long range program begun by the National Park Service in 1969 in cooperation with the American Society of Civil Engineers and the Library of Congress, made a tour of local industries and old industrial sites Tuesday with the aid of Henry Blommel. The project is under the direction of Prof. Aldo Giorgini and the Purdue University School of Civil Engineering. The purpose of the project is to conduct a state wide inventory of the structures and objects of historical interest in the fields of Engineering and Industry and record written data, photographs and measured drawings to be deposited in the Library of Congress in Washington, D.C.

Connersville, long known as a major industrial center for its early auto factories, was but one of several Indiana cities to be surveyed. In addition to industrial facilities the group also will record data on bridges, canals, waterworks, tunnels and the like from all areas of the United States. Taking part in the survey are (left to right): Don Sackheim, Harvard University, historian for the project; Prof. Giorgini; Mike Boles, Ball State, project architect; architect assistants David Arbogast, Iowa State University, John T. Reddick, Ohio State and James T. Robinson, Louisiana State and Blommel, who has done much research and study of local industrial history. (Crone Photo)

Photo and story are from the Connersville (Ind.) News-Examiner, August 4, 1972

1918 FRONTMOBILE TOURING SEDAN

by Dean Batchelor

The February, 1917, issue of *Horseless Age* magazine contained a story and illustrations of a new front wheel drive car that had just been announced at the New York Show. The car, with a roadster body, was called a Frontmobile and was built by the Bateman Company in Grenloch, New Jersey, who were manufacturers of farm, orchard and garden equipment. The car featured a four cylinder Le Roi engine, mounted in front, with the back of the engine toward the front of the car. The shift lever and parking brake handles protruded through the instrument panel.

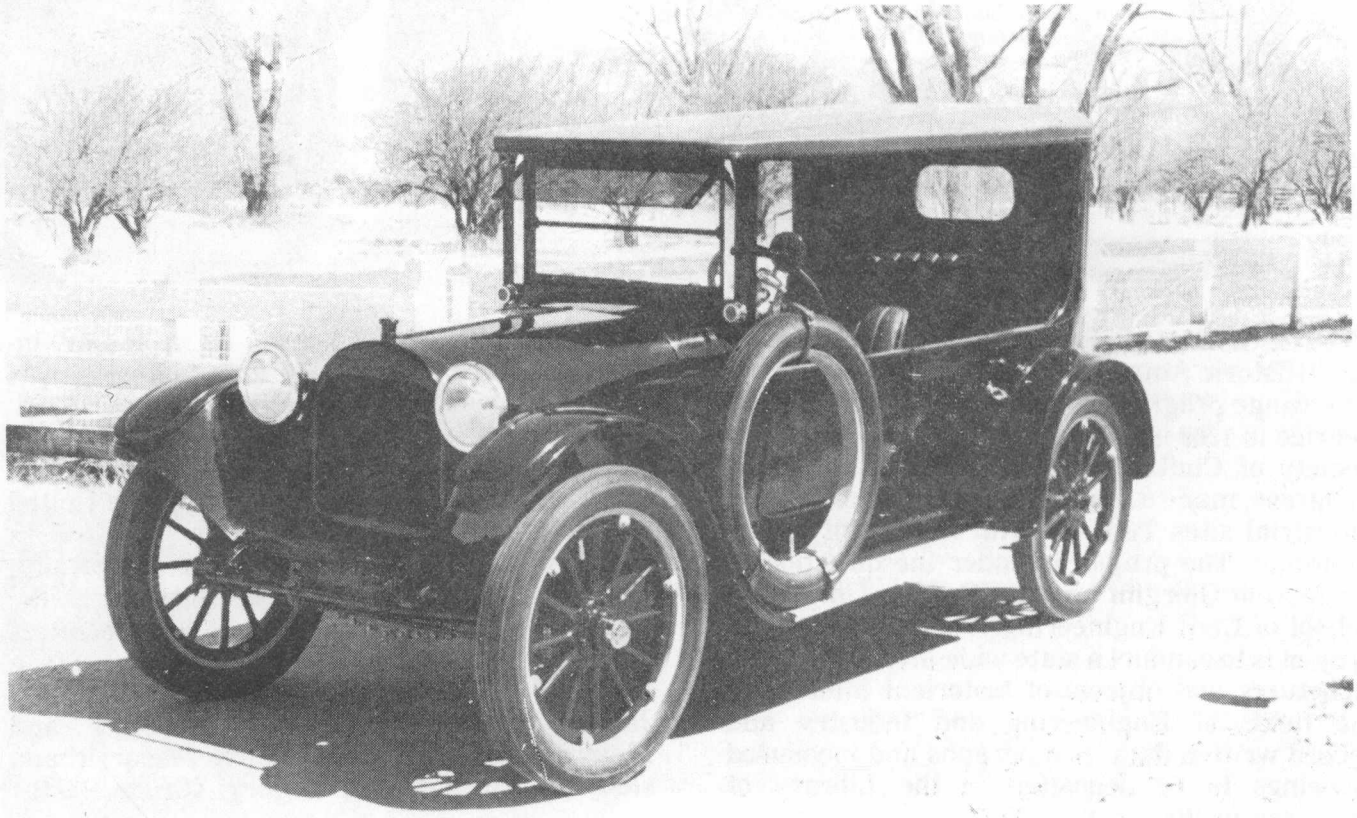
The Bateman Company established Camden Motors Corporation to manufacture cars, and in 1918 a four passenger body was shown. Some changes were also made in the mechanical design, including the use of a Golden, Belknap & Swartz engine in place of the Le Roi unit.

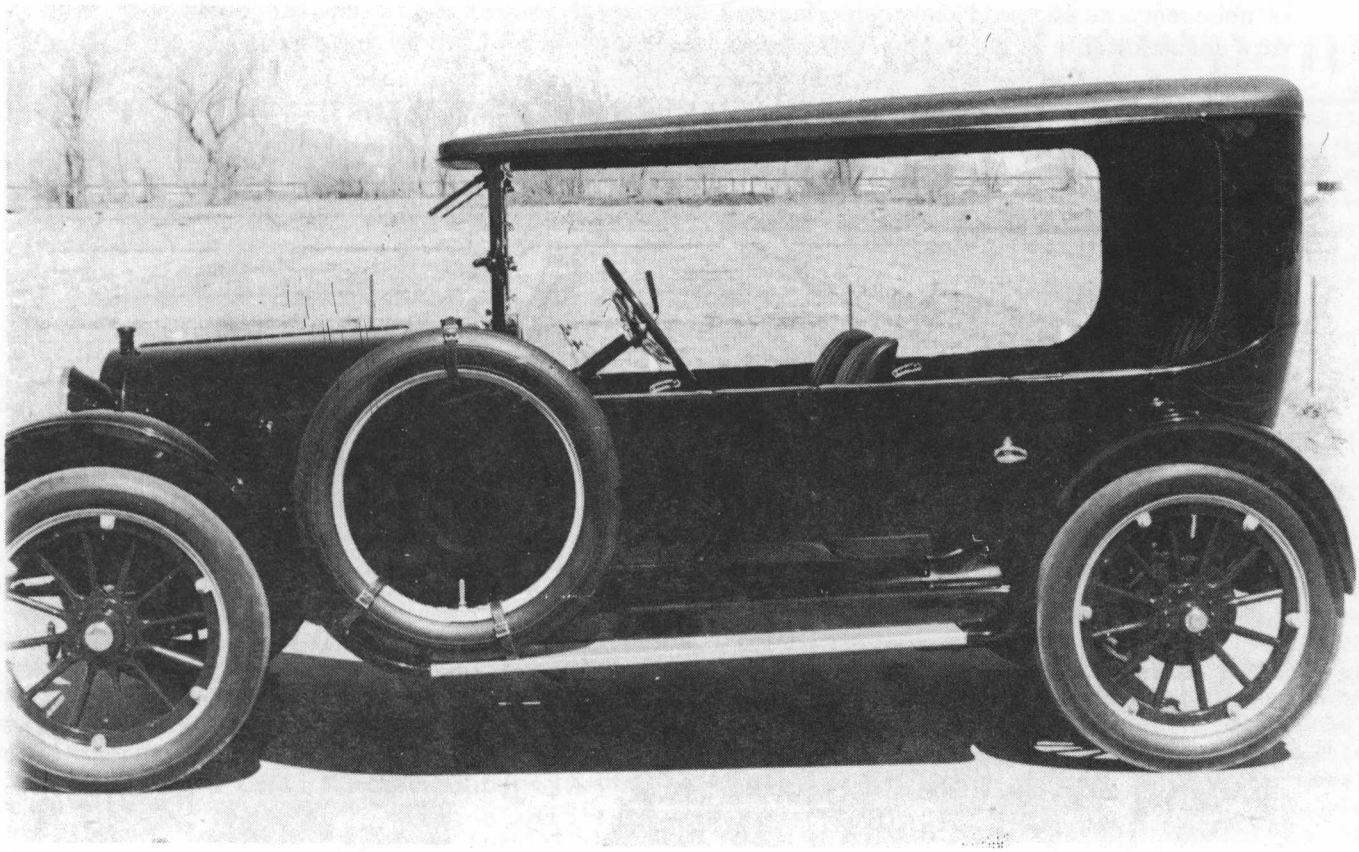
The G B & S engine is a four cylinder L-head design, with thermosiphon cooling (there is no water pump; the hot water rises to the top of the radiator and cools as it descends through the radiator core to the bottom). The three-speed transmission and differential are in one case (these are now called transaxles) at the front, and drive goes through two short shafts, each with a universal joint at its inboard and outboard ends, to the front wheels.

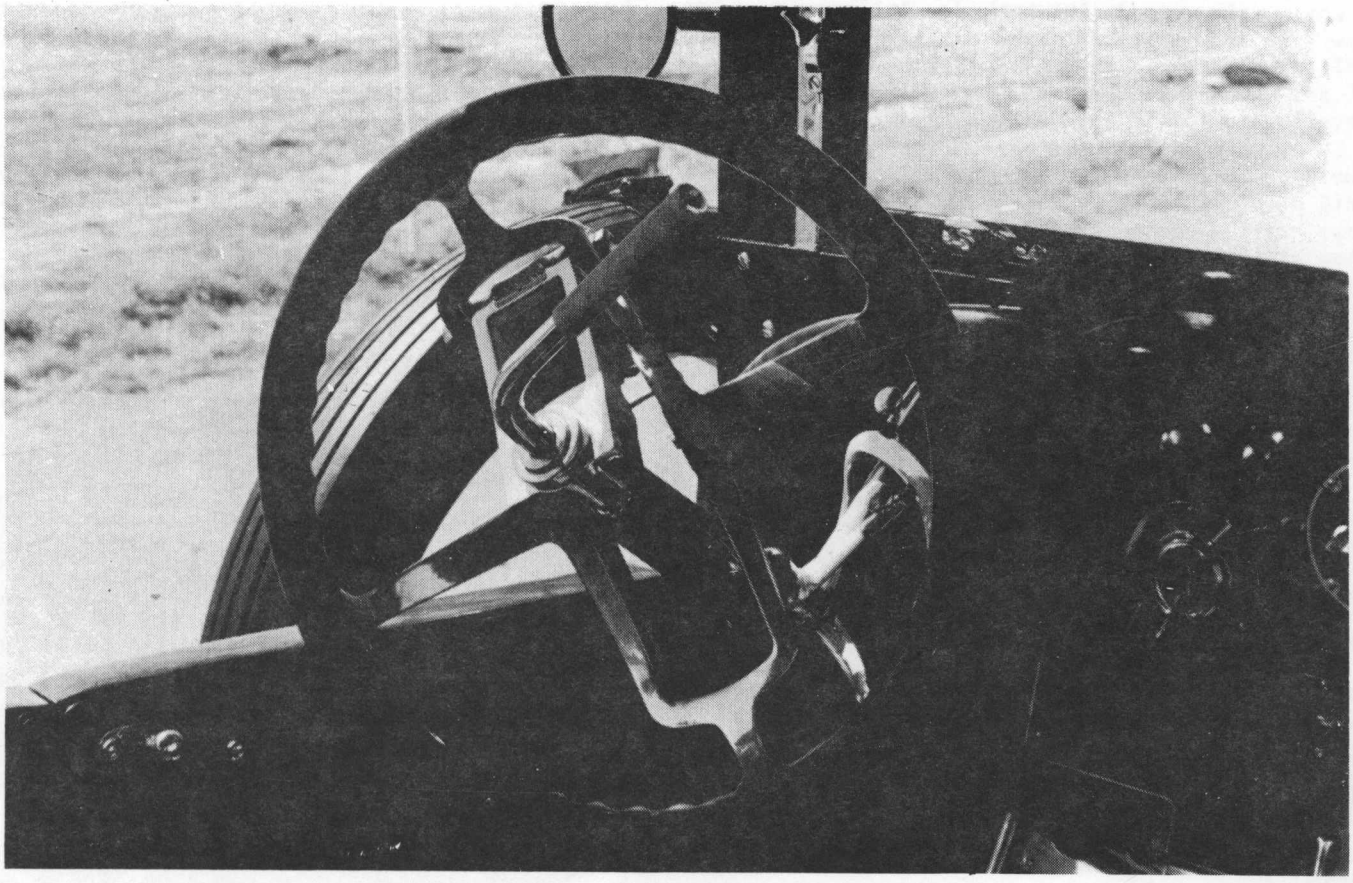
A De Dion axle is used at the front, and a simple tubular steel axle is used at the rear. All springs are semi-elliptic, and the rear springs are cantilevered with the axle at the rearmost ends. Two wheel brakes of the internal expanding type are provided.

A fairly spacious interior provides for four passengers. The steering wheel is a tilt type to aid driver entrance and exit and, unlike the first Frontmobile, the transmission shift mechanism comes up through the steering column with the lever protruding from the center of the steering wheel hub. Driver safety in an accident was obviously not a consideration.

The channel iron frame has a nine inch drop just behind the engine, which allows the the body to be lower than most cars of that era because it doesn't have to contend with a driveshaft running from front to rear. Company advertising claimed a ground clearance of 14 inches, but brake rods and other small but essential pieces reduce the effective clearance to about seven inches.







In any front wheel drive automobile, some form of "independent"* front suspension is necessary as it would make steering and directional control almost unmanageable and ride very uncomfortable if the engine/differentail assembly had to move up and down with the axles any time a road irregularity was encountered. The Frontmobile's assembly utilized a "dead axle beam" which was developed by the French De Dion Company (for its rear axle) and all such designs since then have been referred to as a De Dion axle. This system was later used by Ruxton, Cord, the 1931 Packard Experimental Prototype and Miller racing cars - all with front wheel drive - and at various times on the rear of Mercedes-Benz road and racing cars, and some Ferrari racing cars.

This Frontmobile, the only one known to exist, has recently been restored by Harrah's Automobile Collection, and is on display in Showroom One.

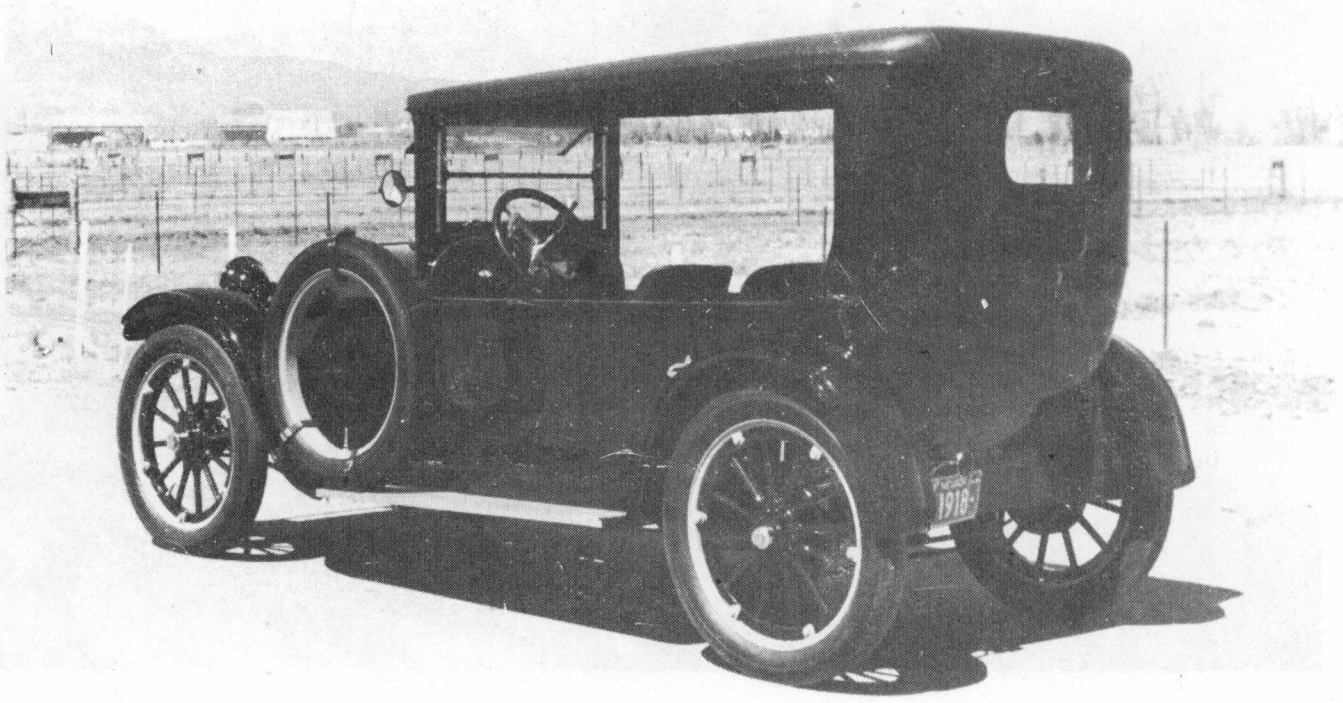
SPECIFICATIONS

Engine	4 cylinder L-head	187.8 cu. in. displacement
Bore	3¾ inches	36 horsepower
Stroke	4¼ inches	Price when new - $1,230

Manufacturer: Camden Motors Corporation, Collingswood, New Jersey

**I used quotes on "independent" because a De Dion axle design is not actually an independent suspension, but it does allow the transaxle to be bolted to the chassis - thus lowering the unsprung weight.*

The Frontmobile pictures were supplied by the author, Dean Batchelor, of Harrah's Automobile Collection, Reno, Nevada.



The Cleburne Motor Car Company

by D. J. KAVA

It is safe to say that so many people have now heard about the Chaparral and the Cleburne Motor Car Company that it can no longer be considered an obscure make. While not unknown to auto historians, it has become widely known to the public in the form of a very popular ride at Six Flags Over Texas Amusement Park near Dallas. Six Flags is based on a regional historic theme. When the developers discovered that a car had once been built in nearby Cleburne, a park ride was worked up featuring the car. Millions of people have read the short (but inexact) story posted by the park and have ridden in the cars.

The actual story opens with Harry Eugene Luck, married, and the father of a couple of small boys, graduating from Add-Ran College near Waco, Texas. The year was 1903 and the Reverend Mr. Luck set off to successive jobs in the Texas towns of Gatesville and Dallas. About 1908 he finally settled in Cleburne, a small town southwest of Dallas. Luck's principal source of transportation was a 1903 Model A Cadillac, which provided good service except for the common complaint of tire trouble. Luck thought he could correct most of his problems by combining a medium-sized solid rubber tire with a soft suspension, thereby providing longer tire life and a more comfortable ride.

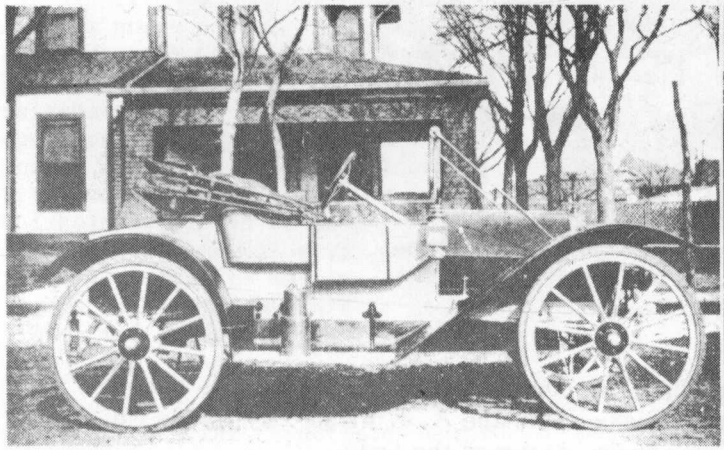
Luck planned to produce cars from the start. The Cleburne Morning Review announced the opening of a factory (a small garage) on July 27, 1910. Plans were laid to assemble a car for display at the Dallas State Fair in October of the following year. Even this modest schedule was not met because parts were slow in arriving. However, time was not wasted. Motor World (September 28, 1911) reported, "Luck recently visited the factories in Michigan and elsewhere and is said to have become so filled with enthusing facts and figures as to believe that a factory in the Lone Star State will earn good profits."

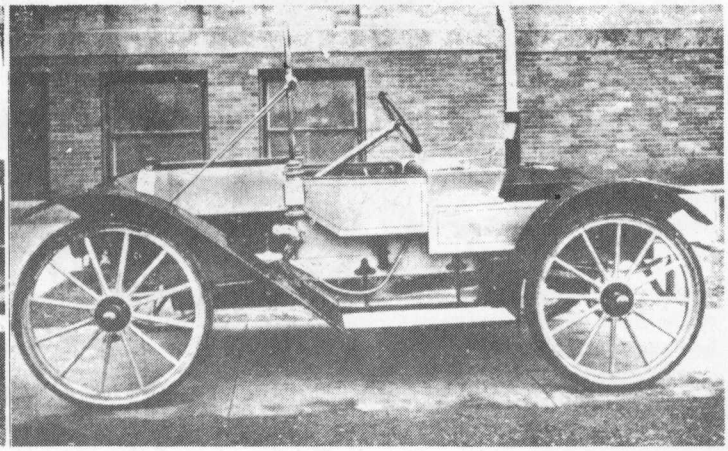
Eventually the car took shape. Re-enforced 2 inch by 6 inch hickory wood formed the frame. A piece of steel, 1/8 of an inch thick and four inches deep, ran the length of the side members in a cut in the bottom edge of the hickory. The frame turned out as desired, strong and light. Naturally, wheels played an important pary in the Luck design. 38 inch rims on wooden artillery wheels were used, sporting solid Swinehart tires. The suspension was a complex affair. Transverse leaf springs were used front and rear, with small coil springs on each end attaching to still more leaf springs on the axles. (Coils may be seen between the rear wheel spokes in the Utility photos). Up front, Timken spindles were used. Most of the work of building this car was done by two mechanics named Barnes and Tuthill, who were assisted by Luck's young son, Eugene. Much of the spring technology may be traced to Mr. Tuthill's brother, who owned the Tuthill Spring Company in Chicago.

Power was provided by an air-cooled engine with two horizontally opposed cylinders. Bore and stroke were approximately 4 x 5 inches. The flywheel was about two feet in diameter and was cast so that the spokes acted as a fan to provide the necessary air circulation. Ignition current was supplied by a friction driven generator, with the driven wheel touching the rear of the flywheel. Power was transmitted via shaft to a rear-mounted planetary transmission which drove the rear wheels through a pair of Diamond Roller chains. A touring body of conventional design was mounted on the frame. Dubbed Chaparral, after the native road-running bird still found in the area, the car was completed on December 11, 1911.

Miserable weather and primitive rural roads prevented road-testing until February, but work was begun on the construction of two more cars. The Cleburne paper mentions that the car made the 17 mile "....trip to Glen Rose over hills and valleys, rocks and sand beds, in an hour and 15 minutes... . H. E. Luck was driving, accompanied by E. N. Brown of Brown Dry Goods Company. Many people in Glen Rose rode in the car and commented about its easy riding and its excellent finish." The results were encouraging. The car was sold immediately to the owner of a local plumbing company.

The two cars under construction during the early part of 1912 differed from the original Chaparral. The first, a lighter car, was the prototype of the Luck Utility line. The second car was built on the Chaparral chassis but represented the first





The Luck Utility as a pleasure car . . . . . and as a delivery vehicle.

venture into the commercial field. This is the panel delivery pictured with its special body, designed by Marvin Wright. The car was built for Marvin's father, who was another local dry goods store operator. A total of nine cars - of which eight were sold immediately - was assembled the first year. A rural mail carrier and a Watkins Products man were among the early customers.

All of this finally attracted local capital, and the Cleburne Motor Car Company was incorporated on September 24, 1924. Luck became president and general manager; R. H. Crank, secretary; E. N. Brown, who rode to Glen Rose on the first trip, became first vice president; F. L. Deal became second vice president. The board of directors consisted of Brown, Deal, and no less than ten other members of the local community. The company's self-description was "We are a Texas company composed of Texas men and capital proposing to meet the needs of Texas roads and business purposes."

The mainstay of the company soon proved to be the Luck Utility, named for its designer, and the fact that its roadster body could be converted into a buckboard affair for light hauling. Luck's stern philospohy required that the car be more than a simple pleasure car. The vehicle's virtues were extolled in an undated handbill:

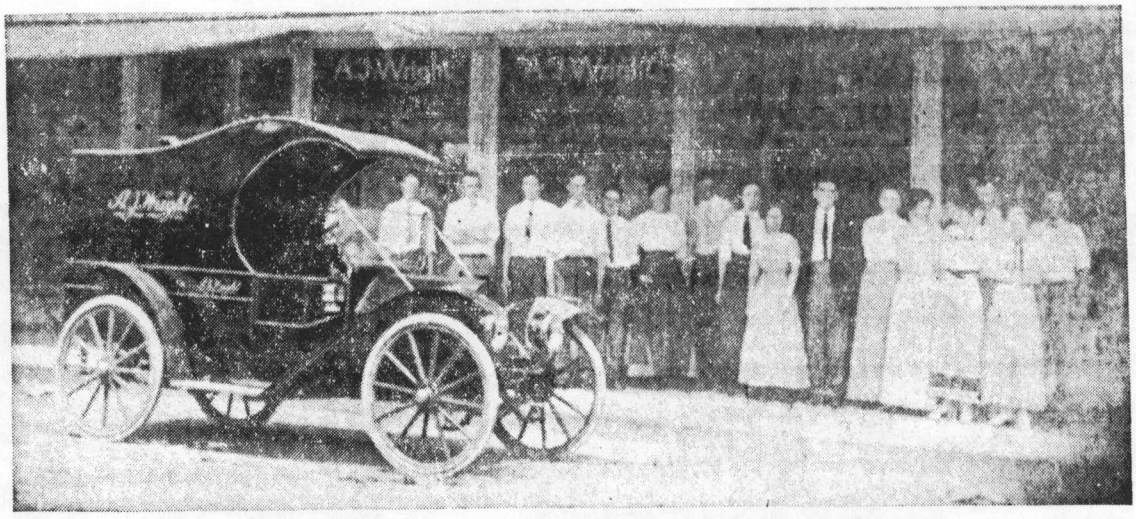
By a quick change of bodies the owner of a 'Luck Utility' has a neat, trim-riding car for his family, social and holiday needs, and has an equally well adapted package or delivery, or light truck when the need calls for it... The cars are in essential parts very much alike, but by change of bodies and seats, by the use of special cabinets, they are very different from one another. These changes may be made in a few moments, converting them readily from riding to hauling vehicles. We are building also a large car of the same general characteristics.

The Utility was modernized with a front mounted water cooled four cylinder side-valve engine with Bosch magneto ignition. A two-speed sliding gear transmission unit was mounted with the motor. These units were supplied by Golden, Belknap and Swartz, who supplied identical units for the first Hupmobile cars. Later Utility cars were equipped with a larger engine and three-speed transmission, thought to be the engine used in the 1911-1913 32 horsepower Hupps. Bodies were built of poplar wood. The re-enforced wood frame and unusual suspension design were retained. Prest-O-Lite lighting equipment was used. The remaining components came off the shelves of numerous suppliers, and they made no secret of the fact: "Our parts are selected from the most reliable builders...We have not been overzealous for originality."

The Utilities, priced at $2000, were no competition for the cheap Fords. Tire improvements cancelled Luck's "better idea". Sales were discouraging - only about 20 cars in all. In an effort to build a marketable vehicle a steel frame was procured and the Luck truck was developed. A handbill stated, "Never runs away or kicks the wagon to pieces", indicating that the company was still aiming at the local farm market. The pitch, of course, was pure Ransom E. Olds, circa 1892. While the theme may have appealed to the rural North Texas promoters, it did not appeal to the farmers. Only one Luck Truck was made. Production ended in 1914; articles of dissolution were filed in June, 1915.

The company was reported to have had an office in Austin, Texas. Mr. Eugene Luck does not recall any such office, but speculated that if such an office existed, it may have been established at the end of the company's life. However, an extensive search of city and business directories of the period did not indicate the existence of an office, factory, or the presence of any officers or board members in Austin at this time. Mr. Luck recalls, "After we closed up, they just gave me the machinery, the tools and everything." He stayed in the garage business for a few years, then moved to Shreveport, Louisiana, to take over a Willard Battery service station.

No great tragedies were noted with the passing of this marque. Harry Luck continued preaching in various Texas towns until his death in 1934. As for the "Texas men and capital", we trust they found other "needs of Texas" to fulfill.



The Cleburne Motor Car Company's first venture into the commercial car field was this panel delivery car built on a Chaparral chassis. It was purchased by the A. J. Wright Dry Goods Co. of Cleburne. Marvin Wright, son of the store's proprietor, designed the body.

THE GREAT "PIONEER" FIASCO

by Max Gregory

In Australia during the 1890s, men of vision, as elsewhere, were being caught up with the possibilities of the new device, the motor vehicle. One such person was Henry Austin, a dentist by profession but an inventor by inclination, of 49 St. Davids Street, Fitzroy, a Melbourne suburb. He had gained some engineering knowledge while working for a period at the Woolwich Arsenal in England prior to making his home in Australia.

By 1896 Austin had determined to construct a suitable motor with the principles of simplicity and light weight foremost, and he obtained a patent titled "Improvements in, and connected with, the motors and mechanisms of mechanically-propelled road vehicles." After four months spent drawing up the plans for the gasoline vapour engine, obtaining the working tools, etc., and advertising his invention, he was able to interest a group of twenty persons who collectively provided an amount of £500 to finance the project. He was able to demonstrate that he was on the right track when his 3 H.P. single cylinder engine first showed its ability.

Unfortunately it not only had the ability to run and to produce power but also to produce smell, smoke and vibration. The vibration was of such magnitude as to completely demolish the stretcher framework to which it was secured. So it was back to the drawing-board for Henry Austin. He spent many more weeks working at these problems as well as evolving a proper electric ignition system and making provision for storing of the gasoline vapour. By adapting a type of tank which he had previously invented, the problem of gasoline vapour was solved.

By this time, however, a cycle show was in the offing, and the Syndicate was overcome by an urge to have something to display at the great spectacle. Much against the advice and wishes of Austin, the men were determined to have a motorcar to exhibit, or bust in the attempt.

The Australasian Horseless Carriage Syndicate had its offices in the City of Melbourne at 432 Collins Street where the secretary, Mr. William J. Barham, could attend to the wants of any intending motorists and furnish them with all the latest literature and journals on the subject. At this address Mr. Barham carried on his usual business of a legal manager and accountant. The Syndicate Chairman was Mr. Walter Ridge, a Yorkshireman with some engineering background, who operated the ice-works and cool stores at the corner of Johnston and Brunswick Streets in Fitzroy. Another prominent member was Mr. A. Chisholm Scott, an estate agent of Smith Street, Collingwood, a neighboring suburb. The Syndicate declared that it was in possession of patent rights to motors designed in Victoria and was in treaty for other overseas motors.

Mr. Austin, having been by-passed, was, naturally, not associated with the "Show or Bust" program, and the Syndicate turned to Messrs. John Grayson and Sons, Engineers, of 141 Johnston Street, Fitzroy, to construct a vehicle for them. Graysons were able to supply a horizontal oil engine of tolerable dimensions for the task, it doubtless being of the type usually employed to drive machinery for industry.

In any event, it used a blowlamp heated hot-tube ignition and burned kerosene (also known as parrafin or lamp oil) and the engine was located under the seats. Construction of the vehicle was under the direction of Mr. William Grayson while the four-seated dos-a-dos carriage work was done by Mr. William Jackson of 16 St. David Street in Fitzroy. An interesting sidelight to the body-building is that one of Jackson's employees who worked on this job later established himself in South Melbourne and there built the first body on a Tarrant. He was Alexander F. Smith who later amalgamated with Tarrants and directed the activities of the subsidiary Melbourne Motor Body Works.

Construction of the exhibition vehicle related closely to horse-drawn vehicle principles and the wheels, with iron tires, the undercarriage and suspension parts were no doubt drawn from that source. The exception to this was the stub-axle steering arrangement, which was credited to Mr. Ridge. The control of this steering arrangement was by a very small diameter wheel equipped with a winding knob on the rim, atop a vertical column. Levers were provided for operating the spoon brakes and for engagement of the friction transmission with its final drive by pitch chain which was a type usually found on agricultural machinery. The engine was started by passing the crank handle through the spokes of the wheel.

The machine was ready in February, 1897, and, with the opening of the Cycle Show on the 26th, it was driven the few blocks to the venue, attracting much attention as it proceeded. The Exhibition Building in Melbourne had been built a few years earlier for staging the International Exhibition of 1889, and the layout of the grounds included a circular pathway which was put to good use by vehicles giving demonstrations during the course of the Cycle Show.

Among the notable personages availing themselves of the novelty were the Governor of Victoria, Lord Brassey, the Governor of New South Wales, Earl Beauchamp, the Premier of Victoria, Sir George Turner, and the Lord Mayor and the Town Clerk of Melbourne. A photograph depicts the Governor and the Premier with the vehicle prior to a run. The driver on that occasion was Mr. Tom Brain, an engineer with the Grayson firm. The *Australian Cyclist* reported that the machine "appeared to spin along the path at over a ten mile speed."

If the Syndicate were seeking publicity, then the men should have been immensely pleased with the attention they attracted during the period of the Cycle Show. Press reaction was favorable, and tinged with an awesome respect quite devoid of criticism. Indeed it is rather amusing to note that, at this time, the press said that the vehicle "behaved itself in a way which gratified

even its constructors" and that "the petroleum engine gives no great evidence of either vibration or smell." Such statements were to conflict with those of a later time when it was clear that the Syndicate and its machine had failed. By then it had become a vehicle which "although it had the habit of jibbing at the most inopportune times, was, to all intents and purposes, a motor-car" using an engine "with a strong weakness for causing smells and smoke that did it credit."

Certainly the officers of the Syndicate were brimming with enthusiasm and exuding great confidence. They let it be known that a prominent business house in the city was making overtures to purchase the machine on show; also that they had placed orders with Graysons for several more engines of the same type for further improved models which were already in hand.

However, from this point onward whatever cohesion still remained within the Syndicate was to totally disappear, and the various directors went about trying out their own ideas, with the result that the money dwindled away without producing any concrete results. Thus, the engine order to Graysons was never completed due to there being no money forthcoming.

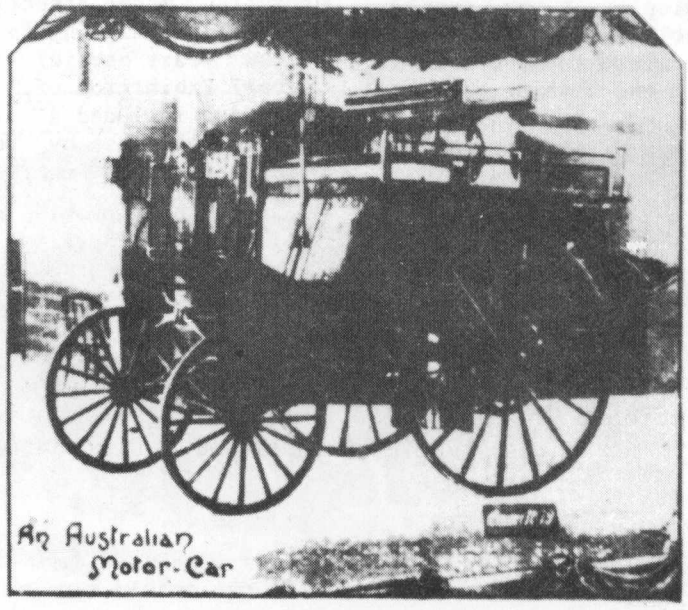
Mr. Austin, by this time, was heartily sick of the whole episode and would not be any further involved with the Syndicate. Of his own engine effort, all that was to be seen for an expenditure of £165 was the decrepit stretcher frame, a collection of old iron, some cog-wheels and a cylinder and piston. An amount of £100 was paid to Graysons to get the oil engine into the vehicle, but since this almost certainly excludes any payment to Jackson for carriagework, it would not have been anything like the total cost of the show machine.

Some year or more later, none the less, Henry Austin was still persisting, on a hobby basis at his own expense, with an exceptionally simple motor of low weight and great economy of operation. He had expended £65 on this project and was earnestly seeking solutions to the problems of internal combustion road vehicles when last heard of.

About three years after the Australasian Horseless Carriage Syndicate motor-car made its triumphal debut at the Cycle Show, *The Australian Cyclist* made caustic comment about the car and its ultimate fate when it stated that its trial had been a fiasco and that it had remained in the same state in a shop in Fitzroy ever since.

The name "Pioneer" may not have been used by the Syndicate for the machine, but may have been bestowed by the press. *The Scientific Australian* and *The Australian Cyclist* both use the term in a descriptive sense in the text of their reports but *The Australia Wheel* however emphasized the word with its use as a proper name and by captioning their photograph "The 'Pioneer' Motor-car". Other names used have been Grayson and Austin-Ridge, but the name Austin would be inappropriate due to Henry Austin's boycott of the exercise.

Some earlier writers on the first Australian motor vehicles have stated that Graysons were manufacturers of oil engines and that the type used in the Syndicate machine was of 5 H.P., but no evidence of this has been encountered in this research. Likewise, no indication has been found of the number of cylinders. Mention, too, has been made of a further key Syndicate member, Mr. T. Copeland, said to have been an electrician, but no authentic identification of him was able to be made.



The Australasian Horseless Carriage Syndicate vehicle on display at Stand No. 79 during the 1897 Cycle Show, Melbourne.

THE COVER PICTURE -

OLIVER EVANS - The Magnificent "Mud Machine"

PROLOGUE

The dampness in the air was the kind that helped to carry the cold through the warmest of clothes. Even the rugged blacksmith shivered in his snug muffler as he walked quickly from his forge to his house where a warm meal waited for him. A fresh blanket of snow lay on the ground and the sky was a dull, depressing overcast. Although the year had yet to come to an end, the children were already becoming tired of the winter which still had nearly four months of life before it would pass on and the warmth of spring would touch these environs of Newport, Delaware. The year was 1772, and the day, the one before Christmas.

Two young boys in their early teens were enjoying the warmth of the blacksmith's shop. One of them, the smithy's son, taking advantage of his father's absence, took a slightly curved musket barrel from a pile of scrap metal and decided upon an experiment. The touch-hole was carefully and firmly plugged, and a few ounces of water poured down into the barrel. Next, some wadding was rammed tightly down the bore of the former weapon and the breech was laid carefully on the glowing embers of the forge.

There followed a period of absolute silence, so often indicative of impending trouble-making when boys get together. Presently, however, a loud report, followed by a cheer from the boys, startled the smith at his meal. The wadding had been propelled across the shed, and a resounding "whack" echoed the blast from the gun barrel as it struck the wall. The experiment was a definite success. A quick dip in the snow, and the barrel was cool enough to try the trick all over again. Soon, the blacksmith returned to his forge, and the boys were sent, protesting, out into the cold, dank weather. Later that evening, the second boy told the whole story to his brother, Oliver.

Oliver Evans was fascinated by the tale. It was just the type of thing that would spark his inquiring mind and it wasn't long before he was wondering if there might be some way to put such power to use. If it could be harnessed, it might be used to run mills, boats or, possibly, wagons on the roads.

This is the legend of how, where and when the dream started in the United States. Oliver Evans, a seventeen-year-old apprentice wheelwright was to become the one on whom the credit would lie for the concept that one day would become our nation's most important industry — Trucks and Trucking.

Oliver Evans was born on September 13, 1755, at Newport, in what was at that time the Crown Colony of Delaware. His father, Charles Evans, was a shoemaker turned farmer, and it was on his father's farm that Oliver grew up. His mother, Ann, bore twelve children, of whom Oliver was the fifth. Unfortunately, there is no authenticated information about his boyhood until his sixteenth year. Prior to that time there is no way of learning what his upbringing and education were like, although it is obvious from his writing and technical abilities that he did receive a good education. Since there were no free or public schools in Delaware at that time, it must be assumed that his tenacious mind and fiery determination were fed by his parents, and by some neighbor of considerable technical skill.

In 1771 Oliver decided that farm life was not what he wanted and apprenticed himself to the local wheelwright. Here he would be able to acquire the mechanical skills which he would need in years to come. Apparently he continued his study of whatever books he could find, for his first biographer, Henry Howe,[1] tells a brief story concerning this part of his life, which may or may not be based on fact.

The wheelwright, an illiterate and particularly parsimonious man, became upset by the number of candles that young Evans was using during his evenings of studying, and forbade him to use any more for such a useless pastime as reading. Undaunted, Oliver proceeded to gather wood shavings from the floor of the shop and, at the end of the day, he would lie down in the chimney corner and study his books by the flickering flames of burning chips. Fact or fancy, the tale does seem to echo the characteristic desire and search for mechanical knowledge which was to become so typical of his entire life.

It was about this time that Oliver's brother told him of the gun barrel incident. Not long afterward he had the opportunity to read a book which contained a description of Newcomen's atmospheric engine. The book, probably Desagulier's *A Course of Experimental Philosophy*,[2] may have been part of the library of his instructive neighbor. No matter what the name or source of the book, it was a major contribution to what was to become nearly thirty years of experimentation and effort to develop a practical engine. All of that time Evans continued harboring the thought of self-propelled road wagons. Unfortunately, it was an idea that met with scorn and derision, and all of his pleas for financial assistance were unsuccessful.

Although he had declared his willingness, Evans never saw service in the Continental Army, and it was during this period that he operated a store in Tuckahoe, Caroline County, Maryland. While times were too full of turmoil to promote the fostering of new ideas, much less their implementation, he did begin to formulate some of his ideas on improvements in milling.

When peace returned, his business prospered, and it wasn't long before he had set aside enough money to get married. On April 22, 1783, Oliver Evans and Sarah Tomlinson were wed in Old Swedes Church, Wilmington, Delaware. Shortly after, he returned to Maryland with his wife and continued to run his store.

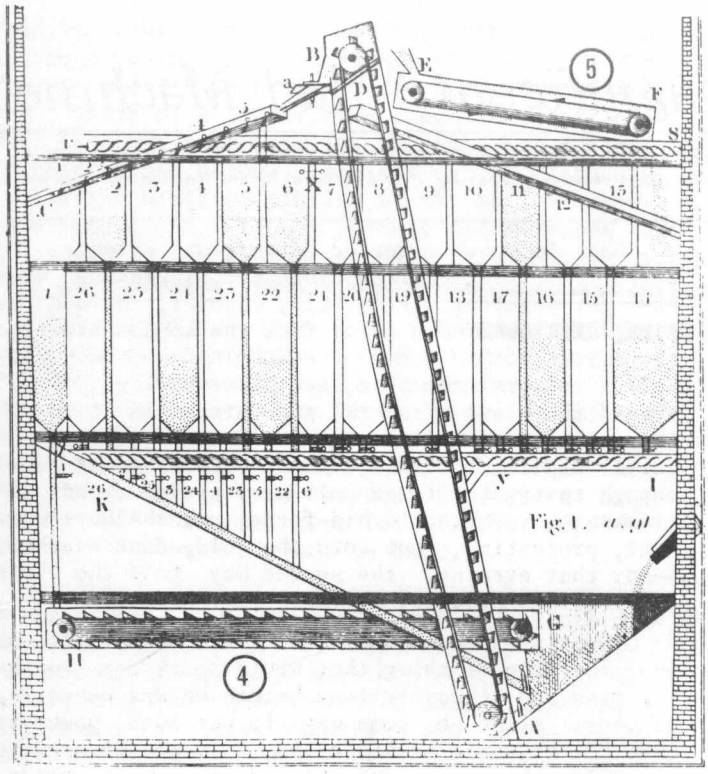


Fig. 1

Figs. 1 & 2. Two plates from Evans' *The Young Mill-Wright & Miller's Guide,* showing (1) The Hopperboy, (2) The Conveyor, (3) The Elevator, (4) The Drill, (5) The Descender. This amazing early example of an attempt at automation did everything from weighing incoming grain and unloading a ship, to the final act of filling the barrels with flour.

(Photo: New York State Public Library, Albany, New York)

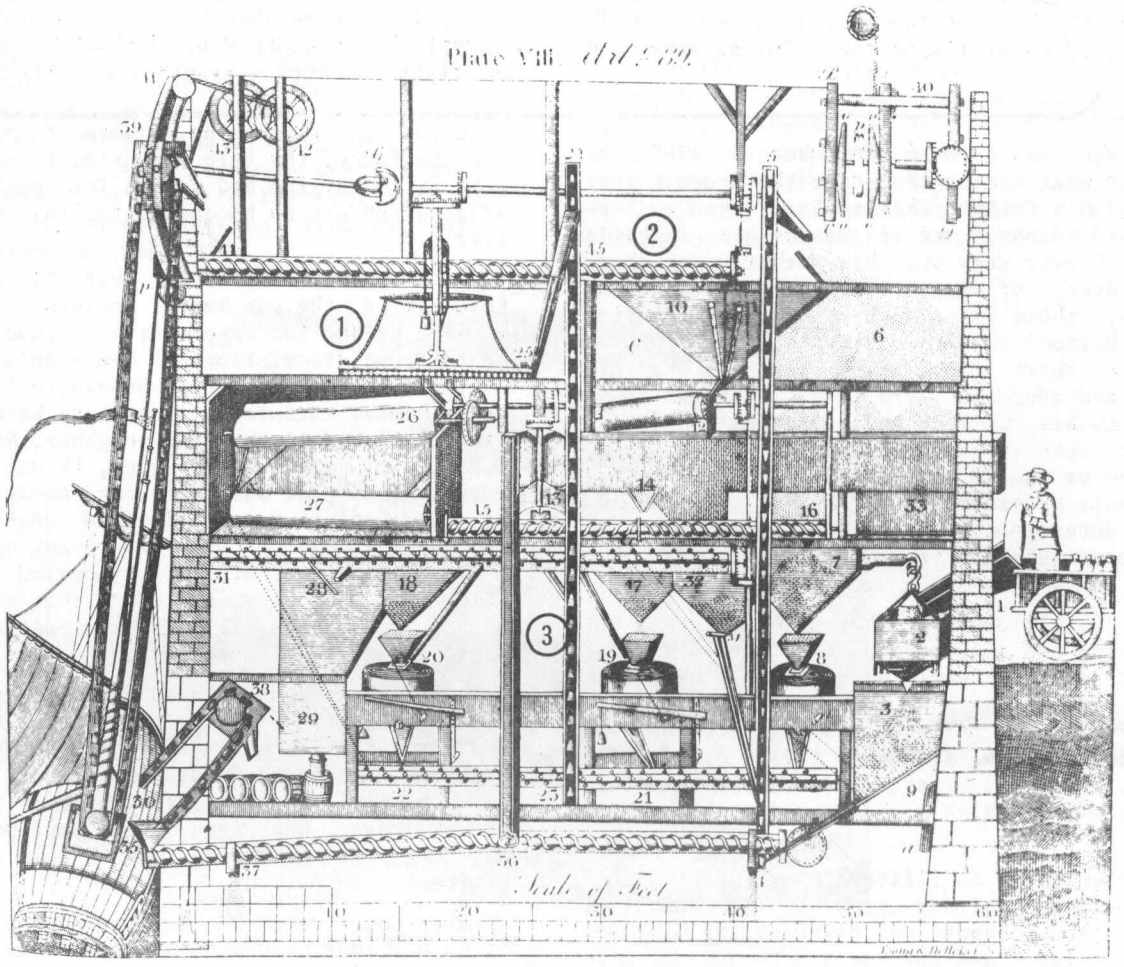


Fig. 2

About that time he managed to complete his plans for a "hopper-boy" and some other pieces of equipment to be used in operating a fully automated flour mill. His ingenious devices would take the grain from a wagon or ship and carry it through all the operations necessary to turn it into the finest grade of flour without the use of manual labor. His efforts to gain financial support to build such a mill were totally ignored, and his failure was a severe blow to Evans. The advantages of his plan were evident, and the practicality of the scheme so certain to him, that he was unable to understand how the whole community could fail to see its tremendous worth. The upshot of the whole matter was that he and his brothers, John and Theophilus, decided to build the mill themselves.

The mill was located on the banks of Red Clay Creek, about three miles west of Newport, and was powered by an overshot water-wheel, fed from a pool about a quarter of a mile up the stream. Finished in September of 1785, it contained five major inventions of Evans': the hopper-boy, a large revolving rake on a vertical driving shaft, which spread the meal on the upper floor of the mill and guided it gradually to the chute over the hopper; the conveyor (based on the principle of the Archimedes screw), used to move the grain on an horizontal plane; the elevator, which moved the grain vertically; the drill, an endless belt, with wooden paddles, used to move the grain horizontally or up slight inclines, to the proper chute; and the descender, a broad canvas belt which ran over two rollers, one slightly lower than the other, operated by the weight of the meal which fell on its top side. This latter item could also be operated by the power of the water-wheel if need be. The whole operation worked without a hitch, and before long, five millers along the Brandywine were using the equipment and offered their public support of it. Even so, a gentleman who had heard these enthusiastic words and had seen an operating model of Evans' mill, exclaimed, in contradiction to what his eyes and ears told him, "It will not do, it cannot do, it is impossible that it should do!"[3] It was a problem that Evans was to meet many times in the future.

In 1786, he realized that in order to protect his ideas, and give the collecting of license fees a firm, legal backing, he would have to acquire patent privileges covering these and other inventions. In order to do this, he first petitioned the Representatives of the State of Delaware to grant exclusive rights to sell and use the milling improvements which he had invented. Shortly afterward he also petitioned the legislature of Pennsylvania for similar rights in that state. This time, however, he included steam wagons in the petition.

Why the applications were different in the two states is not understood, but it was a useless gesture on Evans' part to try to patent his steam wagon at that time. In Pennsylvania the committee listened carefully to all he had to say about his milling devices and considered them worthwhile. As for his steam road vehicles, they were on the verge of thinking him insane. In March of 1787 the legislature of that state granted him the exclusive privileges he wanted on the points regarding milling, but ignored all reference to the wagons.

For unknown reasons, after the rejection he received in Pennsylvania, he decided to include the wagons in his petition to Delaware. On May 28, 1787, he sent the following letter to the General Assembly:[4]

> To the Honourable the Representatives of the Freemen of the Delaware State General Assembly met
>
> The Petition of Oliver Evans of the County of Newcastle respectfully Sheweth
>
> That your Petitioner hath long had in Contemplation the very great Power of Steam and the Pressure of the Atmosphere and hath at great expence of Study Time and Labour in Various Experiments made for the purpose, Invented an entire New Plan of applying said powers to Propelling land Carriages to travel with heavie Burdens up and Down hill without the aid of Animal fource with such Velocity as may be Convenient, and be guided by a person sitting therein Secure from the Inclemancy of the weather — But to Execute said Plan Compleatly, will require more Time, Labour & Money than your Petitioner Can think prudent to expend, without hopes of Considerable profit in Case of Compleat Success — Therefore your petitioner prays your Honours to grant him his heirs and Assigns an exclusive Right of Propelling all land Carriages by Power of Steam and the Pressure of the Atmosphere for the Term of Fifteen years and your Petitioner as in duty bound will ever pray &c
> May 28, 1787

The petition was refused. On May 30, 1787, however, the Delaware lawmakers did pass a bill allowing Evans the rights he wished in regard to mills and milling.

At the same time he petitioned Pennsylvania, he decided to approach the Legislature of Maryland, too. It was here that Mr. Jesse Hollingsworth of Baltimore, a member of the committee before which Evans presented his petition, urged that the adoption of this petition to make use of steam wagons in Maryland, "...could not possibly do any harm."[5] It was with this dubious recommendation that the bill was passed on May 21, 1787, and the state of Maryland became the first to encourage the development of self-propelled road vehicles.

In 1788, Evans applied for similar privileges concerning his milling improvements in the state of New Hampshire but, for unexplained reasons, the steam wagons were not included in the petition. The bill was passed on January 20, 1789, and extended protection to Evans' milling machinery for a period of seven years.

While it is impossible to explain why he did not apply for a patent on his steam vehicles in New Hampshire, it is equally difficult to understand why, in 1790, when the right to grant patents had been transferred to Congress, he did not then or at any other time make application to that body. The closest he ever came to applying for a patent on steam carriages was when he mentioned their possibility in his patent specifications for circular engines. These specifications, filed at the United States Patent Office on October 1, 1792, concerned "...the application of steam as a power to give motion to engines and in particular to propel land carriages."[6]

In December, he wrote to Thomas Jefferson, Henry Knox and Edmund Randolph, who were secretaries in

President Washington's cabinet, "...to cause letters of patent to be made out and granted to your petitioner..."[7] in regard to his engines for propelling carriages. It is clear that he had the idea in the back of his mind, yet it is doubtful that he had developed any definite plan for the construction of such vehicles.

Interestingly enough, another gentleman, working on a self-propelled carriage at the same time, had no better success in obtaining acceptance of his ideas. Judge Nathan Read of Salem, Massachusetts, invented and made a scaled-down model of a steam carriage sometime in 1789. Appropriate patent drawings and descriptions of this and other items were made up and submitted to Congress. When the clerk read the petition for a patent on the steam carriage, a chuckle went through the House and Read, who was present at the time, was so indignant that he immediately withdrew the application. Contrary to popular opinion, he never patented his steam carriage. This is substantiated by his own words[8] and by a thorough search of U. S. Patent Office files. However, copies of this application containing a description and drawings of the vehicle still exist as proof of his ideas and intent.

By 1791, Evans made quite a reputation for himself and for his "Improved Mills". He had supplied the equipment for one of Joseph Tatnall's mills on the Brandywine, and it was in that year that George Washington paid a visit to it. It is apparent that Washington was impressed by what he saw, for he immediately applied for a license to install similar improvements in his own mill on Dogue Creek near Mount Vernon. In a letter, dated September 4, 1791, from Tobias Lear, Washington's private secretary, Evans was informed that the license had been received and that work on the mill would commence without further delay.[9] Through Lear he had a considerable amount of correspondence with President Washington, and the latter requested his advice on several matters concerning the operation of the Dogue Creek mill. Evans had become the most capable and most respected man in the milling industry at that time and Washington was very much aware of it.

In 1792, Oliver Evans moved to Philadelphia and had taken up residence on the banks of Pegg's Run, just outside the city limits. After years of experimenting, he was at last able to put his ideas into a workable format and draw up the specifications for a steam engine. This engine was the circular engine mentioned earlier, and while it was a rather ingenious piece of equipment, it was also a very impractical one. He had a great fondness for this type of engine in spite of its drawbacks, and he designed several versions of it, one of which was indicated in his first plans for a steam wagon, in 1801.

In 1795, Evans wrote his famous book, *The Young Mill-Wright and Miller's Guide*, which had a continued popularity in the trade through fifteen editions and for more than seventy years.

By 1799, he began to formulate a plan for a new steam engine. His proposal was for a high pressure engine with a small diameter cylinder and a long stroke. Steam would be injected into the cylinder for one quarter of the stroke, the expansion of the steam to supply the power for the remainder of the stroke.

About this time an Englishman, Benjamin Henry Latrobe, appeared on the Philadelphia scene. An architect and engineer of near genious capabilities Latrobe was to leave his mark on that city, on the United States and, in a less fortunate manner, on Oliver Evans.

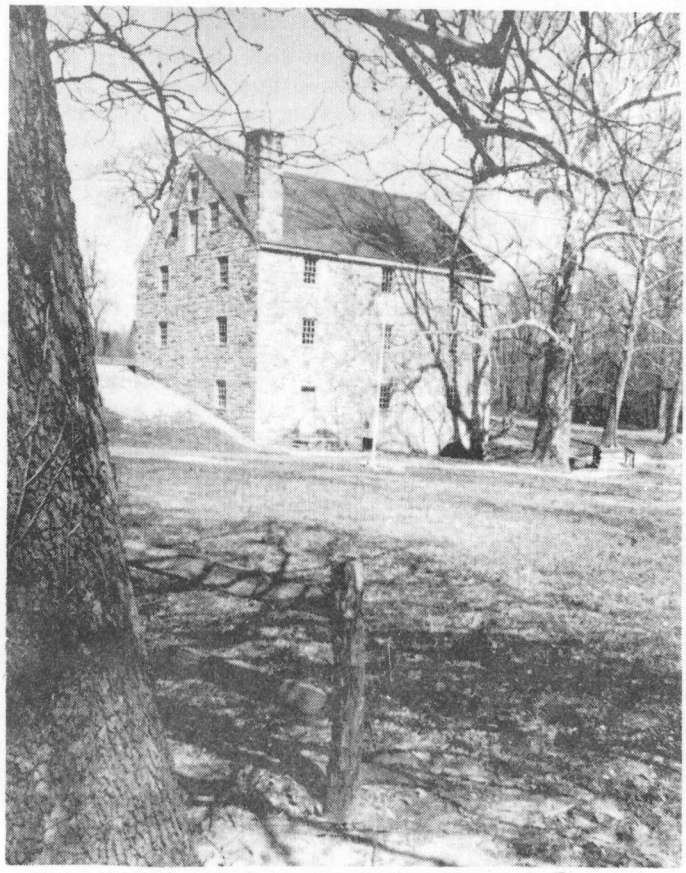


Fig. 3. The modern reconstruction of George Washington's Dogue Creek Mill, near Mount Vernon, Virginia. The original was fully equipped with Evans-designed apparatus.
(Photo by author John M. Peckham. See also inside front cover)

In 1799, about a year after his arrival in the city, Benjamin Latrobe submitted a plan to the City Council for the construction of a water supply system which would employ a pair of large steam pumps, one on the banks of the Schuylkill to pump water from the river, the second engine to raise the water to large wooden tanks which were to be housed in the dome of a Latrobe-designed building. After reviewing these plans and those of others, the Council voted in favor of Latrobe. Work was then started on the Centre Square waterworks, the second Greek revival building in America, and the second such building designed by Latrobe.

The engines were of the low-pressure type, based on the plan of Boulton and Watt and were designed and built by Nicholas Roosevelt at Belleville, New Jersey. The boilers were of the "wooden" variety made of wooden staves and banded with hoops of iron. Greville Bathe, in his biography of Evans,[10] states, "That they did no more than leak most of the time, was merely because they only carried one or two pounds of pressure. The engines, of course, depended entirely on the vacuum produced in the condenser for their power." Despite the drawbacks of immense size, low power and leaky boilers, the engines performed their task for ten years, from 1801 to 1811.

Seeking opinions as to the practicality of his design for the high-pressure engine, Evans took his plans to several eminent men in the city of Philadelphia, Latrobe included. The architect, whose knowledge of steam-enginery was, at best, empirical, was unable to see the obvious advantages of the new type of engine and derided Evans' efforts in this line. In May of 1803, in fact, Latrobe submitted a paper to the American Philosophical Society entitled *First Report in Answer to the Enquiry Whether Any and What Improvements Have Been Made in the Construction of Steam Engines in America.*[11] In the report he declared that the advantages of high-pressure engines such as those of Evans were totally illusory. Latrobe's language was so strong and his ideas so narrow that the members of the Society had many of the comments deleted.

From that time on these two "gentlemen" were at each other's throats and, on occasion, the press was the weapon in the never-ending duel. At one point, Evans wrote to the Washington *Federalist* concerning a piece by Dr. William Thornton, one of Latrobe's chief antagonists, in which the good Doctor referred to Latrobe as, "a carver of chimney pieces." Evans reduced Thornton's high praise by placing B.H.L. in the category of "keeoing a statuary yard" (an apparent jab at the excessively elaborate fountain which Latrobe had placed on the lawn of the Centre Square Waterworks).

In response, Latrobe complained to the Editor that, "It is a most humiliating task...to vindicate my professional character against the rage of a Thornton & the stupidity & officiousness of an Evans."[12] Evans, on the other hand, seems to have adopted that time honored axiom, "Don't get mad. Get even."

In spite of Latrobe's comments on his engine, Evans went ahead with his plans and, in order to start work on it, he moved again. This time he chose a location at the corner of Market and Ninth for his business address. These new premises allowed him to acquire some of the machinery required for building engines, including blacksmith and brass foundry equipment.

A man of high ideals, Evans never forgot that he owed a debt to the state of Maryland. In his own words: In the year 1800 or 1801, never having found a person willing to contribute to the expense, or even to encourage me to risk it myself, it occurred to me that, although I was then in full health, I might suddenly be carried off by the yellow fever, that had so often visited our city (Philadelphia), or by some disease or casualty, to which all are liable; and that I had not yet discharged my debt of honor to the state of Maryland, by producing steam wagons; I determined, therefore, to set to work the next day, to construct one."[13] However, his ideals were tempered by a certain practicality.

He immediately hired workmen and set to work on his much-delayed project. Drawings had been made of the proposed wagon,[14] which indicated that Evans had planned to use one of his circular engines but, from his own words, it is apparent that by the time construction started he had decided to use his new reciprocating engine. It is those very same words which inform us of the downfall of the steam wagon project. Evans wrote, "...and I had made considerable progress in the undertaking, when the thought struck me, that, as my steam engine was entirely different in form as well as principles, from all other in use, I could obtain a patent for it and apply it to mills more profitably than to waggons."[15] Later, in the same article, he describes his engine by saying, "Two weeks afterward I commenced the construction of a small engine, for a mill to grind plaster of Paris. The cylinder six inches in diameter, the stroke of the piston eighteen inches..."[16] Right there we can see that this is not one of the circular engines. Thus, we end his first steam wagon effort.

He had hoped that his experiments with the new type of engine would cost him about $1,000. By the time he had finished them he had spent nearly $3,700! When you consider that a blacksmith earned approximately $210 a year at that time, Evans had pumped an exceptional amount of money into the project. In fact, this was every cent he could scrape up! With the prospect of having to start life over again with a wife, seven children and no money, things looked pretty grim. If his experiments failed, what credit he had would be lost and without money or credit, at the age of forty-eight, his life (in his opinion) would have been a total loss. Fortunately the engine was a success, and his spirits were greatly revived.

The United States Patent Office granted him a patent on his new engine and some related equipment on February 14, 1804. Shortly after, he placed a notice in the Philadelphia *Aurora & General Advertiser* which informed the public of his patent and

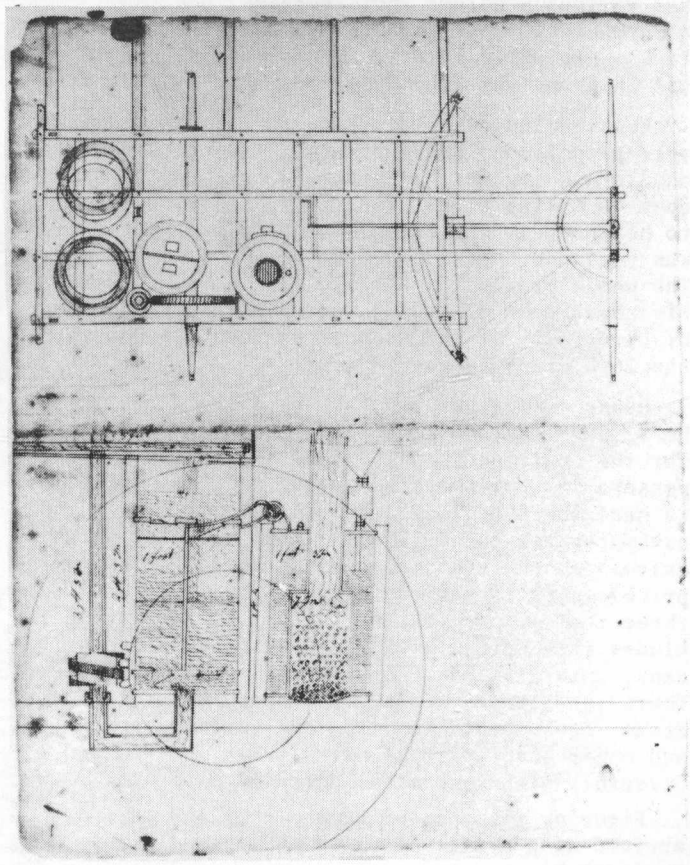


Fig. 4. Evans' drawing for the 1801 steam wagon. This shows, fairly clearly, the method he had proposed for steering the wagon, and that which was most likely used on his 1805 vehicle.

(Photo: Alba B. Johnson Collection, Transportation Library, University of Michigan, Ann Arbor, Michigan)

let them know that his engines were much smaller than any others being used at that time. Of course, their smaller size would mean less room, water and fuel, some very definite advantages over the monstrous low-pressure engines, as employed by Latrobe at the water-works.

However, this was not the first mention in the *Aurora* of Evans' experiments with this engine. A full year earlier, according to a letter from Colonel John Steven of Hoboken, New Jersey, to John Redman Coxe, a physician on the Philadelphia Board of Health, dated February 16, 1803, Stevens mentions having seen an article concerning Evans' new engine in the February 15th issue.[17]

Stevens stated, "As I am extremely envious to know precisely what are the peculiarities of Mr. Evans' steam engine, I must request a favor of you to procure all the information respecting it you can."[18] The Colonel had spent nearly two years perfecting a high-pressure steam engine of his own and, among other things, claimed that he wanted to be sure that the two men's efforts would not create interference in any pending patent applications. It would be easy to assume that Stevens was sending him to spy, but Coxe's reputation was of an honorable and well liked gentleman, and it is doubtful that he would have undertaken anything underhanded. As it was, he approached Evans openly and found him equally open and willing to answer all questions.

Coxe, in a letter to Hoboken, dated February 21, 1803,[19] relates all the specifications that Stevens had asked for plus additional comments by Evans of his various problems and successes, and that, "Mr. E says he would be glad to hear from you." However, it was not until late in 1804 that Stevens' interest in Evans was rekindled. But more of that later.

Evans' mind never drifted far from his dream of self-propelled land carriages, and almost as soon as his new engine had become a reality, he settled down to making plans for an organization that was to be known as *The Experiment Company*. The company was to issue stock valued at $3,450 at $30 a share. The whole proposal, complete with a most comprehensive breakdown of costs, was submitted to the Board of Directors of the Lancaster Turnpike Company on the 26th of September 1804.[20]

Evans estimated the cost of a steam carriage to be $2,500: $1,500 of this was for the engine, $500 for the carriage, plus $500 for "unforeseen expenses."[21] For the five wagons and teams required to haul the same load (100 barrels of flour), his estimate came to $3,304.[22] The care with which he calculated the cost is apparent because, while the price of the steam carriage is broken down into three items, the cost of the horses and wagons includes jack screws, whips, feed troughs and grease cans, plus the usual equipment of harnesses, etc. There is little doubt that Evans was aware that steam wagons would require jack screws, grease, oil and other such paraphernalia. But why burden the Directors with such minor details?

Figuring the cost of feed, coal and driver, he arrived at a profit of $104 on a two-day trip from Philadelphia to Lancaster, as opposed to a profit of $85 on the three-day trip it would take the horses. He then deducted repair costs of two dollars a day for his carriages, and the same amount for each of the five wagons.[25] We can be sure that he realized that his repair costs would be much more than two dollars a day, but what the Directors didn't know wouldn't hurt <u>him</u>.

Those men who directed the course of the Lancaster Turnpike Company, however, were more aware than Evans may have imagined, for they politely refused to substitute his horsepower for their horses.

The next effort of Evans came to light when he approached the Philadelphia Board of Health in November of 1804 with the scheme of building a steam-powered dredge to be used for clearing the sediment and refuse from the area around the Water Street docks in the Delaware River. Since this filthy task was done by hand-hauling buckets along the bottom of the river, the Board saw quite a bit of merit in the plan, and on December 10, a resolution and articles of agreement were signed by all concerned.

Work was to start immediately, but Evans was called to Washington to clear up problems concerning renewal of his patent of 1791 for manufacturing flour and meal. Unfortunately, he had to remain in the Capitol City until the end of February, and the Board of Health had become highly agitated at this delay by the time he returned. At this point, Evans, greatly depressed at his failure to obtain the renewal, suggested that the Board purchase a horse powered dredge such as he had seen in Baltimore. This was taken into consideration, and a letter was sent to find out if such a machine could be built within six weeks for no more than $3000.[24]

After considering the merits of both dredges, the Board decided to stick with Evans and he was instructed to proceed immediately, "...conformably to the terms of his contract."[25] The sum of $500 was advanced on the account of the dredge on April 4, and an additional $500 was put out for the "mud machine" on the 25th of that month.[26] So at last it was under way.

His decision to build and assemble the Hull, boiler and engine in his shop at Market and Ninth Streets may seem a bit strange, considering that the location was nearly a mile from the Delaware River and about a mile and a half from the Schuylkill. But it is obvious, when everything is taken into consideration, that he had planned from the start to run the rig to the river under its own power.

Apparently, through correspondence with Coxe, Col. Stevens had learned of Evans' boat. On October 24, 1804, he wrote Coxe a letter listing eight questions concerning the Philadelphian's engines and boilers.[27] The reply of November 9th goes into considerable detail on the equipment used for grinding "Plaister of Paris" and sawing marble, but only a brief mention appears in the letter of the fact that the boat engine was progressing and that Evans expected it to cost about $5,000.[28]

Not much is known about Evans' magnificent mud machine. Except for two very rough sketches of the boiler in a letter from Coxe to Stevens,[29] no contemporary drawings exist, and the earliest picture to survive (on the cover of the July 1834 issue of *The Mechanic* magazine), is so obviously incorrect that it, and all drawings based on it, can be almost totally disregarded.

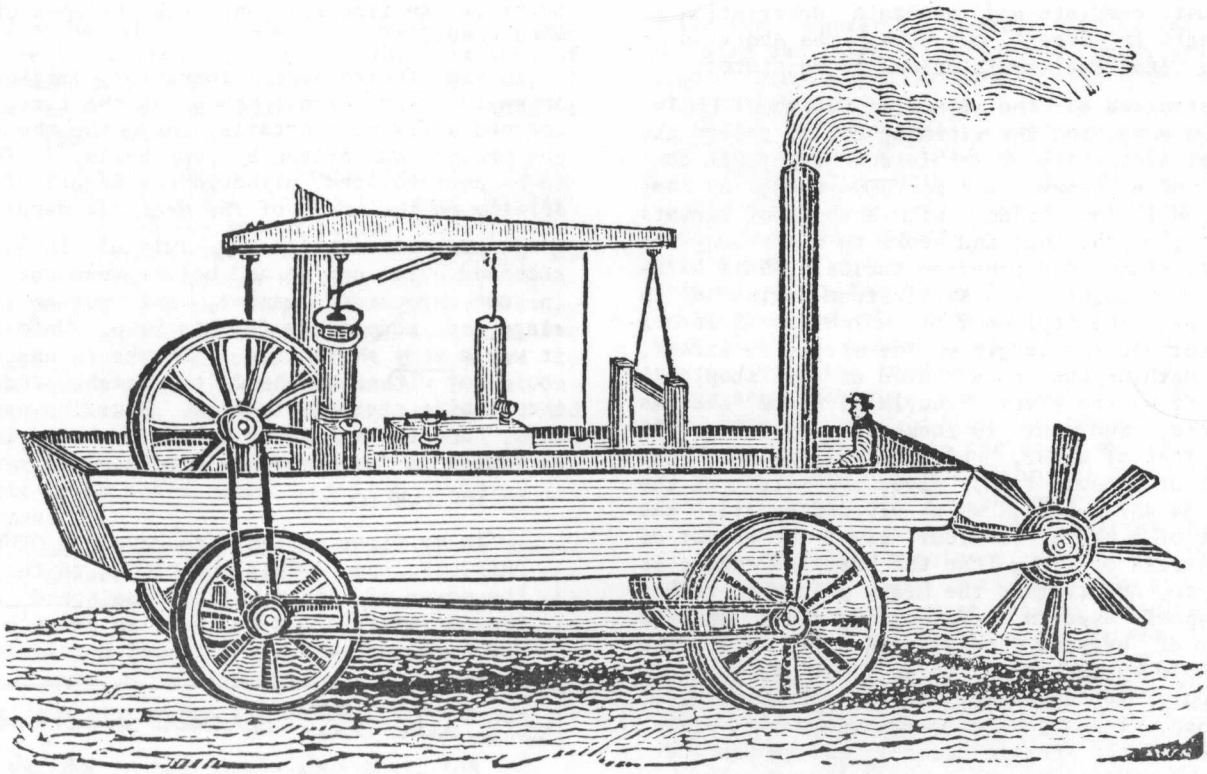


Fig. 5. The earliest known drawing of the Orukter Amphibolis, which appeared on the cover of the July, 1834, issue of *The Mechanic* magazine. Almost every mechanical feature in this picture either would not have worked, or has not been invented in 1805. While the basic engine may be correct, the boiler is wrong; the valve mechanism is a rotary type which Evans did not invent until 1809; one of the beam guideposts is missing; the paddlewheel, which was not put on the boat until after it was in the water, is shown below the water line and, thus, would not have worked; and the rope belt between the front and rear wheels would not have allowed it to be steered. (Photo: New York State Public Library)

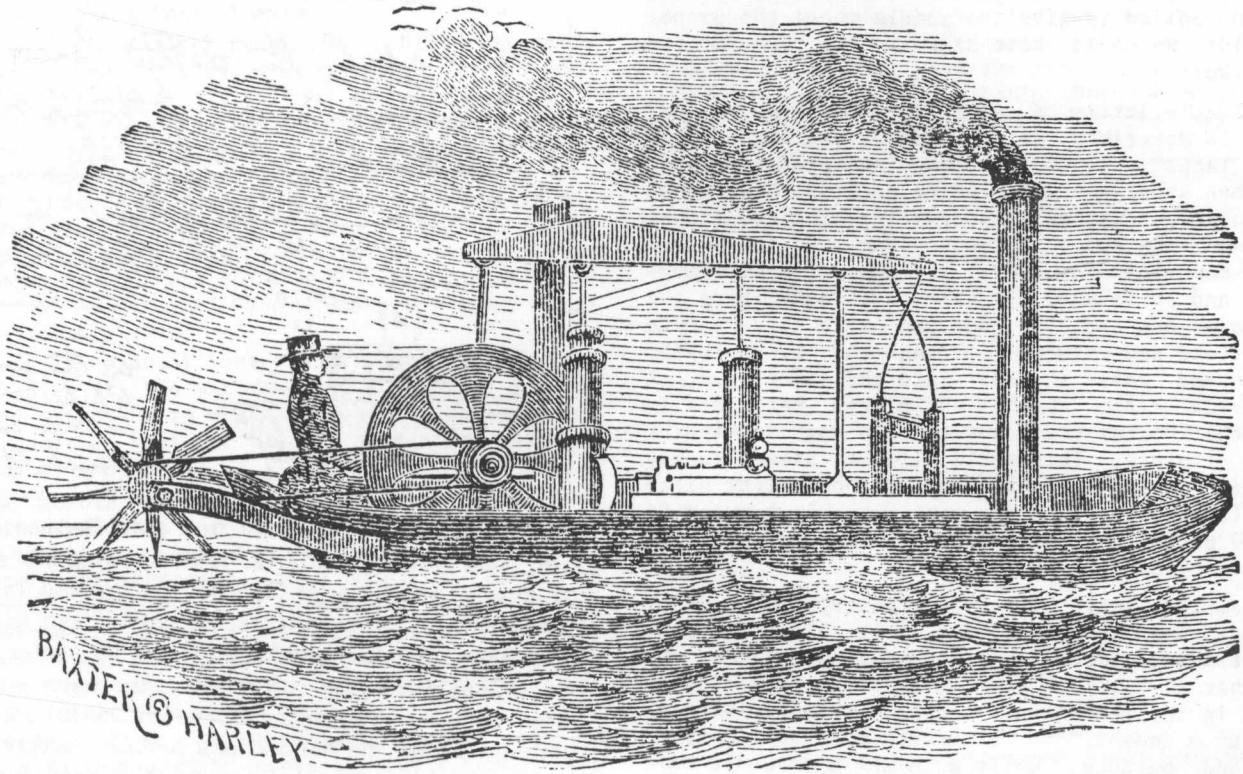


Fig. 6. This engraving from Thompson Westcott's *Life of John Fitch* (1857) is an improvement over the illustration on the cover of *The Mechanic* only in that it places the paddlewheel at the proper end of the hull and high enough to work properly. However, it still shows the 1809 rotary valve engine, taken from a drawing by Evans with one of the upright guideposts missing. Evans did this for clarity only. (Photo: New York State Public Library)

The most complete and accurate description we have appears in Evans' own book, *The Abortion of the Young Steam Engineer's Guide*.[30] He states:

> I constructed for the Board of Health of Philadelphia a machine for cleaning docks, called the Orukter Amphibolis or Amphibious Digger. It consisted of a heavy flat bottomed boat, 30 feet long and 12 feet broad, with a chain of buckets to bring up the mud, and hooks to clear away the sticks, stones and other obstacles. These buckets were wrought by a small steam engine set in the boat, the cylinder of which was 5 inches diameter and the length of the stroke 19 inches. This machine was constructed at my shop, 1½ miles from the river Schuylkill where she was launched. She sunk 19 inches, displacing 551 cubic feet of water, which at 62.5 pounds, the weight of a cubic foot, gives the weight of the boat 34,437 pounds, which divided by 213, the weight of a barrel of flour, gives the weight of 161 barrels of flour that the boat and engine is equal to. Add to this the heavy pieces of timber and wheels used in transporting her, and the number of persons generally in her, will make the whole burden equal to at least 200 barrels of flour. Yet this small engine moved so great a burden, with a gentle motion up Market Street and around the Centre Square; and we concluded from the experiment, that the engine was able to rise any ascent allowed by law on turnpike roads, which is not more than 4 degrees.
>
> When she was launched we fixed a simple wheel at her stern to propel her through the water by the engine. Although she was square at each end and illy constructed for sailing, (excepting that she is turned up at bottom) and drew 19 inches of water, yet we concluded that if power had been applied to give the paddle wheel the proper motion we could have stemmed the tide of the Delaware.

In Coxe's letter of April 12, 1805;[31] the unusual boiler is described. It was made of two large horizontal tubes about 12 feet long (and probably 18 to 20 inches in diameter). Inside each of these tubes was another one of smaller diameter. These acted as flues and the space between them and the outer shells contained the water. The two units were supported and surrounded by brickwork containing the furnace at one end. The heat and smoke travelled to the far end and returned through the flues to the furnace end where it went into the smokestack. A cylindrical steam chamber was placed horizontally above the boiler and connected to each section by a pair of pipes. This would allow a steady supply of steam, no matter which way the boat might pitch or roll. Working pressure was probably between 56 and 90 pounds per square inch, which was able to run the engine at 50 rpm.

An earlier letter from Coxe described a type of flywheel used by Evans, and it is likely that he had not varied the design to any great degree. He said that it "...is 8 feet in diameter made of wood & iron in the interstices & filled with Plaister of Paris as a cement."[32] This would have been easy to build and balance, while a metal one would have created problems to make, out of proportion to the value of the project, although some problems with the plaster of Paris might have arisen due to the dampness on the river. Another option which Evans would have had would have been to bolt thick segments of an iron rim onto the felloes of an all wood wheel.

In some fourth-hand information, originally from an employee in Evans' shop at the time, we have learned a few more details, including the fact that the *Orukter* was driven by rope belts.[33] This tends to be corroborated, although not accurately, by the drawing on the cover of *The Mechanic* magazine.

It was not until early July of 1805 that the combined hull, engine and boiler were completed and in some unrecorded manner, set upon an undercarriage and made ready for its trip. Unfortunately, it was a very short trip. The wheels and axletrees could not withstand the 20 ton weight, and broke as the machine started to move. Sturdier parts were made, and the following notice appeared in *Relf's Philadelphia Gazette* of July 13th.

TO THE PUBLIC

In my first attempt to move the ORUKTER AMPHIBOLIS, or AMPHIBIOUS DIGGER to the water by the power of steam, the wheels and axletrees proved insufficient to bear so great a burthen, and having previously obtained permission of the

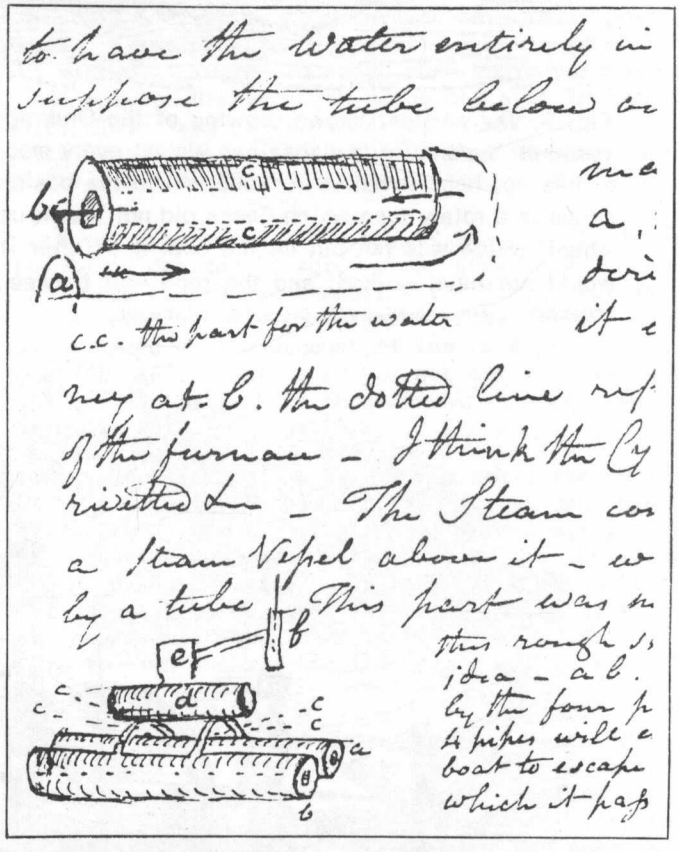


Fig. 7. Section of the letter from John Redman Coxe to Col. John Stevens, April 12, 1805, showing his sketches of Evans' novel boiler. In the top drawing (a) is the furnace; the arrows indicate the path of the smoke and heat under the boiler and back through its center and into the smokestack at (b); (c) indicates the water around the internal flue. In the lower picture, (a) and (b) are the two boilers, (c) are the hollow legs or tubes supporting the steam chamber (d). (e) represented a part not on the boiler at the time of Coxe's visit to Evans' shop, which would have been a safety valve, and a pipe to the cylinder of the engine(f). (Photo: New Jersey Historical Society, Newark, New Jersey)

Board of Health, (for whom this machine is constructed) to greatly gratify the citizens of Philadelphia by the sight of this mechanical curiosity on the supposition that it may lead to useful improvements.

The workmen who had constructed it, voluntarily offered their labour to make without wages, other wheels and axletrees of sufficient strength, and to receive as their reward one half of the sum that may be received from a generous public for the sight thereof, the other half to be at the disposal of the inventor, who pledges himself that it shall be applied to defray the expense of other new and useful inventions, which he has already conceived and arranged in his mind, and which he will put in operation only when money arising from the inventions he has already made, will defray the expense.

The above machine is now seen moving around Centre Square at the expense of the workmen, who expect 25 cents from every generous person who may come to see its operation; but all are invited to come and view it, as well as those who cannot who can conveniently spare the money.

This same piece was run in the *Aurora*, on the 15th.

Now we come to some questions that can only be answered by speculation. Considering the background material which has already been covered, however, some logical answers can be given. Why was the *Orukter Amphibolis* built so far from the water? Why was it driven 1½ miles to Schuylkill, instead of less than a mile to the Delaware, where it was to be used? What was the underiding reason for circling Centre Square for at least three days? There seems to be one answer for all three questions — Benjamin Henry Latrobe.

Besides proving to the general public that self-propelled land vehicles were possible, Evans managed to strike back at Latrobe for all he had said against his engine and ideas. The longer trip to the Schuylkill River took him to Latrobe's Centre Square water-works, where Evans could rub salt into the architect's wounds, and every time the magnificent mud machine completed a trip around the Square Latrobe must have felt a pain in his heart. It is not known how he took this humiliation, but it is known that he remained Evans' bitterest enemy until the end of his days.

There is no doubt that the trip to the river and the display at the water-works attracted a great deal of attention to Evans and his inventions, but it is curious that the local newspapers made no mention of the spectacle.

The *Aurora* seems to have sided with Latrobe on occasion, and this might be a clue as to why it ignored the event. But what of *Relf's Philadelphia Gazette*? Unfortunately, this question cannot be answered, although it is known that Robert Fulton was forced to write to the newspapers, and supply the account of his historic trip up the Hudson, in order to get any coverage. This type of thing was not considered newsworthy.

After touring Centre Square giving rides to those with twenty-five cents in their hands, the monstrous machine rumbled and squeaked its way down Market Street to the Schuylkill, where it was driven into the water. At this point, the ropes that had secured the hull to the wheels and other gear were removed, and the drive belts disconnected. While the *Orukter* sat there, waiting for the tide to rise and lift it from the undercarriage, a simple paddlewheel driven by the rope belts was fitted high on the stern, and an oar was tied in position to be used as a temporary rudder. When the water rose and the craft began to float, steam was raised, the engine started, and a brief maiden voyage began. When all seemed to be in good working order, the final details were taken care of, including a proper rudder, and the vessel embarked on a trip of nearly forty-five miles.

The paddlewheel, turning slowly, propelled the boat down the Schuylkill to the Delaware and from there, with the tide in its favor, up to Dunk's Ferry near Beverly, New Jersey.[34] At this point, the crew of the *Orukter Amphibolis* turned her around and returned to the docks on the east side of Philadelphia. This was, in all probability, the last trip made under her own power.

She was moored at the docks awaiting the fitting of the dredging machinery which, by the end of 1808, had never been satisfactorily accomplished. During this time a great deal of wrangling and legal maneuvering was taking place between the Board of Health and Evans. On September 6, 1808, the Board authorized payment of $843.65, the balance due him at that time. With this, after a total outlay of nearly $5,000, the dredge was laid up.[35]

The last entry in the Minutes of the Board of Health, concerning the machine, is dated June 9, 1809, and reads as follows:[36]

> The Committee appointed to superintend the sale of the Mud Machine reported that he had received twenty-seven dollars for Pig Iron sold to James Ash Jun, and four dollars ten cents for bricks sold to Mr. Hamilton — both articles taken out of said Mud Machine.

Thus, we come to the end of the story of the second self-propelled, commercial road-vehicle in the United States, and the first steamboat, built two years ahead of Fulton's *North River*,[37] to be commissioned by any government: the magnificent Mud Machine.

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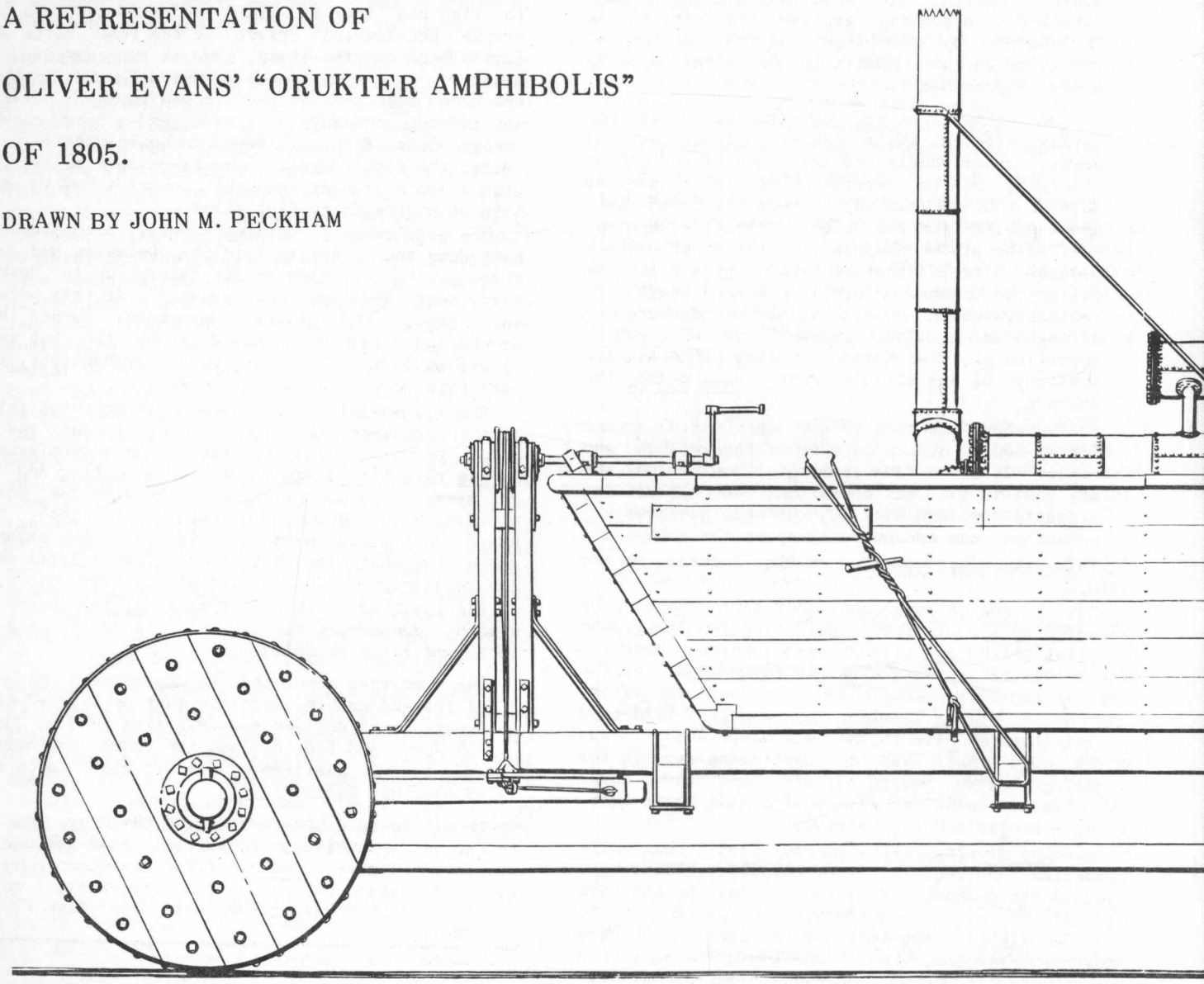
1. Henry Howe, *Memoirs of the Most Eminent American Engineers*, (New York, J. D. Derby, 1856), pp. 68-82.
2. Greville and Dorothy Bathe, *Oliver Evans — A Chronical of Early American Engineering*, (Philadelphia, Historical Society of Pennsylvania, 1935), p. 5.
3. Howe, p. 73.
4. Public Archives Commission of Delaware, Dover, Del.
5. Oliver Evans, "Origin of Steam Boats and Steam Waggons", *The Weekly Register* (Baltimore, H. Niles, 1813, Addenda, Vol. III), p. 2.
6. Bathe, p. 40.
7. *Ibid.*
8. David Read, *Nathan Read*, (New York, Hurd & Houghton, 1870), pp. 90 & 111.
9. George Washington, *Letter Book No. 10*, (Manuscripts Division, Library of Congress, Washington, D. C.
10. Bathe, p. 65.
11. *Transactions of the American Philosophical Society*, (Philadelphia, American Philosophical Society, 1809), Vol. 6, May 20, 1803, pp. 89-98.
12. Talbot Hamlin, *Benjamin Henry Latrobe*, (New York, Oxford University Press, 1955), p. 326.
13. Evans, p. 3.
14. Alba B. Johnson Collection, (Transportation Library, University of Michigan, Ann Arbor, Mich.).
15. Evans, p. 4.
16. *Ibid.*
17. Colonel John Stevens' Papers, (New Jersey Historical Society, Newark, N. J.)
18. *Ibid.*
19. *Ibid.*
20. James L. Wood's Collection, "Oliver Evans' Papers", (The Franklin Institute, Philadelphia, Pa.).
21. *Ibid.*
22. *Ibid.*
23. *Ibid.*
24. Bathe, Appendix I, "Minute Books of the Philadelphia Board of Health", p.303.
25. *Ibid.*
26. *Ibid.*
27. Stevens' Papers.
28. *Ibid.*
29. *Ibid.*, April 12, 1805.
30. Oliver Evans, *The Abortion of the Young Steam Engineer's Guide*, (Philadelphia, Fry and Kammerer, 1805, p. 50.
31. Stevens' Papers
32. *Ibid.*, February 21, 1803.
33. Bathe, p. 110.
34. Thomas Scharf and Thompson Westcott, *History of Philadelphia*, (Philadelphia, V. Brandt & H. Gummere, 1884), Vol. III, p. 2169.
35. Bathe, p. 308.
36. Bathe, p. 309.
37. Erroneously called the *Clermont*. Vide; David C. Ringwald, "First Steamboat to Albany", *The American Neptune*, Vol. XXIV, No. 3, 1964.

A REPRESENTATION OF

OLIVER EVANS' "ORUKTER AMPHIBOLIS"

OF 1805.

DRAWN BY JOHN M. PECKHAM



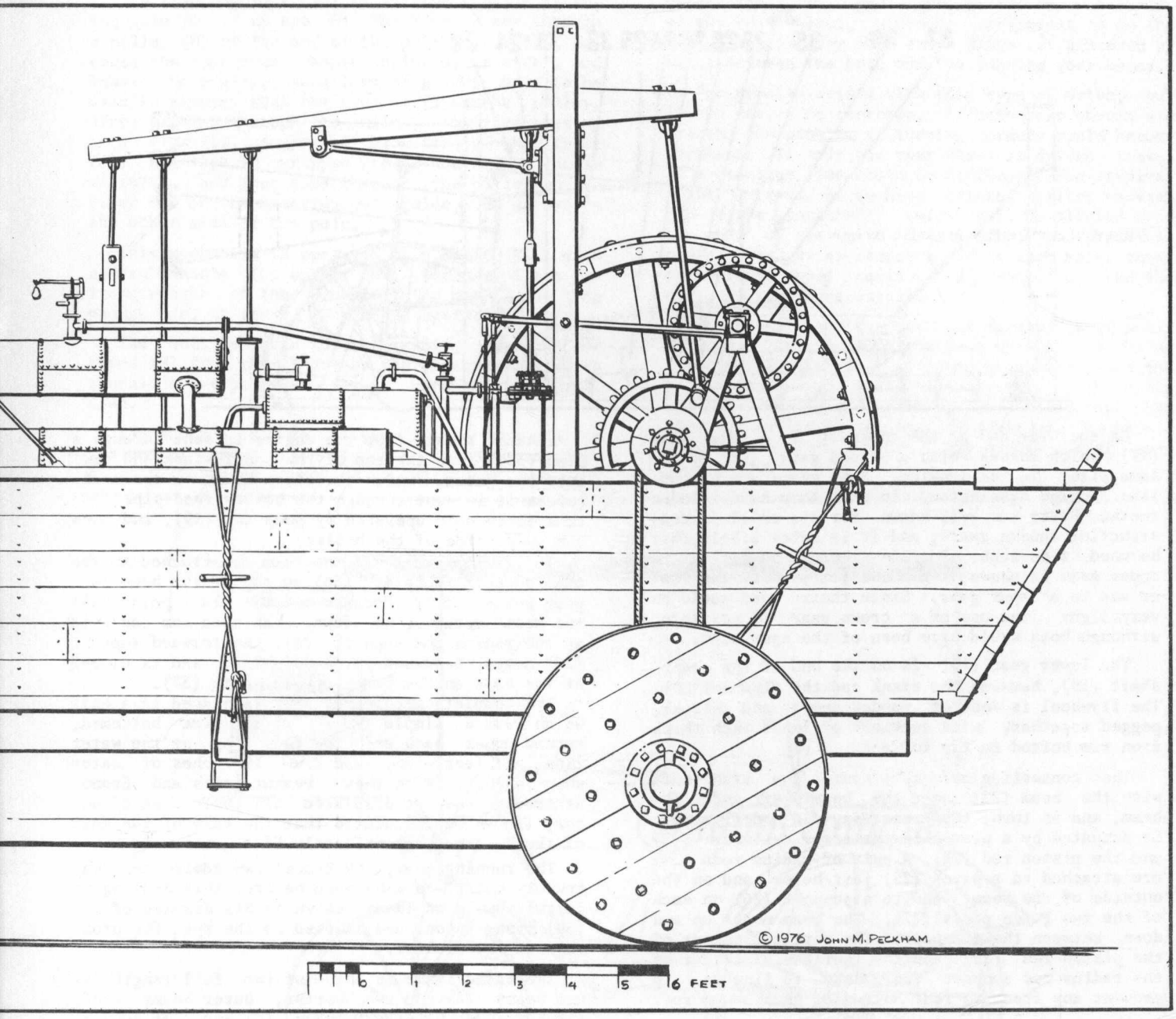
An Explanation and Description of the Orukter Amphibolis. This drawing is not intended to be a representation of exactly how the *Orukter* appeared, since there is far too little accurate information concerning it. What it does show, however, is made up from those few "known" facts; from information based on other works of Evans' about the same time (1805); on contemporary mechanical and construction practices; a certain amount of logic; and a fair dose of just plain supposition. The basic layout of the mechanical parts should be fairly accurate, while details would be infinitely variable. In addition, I have placed some items in certain positions for clarity. Also taken into consideration is the fact that it would have been relatively simple, rugged, of low cost and fairly roughly finished.

* * *

Evans called his engine a "drop-valve" engine, since the valves were opened by cam-actuated rocker arms and valve rods and were allowed to drop closed by their own weight and the pressure of the steam. Generally, however, it was referred to as a "Grasshopper" engine, because of the up and down movement of the beam and the kicking motion of the connecting rod.

The two boilers (1), as described by Coxe, are about 12 feet long and approximately 20 inches in diameter. The flues, after passing through the boilers from the rear to the front, are joined by an inverted "Y" (2) at forward end of the boilers, and fed into a single smokestack(3). The horizontal cylindrical steam chamber (4) is supported and fed by four tubular legs (5), which allowed the steam to enter the chamber in spite of the rocking motion of the boat. The chamber is topped with a safety valve (6) and the connection to the steam feed pipe (8). The steam travels through this pipe to a regulation, or throttle valve (9), and then into the upper inlet pipe (10), and a lower one which is not visible. The inlet valves (11) are at the upper and lower ends of the cylinder (12). These valves, plus the exhaust valves next to them, are actuated by rods (13) attached to rocker arms (14). These are operated by a camshaft (15) with four cams (one per valve and rocker arm). The shaft is supported at each end by an "A" type frame (16).

continued→→→→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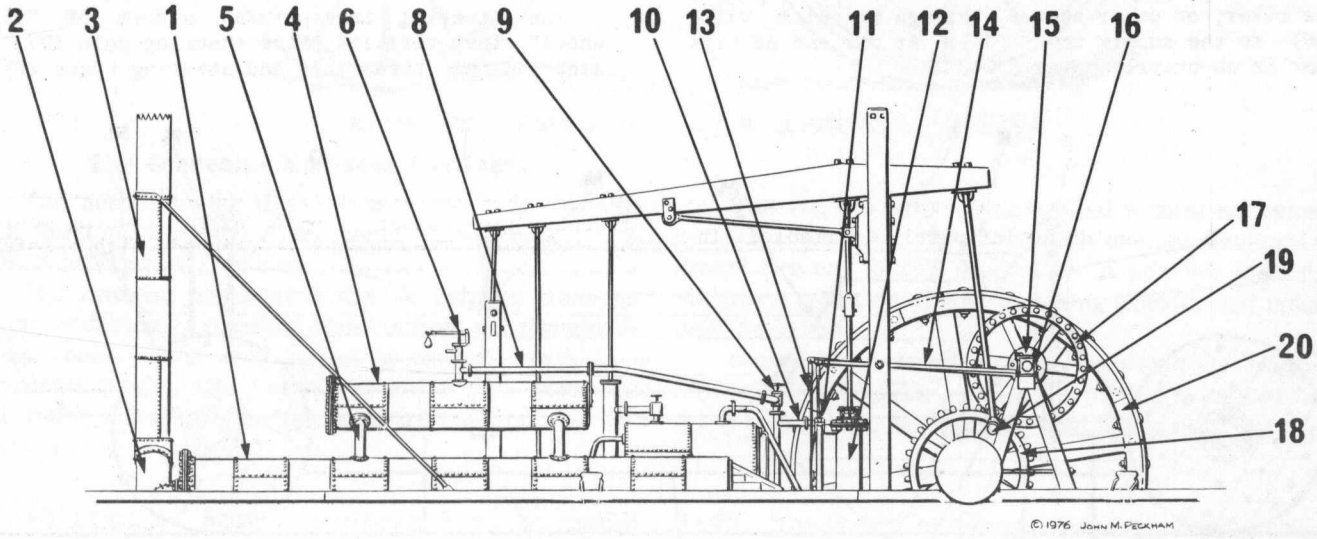
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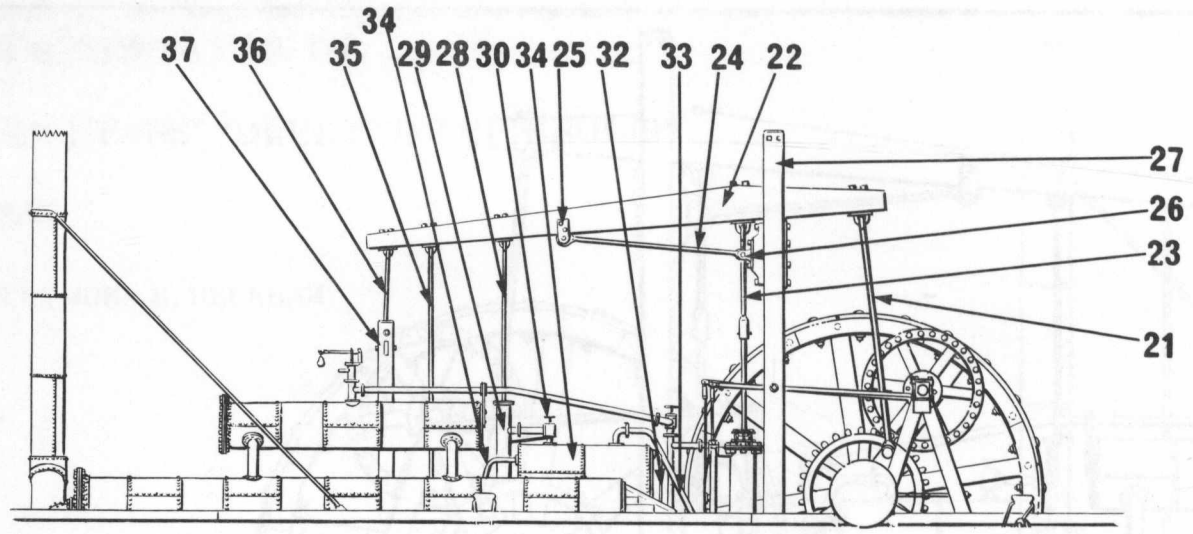


On the far end of the camshaft is a large gear (17) which meshes with a second gear (18) of the same size. In the drawing, both gears are not unlike George Washington, in that they have wooden teeth. Evans was well known for his skill in constructing wooden gears, and it is quite likely that he used this type. For the sake of variety, the upper gear is shown as a crown gear, while the lower one is a spur gear. Since their load would be very light, the use of a crown gear is possible, although both would have been of the spur type.

The lower gear (18) is on the end of the crankshaft (19), between the crank and the flywheel(20). The flywheel is made of wooden spokes and felloes, pegged together, with sections of 1-5/8 inch thick iron rim bolted to the felloes.

The connecting rod (21) joins the crankshaft with the beam (22) near the beam's aft end. The beam, and in turn, the connecting rod and flywheel, is actuated by a piston in the steam cylinder (12) and the piston rod (23). A pair of radius rods (24) are attached to a pivot (25) just below, and on the outside of the beam, and to a support (26) on each of the two guide posts (27). The beam moves up and down between these posts. The vertical center of the piston rod (23) and the horizontal center of the radius rod support (26) have to line up, to prevent any front to rear motion of the piston rod.

Further forward on the beam (22) is attached the supply-tank pump rod (28), which operates a lift and force pump (29) that feeds water directly from the river, or other source, through an inlet valve (30) to the supply tank (31). At one end of this tank is an overflow pipe (32).

Exhaust steam from the engine is sent through a pipe (33) into the top of the supply-tank and down into the water, which the steam helps to pre-heat, before it is sent through the boiler feed-pipe (34) to a force pump operated by pump rod (35), and into the under side of the boiler.

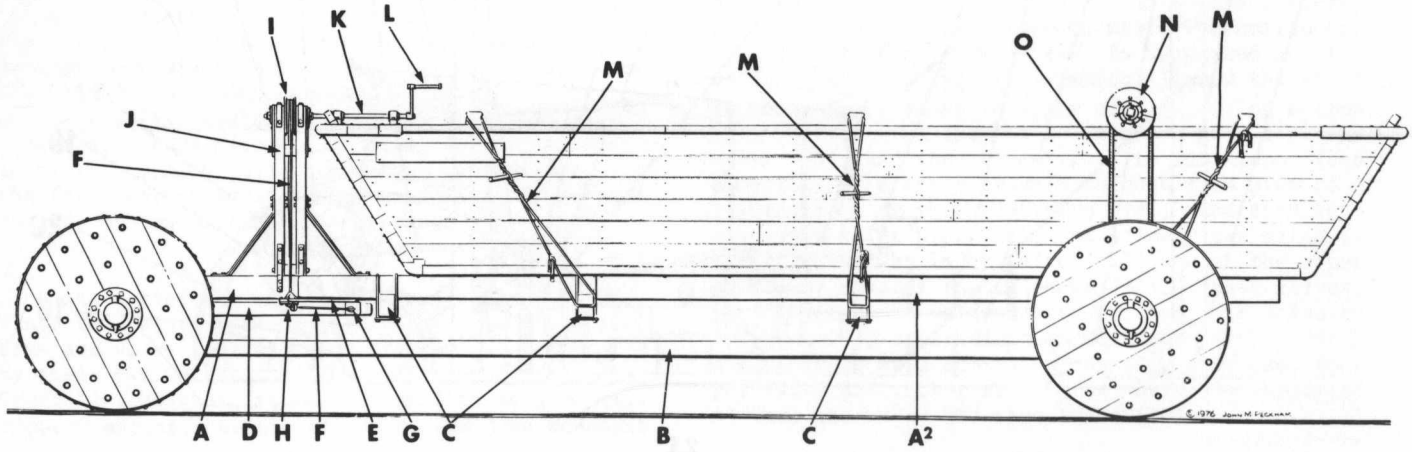
At its forward end, the beam is attached to the beam support "wobbler" (36) on top of the beam support posts (37). Because of the pivot point (25) the beam moves up and down and in an arc centered at the radius rod support (26), the forward support (36) moves back-and-forth slightly, and is hinged at its base on the beam support posts (37).

The complete mechanical unit is placed in a hull which was a simple scow. It is flat bottomed, turned up at each end, 30 feet long at the water line, 12 feet wide, and drew 19 inches of water when afloat. With these measurements and Evans' statement that it displaced 551 cubic feet of water, it can be calculated that the rake of the ends of the hull was approximately 58 degrees.

The running gear, by Evans' own admission, was crudely built. As mentioned before, this drawing is largely based on ideas shown in his drawing of his 1801 steam wagon, and adapted to the specific problems of the Orukter.

The basic frame is made of two full length inner beams (A) and two shorter, outer beams (A^2), strengthened by crossmembers (C) and, of course, the axles, which were also held in place by reach poles (B).

The steering incorporates a form of "fifth-wheel" (not visible), the steering pole (D), the steering pole guide (E), and steering ropes (F).



The steering rope (F) is attached to the steering pole (D) at an eye (G). The rope passes through a pulley (H) at the end of the pole guide (E). Because the rope must change angles as it enters and leaves the pulley, some form of guides have to be used to assure that the rope stays on the pulley. After passing through the pulley, the rope goes up to a drum (I), supported by a form of "A" frame (J). The rope is wrapped around the drum a couple of turns, and goes down through the pulley on the other end of the steering pole guide, to an eye on the other side of the pole.

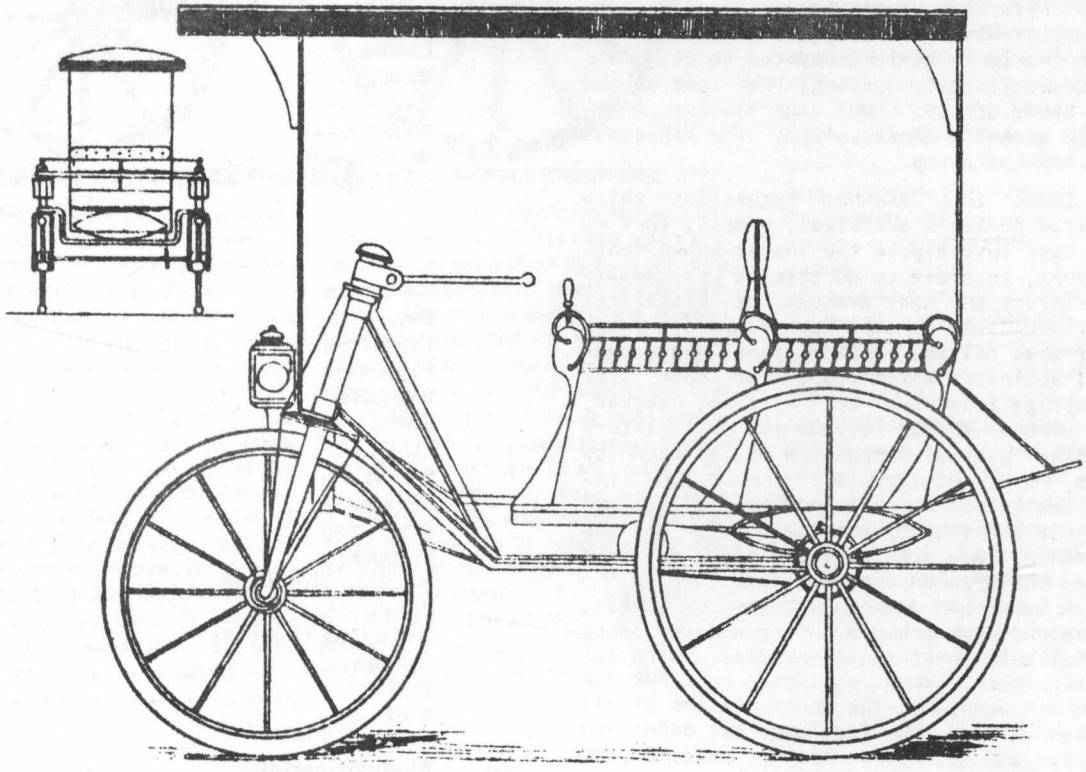
This mechanism is operated by a shaft (K), with a crank handle (L) on its end. Because of the extreme weight of the vehicle, the handle is long enough for, at least, two-handed operation.

The hull is held to the running gear by the ropes (M) from the cleats to the crossmembers, with tourniquet type twist sticks used to tighten it down.

The whole affair is driven from a drum (N) on the end of the crankshaft. Like the steering drum (I), a couple of turns of a continuous rope (O) around this drum, and a similar one on the inside of the rear wheel, would be sufficient to do the job. Tension for the rope drive is achieved by shims between the hull and the running gear beams.

One problem arises with this type of drive, but it can easily be overcome. If both rear wheels are driven, the problem of turning corners would become enormous. If only one rear wheel is driven, travel in a straight line would be difficult. The simplest solution would be to have sliding collars on each end of the crankshaft, which could be slipped over the ends of the drive drum shafts, and pinned in place. Thus, after stopping before each major turn, the inside wheel could be disconnected, and the maneuver made more easily.

It is very doubtful that any form of gears would have been used to drive the rear wheels, if for no other reason than cost and complexity, and that the gears could have been broken easily, due to the violent bumping and jarring the vehicle must have received while in motion. In addition, Evans was just out to prove a point, but at the least personal expense.



KEROSENE CARRIAGE. C. J. & J. W. SCHOENING, OAK PARK, ILL.

The Schoening Kerosene Carriage.

The accompanying illustration of which the smaller is a front view, is the motor vehicle made by C. J. & J. W. Schoening, of Oak Park, Ill.

The drawing power is a double cylinder kerosene engine of decidedly peculiar construction yet remarkable power, both piston rods operating on one crank in a horizontal plane. The valve mechanism, oil pump and and water circulator are operated by one rod and one movement.

The engines after being started require no external heat or electric spark to ignite the charge, making accidental fire to clothing impossible. A positive insulation secures a retention of heat in mixing chamber and insures cool cylinders.

A very complete oil governor regulates the supply of oil according to power required, injecting nozzle expanding or contracting according to road and load.

This item is from *Horseless Age*, November, 1895. The text has been copied verbatim.

A FOLLOW-UP ON THE FEY

(and other Minnesota makes)

by Stanley W. Liszka, Jr.

In reaction to Stanley K. Yost's article on "Fey of Minnesota", (AHR No. 4) and editorial comments in the same issue, I would like to add the following information. Firstly, for any follow-up on the Fey automobile there is an unpublished manuscript in the archives of the Minnesota Historical Society - "School-boy Builders of Some of America's First Gasoline Motor Driven Vehicles". It should be consulted. There is also a number of other manuscripts and materials on file there which deal with the Minnesota vehicle industry. For example, another Minnesota car, the Pan, has had a master's degree thesis in history devoted to it. This study was done by Clark E. Hunting, "Pan Town on the Mississippi; A Study of St. Cloud and the Pan Automobile Company", master's thesis, 1962. The Minnesota Historical Society has a copy.

The above leads into another suggestion which supports the cited Review's editorial; namely, that we as historians must investigate the lesser-known vehicle brands. However, in order to do this it is necessary that we first explore the many avenues of historical sources already available to us. I have learned through trial and error that all the state, regional and community historical societies which might bear upon your particular investigations need to be first checked. Other research avenues should include the oral history approach. A fine partial discussion was advanced by Terry B. Dunham, "Oral History for the S.A.H. Researcher" (SAH Newsletter No. 47, February, 1976), and one should consult a forthcoming article by me on the same subject within the S.A.H. publications. We need more "Tools of the Trade" type articles such as the one by Richard H. Langworth (same Newsletter as Dunham) in order to give our membership a better understanding of locally available historical materials which are indispensable for lesser-known vehicles. Last but not least, we should encourage the documentation of all articles in our S.A.H. publications. All endeavors need foundations, and automotive history needs source foundations as well.

For those readers interested in Minnesota-made vehicles, one must consult an excellent article by Alan Ominsky entitled "A Catalog of Minnesota-made Cars and Trucks", Minnesota History, Fall, 1972, pp. 93-112. Mr. Ominsky's "catalog" goes far beyond the obvious dating of these vehicles' manufacture, but also to their whys and wherefores. His footnotes and bibliography are most invaluable for anybody interested in following up on cars and trucks manufactured within Minnesota. The journal with the pertinent article can be obtained through the Minnesota Historical Society, 1500 Mississippi Street, St. Paul, Minn., 55101. The following inventory is taken from his artical and is reproduced here for quick reference for our membership. Anyone desiring more complete information can send for the noted journal.

The following list of Minnesota-made cars is based upon Alan Ominsky's "A Catalog of Minnesota-Made Cars and Trucks".

Acme or M.B. 22
Ames
Benoit
Bergstrom
Bjella
Brasie Packet
Davenport
Dispatch
Duluth
Fey
Ford
Forsyth
Hoffman
International Harvester
Joerns-Thiem
Kato
Lende
Lenhart
Luverne
Magnolia
Maplebay
Mayer Special
Michaelson
Minneapolis
Moore
New Winona
Overland
Owatonna
Pan
Perfection
Pridemore
Renville
Robinson
St. Cloud
Saroni
Schurmeier
Starr (Star?)
Stickney
Stickney Motorette
Swedland
Twin City (Trucks)
Veerac
Wallof
Ware
Westman
Whaley-Henriette
Wilcox
Wreisner

PLUS POSSIBILITIES

Arrow
Chase
Champion
Continental
Dan Patch/Savage
Granite Falls (Lende?)
Hendel
Minneapolis Automobile Mfg. Co. (Minnies?)
Schmidt
Standard Motor Car Co. (Colby?)
Twin City Motor Car Co.

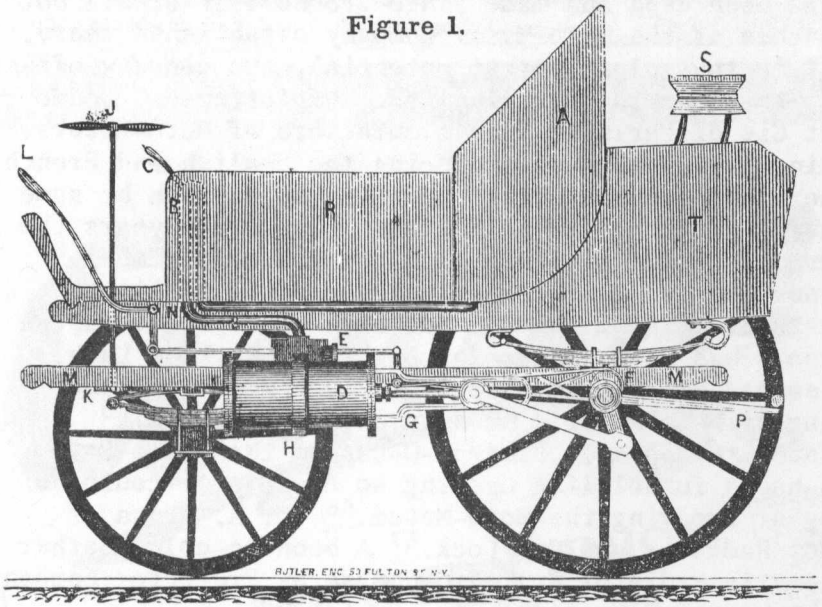
Scientific American.

THE ADVOCATE OF INDUSTRY, AND JOURNAL OF SCIENTIFIC, MECHANICAL AND OTHER IMPROVEMENTS.

Vol. 4. New York, October 14, 1848. No. 4.

STEAM CARRIAGES FOR COMMON ROADS.

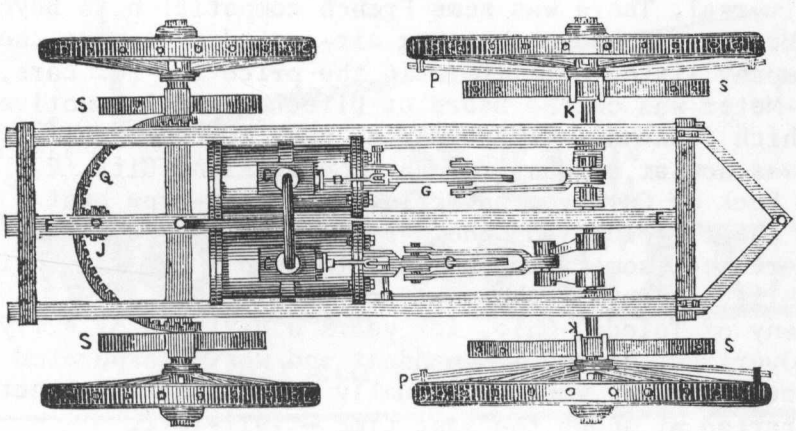
Figure 1.



The invention of Locomotives for common roads is not new to a few, but we presume that it is to many. Of this we were convinced a short time since, by a very respectable gentleman, who called upon us, with such a carriage, a new invention to him, but not so to us. We have also had many enquiries lately respecting such kinds of carriages, especially since we recommended the use of steam carriages for our plank roads. To throw some light on the subject we present this week a side and ground plan of the Locomotive described by Barlow, and invented by Mr. Gurny, an Englishman, and which on a common road went at the rate of 8½ miles per hour. We hope that these engravings will draw the attention of our mechanics to the subject, as we think some of our engineers could so improve on this, as to make it run at the rate of 12 miles an hour on our plank roads.

A, is the position of the boiler without showing the smoke pipe. B, is a steam pipe which leads from the boiler down by N, to the valve boxes of the cylinder D, (there is a cylinder on each side, inside of the travelling wheels.) There is a small wheel attached to the piston rod which runs between two parallel bars G. Attached to this wheel by a spindle is a double connecting rod and during every revolution of the crank the parallel bars are inside of the rod. The fuel and water are kept in R and T. C, is a handle on the steam pipe to regulate the supply. M, is the frame. L, is a lever which the conductor by pulling up, reverses the motion of the carriages or propels them backwards, if necessary. P, is a driving arm. S, is the seat. I, is a lever connected with a pinion K, for turning the carriage, but these will be be better understood by fig 2.

Figure 2.



F F, is the framing I, is the pinion, working into the rack Q, for turning the carriage by the handle, seen in fig. 1. P P, are driving arms, by means of which power is conveyed from the crank shaft to the circumference of the hind wheels, so that one or both wheels may be used. One or both wheels may be used thus it required, as it is obvious, that if the bolt of the driving arm be withdrawn the driving arm will revolve without propelling the wheel. S S, represent the carriage springs between which and the wheels are the driving arms. K K, are the crank shafts. C C, are the valve boxes of the cylinders. G G, are the parallel bars, seen better in fig. 1. The valve rods will be easily distinguished at the extreme ends of the crank shafts, one of them represented by I.

This form of locomotive for common roads was used only for dragging other carriages, and for that purpose it might be useful on our plank roads. When the carriage is to be started, the steam having been up, the conductor opens the steam cock by the handle at his side. The steam then passes through B B, to the cylinders and the action of the engine commences urging forward the carriage on its journey.

It must be known to many of our readers that the ingenious Oliver Evans proposed to drive steam wagons over the roads in Pensylvania. As yet however, no practical test of this kind of Locomotion has been made in our country; in England it has, and would have been successful only it met with such opposition from the Turnpike trustees and from one unluckly accident that occurred on the road between Paisley and Glasgow in 1834, whereby a number of lives were lost.—The experiments made on the Paisley road in Scotland, were mechanically successful—the carriages went through the streets as if drawn by horses and up and down the hills likewise On the road between Cheltenham and Gloucester, England, they were also successful, mechanically speaking. Now as we have no road-trust aristocracy here, we hope to see them permanently successful.

S.A.H. Member J. H. Valentine, Culver City, California, loaned us the original page from which this article was reproduced. It was in remarkably good condition in spite of its age of 128 years. It is evident from the wording of this article that the editors of *SCIENTIFIC AMERICAN* had faith in the idea of self-propelled road vehicles, and encouraged engineers and mechanics to build and improve on this design.

HIGHLIGHTS OF THE DEVELOPMENT OF MOTO METERS AND HEAT INDICATORS

Part II

1921 Boyce Moto-Meters, known as reliable heat indicators, were increasingly in demand by vehicle buyers who counted on this protection for their engines. In Europe such meters had been used and made since around 1911 or '12 but not until 1921 were branches of the Moto-Meter Company established there. Following up on a 1920 trip to explore market potential, two company officers completed arrangements with Benjamin Electric, Ltd., of Tottenham, London, and with F. Repusseau et Cie of Paris for the manufacture of Moto-Meters.[61] By the end of 1921 working factories were producing the English and French versions. However, General Manager Henneke found that opposition by some automobile clubs continued, particularly in England. There for years the radiator had been reserved for club insignia with its member's number.[62] Moto-Meter Company had new items. Dealers could buy a drilling kit to simplify the work of installing instruments. For each model there was an adaptor.[63] A new accessory was Boyce Motometer Light and Parking Lamp.[64] Interested in boosting sales, one dealer displayed a burned-out cylinder along with a sign telling of Moto-Meter's savings on repair bills.[65] Inventive devices continued to appear. Protect-O-Cap of the Up-To-Date Machine Works, Chicago, had a funnel-like opening so a radiator could be filled without unlocking or removing the Moto-Meter.[66] W. A. Hanna of Chicago sold the Red Spot Radiator and Cap Lock.[67] A boon to cold-weather drivers, the Wilson Automatic Radiator Protector, made by Protector Company of Minneapolis, had a thermostat to operate its shutter.[68] Competitors came up with new versions of heat indicators. Stewart-Warner Speedometer Company, Chicago, had been making various meters and gauges for years. Now its first heat indicator was introduced, the Warn-O-Meter. A simple device with small light bulbs, its green light glowed unless the thermostat indicated overheating, in which case the red light came on.[69] Whyte Motor Control by Whyte-Duffield, Chicago, had instruments inside the car on the steering wheel. The special device containing oil gauge, switch, ammeter, motometer, clock, etc., was sold only to manufacturers.[70] The Aero-Cap was a popular winged device made by F. Wolk & Sons, Louisville. Winged caps and dogbone radiator caps made for easier handling, whether used with or without Moto-Meters, so they were popular accessory items.[71]

1922 By now Boyce Moto-Meters were standard equipment on over 160 cars.[72] The DeLuxe model with Schlaich Lock, at $15.00, was the highest priced. This lock was marketed by J. C. McAdams Company, New York City.[73] The Universal model was gaining in popularity. It was somewhat smaller than the Standard, a leader for years. French catalogs showed three models, Standard, Midget and Universal. There was some French competition to Boyce. Prestige of Boyce Moto-Meters was shown when Fox air-cooled cars wore them for decoration. The company listed motometers in the price for Fox cars.[74] Earl V. Henneke of Moto-Meter was on the Board of Directors of Automotive Equipment Association which launched an "Ask 'Em to Buy" ad campaign.[75] Boyce & Veeder Company was now at 68 Hunter Point, Long Island City.[76] Another company, Borg & Beck of Chicago, advertised its dash-type heat indicator, stating that their product was theft-proof and easy to read.[77] Numerous locks were advertised, some were designed to keep a car from being stolen, others specifically to prevent the theft of Moto-Meters.[78] Electric Auto-Lite Company of Toledo, Ohio, for years a division of Willys Corporation and Willys-Overland, became independent and was incorporated May 31, 1922.[79] Moto-Meter Company would eventually become part of Electric Auto-Lite. They both started at about the same time — 1911-1912.

MOTOR WORLD
for
DEALERS, JOBBERS AND GARAGEMEN

Volume LXXI
Number 13

PUBLISHED WEEKLY AT 239 WEST 39th STREET
NEW YORK, JUNE 28, 1922

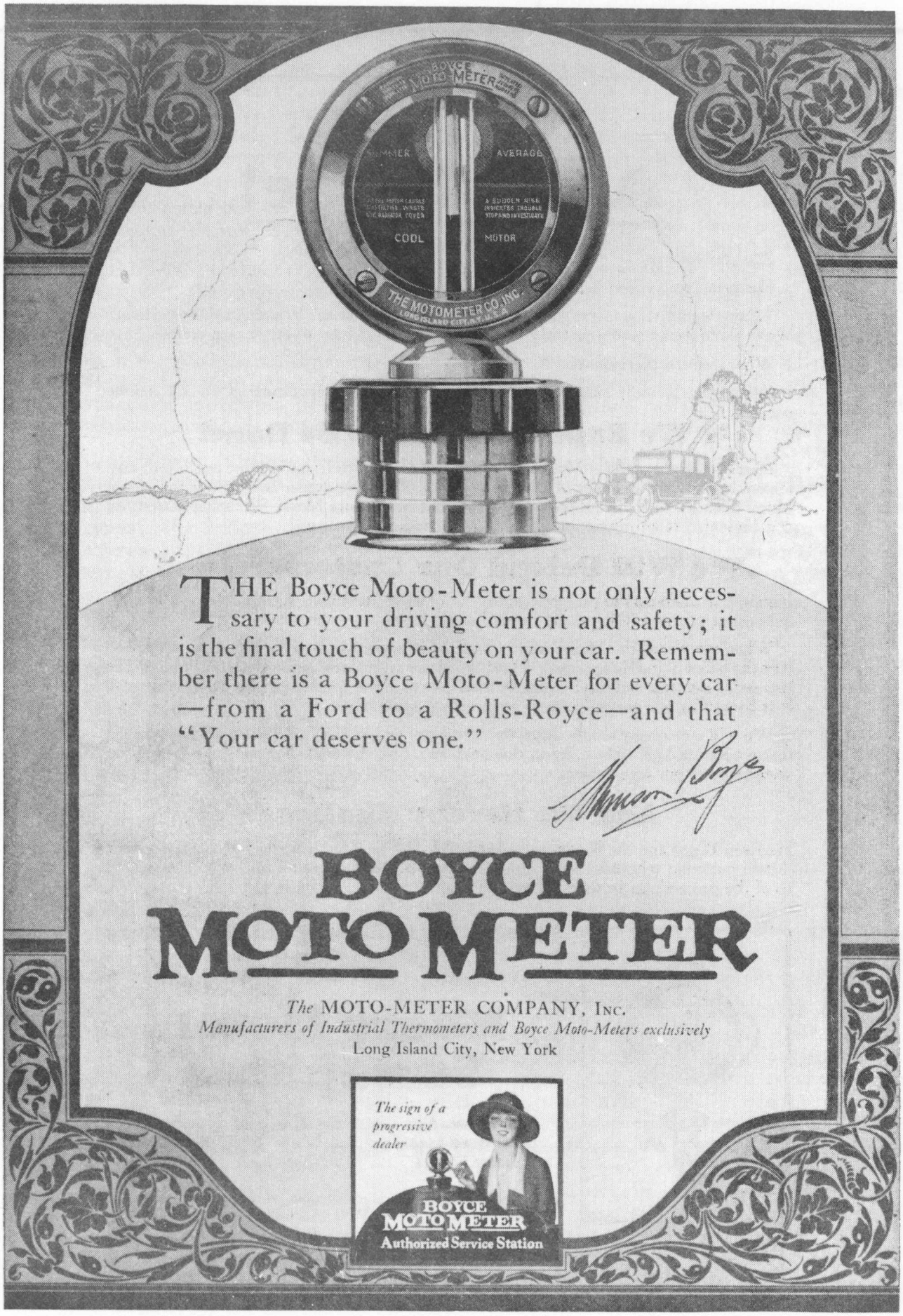
Thirty-five cents a copy
Three dollars a year

Makers of specialty items have always been quick to claim their share of credit for auto racing victories, and the Boyce MotoMeter Company was no exception, as this front-cover advertisement of 1922 indicates.

1923 Moto-Meter ads stressed that their product "Covers the Country." To the stations the company was offering inducements to "Ask 'Em to Buy" and promoting the plan of Authorized Boyce Moto-Meter Service Stations.[80] From its start the company displayed a strong belief in the power of advertising.
J. C. McAdams Company had three Schlaich Lock models, one with chain.[81]
In radiator cap and ornament listings many had a notation beside the name that item could be combined with motometers or other heat indicators.[82]
Another competitor, Steameter Company, Chicago, advertised a heat indicator with bell that warned of overheating with a loud, penetrating ring.[83]
Boyce & Veeder Company listed the "Boyce" hand operated Fire Extinguisher, but made no mention this year of the automatic feature.[84]

1924 "Your car deserves one" was stressed this year.[85] The phrase was included in a January *Motor* ad after the statement, "...Remember there is a Boyce Moto-Meter for every car — from a Ford to a Rolls-Royce." This statement was signed with the unmistakable signature of Harrison Boyce.[86] None of the ads Boyce signed tell of his position with the company, but he was obviously still connected with Moto-Meter all during the time he was inventing and promoting other products. His other devices never had the impact on the automotive market that his heat indicator did. The Boyce & Veeder Fire Extinguisher was still listed.[87] In addition the company had a new product, a Gasoline Treating Compound named "Boyce-ite" which was guaranteed by Harrison Boyce, "inventor of the Boyce Moto-Meter."[88]
The Moto-Meter Company was manufacturing industrial thermometers and Boyce Moto-Meters, as well as radiator thermometer lights and parking lights.[89]
Three pictures of the Moto-Meters were used in a *Motor* Magazine article on "Winter Weather Driving Tips", demonstrating the instruments' importance.[90]
The same *Motor* Annual had a list of 1924 car specifications.[91] Of over 90 cars covered in the Radiator Meter column 27 had no report, 5 used the Radi-Meter, 2 used Jarvice, and all others specified Boyce. The Jarvice was made in Grand Rapids, Michigan, by W. B. Jarvice Company.[92]
More Schlaich Lock models were added by McAdams Company, which boasted, "Made by the Pioneers in Moto-Meter Protection."[93]
A new dash-attached thermometer was Safe-T-Stat, made in Philadelphia.[94]
In spite of increasing numbers of dashboard-mounted temperature indicators, popularity of radiator-mounted types was illustrated in the numerous ads of unrelated products (polishes, headlights, etc.) showing radiator meters.
A new competitor challenged Moto-Meter Company and Harrison Boyce personally in a January ad.[95] Semaphoric Indicator Company of Chicago called its heat indicator various names in 1923 and 1924: "Moore", "Semaphore" and "Moore Motor Semaphore".[95] Obviously it was a successful competitor.

1925 By now Boyce Moto-Meters were standard equipment on over 180 makes.[96]
There was an added model, the Aristocrat for Fords, priced at $7.00.[97]
In *Motor* Annual's Specifications on thermometers the Boyce name and radiator location were given for all except two makes: Westcott and Chrysler.[98]
Moto-Meter Company continued to branch out and made oil temperature meters.[99]
Half a dozen others were making radiator thermometer lights.[100] Teltailite, sold by Imperial Brass of Chicago, came on automatically when the stop light was working, and a lighted sign "SLO" warned oncoming drivers.[101]
Saf-T-Stat had a new dash indicator. "It leaves the radiator cap free."[102]
Boyce-ite was advertised with a guarantee included. A full page ad by Boyce stated: "Boyce & Veeder Co., Inc., Manufacturers of Boyce-ite exclusively."
This compound could be obtained from certified Boyce-ite Blu-Green pumps in one hundred cities or from the Boyce-ite can sold by dealers, the ad told.[103]
This indicated a well-organized selling campaign had been launched. No mention was made of the fire extinguisher, their previous product.



Boyce MotoMeter advertisement, from MoToR magazine, January, 1924.

A Challenge!

Are you with us?

Has competition been healthy for the automotive world?

Where would we be if only one man produced automobiles? What would the price be? What year's model would you still be driving? Would it have a starter or a crank?

Who invented thermometers?

Can anyone lawfully monopolize the indicating of the temperature of an automobile engine?

We Expect Justice to Be Done!

Harrison Boyce and the Motometer Company commenced suit against one of our customers in the District Court of New Jersey to enjoin this customer from selling the Moore Motor Semaphore. This customer purchased but few Moore Motor Semaphores from us, and consented to an injunction without our knowledge or consent.

We Will Defend Our Customers, and

request our customers to promptly notify us of any attempt to intimidate them into acquiescence in the validity of the Boyce Patent.

When we placed the Moore Motor Semaphore in the hands of the Motorists we placed it on the ballot of public approval. Has it stood the critical test of the motoring public? The increasing demand month after month is an answer to this question, and proves it a success. It is backed by our guarantee as to performance and quality.

We will not submit to any illegal straight-jacket or intimidation. Were we not satisfied that we have a legal right to be in this field, and that the trade demands our device, we would stop of our own accord.

And We Hereby Challenge

Harrison Boyce and the Motometer Company to sue us directly instead of attacking some distant customer who has insufficient interest to properly contest a suit, or to even advise us of the proceedings in time for us to do so.

Semaphoric Indicator Sales Company
1102-06 So. California Avenue
CHICAGO

Moore Motor Semaphore

Master Model	**$9.00**
Standard Model	**7.50**
Junior Model	**3.50**

The New Junior Model is a welcome addition and now makes the line of Moore Motor Semaphores complete

A challenge from a competitor - this advertisement appeared in the January, 1924 issue of MoToR.

1926 The Moto-Meter Company acquired National Gauge & Equipment Company of LaCrosse, Wisconsin, on September 11, 1926. The latter had been making the Radi-Meter, a dash-mounted heat indicator, as well as a variety of other gages. Moto-Meter also controlled Moto Meter Gesellschaft-m.b.H., of Frankfort, Germany, and the Moto-Meter Company of Canada, Ltd.[104]
Ads stated Moto-Meter instruments stood guardian over 8,000,000 motors.[105]
Now only Midget models had plain rims, others wore fancy wreaths on the rims. Junior models had beveled glass, similar to the larger Universals. Inner faces on the DeLuxe and the Standard were in gold finish with small Italic type lettering. Usually dials were made of zinc, discs of brass.
Some radiator thermometer lights still made; most companies listed dash.[106]
Boyce & Veeder continued listing Gasoline Treating Compounds.[107] They had a new address at Eastern Parkway, Farmingdale, Long Island, New York.
In other countries competition had been increasing. The Calormeter by the Wilmot Manufacturing Co., Ltd., Birmingham, England, was popular, and was standard equipment on Morris and MG cars. This was an open-faced meter with tube immersed in radiator water. The dial was visible day or night.[108]

1927 The company claimed Moto Meters were now guardians of 10,000,000 cars.[109]
Although they made and advertised dash-mounted types (Model H with or without illumination) and steering column-mounted types (Model S), distance types; the company recommended radiator-mounted Moto Meters (8 models).[110]
A wreathed Boyce Moto Meter with Cadillac emblem on front was used by author Harold F. Blanchard to illustrate the "careful attention to detail" which he mentioned was characteristic of the new cars in his article in *Motor*.[111]
The 1927 *Motor* Thermometer Equipment List gave Boyce and National as standard equipment for most cars.[112] Rickenbacker used Borg & Beck. Velie Motors claimed, "Only car with heat indicator on the dash."[113] That meant in that price class. Chrysler had been furnishing higher-priced cars with item.
News item mentioned Moto Meter had acquired National Gauge & Equipment.[114] (Date was September 1926.) Moto Meter name spelled without hyphen again.
Listings included Radi-Meter.[115] National Gauge & Equipment listed other gages.[116] This spelling of "gage" commoner now than "gauge".
There were no fire extinguisher listings or mixers, no Boyce & Veeder ads or listings in *Chilton Directories*, and no new Harrison Boyce products.
Radiator meter locks continued to be big business. McAdams advertised its locking caps, but were expanding the line to allied items (shutters, etc.)[117]
Metal and fiber radiator covers were listed as shutters.[118]
Radiator caps were going to extremes as manufacturers tried to combine various figures and designs with the useful heat indicators.[119] They were more than a sideline now. Irving Florman Company of New York City claimed, "We are the pioneer and originator of Modern radiator ornaments."[120]

1928 Moto Meter ads reflected its expanding lines.[121] Besides the various heat indicators, warning signals, spark plugs and tire testers were mentioned.
Their Red Ball Boyce Motor Meter had a simpler dial, with red light.[122]
While Moto Meter was getting into the spark plug business, a leader in that field, AC Spark Plug of Flint, Michigan, was making heat indicating meters. Their ad mentioned they were the world's largest manufacturer of automobile accessories.[123] In the 1928 *Motor* Equipment List 84 makes and models were equipped with the AC dash thermometer. Of the 600 total named, National supplied 125, Moto Meter 78 radiator mounted meters and 48 dash mounted, Safe-T-Stat supplied 7, and 267 cars had no report.[124] The Safe-T-Stat was made by a company of the same name located in Philadelphia, next in Brooklyn, but this year the product was taken over by Nagel Electric Company of Toledo, Ohio. Durant was the only car using Safe-T-Stat.[125]

1928 continued

Obviously 1928 was an important year of change for heat indicators. New cars appeared without the usual Moto Meters on radiators. Relieving the bare look though some followed the example set long ago by Rolls-Royce cars and had a special figure or design for each make: Pontiac's Indian, Wills Ste Claire's bird, Chrysler's winged cap, Franklin's airman figure, and Packard's "man with the doughnut". To add to the variety of these items of adornment introduced in the Twenties, ornament makers continued to supply individuals whose cars did not come equipped with some eye-catching mark of identity. A popular item offered was one inspired by the Lindbergh flight. This "Lone Eagle" came in three models, one for cars with Moto Meters. Each model had a small plane equipped with a propeller which spun as the car moved.[126] The fanciest model had an eagle atop the radiator cap. New companies continued to enter the dwindling field of heat indicators. Anderson Company of Gary, Indiana, made Anco Motector which had a glass come that fogged when the danger point was reached in the cooling system.[127] A heat indicator light with a similar name, Amco, was made by Acorn Company, Erie, Pennsylvania.[128] Chilton *Directories* used a new heading for Radiator Thermometer Lights – now "Lights, Motor Meter".[129] The word had entered automotive literature as a common term. Perhaps that is the reason the Moto Meter Company this year stated in some ads: "The name Moto Meter is the registered trade mark and exclusive property of this company."[130] They were fighting a losing battle on that point.

This pair of advertisements from the April, 1927, Chilton Directory demonstrates the shift to steering column and dashboard heat indicators, and the expansion of the MotoMeter line using the new company name.

The MoToVoX horn was one of several items which the Moto Meter Gauge & Equipment Corporation added to its line of products, many of which became standard equipment on several makes of cars in the 1930's.

By 1930 the Moto Meter Gauge & Equipment Corporation had adopted this new trade-mark, from which the name "Boyce" was missing.

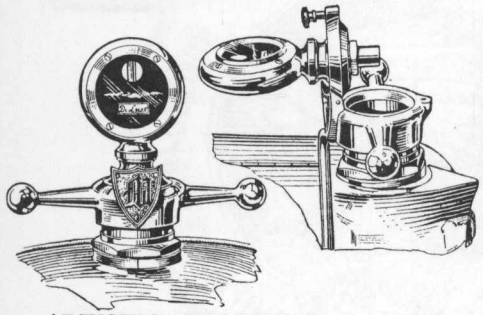
1929 The company name changed to Moto Meter Gauge & Equipment Company, but they were still in Long Island City.[131] Products included Safe-T-Stat, Nagel, Red Ball, Radi-Meter, besides Boyce Moto Meter. W. G. Nagel Electric Company of Toledo, Ohio, had been taken over, so now the only important competition in the Water Temperature Indicating market came from AC Spark Plug Company with its AC Thermo Gauges.[132] Moto Meter was pushing MoToVoX warning signals. Along with National Gauge, Moto Meter was among the few competing with their old associate, Taylor Instruments of Rochester.[133] In England an open-faced model of Boyce Moto Meter with light was made, and cashing in on interest in radios, it was called "Radio" model.[134]

1930 Now Moto Meter Gauge & Equipment Corporation had main addresses at Toledo, Ohio; Long Island City, New York; LaCrosse, Wisconsin; and factories at Long Island City, Toledo, LaCrosse, in Canada, England, France, Germany, and Australia. The new trademark reflected the various companies, but had no Boyce name included, nor did Boyce show on pictured products in ads. This trademark combined the Indian head used by National Gauge for years with a triangular insert at bottom of the circle with key and bolt of lightning design inside triangle. A heavy-lettered MOTOMETER was at top, "Trade mark Reg. U.S. Pat. Off." below, and circling the Indian the name of the company. The full line of major products was advertised: heat indicators, oil pressure gauges, tire testers, and MoToVoX, "The warning signal that has taken the country by storm." A list included all the various products the three main companies had been making: automobile, marine, and aviation instruments (the latter a growing business); automobile panels, Bakelite parts, and spark plugs. Final in the list was "Electric Temperature Gauges — Sole Sales Agents for Boyce Moto Meters."[135]

The *Motor Annual* Specifications pages showed that the company was supplying ammeters, thermometers, gas gauges and car locks to many 1930 cars.[136] Moto Meter Gauge had a line of combination mascots and temperature gauges. This continued the company's policy over the years of catering to tastes of owners. Their basic models could be changed to fit cars, trucks and tractors with special problems, and the faces of the gauges could also be decorated with owner's name, car name, or other insignia.

An interesting new model was the Gardner Front Drive Six. It had no separate parking lights, instead used in front the MoToVoX signal of Moto Meter.[137]

MONOGRAM
The
Automatic Locking Radiator Cap



ARTISTIC—PRACTICAL—SECURE

A perfectly safe and secure device that **stops the** petty thief from stealing Moto-Meter.
No keys or locks to bother with. **Screws on like** ordinary cap. **Does not screw off** without shop tools.
Radiator can be filled **without removing anything from car.** Steam and water tight.
Shield furnished separately with beautifully engraved **initial or fraternal emblem,** which adds a touch of distinction to the **finest make car.**

NEW SAFETICAP FOR FORD CARS
Has same locking feature as Monogram Cap, but is furnished without the shield. List price, $4.25.

Sold by America's leading jobbers
JOBBERS: Write for Details

General Automotive Corporation
Wrigley Building, Chicago

---

5 Styles B&B 3 IN 1 **5 Styles**

A CAP FOR EVERY CAR

LOCKS TO MAKE THEM THEFT-PROOF

Dealers Wanted

A Good Accessory to Handle, With Good Profit

Write Today for Samples and Proposition

Styles

Large Round **Small Round**
Eagle Wing **Octagon**
Octagon **Ford**

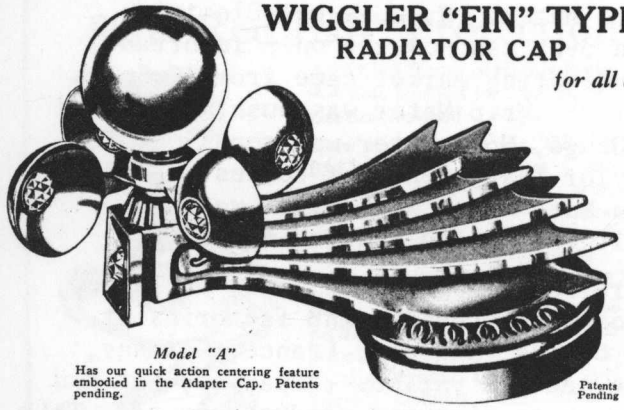
Originators of the Radiator Bar Cap

Made of Solid Brass, Triple-Nickel Plated

B. & B. Accessories Co., Inc.
8 and 10 Pembroke Arcade Indianapolis, Ind.

The MotoMeter was one of the most popular accessories ever to be offered to the motoring public, and as such it became a tempting target for thieves. Dozens - perhaps hundreds - of accessory makers produced locking devices similar to the pair shown here in advertisements from the year 1922.

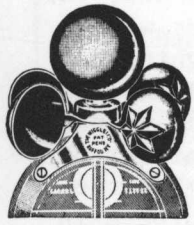
WIGGLER "FIN" TYPE
RADIATOR CAP
for all cars

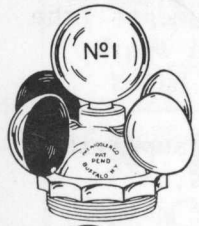


Model "A"
Has our quick action centering feature embodied in the Adapter Cap. Patents pending.

Patents Pending

This model is very appropriate for the finest cars. Superior in originality, design, workmanship. Far ahead of all other ornaments and more symbolic of flight or speed. Highest quality finish.





ROTASCOPES

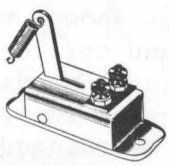
Patented December 8, 1925 and June 29, 1926
Infringers will be prosecuted

Our products are making new sales records all over the world. The demand exceeds all former records for Rotascopes and other famous Wiggler Products.
All Rotascopes now furnished with or without jewelled cups.
We also manufacture flag, pennant and emblem holders.

No. 0 Rotascope for General Use (no cap)
No. 1 Regular Ford Rotascope
No. 2 Fender Rotascope
No. 3 Universal Motometer Rotascope
No. 4 Midget Motometer Rotascope
No. 5 Ford Bar Cap Rotascope
No. 6 Chevrolet, Star or Essex Bar Cap Rotascope
No. 7 Flag Holder
No. 8 Gazing Globe for Universal Motometer
No. 9 Gazing Globe for Midget Motometer
No. 10 Gazing Globe only (Screw, nut and washer)
No. 11 Ball type Fluted Ford Cap
No. 12 "WIGGLER" Truck Signal
No. 13 "Snappy" Stoplight Switch

Order Wiggler Products by number—it saves confusion. Ask your jobber. If he can't supply you, write us direct.

THE "WIGGLER"
Truck Signal
List Price $2.00



No. 13
Stop Light Switch
List Price 50c

THE WIGGLER COMPANY
2355 Main St., Buffalo, N. Y., U. S. A.
Export Office: 116 Broad St., New York City

Some manufacturers even designed items to be attached to the Motometer itself - accessories for an accessory! Some models of the "Rotascope" (a useless and distracting gadget) shown in this 1928 advertisement, were made to fit various sizes of MotoMeters.

1931 By this time fewer bolt-on devices were made for radiator-type Moto Meters. Plainer hoods, low radiator caps or restrained ornaments with caps were the style. The Lincoln still sported its racing dog, Pierce-Arrow its archer, while some other makes displayed emblems on only certain models. Almost every car still had the wide metal radiator shell, and in it the radiator fill pipe with cover, all a distinctive part of body design. The talk, though, was of streamlined design. Until radiators changed drastically, there was still demand for one accessory, shutters. Pines continued to be a leader in that field, and had expanded its plant capacity recently.
In the early Thirties dash gasoline gauges were of two main types: the hydrostatic (King-Seeley the leading maker) and the electric (Electric Auto-Lite and Moto Meter leading makers). Moto Meter's was the RKD Electric gasoline gauge.[138] Ammeters were provided by AC, Stewart, U. S. Gauge and Moto Meter, with a few by Weston (not Western) Electric Instrument Company. Moto Meter led with thermometers, although King-Seeley and AC provided some.
Along with automobile production, that of accessories and parts was at a low point this year compared with the mid-Twenties — a peak time for Moto-Meter Company. The U. S. Commerce Department's *1931 Biennial Census of Manufacturers* gave a value for this classification, though it was not reported by different kinds of auto parts and accessories. Value of the production in 1925 was $647,853,494; in 1931 it was $348,521,610.[139]

1932 Address of Moto Meter Gauge & Equipment Corporation was given as Toledo, Ohio, with other locations for plants. However, no mention was made of any plant or office in Long Island City or in New York City.[140]
Despite a long list of products in their ad, specification pages on 1932 cars in *Motor* had the Moto Meter name only under the ammeter, thermometer, and gas gauge headings. Many of the products advertised, though, consisted of shop equipment and industrial supplies. Stewart-Warner and Sterling Clock were among the suppliers of thermometers for 1932 cars.[141]
One new car came out with concealed radiator cap. The Hupmobile 8, featured in *Motor Annual*, showed a stylized "H" in the usual place of a radiator cap. The article reported, "Radiator shell is tastefully decorated. The water filler is under the hood." Of course the thermometer gauge was on dash.[142]

1933 What was important now in accessories? Radio was so popular some cars were coming out of factories with built-in antennas even though the radio itself was an optional accessory. Some 1933 cars still classed heat indicators as accessories; when standard, they were located on the dash.[143]
Aero-dynamic streamlining was noticeable at National Automobile Shows, and the flat radiator out front was less common.[144] More filler caps were inside.

1934 After taking over numerous companies throughout the years, the time had come when the Moto Meter Company would be absorbed by another which had survived Depression Years better than it had. A notice in *Motor* for April, 1934, stated: The stockholders of Electric Auto-Lite Corp., coincidental with the absorption of Moto-Meter Gauge & Equipment Co., have been asked to sanction a change of name." The name had not yet been decided on; also there would be some changes in the articles of incorporation.[145] From here on the address for the Moto Meter Division was given as LaCrosse, Wisconsin, and this was to be used in ordering ammeters, gauges, thermometers, horns, etc.[146]

1935 The same companies were supplying thermometers for 1935 cars as during the last two years, also gas gauges, ammeters, and, except for the MoToVoX horn, Moto Meter instruments held a leading place among suppliers.[147]

1936 on...To stimulate the economy, 1936 auto models were introduced during the preceding fall, so *Motor* put out its Annual Number in November, 1935. According to the Tables more cars were using the Moto Meter ammeter, speedometer and gas gauges; only Chrysler was using their horn.[148] An article with pictures of new Pontiacs indicated the trend towards all-in-one instruments. On the dashboard were two round dials, each with a red dot. That on the speedometer lighted when upper headlights were on; the article stated that on the dial with gas and oil gauges and thermometer, "Instead of an ammeter, a red jewel lights up when the battery is discharging."[149]
Electric Auto-Lite's ad in the Annual included the names "Motometer", "USL Batteries", "Corcoran-Brown", and "Prest-O-Lite" alongside its own and a long list of over a hundred products for autos, aircraft, industry, sales, even kitchens showed their diversification.[150]
In another 1936 ad Auto-Lite named its companies and subsidiaries in the United States and Canada at the time. Moto Meter in LaCrosse produced 12 different items.[151] Radiator type Moto Meters were still listed but not shown on new model cars. One item listed in a *Motor* Manual covering cars between 1935 and 1948, but not heretofore mentioned, was the Moto Meter Neco electric gasoline gauge. It was used on various popular cars between 1935 and 1938 but on only the 1939 Packard and Lafayette up to 1940. From then on, Auto-Lite brand or that of a competitor was named.[152] In another book the part was called Moto Meter National.[153] Such references to Moto Meter and its various products kept disappearing gradually over the years.

Electric Auto-Lite had acquired its various companies along the way — most in the automotive field — to supplement its original electrical systems. In the Twenties it was American Bosch Magneto, Gray & Davis, Prest-O-Lite, and several others.[154] In the Thirties it was the Moto Meter Company and its subsidiaries. Later the process started to reverse. In 1961 Ford Motor Corporation purchased two of the Auto-Lite plants, those that made batteries and spark plugs.[155] Then in 1963 the company merged with Mergenthaler Linotype Company to become Eltra Corporation with branches all over the world and in cities in this country.[156] The two cities which were featured in the history of Moto Meter were not mentioned — Long Island City, New York, and LaCrosse, Wisconsin — and none of the Moto Meter patents were included.

MODERN DEVELOPMENTS: Even though it may not appear on modern factories, the Boyce Moto Meter name lives on in the world of old cars. Original instruments, both those made by the Moto Meter Company and by its numerous competitors, have been collected by many individuals and museums. Since drivers of early cars up through the Twenties have always found a temperature gauge a useful and attractive accessory, the supply of originals available to present-day driver/collectors cannot supply the demand. Therefore, the most popular models are being reproduced in authentic detail by several firms named below:

Pulfer & Williams, Robbins Road, RFD 1, Rindge, New Hampshire 03461.
Greenland Company, 3761 Hillway Drive, Glendale, California 91208.
Omego Imports, 46 Main Heights, New Canaan, Connecticut 06840. (They sell the MESSKO MM German-made instruments with centrigrade markings and small bulbs.)

These companies have various dealers and some car catalogs list their items. Harry Pulfer has been a leader in this field, and his company, Pulfer & Williams (W. C. Williams), supplies instruments for most every car which used Boyce Moto Meters. Also, they make up special orders as well as repair original instruments. These items are working instruments designed to carry on the Boyce and Moto Meter purpose of saving the driver from worry and expense by guarding his motor.

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As They Are Now . . .

The pictures on the facing page were sent by SAH Member J. H. Valentine, Culver City California, with the "....thought that perhaps they could be added to the pile of as-they-are-now, before-they-are-gone group."

THE AUTO VEHICLE COMPANY, 943 North Main Street, Los Angeles, California. This two-story brick building was used in 1902, 1903, and 1904 for building the TOURIST car. Auto Vehicle moved to Tenth and Main Streets South for the remainder of its life. That building, along with others (including the DUROCAR Manufacturing Company) has made way for a large high-rise building using a full block of property. The building shown was used both before and after Auto Vehicle for machine shop and foundry purposes, but now appears to be used only for storage.

(1). Front view of AUTO VEHICLE factory. (2). Side view from front.
(3). Side view from rear. (4). Rear view of building.

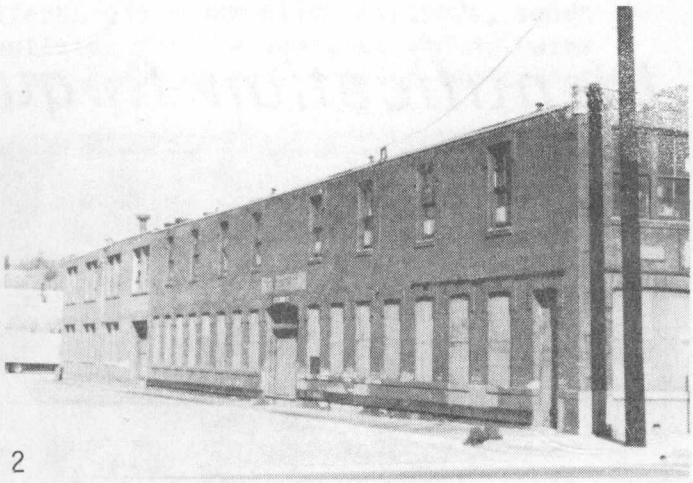
The KLEIBER MOTOR TRUCK COMPANY, 1100 South San Pedro Street, Los Angeles. The company, known as the Kleiber Motor Company from 1927 on, used this building as both factory assembly area and sales from 1924 to 1928 for KLEIBER trucks, and from 1925 to 1928 for KLEIBER automobiles. After this the passenger cars were dropped, and the trucks were built only at the company's San Francisco plant. The building is presently used as a terminal by a long-distance trucking firm.

(5). The former KLEIBER plant in Los Angeles.

PACIFIC STEAM CAR COMPANY and ENDURANCE STEAM CAR COMPANY, 1246-48 South Flower St. Los Angeles. Pacific was the manufacturer and Endurance the sales organization for the ENDURANCE steam car. They shared the one-story brick building, their company officers, and their short term in business in 1923 and 1924. The building is presen ly occupied by a merchandise firm.

(6), (7), and (8). Three views of what was once a steam automobile factory.

1



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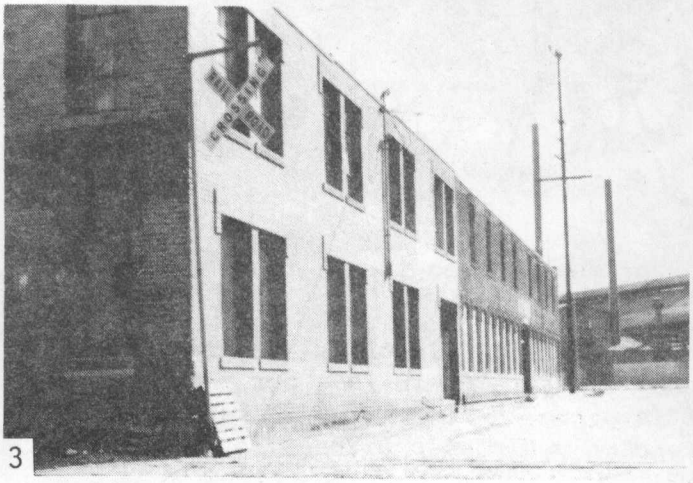

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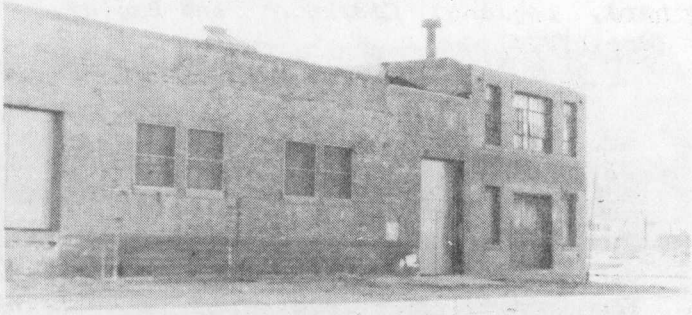


4

5


HARRY ROSENBLATT & SONS

6


HARRY ROSENBLATT & SONS
DISTRIBUTORS
WAREHOUSE SALE
BUY DIRECT & SAVE BUY DIRECT
50 TO 90
OPEN TO THE PUBLIC

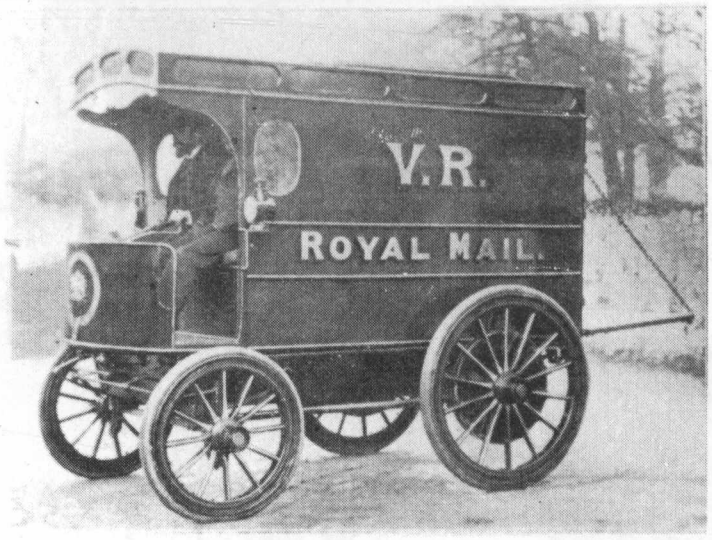
7

8

Identification Requested

SAH Member J. H. Valentine sent a picture that is a puzzler:

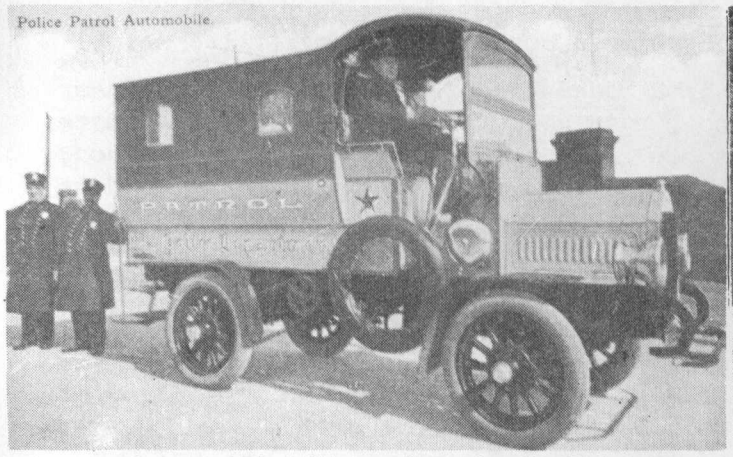
Being a fan of the "Mystery Cars" in AHR, I thought I may have another puzzler here. I enclose this copy of a picture from The International Yearbook *(of)* 1899 copyright 1900 Dodd, Mead and Company. *It is identified only as "the Royal Mail steam van of England". It is accompanied by another picture of what is obviously a LIFU, and the breif (sp) text mentions Thornycroft, Coulthard, Leyland, Clarkson, and Bayley. (Not LIFU!).*



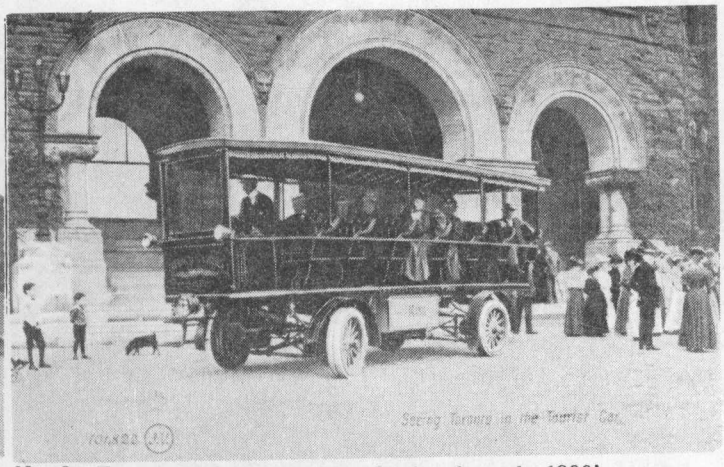
Member G. N. Georgano at the National Motor Museum, Beaulieu, found another bus picture to identify:

Here is another mystery photograph for you. It is an electrical sight-seeing bus taken in New York. It was published in the Car Illustrated *in 1906 but may well be a few years earlier in date. I would think it is either a Columbia, Riker or VEC, as these were the major manufacturers of this type of vehicle, but do you or any of your readers know exactly how to distinguish them?*

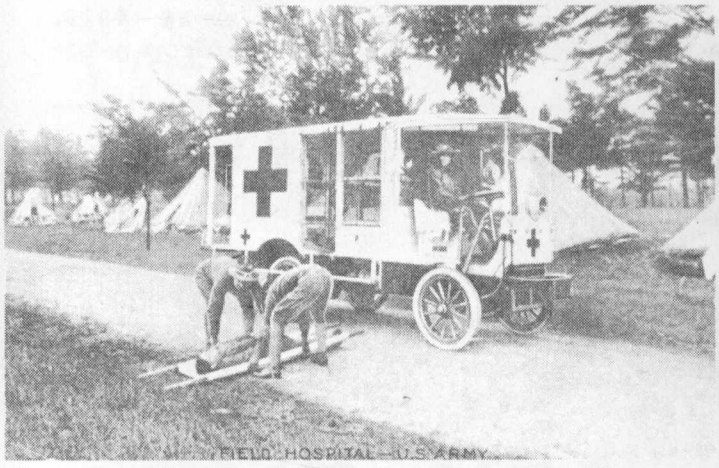
Member Richard J. Sagall, Toledo, Ohio, who collects old automobile postcards, sends the following group in the hope of establishing identities for the vehicles shown. Dates mentioned are the postmark dates on the cards - not the supposed dates of the cars themselves.



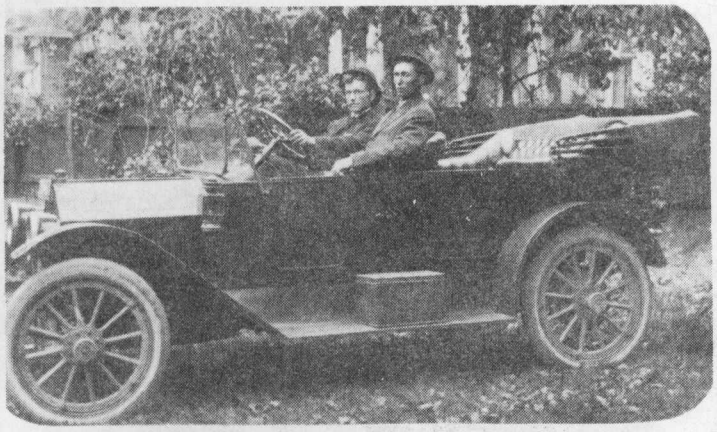
No. 1. Card postmarked at Chicago, September 12, 1911.



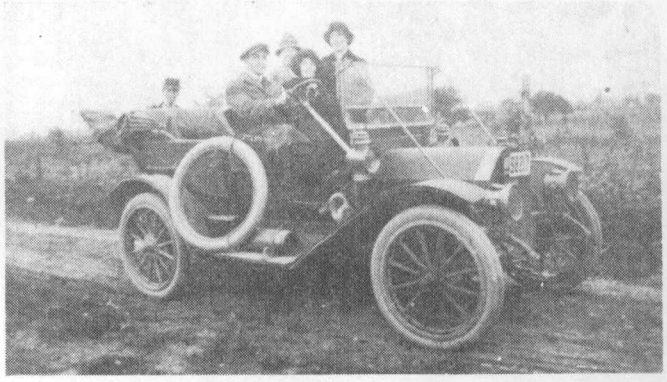
No. 2. Toronto sight-seeing bus. Obviously early 1900's.



No. 3. Army Field Hospital Car. Card postmarked 1921.

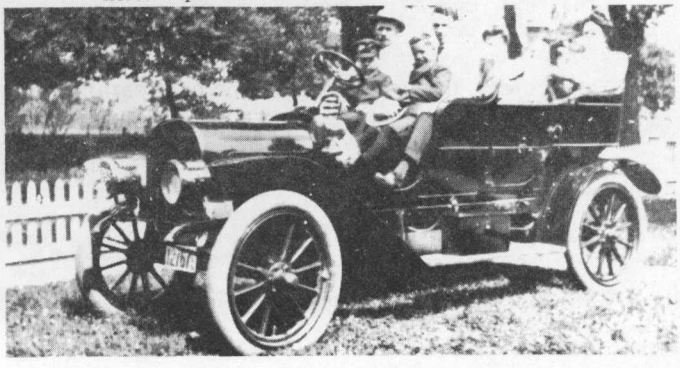


No. 4. No date on card. In the original picture the number '31' is plainly visible in the center of the hubcaps.



No. 5. No. date on card. The Ohio license tag is dated 1914, but the car looks more like 1911.

No. 6. 1908 date on license plate. Absence of starting crank suggests engine under seat. Note that two filler caps are visible on the hood.



No. 7. Card is postmarked July, 1910. Narrow band at front of hood instead of wider radiator shell suggests air cooling. Like car No. 6, no starting crank is visible and there appear to be two filler caps on the top of the hood. The hood is flared outward at its lower edge where it meets the frame, similar to the style of the 1908 Studebaker and Frayer-Miller cars, of which this car seems to be neither.

ANSWERS TO IDENTIFICATION REQUESTED ...

From G. N. Georgano, Ringwood, Hants., England:

Here are a few comments on the "Identification Requested" photos. (Issue No. 5)

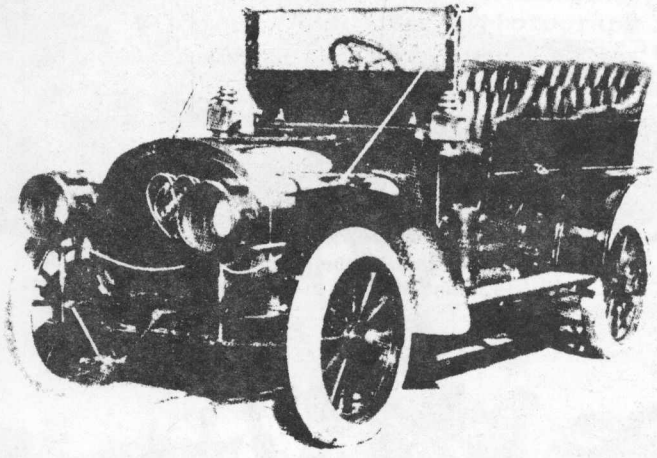
(1) Gilmore tanker truck is definitely a White Model 731 of 1935, with 12-cylinder underfloor opposed engine. It is probable that Standard Auto-Body Works did no more than supply the special cab and decorative sheet metal around the tank. The tank body itself is more likely to have come from Heil who were specialists in this kind of work. All this information was sent to me by Rolland Jerry shortly after I sent the photo to Mr. Wawrzyniak.

(2) Texaco tanker truck. This is almost certainly a GMC of the 1939-42 era. In Gini Rice's book, GMC Gems, *page 144, there is a photo of two GMC Model AFTX-854 trucks, operated by Texaco, whose appearance is very close to this one, although they had divided windshields and slightly different grilles. I remember having a GMC catalog of 1941 which illustrated a similar tanker, though with different grille again, more square in shape.*

(3) Bus. I am much less certain about this, but it could be an ACF of about 1929. The thick radiator shell matches with some ACF photos I have, and the teardrop headlights could be a special fitment.

AUTOMOTIVE ODDITIES

by Richard Brigham



A CAR WITH TWO ENGINES

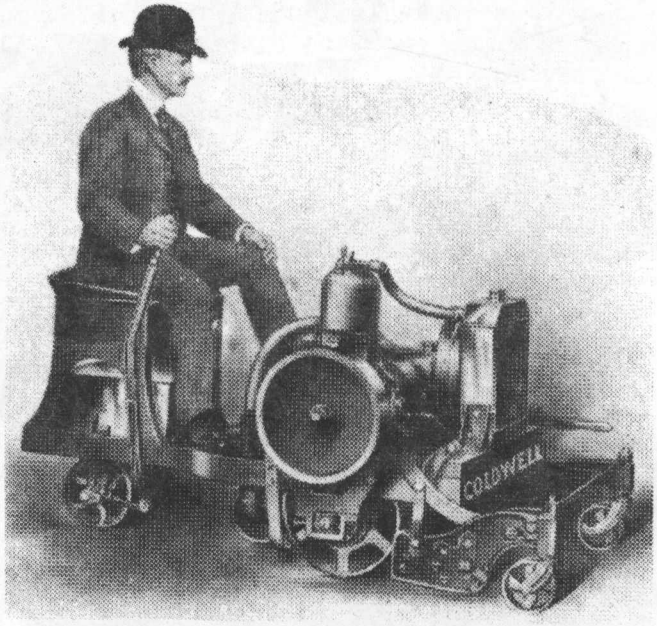
This is the Carter Twin-Engine car, made by the Carter Motor Car Corporation of Washington, D.C., in its plant at Hyattsville, Maryland.

The Carter was equipped with two identical four-cylinder engines of 35 horsepower placed side by side under the hood. The radiator was divided into two sections, one for each engine, and there were two complete exhaust systems. Note the two starting cranks.

The car could be operated on either engine or both at the same time. The designers seem to have had complete reliability in mind, although by 1907, when this car appeared on the market, the internal combustion engine had become a dependable source of motive power.

Apparently the makers of the Carter came to the conclusion that two engines were just one too many, for in 1909 the dual-engined car was discontinued and replaced by a new car called the Washington, which had only one engine. This car was made until 1911.

The Carter Motor Car Corporation was succeeded in 1911 by the Washington Motor Car Company. Trade publications and other references indicate that the new company remained in existence until 1917, but produced few, if any, automobiles.

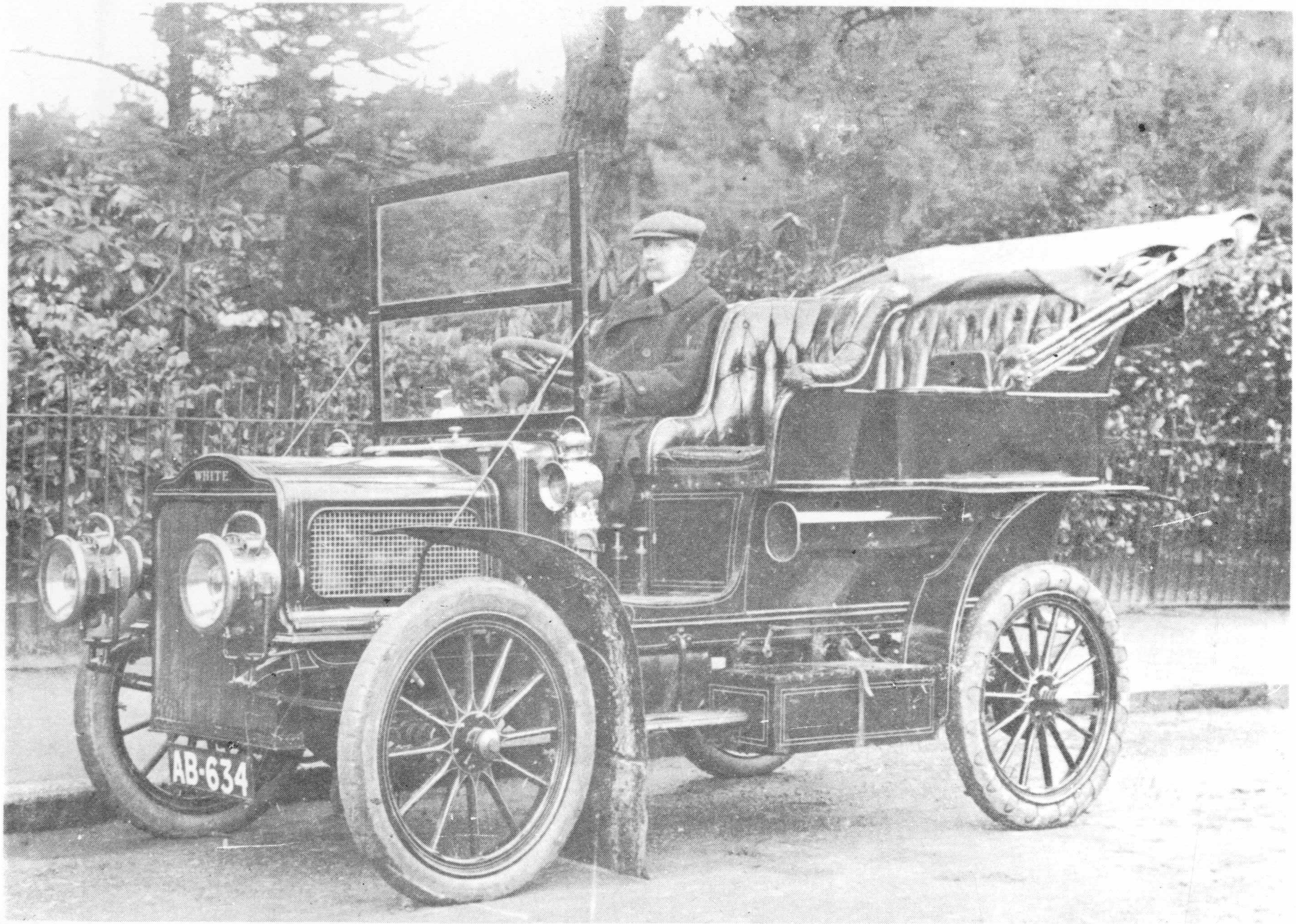


COLDWELL MOTOR MOWER, 1905

This somewhat primitive version of the riding lawn mower was made by the Coldwell Lawn Mower Company of Newburgh, New York, in 1905. Note the water-cooled engine, with automobile type radiator. Steering seems to have been controlled by the lever in the gentleman's right hand, which was connected to the single rear wheel.

If this picture is to be believed, the well-dressed yardman of 1905 wore a business suit complete with collar and tie, plus a derby hat.

The illustration was taken from an advertisement which appeared in *Rider and Driver* magazine, May 6, 1905. This advertisement states that these machines "...are used exclusively on the parks of New York, Brooklyn, Buffalo and many other large cities exclusively, and by all the leading Golf Clubs of the United States and Canada."


WHITE
AB-634

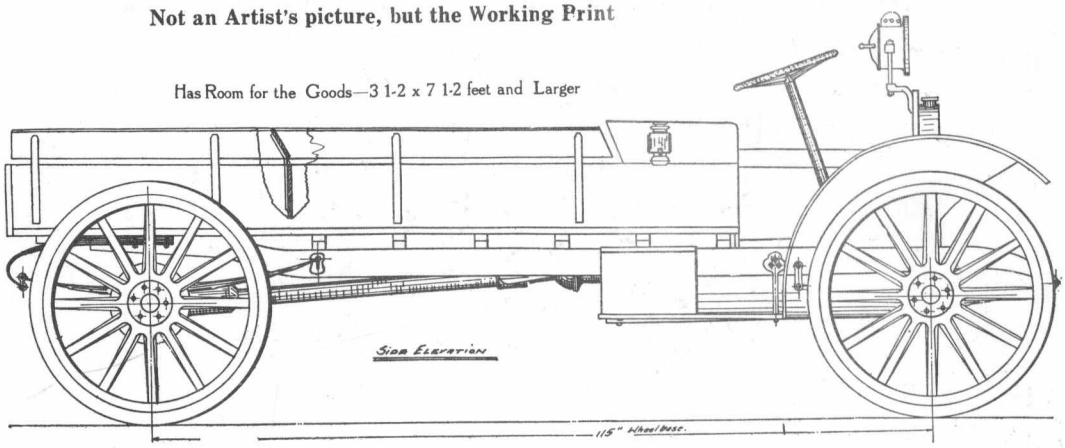
We offer no Advice

But Beg to Advise that We Build the Car Your Business Will Have to Have

HERE IT IS--LOOK AT IT

Not an Artist's picture, but the Working Print

Has Room for the Goods—3 1-2 x 7 1-2 feet and Larger



Capacity—Half-Ton

Specifications

FRONT AXLE—Drop Forged I beam, steering yokes extra wide and equipped with ball bearings at top.

REAR AXLE—1 3-8 inch chrome nickle steel spindles. Hyatt Roller Bearings. Browne-Lipe differential, 6-1 reduction, shaft tube furnished with yoke.

BRAKES—Four contracting and expanding—operating on 12 inch drums.

SPRINGS—2inch by 36 inch semi-cliptic in front and 2 inch by 44 inch three quarter ecliptic on the rear.

FRAME—Steel channel section 3-16 inch by 1 1-4 inch by 4 inch.

WHEEL BASE—115 inches, tread 56 inches.

COOLING—Water—flat tube radiator—fan.

MOTOR—4 cylinder 3 1-2 by 4 1-4, 3 large bearings, valves adjustible and inclosed, large hand holes for ajustment. Motor and transmission a unit.

LUBRICATION—Integral with crank case base, force pump to bearings and splash to pistons, etc.

IGNITION—Dual—New Remy Magneto and dry cells.

TRANSMISSION—Selective, 3 speeds forward and reverse, ball bearings.

STEERING—Fore and aft, 16 inch wheel with controls.

WHEELS—Strong and stocky, 34 inch over all, 1 3-4 inch spokes, heavy hubs and flanges.

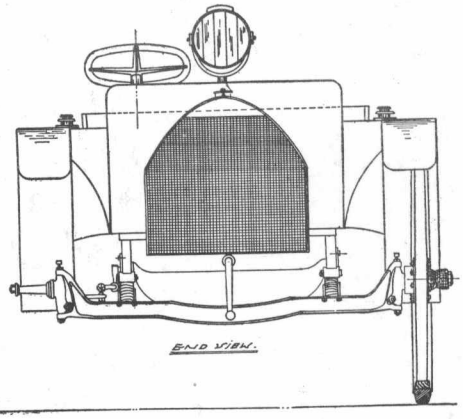
TIRES—Solid 2 1-2 inch front and 3inch rear.

REGULAR BODY SIZE—3 1-2 feet by 7 1-2 feet inside measure back of seat. Furnished with flare boards.

EQUPMENT—Kit of tools, 3 oil lamps, one large gas head light on swivel, and generator.

It runs Right.

CALL ON US TO CALL ON YOU



Why Use a LUCK-TRUCK?

Economy Renders the Motor Wagon Imperative.

SAVES TIME—MAKES TIME.
SAVES MONEY—MAKES MONEY.
SAVES NERVES—MAKES NERVES.
SAVES CUSTOMERS—MAKES CUSTOMERS.

Sundry Considerations Favoring Its Adoption.

Costs one cent per mile while running.
Cost nothing when not running.
Requires no morning, night or Sunday chores.
Does away with sick and lame horses.
No suffering in cold weather.
Never exhausted in hot weather.
Does not even get tired.
Does not shy at paper, trains or brass bands.
Never runs away or kicks the wagon to pieces.
Absolutely reliable wherever you drive or leave it.
No care or responsibility when not in use.
Cost less at our prices than the necessary horses and wagons.
With a sane man at the wheel will cost practically nothing for repairs.
It is clean and sanitary.
The public is calling for it.
Inquiriee about this car ofr both home and foreign trade are deluging us and sales have begun.

Special Features

DRIVER'S SEAT POSITION—Well to the front and low, convenient for frequent mounting and dismounting, while the driver is protected by the fender and dash. Which fully incloses the front. The driver's feet and the controls are along side the motor which is protected by a close fitting cover, or diminutive hood. It is in the regular position and easily accessible.

BODIES—This position of the seat gives large and roomy bodies. Regular size, back of seat, 7 1-2 feet by 3 1-2 by 10 inches. Furnished for all special purposes, furniture electrical work, etc. in any size and construction. The load is carried well between the axles avoiding rear overhang and consequent jumping, and the load level being low, only 28 inches from the ground, there is no high lifting and no swinging.

SHAFT DRIVEN REAR AXLE—We have worked persistently to avoid the use of noisy chains, and after two years have succeeded in getting a high grade rear axle of wide reduction. This ratio is 6-1 and gives the slower movement required for commercial and industrial purposes. It carries heavy spindles of the finest chrome nickle steel, has the Browne-Lipe differential and Hyatt Roller Bearings. All working parts can be disassembled and reassembled without being taken from under the car. Remember, there are no chains to clank and rattle.

It is Built Right.

The Price is Right

Cleburne Motor Car Manufacturing Company

CLEBURNE, TEXAS