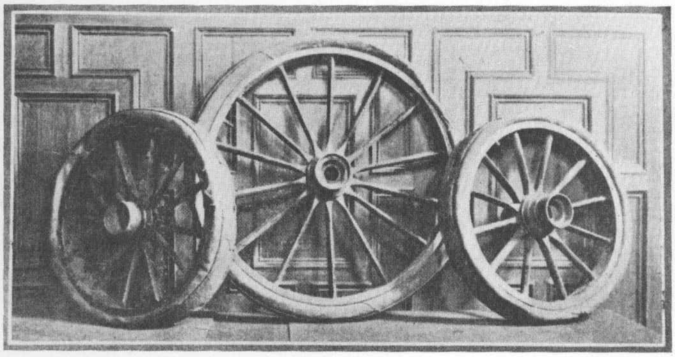
The Society of Automotive Historians

AUTOMOTIVE HISTORY REVIEW

FALL 1982 ISSUE NUMBER 15

A PUBLICATION OF THE SOCIETY OF AUTOMOTIVE HISTORIANS, INC.

From the Editor



The object on our cover is a reproduction of one of the "aerial wheels" patented by Robert William Thomson (1822–1873) December 10, 1845 and actually put into use in the next few years. It appears on our cover for two reasons: first because this was probably the earliest attempt to use air and vulcanised rubber in a vehicle tire, and second, because it relates to and extends the story of the work of this nineteenth century pioneer and his ardent supporter, Col. R. E. B. Crompton, which is the lead article in this issue. The details of Thomson's tires and his attempts to put them into practical use deserve our attention.

The wheel on the cover and the similar one on this page exist in the Science Museum, South Kensington, London, and it is through the excellent assistance of Mr. Peter R. Mann, Assistant Keeper of their Road Transport Collection that the photos and some of the other information on Messrs. Thomson and Crompton have been made available. Mr. Mann sent me copies of the descriptive placards used with the display of these wheels and our captions for the photos reproduce substantially all of their texts in which the construction of Thomson's tires is clearly described. The first set of these tires sold cost £42.2/- with an additional charge of 12 shillings for a "Brass Condenser" (tire pump). Lord Loraine at Albury Park and the Duke of Northumberland were among the customers who had Thomson's "aerial wheels" fitted to their broughams.

A set of these wheels that was run for three months in 1847 afterwards was retained by the makers until the early nineties, when they were retrieved from storage and put on display at one of the yearly Stanley Cycle Shows. By this date, of course, Dunlop had "re-invented" the pneumatic tire and a company bearing his name, as well as others, were in the business of building tires, primarily for bicycles. Someone from the Dunlop Tire Company saw Thomson wheels and is said to have purchased them for £250. They subsequently disappeared and it is believed that they probably were destroyed by the Dunlop Co. as being the only existing evidence that Thomson's tires were actually made and used. Some time after 1893 and before 1910 these reproductions were made to represent the wheel as patented, probably by Dunlop, as they were the source of the two on display.

The reproductions are thought to be heavier than the originals, and furthermore not to be identical with Thomson wheels built earlier than 1847. The grandson of the maker of the original 1847 set imparted this information to a representative of the Science Museum in 1922.

continued on page 2

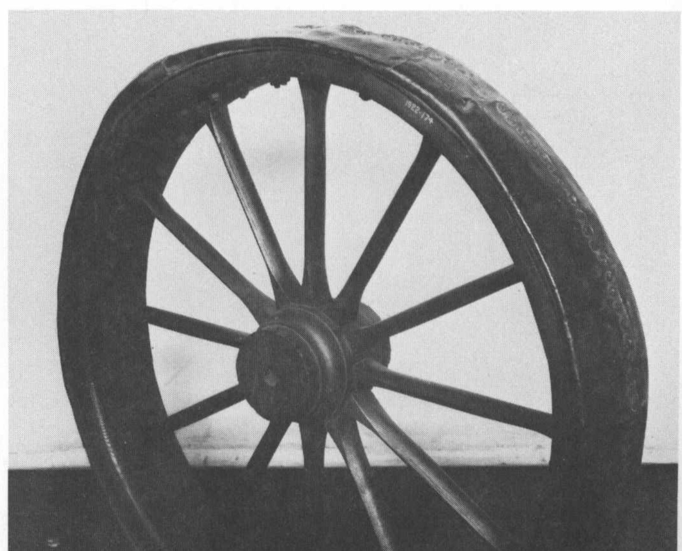
This is a reproduction of one of the original forms of the pneumatic tyre patented by Mr. R. W. Thomson in 1845 and is based on the drawings and description given in the patent specification.

Thomson's tyres were actually made and tried on horse-drawn carriages in 1847 and were found to be noiseless and comfortable and to greatly reduce the tractive effort required. The Mechanics' Magazine for 27th March, 1847, contains an article describing some tests made on a Brougham fitted with such tyres, in which it is stated that the tyres were said to have travelled more than 1,200 miles and showed no signs of deterioration. There is no mention of punctures in these early days, but in the patent specification the inventor is clearly concerned with the question of preventing the tyre from being cut.

The use of pneumatic tyres, however, did not develop at the time, probably because their cost and the extra trouble involved did not make them worth adopting. Solid rubber tyres, however, which also appear to have been covered by Thomson's patent, did gradually increased in popularity. On the advent of the safety bicycle the pneumatic tyre was independently revived, re-patented and developed by Mr. J. B. Dunlop, and such tyres are now almost universally used on bicycles and motor vehicles.

The tyre shown has a single continuous inner tube, constructed of rubber and canvas in the manner described in the patent specification, which is surrounded by a leather casing built up of sections sewn together. The wheel is made of wood in the ordinary way but has a very wide rim, 7.5 in. across, with flat iron tyre. The leather cover is laid open upon this and bolts are passed through it and the rim to secure it. The air tube is then laid on the cover, the two edges of which are turned over to enclose it, overlapped and riveted together. For blowing up the tyre a small rubber tube is vulcanised to the main inner tube and is bound around a metal tube screwed for connection to the inflator. This tube is passed through a hole in the rim. No valve is fitted, but a leather seated screw cap was used to seal the end of the filling tube.

The wheel shown is 47 in. diameter over the iron tyre, while the air tube when inflated would be about 6 in. diameter.



A PUBLICATION OF
The Society of
Automotive
Historians INC

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AUTOMOTIVE HISTORY REVIEW is a publication of the Society of Automotive Historians, Inc. Typesetting and printing by Wellesley Press, Inc., Framingham, MA 01701.

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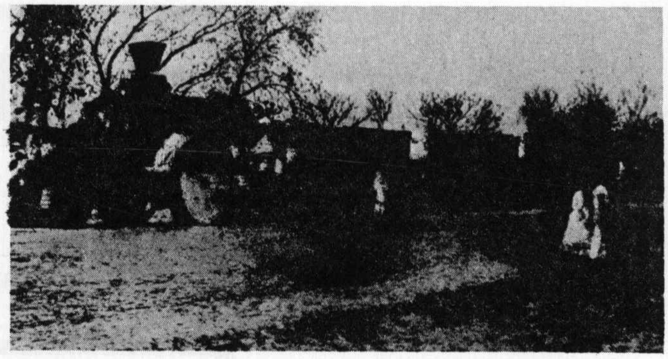
Front Cover: Replica of an original Thomson tire.

Further information about the Society of Automotive Historians, Inc., may be obtained by writing to the Society of Automotive Historians, Inc., c/o National Automotive History Collection, Detroit Public Library, 5201 Woodward Avenue, Detroit, MI 48202.

FROM THE EDITOR, *continued;*

The small photos of three wheels was copied from the "The World on Wheels", by H. O. Duncan, 1926. According to Duncan, who was closely involved with much that happened in cycling and motoring circles in England in the nineties, after the original Thomson wheels "were unearthed in a forgotten corner of a coach works", then "They were afterwards kept for several years in the office of Mr. Roger Wallace, K. C.". Since the background of the photo is a panelled wall more appropriate to a law office than a carriage house, it seems quite probable that the wheels shown are the originals. Dates and details in the Science Museum account, the Duncan Account, and in a booklet issued on the 100th anniverasary of Thomson's death do not always coincide, but it appears that the history of the Thomson wheels is substantially as described.

The story of Robert Thomson and his pneumatic tire is another example of the ability men of imagination have always enjoyed to conceive very practical ideas well before the technological means to implement them successfully existed. But Thomson did not rest on his ideas. Unable to get rubber companies to produce materials of suitable qualities to make his pneumatic tires a success, he turned to other pursuits, which included successful applications of solid rubber tires. These absorbing adventures form the basis for Col. Crompton's story, which Max Gregory brought to our attention.



Indian Transport Service Road Train, 1871-1878.

The Science Museum description of the tire on the front cover.

This is a reproduction of one of the original forms of the pneumatic tyre patented by Mr. R. W. Thomson in 1845 and is based on the drawings and description given in the patent specification.

The construction of the wheel is similar to that shown near by, but the inner tube, instead of being a single continuous tube, is composed of eight short closed tubes each occupying one eighth of the circumference of the tyre and each having its separate filling tube. In accordance with a construction described in the patent specification, the tube has been stuffed with some loose elastic material in addition to the use of compressed air. Both the stuffing of the tube and its division into short sections were suggested as means of preventing the tyre being cut, since it was less likely that a sharp object could press the cover directly against the hard metal rim of the wheel.

The outer cover is made in two halves, one of which is bolted to the rim while the other is riveted to the first along one edge, turned over to cover the inner tube, and laced along the other edge. This construction enables the tube to be removed after unlacing the cover. About 1849 the outer cover was made of canvas and was provided with a rubber bearing band on the tread.

In another construction described by the inventor, the inner tube was to be composed of several tubes each passing completely round the wheel, and it was claimed that if the tubes nearest the wheel rim were filled with air more highly compressed than those nearest the tread of the tyre, "this would serve to graduate the resiliency of the belt in a manner highly favourable to the efficiency of its action".

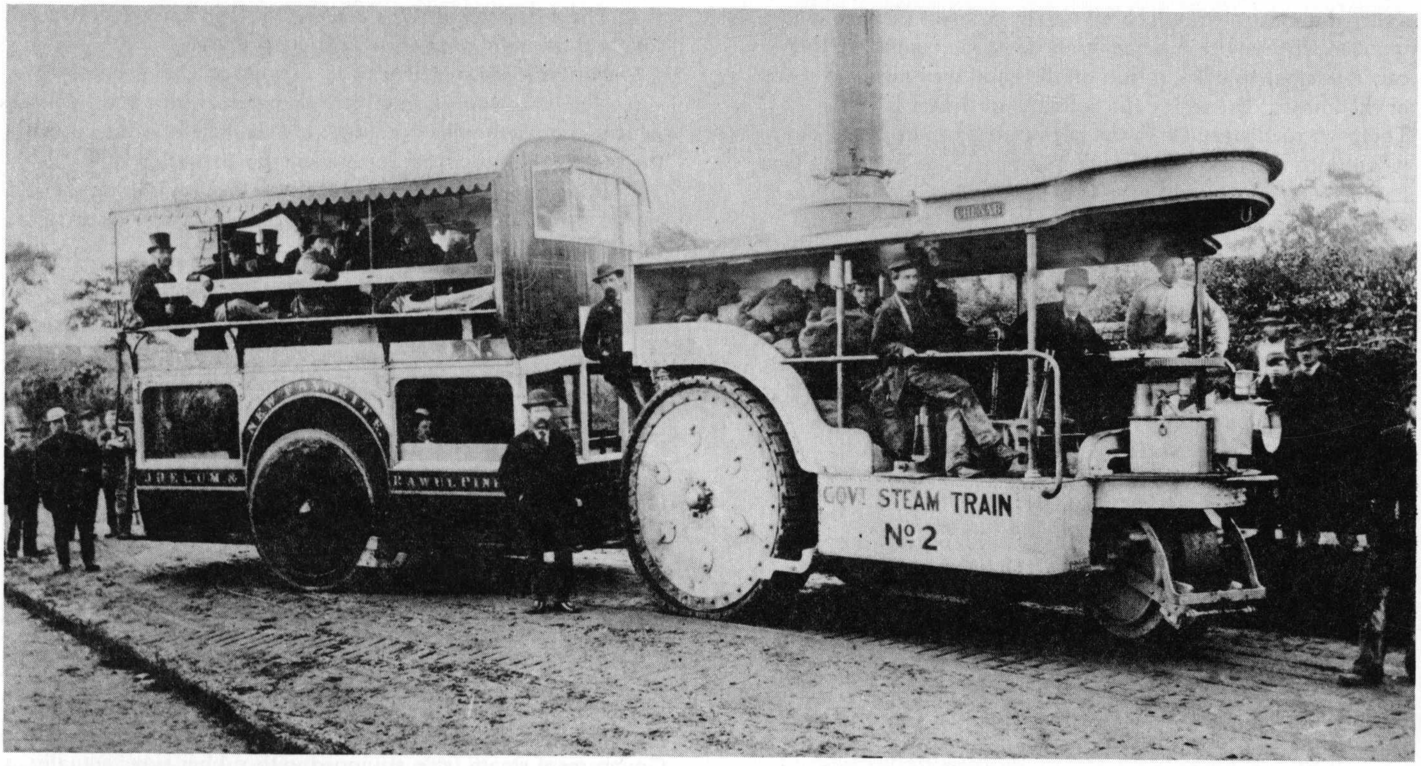
It is interesting to note that Thomson's patent also describes the use of rivets to be held in place in the outer leather cover between washers in order to increase the grip of the tyre on the road. Tyre treads of this type were commonly used for motor cars early in the present century.

An Introduction to the following article
By MAX GREGORY

Given the expression of interest shown in recent issues of the A.H.R. in the early road steamers used in Scotland during last century, perhaps the following piece on the Thomson developments, which I recently encountered in an Australian journal, the "Coach and Motor Builder" of December 1925 and January 1926, will help to fill in some gaps. Despite the undoubted efforts made by Thomson in developing road steamers for haulage, he is often overlooked by writers of motor history. However his venture does rate an entry in Georgano's "The World's Commercial Vehicles 1830-1964" and in Kidner's "Early History of the Motor Car 1769-1897", both of which cite the period as the late 1860's to the mid-1870's. A drawing of the Thomson steamer, with three waggons, is seen in R.B. Gray's "Development of the Agricultural Tractor in the United States", this having been drawn from the Pacific Rural Press of January 1871. This report was on the occasion of the Thomson machine being taken to the U.S.A. where it was entered in the California State and San Joaquin Valley Fairs.

The fact that Thomson has tended to be overlooked and is now, unfortunately, best remembered as the man who failed to make a success of the pneumatic tyre might well be explained by some of the statements of Colonel R.E. Crompton, C.B., made in an address to the Royal Society of Arts in London in 1925. In particular the points made about the deterioration of Thomson's health may well be considered relevant in this regard.

Other matters such as the technical development of the road train, the extent of the road transport exercise in India, the retarding effects of the Red Flag Act in England and the notes on the vehicle constructed by Crompton in India will also be worthy of perusal. Allowing for a certain quaintness, to modern eyes, in grammar and for some of his subjective claims, the following, being the text of Crompton's lecture, is presented verbatim :-



Thomson Government of India Steam train No. 2, "Chenab" under test in England, 1871. This view clearly shows details of the tires, unprotected on the front wheel and with the protective plates on the rear. Mrs. Crompton can be seen in the window of the trailer. Photos from the Science Museum, London.

Thomson's Road Steamers

By Col. R. E. B. CROMPTON, C. B.

It may be said with truth that the coming of the automobile vehicle, whether motor car or motor waggon, which has revolutionised modern road transport, really commenced with the invention of elastic tyres, either made of solid rubber or in the form of pneumatic tyres in which air is used as the elastic medium and it is the object of this paper to show that the real man to whom most of the credit for modern Automobilism is due was R.W. Thomson, of Edinburgh, and it is fitting that the author, who was associated with Thomson in the greatest of experimental developments should now put on record the great work carried out by him in the early '70's of last century.

Mr. R.W. Thomson was born at Stonehaven in 1822. He went out to America as a boy, but returned to England, and when only 16 years old showed great talent for invention in Engineering matters. He was therefore apprenticed as an Engineer in Aberdeen and Dundee, but in 1844, when only 22 years of age, set up in business on his own account, and a year later had conceived the idea of applying rubber tyres to ordinary vehicles. We read in Volume XLV of the "Mechanic's Magazine" that he applied noiseless tyres to a brougham, which was then running in the London parks. He took out a patent for these penumatic tyres in the year 1845, but at that time india-rubber was scarce and it was difficult to make what we now term the inner tubes of these pneumatics sufficiently airtight. He had great trouble with the manufacturers, Messrs. MacIntosh and others, and on account of these difficulties of manufacture his invention made poor progress. The railway companies of that time adopted the tyres for the platform hand carts, but paid Thomson no royalty.

In 1851, the first fountain pen, which was Thomson's invention, was shown and sold at the Great Exhibition. By 1862 he had got together a business as a consulting engineer and settled in Edinburgh. One of his first inventions was a portable lifting crane. He also designed what is believed to have been the first floating dock: this was sent out to the Dutch East Indies. In the course of his engineering work when developing certain collieries established at Labuan, he found it necessary to haul the coal from the collieries to the landing stage by some form of traction engine, and, as the traction engines of that time were not suitable for traversing rough and uneven ground, and were very deficient in hauling power in proportion to the weight on the driving wheels, he returned to his older love, but as he could not even then have his pneumatic tyres manufactured with any reasonable certainty of success, he turned his attention to a new kind of wheel. This wheel consisted of a light wrought iron drum about 4 ft. in diameter by 12 ins. wide, having flanges one inch thick on either side, over which was slipped or stretched a flat india-rubber band 12 ins. wide by 4½ ins. thick. He then designed what he called a road steamer mounted on three wheels for the Labuan colliery works. He had this road steamer fitted with heavy ring rubber tyres at work in a test in December 1867, and the newspapers of the time pronounced it to be in advance of anything which had ever been put on the road. Numerous trials were made with this engine drawing a large bus behind it at the rate of 12 miles per hour.

At that time, the author, who was in the army in India serving as a Lieutenant in the Rifle Brigade, had already constructed a motor car, which was really a steam carriage with wooden wheels with ordinary iron tyres. He completed this car: it was set to work to run on the good well-metalled roads of the Punjab, but seeing the accounts of the trials of the Thomson road steamers in the engineering papers of the day, he got into correspondence with Thomson. The following year, having been appointed to the Commander-in-Chief's staff as his aide-de-camp, and being full of his road engine project, he talked it over with the Commander-in-Chief, and afterwards with Lord Mayo, who was then the Governor-General. Lord Mayo was an exceptionally liberal-minded and far-seeing man, and interested himself so much that he suggested to the author that he should make a report to the Director-General of Post Offices in India embodying a proposal for working by the Thomson engine the bullock trains which at that time were the only form of haulage, the railways of India having been only partially completed.

The author was fortunate in being able to persuade the Government of India to support his ideas, and authority was given to him to invite a tender from Thomson to send out a trial engine. Thomson agreed to do this provided the experiment was put into the author's hands. A department was accordingly formed called the Government Steam Train, and the author was appointed first Superintendent.

"The first Thomson road steamer arrived at Calcutta and was put together at the Alighar workshops during the year 1869, and, as far as hauling power, good adhesion and freedom from vibration when running at considerable speed are concerned, the engine was successful. It failed, however, in that its small fire-box did not admit of the use of wood fuel, and as coal fuel was not available on the line chosen for the test, which lay between Amballa and Kalka, this, the first Government steam train engine, had to stop so frequently to raise steam that its speed was not much greater than that of the bullock train that it was intended to supersede. The author, feeling that this boiler failure was quite apart from Thomson's rubber tyre invention, spent many anxious weeks up at Simla endeavoring to persuade the authorities to give this road transport experiment another chance.

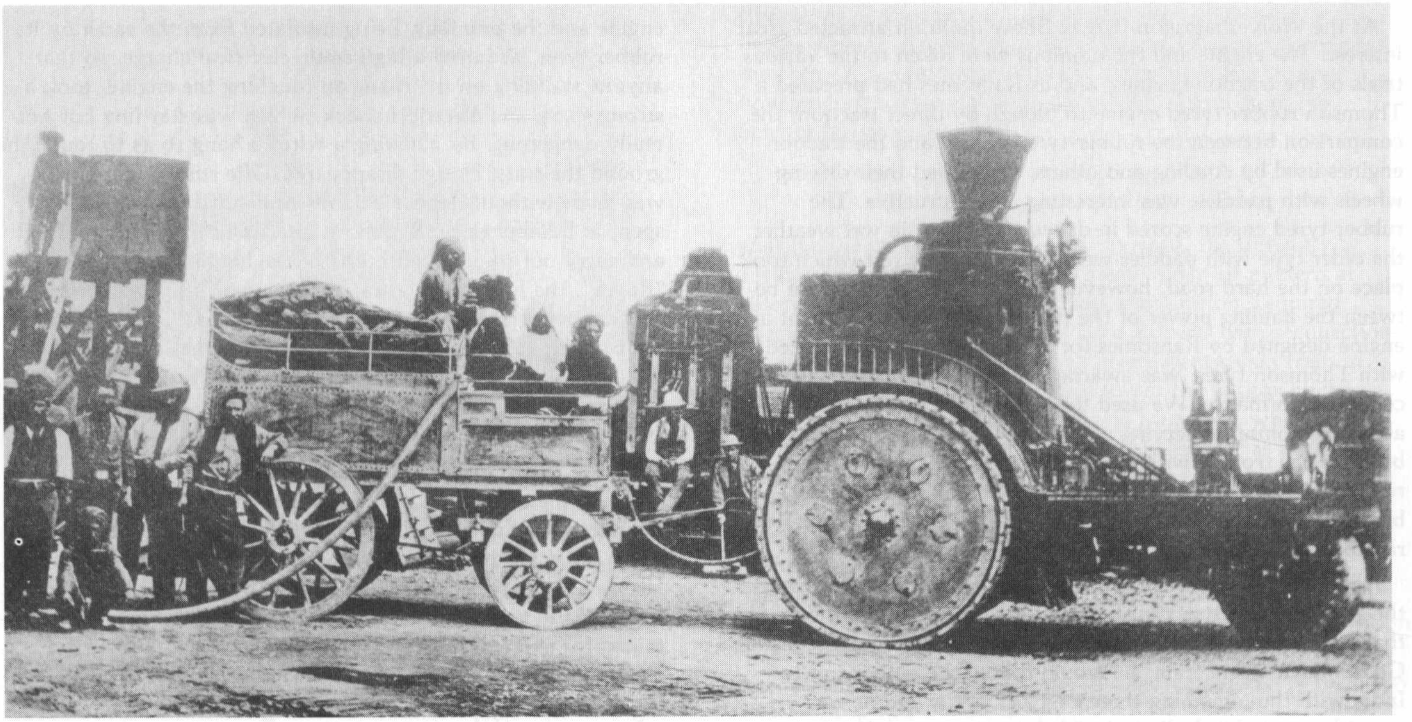
"This chance was given, Lord Mayo himself signing the authority for the expenditure of a sufficient amount to purchase and equip with waggons and passenger vehicles several improved steam trains, four of which were to be ordered, the engines to be made in England to Thomson's design and specification, the waggons and remainder at the government workshop at Alighar in the North-West Provinces. Under the strain of the boiler disappointment, the author's health broke down, but the Government of India sent him to England at Government expense, to discuss with Thomson all the points in which road transport in India differed from that in England or any other country, of which but little experience was available.

The memorandum attached to the order for the large-scale experiment is interesting, and is quoted here verbatim, as it shows that the knowledge of road transport that had already been acquired was very considerable. The memorandum states that for Indian requirements we must have:—

1. Great lightness consistent with safety and economy of fuel and water. Simplicity of parts requiring renewal, capacity for ready repair on the road.
2. A further adaptation and improvement of the rubber tyres now used by Thomson, so as to increase their very perfect springing action.
3. The reduction of the wear and tear of highway which must follow from the use of elastic tyres.
4. The reduction of wear and tear of highway which would follow from improving existing friction brakes.
5. Further, improvement of the Thomson chain shoes.
6. The best proportion of tyre diameter, width and thickness which, combined with the shoes, is necessary in order to get the best grip on the road for haulage purposes.
7. In view of the cost of rubber, can any arrangement of elastic wheels be devised to take the place wholly or partly of the rubber tyres?

After interesting adventures, on his return voyage in 1870, when travelling across Europe in the rear of the German army, the author arrived in England and reported himself to the India Office, and a few days later saw R.W. Thomson for the first time. He now believes that on the day of his first interview with Thomson, modern road transport took a great step forward, a step which undoubtedly led to the huge development that has since taken place. At the time when he came home from India, although it is true that the agricultural engineers were building traction engines having broad steel tyres, these engines lumbered along with a man walking in the front of them carrying a red flag to warn other traffic, so that it was impossible for the driver to exceed the flag-man's walking pace, namely, four miles per hour. Owing to Thomson's work on the Indian steam train during the 18 months that the author was in England, such progress was made that the engines of the Indian Government steam train equipped with rubber tyres actually travelled at speeds up to 25 miles per hour, when carrying 100 passengers. During the same period the tractive effort, which on the rigid-tyred traction engines rarely reached as high as 30 per cent. of the weight on the engine driving wheels, was increased by the rubber tyre to double this figure.

The author found that Thomson was an invalid, suffering from locomotor ataxy, so that he was unable to leave his sofa, though his brain was extraordinarily active. His wife was then helping him in his work but when she found that the author was already her husband's faithful disciple, she asked him to help her in the propaganda work that Thomson had already started for developing road transport. The author stayed at Thomson's house for some months, in fact, until new designs had been prepared by Thomson to meet the Indian requirements. The leading draghtsman who was engaged to make the working drawings was Gustave Bremme. At that time, Kennedy, now Sir Alexander Kennedy, was in the drawing office at Tennants, at Leigh, where one or two of the earlier Thomson road steamers had been constructed. The author found that the small type of Thomson road steamer, similar to the one that he had been testing in India, had already been improved, and Messrs. Robeys, of Lincoln, were then constructing one named "The Advance." After this engine was tried, the new type which Bremme drew out for the Indian requirements was again modified. The defects already noted in India and the memorandum which had been laid before the Indian Government served as a basis of discussion. A point on which the author differed from Thomson was the boiler to be used in India. Thomson did not at first appreciate the large grate-area required for burning wood fuel. He was then using a boiler of his own design called the "pot" boiler, which gave great trouble, whereas the author preferred to use the Field type of boiler that Messrs. Merryweather were then using on steam fire engines, and which he had himself used for his own engine built in India. The matter was compromised by Thomson starting on his own type for the first two engines, and the first trials were therefore made with the Thomson "pot" boiler. These were soon replaced by the Field type of boiler, which was



A Thomson Steam train in use in India, 1872. Obviously in the field certain amenities were dispensed with. Photo from the Science Museum, London.

adopted throughout and on the whole gave satisfactory results. A good many of the preliminary trials were made with Thomson's "pot" boiler, and this undoubtedly prejudiced the new form of road vehicle, because the delays and breakdowns, entirely due to Thomson's boiler, were put down by our rivals, the traction-engine people, to tyre troubles, which did not really exist. At the same time it is true that the new engines, being able to run at higher speeds than had hitherto been possible, made it possible for us to observe and study many of the phenomena connected with the use of rubber tyres, such as side-slip on a greasy road, heating due to rapidly repeated deformation, which only occurs at high speeds, and which in our case sometimes reached such a point that the rubber itself became decomposed (gases were given off and huge bladder-like wens were formed on the tyre surface).

The dimensions of the tyres of the new engines were as follows: Driving wheels over-all diameter, about 6 ft. 6 in., width of rubber, 15 in., thickness, 4½ to 5 in.

These engines were fully described and illustrated in a paper read by the present author before the institution of Mechanical Engineers shortly after his return from India. The building of the first engines was entrusted to Messrs. Ransomes, Sims and Head, of Ipswich, and by the middle of May 1871, the first engine, the "Chenab", named after one of the Punjab rivers, was sufficiently advanced to be tried in a preliminary test on the roads near Ipswich. These trials were reasonably successful, but although coal was used as fuel it was evident that the boiler would not be able to make sufficient steam with wood fuel. In fact, it was necessary to sharpen the blast so much that the "Chenab" became a fire thrower and set fire to the grandstand on the Ipswich racecourse, and the Government of India had to pay for a new one. Although it was then seen that the boiler in the "Chenab" was a failure, Messrs. Ransomes were so anxious to show one of these new engines at the Royal Agricultural Society's Show at Wolverhampton, that the "Chenab" was finished off for show purposes with the original "pot" boiler as designed by Thomson. By that time the author was so disgusted with the boiler that he arranged with Lewis Olrick to design and tender for the construction of Field boilers of the same external dimensions to be interchangeable with, and to fit into the same engine frames, having a sufficient number of Field tubes to give larger heating surfaces, and to hurry these boilers forward, so that one of them could be fitted into the second engine, called the "Ravee", by the end of May.

Early in the summer we started from Ipswich on the run to Wolverhampton, having coupled to the engine a rubber-tyred omnibus, which had been built in Edinburgh to carry 130 people, 60 below and 70 above. This omnibus had only two rubber-tyred wheels, and the total combination of the three-wheeled tractor with the omnibus constituted a five-wheeled vehicle, which was therefore the first fore runner of the six-wheeled arrangement that are now so much under discussion. This omnibus carried a considerable party, as there was ample room to use the lower part as a sleeping-room. In addition to the author and his wife were Bemme, the chief designer, and his wife; a pupil named Attwood; a leading fitter, Tom Wooley, and a fireman named Pipe, and, with the addition of one or two boiler-makers, the crew numbered 14 to 16 persons, for which the large bus became the dwelling-house.

On this first trip there were plenty of boiler troubles and a good deal of amusement. Eight days were occupied on this first run, which irreverent people called "Lieutenant Crompton's honeymoon trip". Throughout the journey the Thomson boiler gave infinite trouble, and the boiler-makers who accompanied us had to expand the vertical fire-tubes every night. This experience confirmed the author in his views that this type of boiler must be scrapped and the four engines fitted with the Field boiler that Olrick had already designed for them.

At the Wolverhampton R.A.S. Show the train attracted great interest. The engine and the omnibus were taken to the various trials of the traction engines, and as Ransomes had prepared a Thomson rubber-tyred engine to plough by direct traction, the comparison between the rubber-tyred engine and the traction engines used by Aveling and others, who fitted their driving wheels with paddles, was interesting and instructive. The rubber-tyred engine scored in dry weather, but in wet weather the older type with paddles were victors. In the test which took place on the hard road, however, there was no comparison between the hauling power of the two types of engine, so that an engine designed by Ransomes for agricultural purposes, fitted with Thomson tyres, was awarded a special medal for its excellent performance. We used the "Chenab" to carry the judges about, the omnibus serving as a judges office, and if it had not been for the trouble with the boiler the vehicle would have received a great deal of credit. The perpetual boiler breakdowns caused the author to send the "Chenab" home by rail to Ipswich, to have a Field boiler fitted.

About this time the author met a Mr. Muirhead, who was the engineering instructor at Farnah Hall, Derby, and thought that he would be a likely man to act as assistant engineer of the Government steam train; he would follow the author out to India with the remaining three engines, as the author was urgently wanted in India to build the wagons and design the workshops required for the extended experiment.

By August 1871, the "Ravee", the second engine, was ready for trial with a Field boiler. It was fitted with a sufficiently good spark arrester, and made ample speed when wood fuel was used, but with burning coal we were obliged to block off the centre of the fire grate.

On August 19, we started on what might be called the first really satisfactory long run on a highway. This was from Ipswich to Edinburgh, in order that Thomson might himself be able to see one of his engines on the road. Our actual start was made on September 13, with the same large omnibus, making the five-wheeled arrangement. With the "Ravee" we were able to slash along at a great pace, practically only limited by the requirements of the traffic. Through the influence of the Government of India we were armed with a permit to carry on road tests with these engines at speeds above those allowed by the Red Flag Act, and we soon found that on open stretches of level road we could get up to speeds exceeding 20 miles per hour.

On this trip we found that when we ran with bare rubber tyres, which we were able to do in dry weather, the rubber rolled out in front of the driving wheels and actually left the polished steel treads, so that the engine practically ran on the upper surface of a continuous track resembling the modern caterpillar track. We were then really forestalling arrangements that have been quite recently introduced by the Citroen Company for their most recent track-laying cars, designed with belt-tracks for crossing deserts. At first we attempted to travel through the night, but had some dangerous adventures on narrow embankments in the Fen district. Near Stanford, Muirhead joined us with Mr. Montford and some of his pupils. On the way to Doncaster the highest speed ever made on a highway, that is, over 25 miles per hour, was recorded. The route was on the Great North Road at points where it ran parallel to the Great Northern Railway, and the road train overtook and passed several goods trains travelling in the same direction; as the load and train together weighed about 40 tons, this constituted a record in road locomotion both for speed and power developed. The night was passed at Doncaster. Next day, on Bramham Moor, a curious phenomenon was noticed: the engine and the omnibus, being insulated from the earth by its rubber tyres, acquired a high static electrical charge, so that anyone standing on the road, on touching the engine, took a strong spark and electrical shock, which was startling but not really dangerous. By allowing a wire to hang so as to touch the ground the static charge disappeared. The run to Edinburgh was made without further trouble, and sufficient time was spent in Edinburgh for Thomson himself to inspect the train and carry out some careful tests of the hauling power of the "Ravee", the load being a train of waggons borrowed from contractors. The tests were on an incline near Edinburgh called Soutra Hill. In these tests a coefficient of adhesion was obtained of 60 per cent. of the weight on the driving wheel. At this trial the total weight of the engine and omnibus was about 19 tons.

By the return journey the men had ample experience in working the engine, and the 425 miles took nine days, giving 47 miles as the average distance per day, and a speed of about seven miles per hour for the time actually running; but on the last day the average speed was about 10 miles per hour, whilst occasionally a speed of from 15 to 20 miles per hour was maintained for short distances.

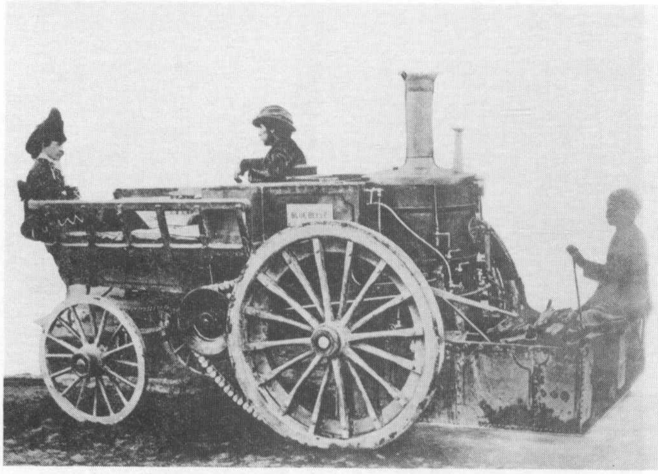
In India the spring of the year 1872 was occupied in preparing the necessary premises for running the Government steam train between Rawal Pindi, the principal military station in the Punjab, and Attock, where the trunk road crosses the Indus, a distance of about 70 miles.

The original programme was that as there was considerable traffic both in goods and passengers between Rawal Pindi and the frontier station at Peshawar, this section should be worked by the Government steam train, in place of the bullock train that had been used for goods haulage, and the Dak Gharris on which passengers up to that time had had to travel.

In the early portion of this year two of the new engines arrived, but the road haulage system did not get to work until the autumn of 1872. Within two months of starting the first troubles began: the crankshafts of the "Ravee" and of the other engine broke, due to torsional stresses set up in the mild steel then used. At that time it was thought that as the driving wheels could slip to a certain extent inside their tyres, a differential gear was unnecessary, but this view proved to be mistaken, for, although this slip did undoubtedly take place and was sufficient to allow of accurate steering around curves of great radius, on curves of small radius the drivers were instructed to throw out of gear the wheel on the inner side of the curve, but the drivers did not always obey orders, and, undoubtedly, this was the cause of the crankshaft failures. Curiously enough, the head of the Post Office, under which the Government steam train was working, Mr. A.M. Monteith, who had considerable mechanical ingenuity, brought to the author several designs for arranging a differential mechanism in the crankshaft itself, but for want of means for making the necessary forgings, and of the complicated machinery required, the designs were not then carried out; they were, however, identical in every way with a crankshaft so fitted shown on the Super-Sentinel steam waggon at the Commercial Vehicle Show in 1923.

The crankshaft trouble was dealt with by altering the ratio of the gearing of the countershaft and instructing the drivers always to run with the countershaft in gear, removing the pinions from the crankshaft, and in this way the crankshafts were saved, but the countershafts, although they had a longer life, failed from the same cause after a given mileage.

During the following year, when war threatened with the



Col. R. E. B. Crompton's "Blue Belle" after rebuilding in 1865 in Rawalpindi. According to R. W. Kidner in this photograph the then Lt. Crompton and Mrs. Crompton while on their honeymoon, with a native boiler tender. Photo from the Science Museum, London.

Amir of Afghanistan, the military authorities decided to hold a camp of exercise at Hussun Abdul, half-way between Rawal Pindi and Attock. One reason for choosing this point was that they could thoroughly test the capacity of the Government steam train for moving troops, guns, and military stores. This Hussun camp of exercise gave work for the steam train during the winter of '73, and there is no doubt that the excellent work then done was the cause of Lord Roberts, who was at that camp, advocating the use of mechanical transport for our Army during the Cape War in 1900; in fact, Lord Roberts informed the author that this was the case.

After the camp of exercise during the years of 1874–75, the steam train was employed for regular haulage and passenger service. The cost in those days, was considered high, but would at the present time be considered quite satisfactory.

In the early part of the year 1873 the Government of India appointed a committee of inquiry to sit at Rawal Pindi to examine the whole question of the progress made up to that date by the Government steam train, as it was then developed.

The report of this committee was, on the whole, so favourable that everyone, including the author, believed that the Government steam train experiment would be continued on a largely increased scale. In the year 1875, however, the period for which the author had been seconded from active service with his regiment expired, and he was ordered to rejoin his regiment.

After the author left for England, his assistant, Mr. Richard Muirhead, carried on the work of Superintendent of the train for several years; in fact, until the period at which the craze for light railways, substituting the metre gauge for the existing Indian broad gauge, caused the Government of India to decide that the road steam train would no longer be necessary. The engines and plant were then handed over to the Northern State Railway.

As far as the author is concerned, this great experiment in road transport terminated in 1875, and although, for the reasons above given, it did not at the time lead to any great development of mechanical road haulage either in England or in the Colonies, it is practically certain that the reports of Colonel Hyde's committee and the good services rendered by the trains in transporting troops and stores at the Hussun Abdul camp of exercises did greatly impress the military authorities of India, including General Roberts, who was then on the Quartermaster-General's staff. The evidence of this came 25 years later, in 1899, on the outbreak of war in South Africa, when Lord Roberts, as he had then become, quickly realised that for the great distances to be traversed, the difficulty of feeding transport cattle, and the great weight of modern artillery and machine guns with their ammunition, required special means of transport, and Lord Roberts own recollection of what the author did with the Government steam train in India in the seventies, caused him to put the author in charge of the small instalment of mechanical transports which had been taken to South Africa by Colonel Templar as part of the equipment of the Balloon Corps. The work then done by the mechanical transport under the author's charge so impressed the War Office authorites in England that they asked Lord Roberts to send the author home to organise mechanical transport for the Army, and from that date mechanical transport for the Army has steadily increased up to the position which it occupied in the last great war, in which it may be safely said it completely ousted animal haulage except for a few special purposes.

The author, in his opening remarks, stated that Thomson's work commenced in the sixties of last century, was carried on by the Government steam train in India without interruption up to the year 1878, or thereabouts, and constituted a chapter in the history of road transport which can never be forgotten. For through that period not only were most of the problems inherent to the use of rubber for tyres encountered, and to some extent successfully solved, but many other phenomena which have to be mastered before road trains consisting of more than one vehicle can be succesfully worked on our existing roads were then investigated, and established the basis for regular service. For instance the Rawal Pindi-Attock road trains tested in the presence of Colonel Hyde's committee consisted of nineteen vehicles, and of the total gross moving load on the road of over 70 tons, 40 tons was the net paying load. The difficulties of manoeuvring such long trains were at first considerable. When running on the level or descending inclines at high speed there was a tendency for any slight lateral movement of the coupling-pin in the rear of the engine to exaggerate itself backward through the train, so that when these long trains were first used the side oscillations of the rear waggons would be so great as to throw them off the road. This difficulty was dealt with by careful proportioning of the distance from the centre of the rear wheels of each vehicle to the coupling point, and similarly from the centre of the front wheels of the vehicle following up to the same coupling point. In addition to this, coupling brakes were fitted on the turn-tables of the front wheels of each vehicle, so that toward the close of this great experiment there was no difficulty experienced in running these long trains at high speed, and the danger from side oscillations at first observed was eliminated.

The improvement of the tyres themselves, in the shape of their cross section, and in the method of attachment to the wheels, and also of the protecting shoes or armour which were from time to time modified by the combined work of Richard Muirhead and the author, had the ultimate effect of reducing the total tyre cost per mile run to about half of the figure noted during the first year of running.

In those days it was found best to let the rubber expand forward under the rolling action of the wheel, and then to pass back over the top of the wheel, the friction on the inner surface being taken up by transverse metal rods covered with anti-friction bearing metal; in this manner the wear, which up to that time had taken place largely on the inner surface of the rubber tyres, was transferred to these transverse rods, which could be easily and cheaply renewed.

The external protecting armour of the tyres (then known as the "shoes") was gradually modifed from the chain-like form originally adopted by Thomson, which gave endless trouble, due to link wear, and an entirely new form, called clip shoes, was adopted; these were not linked together, but were held in position by having their outer ends turned up and hooked outwards and held in circumferentially by steel hoops slipped over the hooked ends.

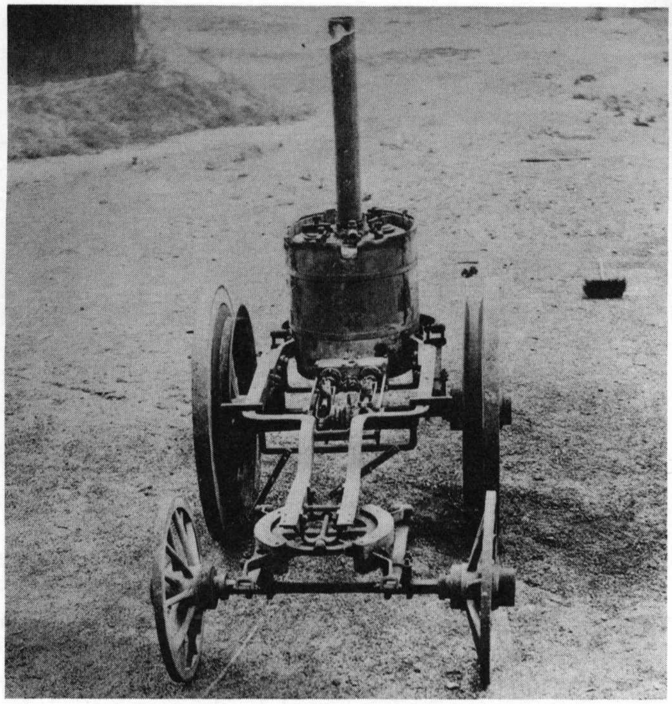
It will be seen that the great strides made by the use of Thomson's inventions in Road Transport were only possible at that time because the conditions of road transport which rule in our great Indian Empire are wholly different from the conditions that then prevailed in England. In India there was no legal limitation to speed, the Grand Trunk road is laid out with easy and regular gradients, its metalled surface is smooth, well-formed and consolidated. Hence it was not unreasonable to expect that if high speed engines could be made successful anywhere they would be so under such favourable conditions.

From what I have said it is clear that these expectations were fully realised by us at the early period. During the years between 1871 and 1875 high speed was obtained without excessive wear and tear, very regular running and timing were observed, great numbers of passengers were conveyed and cheaply and safely, and goods carried at a cheaper rate than by any land carriage other than rail.

In India it was found advisable to reduce the weight of the loaded engines from 14 tons, as they first erected in Rawal Pindi, down to 9 tons, as it was considered that the former weight was too great for the timber bridges of the Trunk Road. Moreover the excessive weight on the driving wheels of the engines greatly reduced the life of the rubber tyres. So that at an early date separate four-wheeled tenders carrying 500 gallons of water and a supply of wood fuel were made. This reduced the total weight of the engines by five tons.

There were few accidents; once a driving wheel came off, twice a train became uncoupled, and once the English soldier driver got drunk, and drove his engine off the road, the engine being turned upside down and considerably damaged. It was a tedious job to repair the engine after this last accident, but after repairs it was worked for nine weeks, running night and day, covering nearly 2000 miles without coming into the repair shed. Another point interesting to notice is how trustworthy the native drivers became; whereas with European drivers we had narrowly escaped having two terrible accidents, entirely due to the curse of drink; the Mohammedan drivers did not drink; drove steadily and could be thoroughly depended on.

Enough has been said to show that this great experiment was the real precursor of modern road transport, and that if it had not been for the prohibitive legislation that held at the time of the author's return to England in 1875, he was then in a position to do all that has been done since in extending road transport as far as it has been done by the steam motor waggons of the Foden, Sentinel, Burrell and Aveling types with which we are now so familiar. It is true that the use of the internal combustion engine came later, but it is an entire mistake to suppose that the road motor was due to the genius of the French. Whereas if the French had not had the successful works of Thomson before them they would have had to wait for the later re-introducing of pneumatics by Dunlop and Michelin, and still later for the re-introduction of the solid Ring tyres that we now see everywhere on commercial vehicles.



The remains of Crompton's "Blue Belle", 1878, complete chassis, engine and boiler, including chimney which had disappeared when the vehicle came to the Science Museum in 1922, where parts of it are displayed. The vee-section of the drive pulleys is quite obvious. The link type belts show clearly in the 1865 picture. Photo from the Science Museum, London.

It will perhaps interest my audience, who for some years past have grown accustomed to seeing all our highways covered with automobile vehicles ranging from the six-wheeled 10-ton motor lorry down to the tiny cars that have been put on the road within the last two years, when I tell you that our journey in 1871 along the Great North Road and other English highways was considered such an extraordinary event that our daily progress was recorded in the "Times" and in the best evening paper of those days, the "Pall Mall Gazette" in its earliest form. Most of the time we had reporters of one or other of these papers with us, and were amused to read very exaggerated accounts of our adventures the day after they had occurred. Our large omnibus which was constructed to carry 130 people — 60 inside, 70 outside — was divided by a curtain so that the front part became a parlour for my wife and her maid and any guests, and the back half for engineers and others who joined us for a trip on the road. The top of the omnibus was partly occupied by spares, but, being good natured, we frequently took up considerable parties and transferred them by road from one village to another. We had a good deal of fun out of these visitors. On one occasion running south through a colliery village in Durham quite late in the evening a number of colliery girls who were just going to bed jumped on the back platform of the omnibus and asked for a ride as we slowed down at their village. Our driver quickened up after we passed the village, and I told the young women that if they did not jump off soon we should be taking them too far from their homes. They were very lightly clad and I thought they might catch a cold. I advised them to step off backwards in the proper way, but, no, they knew better than that; they jumped the reverse way and every one of them turned somersaults.

At a toll-gate somewhere on the road into Scotland near a place called Wooler, the toll-gate was closed against us. We demanded to be let through free as on Government work. The gateman had closed and locked the gate and said, "Well you can stay on the road all night". As he spoke, I, who was driving, very gently allowed our train to press against the gate; the gate bent until it left both hinges and lock and flipped away into the adjoining field. The gateman's face was interesting. As this was recorded in the "Times" and the "Pall Mall Gazette", on our return journey he saw that he had been made a fool of, and the gate was left wide open and he bowed to us most politely.

When we had the train at Wolverhampton at the R.A.S. Show the judges, including the Duke of Devonshire, Sir Frederick Bramwell, and many other great swells, came on board and asked us to do a bit of manoeuvring, turning sharp circles, figures of eight, etc., in the open space. I was driving; I commenced slowly, very gradually increasing the speed until we were spinning around figures of eight at nearly 20 miles per hour. We heard shrieks from the inside of the omnibus. I stopped, and I regret to say that many of the judges had been sea-sick.

In returning from the North travelling down Dean Street, Newcastle, we experienced the first real bad side slip. The engine with the omnibus measured over 60 ft. in length. It was very greasy and, although we were descending the street at a very moderate pace, I found the whole train gradually turning sideways across the street. I tried to straighten it by accelerating the engine, it made matters worse, and eventually we slipped sidelong down the whole width of the street, sweeping everything before us, damaging a great number of lamp posts, and only straightened up when we got to the level at the bottom. On the Gateshead side we had to mount an incline of about 1 in 12 on granite sets, very greasy and slippery, and when halfway up the train slipped staight backward to the bottom. We managed eventually to mount the hill by borrowing sacks, which we laid on the street in front of the tyres, and which we picked up and laid down again in rotation, and so we managed to get up the Gatehead incline.

So it may be truly said that on these journeys, and on the many hundreds of journeys that followed when these engines were used, during the years from 1871–77, we met with and successfully combated most of the identical troubles that are familiar to everyone who now drives his car or motor lorry along our highways.

As a post script I feel the following quotations from R. W. Kidner's "The First Hundred Road Motors" (The Oakwood Press, 1950) is in order:

The degree of success of the Thomson steamer is not sufficiently recognised. It was no flash in the pan. Robeys were still building them to order in 1891, having by then made 50 to 60 such engines. Mr. Harry Stanger, a traction-engine driver, told the Institute of Civil Engineers in 1890 "any one who has tried to get an ordinary engine out of a dirty occupation road through a narrow gate could understand the difficulty of just hitting the right place between the gate posts; but with a road steamer the driver would be able to steer his engine right through." They were, however, more expensive than ordinary traction engines. Capt. Losada, manager of the Glasgow Tramways, stated in 1879 that the Thomson engines were so fully established in that town that "no single article weighing over 10 tons was ever moved except by one of them".

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Early tire technology is an important feature in several articles in this issue. Mr. Carson mentions John F. Palmer as the inventor of the cord tire. The following paragraph is from an article by Mr. Palmer that appeared in *The Automobile*, June 10, 1915, pages 1020–1022 and I think it is relevant to quote it here. Others besides myself who have been confused by the terms used in tire descriptions and the position occupied by Mr. Palmer in tire developments on both sides of the Atlantic will find his description informative.

"The name cord tire originated in England, about 1900, when the conventional type of cord tire was first used on automobiles to distinguish it from a lighter cord tire used on bicycles for seven or eight years previously. The original bicycle tire was known as the Palmer and the tire for automobiles known as the Palmer cord. The Silvertown cord tires, used on all the cars finishing at Indianapolis this year, is the English Palmer cord, made under license in this country by the Goodrich company."

Originally pneumatic tires were constructed with layers of normally woven fabric for support. The cord tire improved on the durability and load-carrying capacity by using a material made by bonding longer strands of cord in a rubber base that could be formed into the tire carcass in such a way that the weight of the vehicle and the stresses of its motion were supported by a greater proportion of the air column enclosed by the tire. Mr. Palmer developed this construction in 1893. About 1899 after prolonged litigation between his company and the holders of the Dunlop patents, a settlement recognised Palmer's improvements.

GUSTAV HEINE and his CARS

By KEVIN SCOTT TIKKER

All the contemporary photos are from the albums of Mrs. Ruth Dahl, Oakland, CA, Gustav Heine's daughter.

E. J. Hall and Gustav Heine in the front seat of Heine's first 1904 tourer in Golden Gate Park, San Francisco. Heine's elaborate monogram adorns the radiator.

Most of what is known about the history and development of the American automobile comes from east of the Mississippi. These pioneers such as Duryea, Stanley and Ford developed and later manufactured their cars. And, in that context, Detroit became the automobile producing capitol of the United States.

Because of the attention given developments in the Middle West and on the East Coast, we rarely hear about automotive efforts on the West Coast. While there were not as many inventors or manufacturers, for which we can thank Detroit's influence, significant automobiles were produced there. Now is the time to say something about one of them.

California is the only Pacific Coast state to have produced a considerable number of automobiles from the 1890s to the kit cars of today. Los Angeles leads with the most car manufacturers; San Francisco is second. In the latter city there were about twenty different makes of cars produced from 1896 to 1961. One of the most interesting and unusual was the Heine-Velox which was developed and produced by Gustav Otto Heine, a successful San Francisco piano dealer. Unlike other wealthy sportsmen of the time, Heine possessed the technical ability, as well as the money, to perfect a personal statement on motoring.

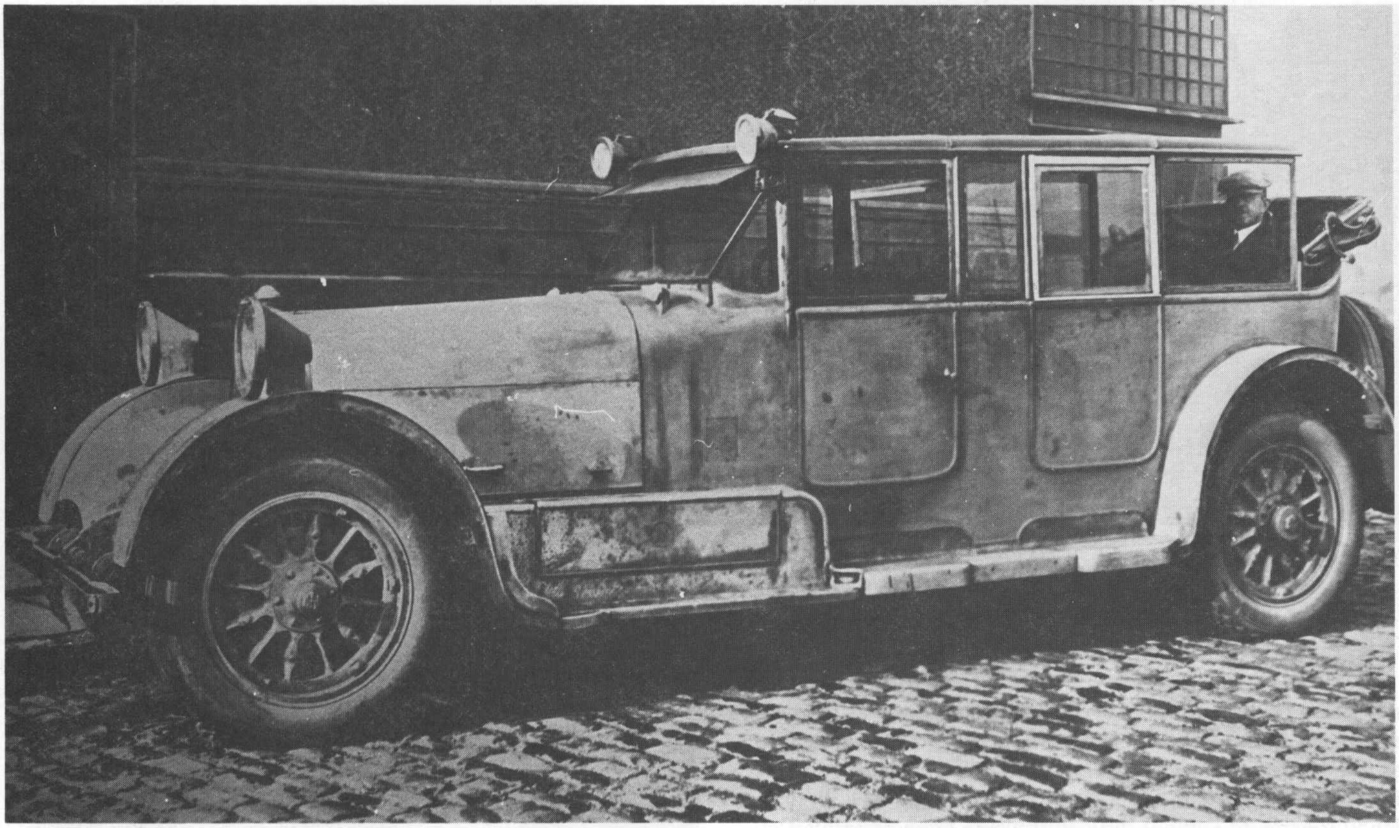
Gustav Otto Ludolf Heine was born on January 7, 1868, in Vierkrug, near the town of Boisenberg on the Elbe River, in what is now East Germany; he was next to the youngest of eight children. Heine's father, Ferdinand, first emigrated to the United States, bringing two of Gustav's older brothers. Then, in 1873, the rest of the family sailed on the *Teutonia* to join the father. Shortly, thereafter the Heines settled in the Capa Valley of Northern California. Ferdinand Heine died in 1877, leaving Bertha and the older children to support the family.[1]

Young Gustav's formal education in Yolo County ended with the fifth grade, his scholastic career cut short when a new "city teacher" requested he cut a switch to be used in punishing a fellow student. Obediently he searched, found a suitably sized branch, stripped off the leaves and brought it back to this teacher. After administering the corporal punishment, the teacher found his body tormented by severe itching — naughty Gustav had chosen a wand of poison oak![2]

At the age of sixteen young Heine left home for San Francisco. There he secured a job sweeping floors at the Bruenn Piano Company, in a short time was trained as a piano tuner, and in two years became a full partner in the firm. Rather intractable by nature, Heine often argued with Bruenn. Their final argument ended in a fight in which the weapons were tuning hammers. One result was that Heine carried a lifelong scar, another was that he took over the company and renamed it the Heine Piano Company.[3]

Engineering always intrigued Heine. A light sleeper, he kept a sketch pad on the nightstand so that he might jot down his latest inspiration. He enjoyed designing and inventing other things besides automobiles. At his home in Sunol he designed a swimming pool for his personal use that was just wide enough to swim in. His original and energy saving system of warm air flues running from the fireplace in the house out to encircle the pool and warm the water would certainly be timely today.[4]

Although it cannot be substantiated, it has been suggested that Heine worked a short time with Henry Ford just before the turn of the century. He did, however, send Ford a letter of advertisement about his ventilator in 1928.[5] Early in the new century he developed a new tire design that had bits of steel imbedded in the tread. This tire proved to be somewhat



Heine-Velox sedan-landaulet with Gustav Heine in back seat.

unstable and dangerous at speeds of more than twenty-five miles per hour, since it displayed an alarming tendency to hurl the steel inserts at passersby. However, this tire may be the only one of Heine's inventions for which he is remembered.[6]

Gustav Heine claimed that his first car, an experimental motorized buggy with friction drive, was designed in 1888. Nothing else is known about this early vehicle, mentioned in a factory circular dated 1921 that is preserved in his personal papers. Although the first car to be called Heine-Velox did not appear until 1904, Heine owned and raced cars, possibly at local tracks such as Tanforan and Ingleside, before that time. In this early period Barney Oldfield was often a guest in the Heine home.[7]

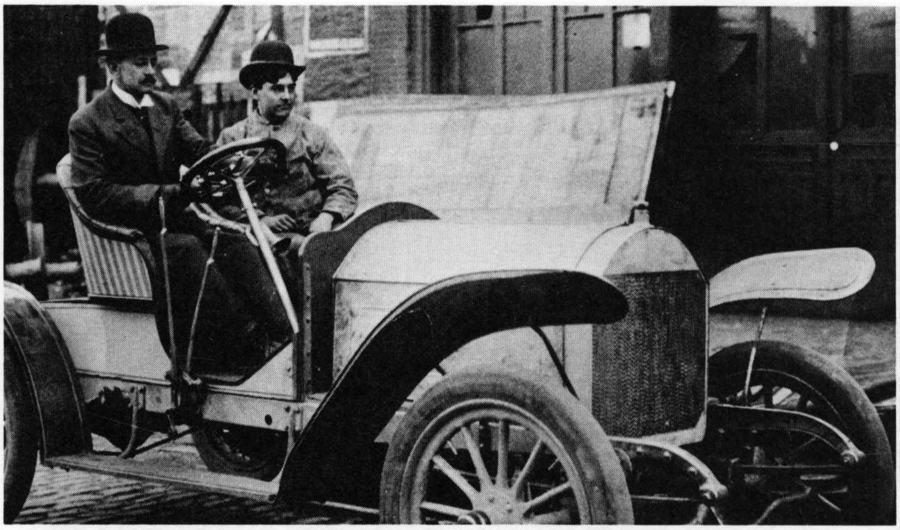
About this time Heine also met E. J. Hall, the subsequently famous Colonel Hall of Liberty engine fame. They are said to have met as Hall was taking down the engine of a car he had parked in the street.[8] Hall had come to San Francisco from Santa Clara to study engineering and drafting. In 1902 he acquired a half interest in the I. L. Burton Company, a machine shop engaged in the design and production of industrial and marine engines, which had been his employer. Then he opened a small factory where he replaced regular production automobile motors with his specially designed hill-climbing units, most appropriate in San Francisco.[9] In 1905 he transferred his activities to the Heine-Velox Company and remained there for about two and a half years.

The first Heine-Velox of 1904 was a tourer with 35–40 h.p. engine. The name, Heine-Velox, is interesting and invites speculation. Velox could refer to velocity or it might be a reference to the Velox Motor Company of Coventry, England, which was in existence from 1901 to 1904. An article in *The Auto*(mobile) of February 1, 1906, indicated that further information on the Heine-Velox was unavailable because of pending foreign patents. Since neither Heine nor Hall ever bothered to patent their inventions, they may have used some component of the English car under a license agreement. This has yet to be substantiated.[10] The tourer also had an especially designed carburetor that heated the fuel before combustion thus enhancing fuel efficiency.

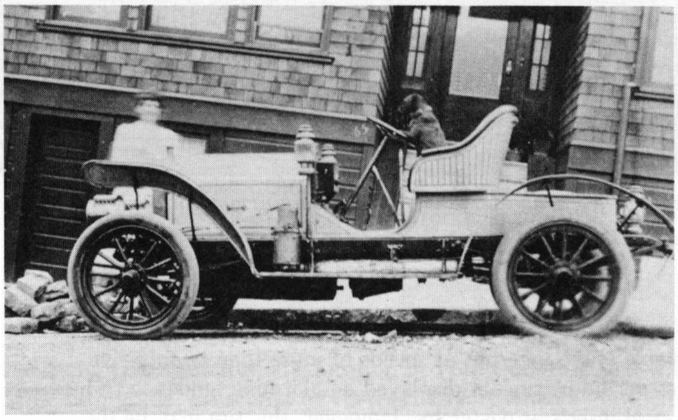
An illustration from 1904 shows one of the early Heine-Velox cars out for a drive in San Francisco's Golden Gate Park. Heine can be seen in the front seat next to Hall. After joining Heine's company, Hall functioned variously as works driver, repairman, chauffeur, salesmen and general partner. In designing automobiles, Heine considered the car as a whole, not just the separate parts and may have relied upon Hall for his expertise in engine design. The factory was located on Main Street between Howard and Folsom, while the company office shared the address of the Heine Piano Company.

There were probably three cars produced in the San Francisco factory between 1904 and April 1906. One was a two-seat runabout that Heine designed to enter in the Vanderbilt Cup Race of 1906. Powered by a big four cylinder 40–50 h.p. engine, the car would cruise at sixty miles per hour, with a top speed of seventy. With flared mudguards, low slung body and rakish styling, it was the ultimate sports car of its day.

On April 18, 1906, the San Francisco earthquake and fire destroyed the Heine-Velox factory and the newly opened piano store at 235–237 Geary Street. When Heine came downtown that morning to survey the damage he found the area sealed off by federal troops. In order to pass through he offered his services and the use of his larger tourer. In the aftermath of the



Heine and Hall in the newly-built 50–60 hp runabout, taken near the factory site on Main Street, San Francisco early in 1906 before the buildings were destroyed by the April earthquake.



Two views of the 1906 runabout taken in 1908 in front of the Heine residence on one of San Francisco's hilly streets. Much equipment has been added to the car since its construction.

disaster Heine helped transport needed supplies as well as the wounded and dead.[11] Meanwhile the runabout had been stolen. It was found four days later, having been driven without water or oil. Heine filled the car and took it across the bay to Oakland (apparently without difficulty) where he disassembled the engine. He mounted the crankshaft in a lathe and measured it to discover if it had suffered from the ill treatment. But the crankshaft was in virtually the same condition as it had been when originally installed.[12]

Following the earthquake Heine sold what was left of the company in San Francisco and later that year went to Milwaukee to arrange for the manufacture of a new model Heine-Velox to be sold in San Francisco.[13] This 45–50 h.p. model was advertised as being the most powerful car with the fewest parts for its weight and size in the world. Heine backed this claim with a $5,000 guarantee.

In February, 1907, San Franciscans experienced their first big car show at the brand new Coliseum in the Panhandle of Golden Gate Park. All makes of cars, both foreign and domestic, filled the sixty-nine display areas. Companies such as Pope-Toledo, Thomas Flyer, Locomobile and Lozier displayed their wares as did many of the California based firms. The Tourist car of Los Angeles was represented as were the Victor, Sunset and California from San Francisco. The Heine-Velox was shown by the Mauvais Motor Car Company of 489 Golden Gate Avenue. Like Heine, Roy Mauvais, the agent for Heine-Velox, was a piano dealer who also owned an engineering and contracting firm. He later sold his Mauvais House of Music to the well-known Sherman-Clay Piano Company. Mauvais built a car that he called the Comet about this time in San Jose. In 1907 Hall opened his shop in San Francisco where he also produced cars called Comets. However no connection is known.

At the show the Mauvais Motor Car Company displayed an H-V chassis and one of the newly manufactured tourers. Mauvais, Hall, and occasionally, Heine were kept busy explaining the vehicles to an admiring public.[14] Toward the end of the show all of the manufacturers and dealers reported excellent sales records. Mr. James Tyson, manager of the Charles Nelson Lumber Company of Alameda ordered a tourer model Heine-Velox.[15]

Just after the show in February, 1907, Heine encountered a Fiat roadster while motoring in his runabout, challenged the driver to a fifty-mile race, and left $2500 in prize money in safekeeping with Roy Mauvais. Recognizing the publicity value, the local Fiat dealer offered to buy the challenged car from its owner, a Mr. Roos, if he would race it; in return he would also give Mr. Roos a brand new Fiat. E.J. Hall was chosen to drive the Heine-Velox as he was considered to be a "clever driver" and was a racing driver of note on the West Coast. Heine raised the purse to five thousand dollars, but ultimately Mr. Roos developed cold feet and the race was called off.[16] After this incident, Heine maintained a standing challenge to any car with the same size motor, bore and weight as the Heine-Velox.

Later that year, as part of a promotional campaign, and — with the sanction of the Automobile Dealers' Association, Mauvais planned an endurance run to start in San Francisco, go through San Mateo to Half Moon Bay, on to La Honda, Redwood City and back to San Francisco. The rally was meant to be leisurely and to afford the contestants time to stop along the way. A trophy was offered by the Association to the driver with the best scorecard.[17]

Production of the Heine-Velox ceased in 1908. It was not known why, although Heine may have become impatient with the whole enterprise. Having a thriving piano business he could afford to do as he pleased. During the next decade or so he expanded his piano company and on the side worked on various automotive projects.

Heine was then planning the car for which he would be best remembered, the 1921 V-12 Heine-Velox. His aim was to achieve the ultimate in luxury, comfort, speed, reliability, safety and beauty. He began by purchasing the Economy Steel Manufacturing Company, fabricators of trailers and rolling stock at 234–236 Folsom Street. The car was assembled from standard parts which Heine re-engineered to his own specifications.[18] Its engine was a Weidely V-12 engine used also by H.A.L. and others. Heine became interested in the possibility of patenting some of his inventions to be used in the new car and wrote to various patent attorneys. Later he hired Werner Olschewski, a lawyer, to act as his agent in searching the patents.

The Heine-Velox was first advertised in January, 1921.[19] It was offered as an ultra-luxurious custom built car ranging in price from seventeen to twenty-five thousand dollars. Considering that at the time a reasonably well-appointed Rolls-Royce was available for less than ten thousand dollars, the Heine-Velox was very expensive. The car had some unique and unusual features, most of which were designed by Heine, such as:

Four-wheel Hydraulic Brakes: This is believed to be one of the first, if not the first, applications of four-wheel hydraulic brakes in the United States. Traditionally, the Colonial Company is credited with this distinction. But who designed the system is not known. It has been suggested that Heine, with the possible assistance of Abner Doble, designed the brakes and that commercial spies from Chrysler took their idea back to Detroit.[20] Another possibility is that Joseph Molinari, a young machinist who helped in the Heine factory, was the brake designer. While working for Otis Elevator Company Molinari is said to have received his inspiration from the elevator braking system and then to have adapted this principle to the automobile.[21] The third supposition is that Lockheed had some part in developing the hydraulic brakes.[22]

The H-V brake system had a five gallon reserve tank under the dashboard which could be adjusted to refill either the front or rear brakes or both at once. An additional feature was that the brakes could be locked in position, thus discouraging theft of the car.[23]

Removable Top: The sedan models of the Heine-Velox had special body construction and a removable top which in a matter of minutes could change the appearance of the car. The top, made in three sections, was held together with special clips. With the front section removed the result was a town car or de ville style with an open front seat. A landaulet was created with the removal of the rear section. Remove the entire top and a couple of the windows — and there was an open touring car.

Pivoting Windows: Unlike other contemporary cars, the windows of which operated in a vertical up and down motion and were either hand cranked or pulled up by a strap, the H-V windows pivoted. A ratchet-like device operated the windows and locked them into position at any point. Heine may have driven one of his cars to Detroit to show to the Chevrolet people. On his arrival at the plant, he was informed that the head engineer was busy. Heine could not wait gracefully for anyone; he offered the shop personnel a suggestion as to where the head engineer could go and departed leaving his car behind. Supposedly, the next year Chevrolet came out with the wing window, an idea perhaps taken from Heine's abandoned auto.[24]

Radiator: The radiator was oversized, "thirty degrees overradiated" in order to maintain a constant engine temperature in any weather.

Gravity Oil-feed Reserve Tank: Mounted in the cowl was a seven gallon reserve oil tank which had a level gauge on the dash directly above the steering wheel. In the floorboard there was a gauge that was mounted directly on the top of the crank case. When the oil level became low, it was necessary only to turn the cock and the reserve oil would flow into and fill the crankcase. Heine felt this was more convenient than lifting the hood to check the oil level and pour oil into the crankcase. The reservoir was replenished via a louvre in the cowl.[25]

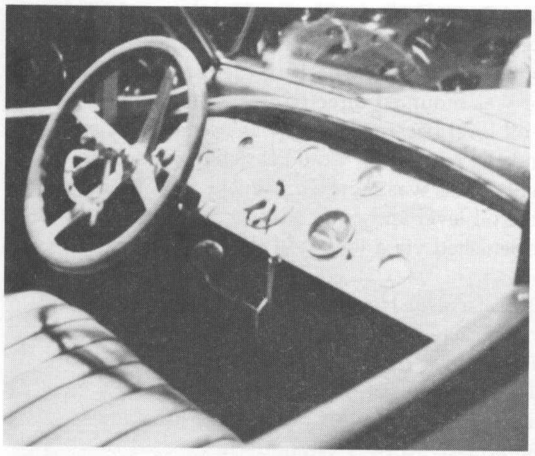
Clear Vision Windscreen: Heine designed an undivided windscreen for an unobstructed view of the road. To be weatherproof, the windscreen was sealed all around the edge with rubber. The ventilator (see illustration #) at the top of the windscreen, was designed to prevent dirt particles, insects and moisture from entering with the fresh air.

Body Construction: The car body was fastened to the side rather than to the top of the frame, thus assuring greater rigidity as well as a lower center of gravity and a lower slung appearance. All of the body work was done by the Heine-Velox Engineering Company.

Baggage Carriers: The car had luggage carriers not only on the rear but on the sides and front as well. A metal apron attached between the two goosenecks in front of the radiator allowed the carrying of a bag or two without having to be secured. This apron served a dual purpose by also aiding in deflecting dirt from the radiator. Small hand luggage could be stored in two metal boxes mounted on the running boards. These boxes could be locked and additional pieces of luggage could be secured on top. Loose items or even a trunk might be placed on a rack located against the rear window; to each side were smaller racks on which small pieces of luggage could be fastened. Individual carriers for umbrellas, walking canes and the like were located on the sides of these racks.

Thermostatic Cut Out: Quick starts on cold mornings were the object of this dashboard controlled device.

Heine in the 1907–08 model on the Seventeen Mile drive near Carmel, CA, 1908.



Combination Instrument Panel: The instrument panel was mounted at a forty-five degree angle instead of vertically as in most cars of the day. Heine felt that this was more convenient for the driver and also that it hid the steering column, which he thought ugly. The gearshift lever and the hand brake were also designed so that the driver did not need to lean forward in the seat. Underneath was a storage area with shelves. (see illustration 25)

Headlamps: The headlamps were set very high and wide apart to be out of the line of vision of the driver while providing superior illumination. Their mounting on top of the fenders eliminated the need for brackets, which Heine felt were less stable. The lights were equipped with high and low beams, indicated by a reflector on the back of the lamps and operated by a vacuum switch.

Combination Footrest, Extra Seat and Storage Compartment: The rear seating area was served by two footrests which could be adjusted in length and could also be pulled up into extra seats. A key was provided for the storage compartment under the footrest-seats.

Turn Signal, Speed Indicator and "Horn Enunciator": Mounted in the rear was a combination turn signal and horn. When the driver turned, accelerated, stopped or reversed, the motorist following behind would be advised of these actions by the "horn enunciator" as well as by a light.

Some features that Heine had intended to incorporate in the design of his cars were not included because of possible patent conflicts. They were:

Adjustable Armrest: Heine had devised an armrest for the rear seat which consisted of a rail mounted on the floor parallel to the base of the seat. Along this track ran a shaped metal piece conforming to the contour of the seat and adjustable to any width for the passenger's comfort. Unfortunately, Heine's application for a patent brought the news that a New York resident held a general patent on movable armrests. This meant that only a stationary armrest would be safe from possible infringement.[26]

Shock Absorbers: At first the patent search looked favorable for Heine's simple and cheap-to-produce spring-type shock absorber. But then over five hundred existing patents for shock absorbers were discovered. He thought of trying to patent his invention under the principle of "no resistance on the downward stroke of the shock absorber, and all resistance on the upward stroke of the shock absorber." His patent attorney's agent refused to try to apply this rather broad principle to his search since it would involve countless patents in close detail. Heine found a shock absorber that suited him and offered the inventor and patent holder fifty dollars for it. One wonders at Heine's proffering such a paltry sum. The inventor replied that the minimum he would accept was two thousand dollars; Heine was not amenable.[27]

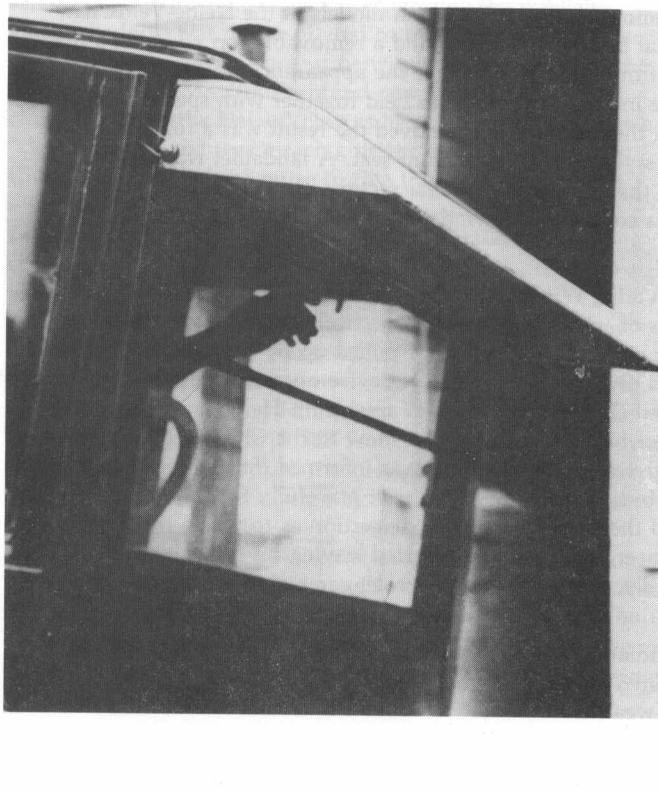
Heine felt that he could manufacture such features as the luggage racks and ventilator, as accessories for other automobile producers. Thus the circulars he sent out, in addition to advertising the Heine-Velox car, stressed the features which might soon influence automobile design in general.[28]

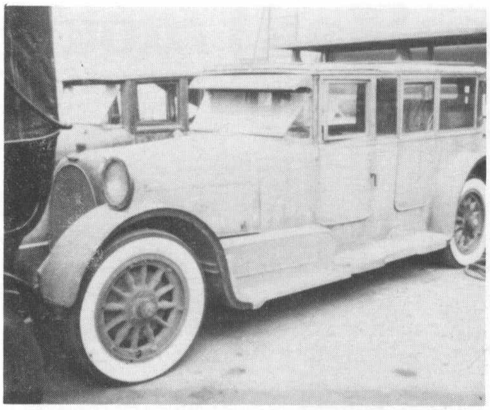
For all his inventions, Heine apparently never completed the patenting of a single one. Research began, and in some instances he drew diagrams and petitions of patent. But he never went further than that. Perhaps this was because he regarded the enterprise only half seriously, considering it mainly an outlet for his automotive interests.

He road-tested the cars rigorously and put thirteen thousand miles on one car in a matter of months. He would drive to the Arizona Desert or across a river on a barge; the car or chassis was driven constantly by him or by a member of his family. His daughter Ruth remembers that he took the cars apart quite often and that she would drive the chassis around town. The chassis would be bare except for various wires, ropes and string holding certain things together. Needless to say, this was quite an attention getter, and certainly appealing to a teen-age girl. A family trip was more like a shake-down cruise. First the previous gas mileage was figured, then the distance to the next destination. While driving along at high speed Heine insisted that the slightest hint of noise be investigated immediately. Then heads craned out of the windows trying to peer under the car to determine what would dare to squeak.[29]

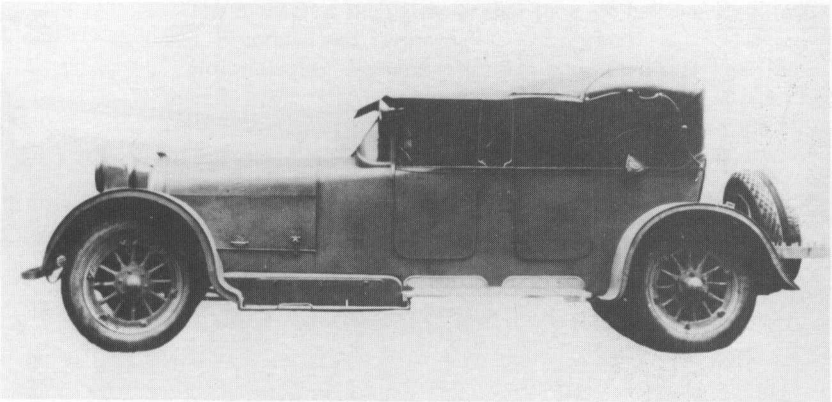
Shortly after Heine completed the five cars, he stored them in a garage. Mrs. Heine could not understand her husband's allowing cars worth about twenty-five thousand dollars each to sit in the garage and return nothing. A friend of the family, who was a Hollywood actor, sent Heine a check to purchase one of the cars. Even though it was for the proper amount, Heine wrote cross the check, "We do not accept charity", and returned it. Needless to say, Mrs. Heine was furious, but Gustav Heine felt that it was his money to do with as he

One of Heine's ventilators as installed on another make of car.





The sedan and unfinished limousine in their present storage location.



The sporting victoria now in Harrah's Collection.

pleased, especially if it concerned one of his hobbies.[30] Heine never sold any of his V-12 Heine-Velox models. He kept some and gave the others away.

In 1923 Economy Steel Manufacturing Company closed and with that ended the production of the V-12 Heine-Velox. At that time Heine decided to go to Southern California to resume his interest in playing and composing for the piano. He also purchased many different cars for his personal transportation.[31] As far as is known, Heine did not design or build another automobile. Gustav Otto Heine died at his home in Sunol, California, April 28, 1959. He was ninety-one years old.[32]

SPECIFICATIONS OF THE HEINE-VELOX

Model 1904–06 tourer

4 cylinder engine, cast in pairs	*special design carburetor*
35–40 h.p.	*weight: 2,000 lbs.*
bore: 4¾ × 5″	
Valves on top	

Model 1907–08

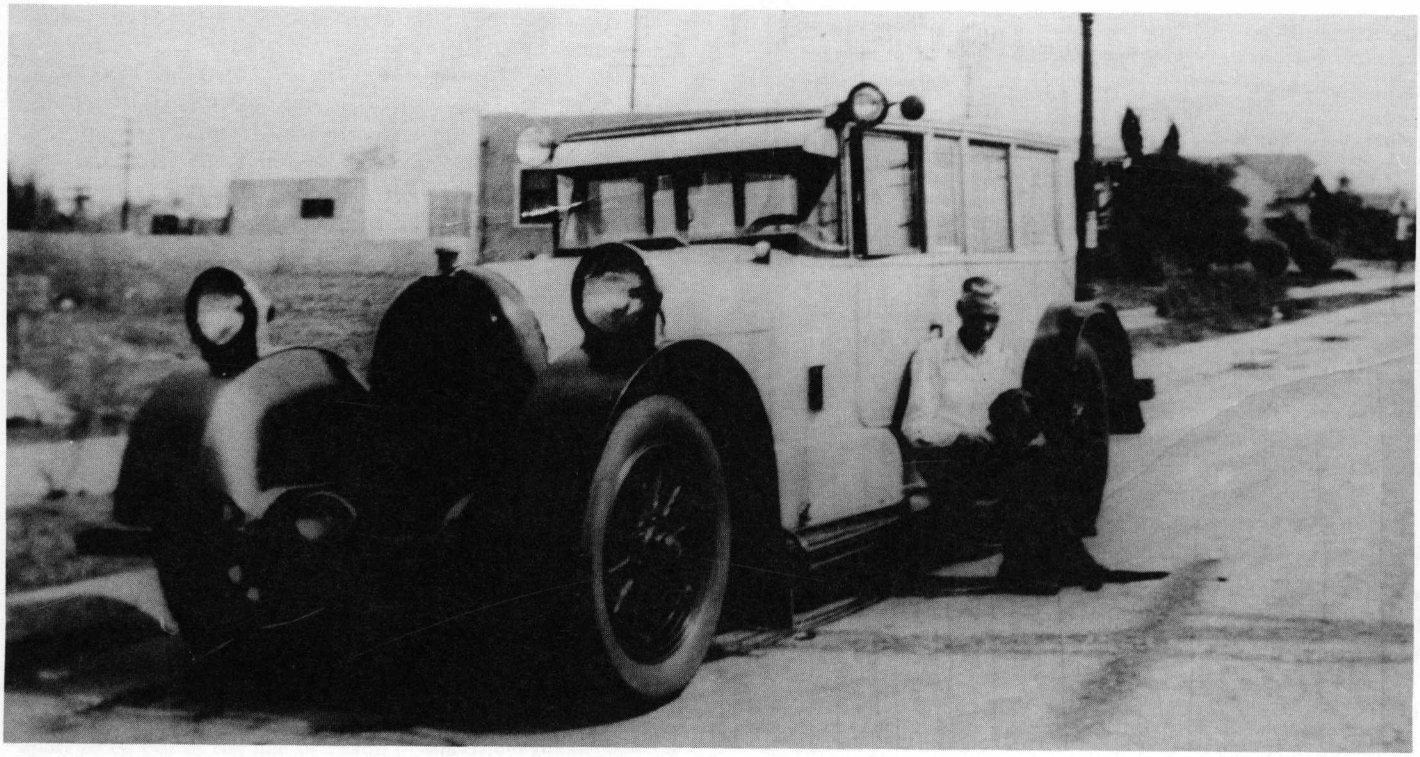
4 cylinders cast in pairs	*shaft drive*
35–40 h.p.	*bearings used:*
bore: 4 × 4¾″	*crankshaft — plain*
stroke: 5″	*wheels front — ball*
valves on top	*wheels back — ball*
water cooled	*wheelbase: 127″*
ignition: jumpspark	*track: 56″*
current supply: magneto and battery	*tire size, front: 3½″ × 34″ back: 4″ × 34″*
lubrication: mechanical Mc Cord oiler	*brakes: external and internal*
	springs: semi-eliptical
clutch: special cone	*price: $5,500.00*
change gear: progressive type	
speeds: 3	

Model 1921 V-12

V-12 Weidley engine cast in pairs of three	*wheels: wooden artillery type bolted to the wheel hub*
displacement: 389.5	*tire size: 33″ × 5.00/ 35″ × 5.00*
bore: 2.875	*3 speeds*
stroke: 5.00	*dual cutouts on exhaust*
overhead valves	*body types: Sporting Victoria, Sedans, Limosines. Bodies built by the Heine-Velox Engineering Co., San Francisco, California.*
ignition: Delco	
carburetor: Rayfield	
115 h.p. at 2400 r.p.m.	
fuel consumption: 12–15 m.p.g.	
weight: 4500 lbs.	*price: 1921 $17,000.00 to $25,000.00*

NOTES

1. *From an interview with Thomas W. High, San Francisco, April 7, 1981.*
2. *From an interview with Ruth Heine Dahl, Oakland, December 1, 1980.*
3. *Ibid.*
4. *Thomas High interview.*
5. *Ibid. Letter, blueprint and response from Ford Motor Co., 1928.*
6. *Ruth Dahl interview.*
7. *Ibid.*
8. *Ibid.*
9. The National Cyclopedia of American Biography, *Vol. 34, pps. 493–495.*
10. *The answer to this supposition may lie in an article in* The Royal Automobile Club Yearbook 1910, *pg. 357. (Author has not seen this.)*
11. *Dahl interview.*
12. The San Francisco Chronicle, *February 17, 1907, page 7.*
13. *Ibid.*
    Mauvais built a car that he called the Comet about this time in San Jose, CA. In 1907, Hall opened his repair shop in San Francisco and also produced cars which he called Comets. However, no connection is known.
14. The San Francisco Chronicle, *February 17, 1907, Mauvais Motorcar Co. adv.*
15. *Ibid, February 20, 1907, page 9.*
16. *Ibid, February 23, 1907, page 9.*
17. *Ibid, February 24, 1907, page 12.*
18. *Dahl interview.*
    The H.A.L. car was built by Lozier in the late teens and early twenties. See Automobile Quarterly *and G.N. Giorgano in bibliography.*
19. *In trade publications in 1921. See bibliography.*
20. *Dahl interview.*
21. *Interview with Henry F. Straub, Tahoe Paradise, CA, April 14, 1981.*
22. Clymer Scrapbook, *Number 4, page 174.*
23. *From 4 page factory circular describing general features of the car, undated, Heine's personal papers, Sunol, CA.*
24. *Dahl interview.*
25. *From correspondence between Heine and patent attorneys, dated 1921 and 1922. Heine's personal papers, Sunol, CA.*
26. *Ibid, letter dated April 15, 1921.*
27. *Ibid, letter of reply on business letterhead of Spagnolo, June 1, 1929.*
28. *Factory Circular of #23.*
29. *Dahl interview.*
30. *Ibid.*
31. *Ibid.*
32. The San Francisco Chronicle, *April 24, 1959, page 40, obituary.*



The car given by Gustav Heine to his brother Fred, who may be the man on the running board.

The Migration of the Heine-Velox

As of this writing, none of the early types — the 1888 experimental buggy, the 1904–06 model or the 1907–08 is known to be extant. In all there were probably no more than ten cars produced in this early period.

Heine did retain one of these early vehicles for a number of years, although nothing is now known of its fate. Mauvais also owned an early Heine-Velox, but it too is lost.[1]

In the later V-12 period five vehicles were produced — a Sporting Victoria, three sedans and one unfinished limousine. Four of these cars have survived. Joseph Molinari, the young machinist who helped assemble the cars, took one of the chassis when the factory closed and built himself a car which he called the Molinari Velocity, that designation appearing on its bronze valve covers and bronze foot pedals. It is not known if a body was ever mounted on this chassis.[2]

The Sporting Victoria was probably the most striking of all the Heine-Veloxes and in the opinion of Ruth Heine Dahl, drove and performed the best. It is now part of Harrah's Automobile Collection in Reno, Nevada. Brought to Reno by a mining engineer, the car was modified by covering the windows with wood panels, replacing the hydraulic brakes with mechanical brakes and altering the spare tire and trunk carriers on the rear. During the late fifties, Dr. William O'Brien saw the Victoria on the street and bought it. In 1961 Dr. O'Brien sold the car to Bill Harrah in essentially the condition it is shown in the Collection.[3]

The second and third vehicles, a sedan and an unfinished limousine, were stored at Heine's Sunol residence until 1953, when they were obtained by Louis D'Julio of Fremont, California. He kept them for twenty years and in 1973 sold them to James Brucker, Sr., of the Brucker Automobile Collection, Los Angeles.[4] From 1976 the two cars were displayed at the Bruckers' museum, Movieworld Cars of the Stars in Buena Park, California. The museum and some of the cars were auctioned off in 1980 and the two Heine-Veloxes were put into storage in Santa Paula, California, where they remain today.[5]

Unlike the Sporting Victoria in Harrah's collection, these two cars are in less than concours condition. The front axle of the limousine is missing, as are parts of the headlamps and nameplates; the dashboard has few instruments. This uncompleted car may have never even been on the road, since it displays no wear, other than deterioration from age. The sedan has one of the removable tops that can be changed into any of three configurations.

The fourth car, with the same removable top, was given to Heine's brother, Fred, of Santa Rosa, California in the 1930s. Fred was sickly and a clumsy driver so he gave the car to his sister Rosalie Heine High and her family soon thereafter. The High family found the car too unwieldly and left it out by a chicken coop, where Henry F. Straug, of Santa Rosa discovered and bought the abandoned treasure in 1973.[6] Although the car had been out in all weather, it was basically sound except for the missing radiator[7] and shell; the top was gone, too. Straub kept it until 1978, when he sold it to the present owner, a collector in Northern California.

There are references to a possible fifth car[8] that was either hit by a train[9] or destroyed by a fire.[10] One source says this may have been a coupe, but others state that no coupe was ever produced by Heine-Velox.[11]

From the Readers

From Donald J. Summar, 607 West Lemon St., Lancaster, PA 17603

It seems to be a truism that some new bit of information always turns up after the research is "complete" and the article written and submitted. Not long after I sent the Twyford article in I found an article in the May 1907 issue of *The Carriage Monthly* about the showing of a Twyford motor car in New York City. Titled "A New Principle", the first paragraph of the article reads:

"Recently there has been exhibited on Broadway, just above Fifty-third Street, New York City, an entirely new principle in automobile building. It is the work of R. E. Twyford, a mechanical engineer and draughtsman of experience, who has formed a company called the Twyford Motor Car Co. This concern has a small factory at Brookville, Pa., which will shortly be enlarged, and a number of these cars will be turned out in the near future. The chassis of the new invention, with a 9 horse-power, three-port, two-cycle, two-cylinder engine, is being shown in the window, and is attracting a great deal of attention on the part of automobilists and mechanical men. The Twyford car is a four-wheel drive, the front wheels, like the rear, being driven from a fore-and-aft shaft, which has a differential at each end operating on each axle."

The remaining two paragraphs of the article describe the four-wheel-drive and the steering mechanisms in the usual terms. To put this "news" item in context with what is known about the company's activities, it should be noted that Twyford's mechanism was not (in 1907) a new principle, since R. E. Twyford had been trying to build and sell vehicles using the principle since 1899; that the Twyford Motor Car Company was not a new firm and was presumably by that time already out of business, based on its absence from the Brookville newspapers; and that from mid-1906 or earlier R. E. Twyford had no say in the firm's affairs, so that even if it had been in business in April 1907 it is unlikely that he would have been spokesman for the firm. Given these facts, it seems likely that the exhibition of a Twyford automobile in New York City in 1907 was simply another effort by Robert E. Twyford to find yet another group of financial backers, after having gone through the investment of backers in Pittsburgh and Brookville. I would be most interested in learning of *any* Twyford items in trade journals after May 1907.

From Ralph Dunwoodie, 5935 Calico Drive, Sun Valley, NV 89431

I have just read with considerable appreciation Donald J. Summar's Twyford article. Don mentions that Robert Twyford's activities after leaving the firm in mid-1906 are not known and I would like to add what little I have on the man after 1906.

He turned up in San Antonio, Texas is 1911, according to an article in *Horseless Age* for November 29th. This states that "about four years earlier R. E. Twyford had exhibited in New York a patented four wheel drive chassis and had endeavored to get manufacturers interested in it. But a few days ago articles of agreement between the owners of the Twyford patent and The Commercial Motor Car Co. of San Antonio were filed with the County Clerk at Houston, Texas."

The owners of the patent at that time are listed as Z. Z. and L. J. Brandon, and Twyford.

Horseless Age, September 6, 1911 had noted that The Commercial Motor Car Co. had recently completed a large plant in Houston, Texas and had begun the manufacture of a four wheel drive motor car known as the Brandon. Then in the issue of November 8th a news item stated that the first truck of one ton capacity would be ready in a few days.

But in April 1912 an announcement in *Commercial Car Journal* states that the Commercial & Motor Car Co. had discontinued business.

Then in *Automobile Topics*, March 23, 1912, p. 295 it is noted that R. F. (sic) Twyford organized the Twyford Auto Manufacturing Co. in Houston, Texas and was selling shares at $1.00. *Commercial Car Journal*, May 15, 1912, states that the Twyford Auto Manufacturing Co. has purchased thirty acres of ground at South Houston and will build commercial cars. I have nothing beyond this hopeful reference. Perhaps after this many fruitless attempts Twyford decided to hang it up.

To go back to 1900, *The Motor Vehicle Review* for November 15th noted "The Twyford Vehicle Company, Pittsburgh, Pa. has completed two four passenger vehicles and is now at work on a runabout". This adds a bit of concrete information on the early years.

From the late George Risley, 4863 Second Ave., Detroit, MI 48201

Issue 14 of the AHR contains several articles of interest to me. One in particular is the Twyford piece by Mr. Summar. He is to be applauded for this highly readable and well documented story of a rather obscure automotive effort that appeared and retired with hardly a ripple, so to speak.

There seems to have been a little bit of anti-climax that might deserve notation. In 1910 there was formed at San Antonio, Texas, something called the Commercial Motor Car Company which acquired the rights to Mr. Twyford's patents presumably for the manufacture of four-wheel-drive trucks. Efforts to promote this venture were still under way in mid-1913. Thereafter, there seems to be no further information. Undoubtedly, the project came to nothing but there is the possibility that Twyford's dream survived in one form or another. I certainly don't know but can anyone else provide a conclusion?

I've pieced together the above comments from the following sources:
p 24, July 7, 1909 *Horseless Age*
p. 246, Aug. 10, 1910 *Auto Trade Journ.*
p. 829 Nov. 29, 1911 *Horseless Age*
p. 819 July 26, 1913 *Automobile Topics*

From Lawrence A. Brough, 516 Yorkshire Drive, Newark, Ohio 43055, excerpted from a letter to Keith Marvin.

Your recent reply to my letter about the Falcons prompted me to see if I could learn any more on the subject. Unfortunately, what I learned was that old timers keep getting older or fade from the scene. Alas, the man whom I had interviewed some years ago had passed away. I did find another interested witness to the events of the day, however.

This fellow lived near the old Halladay plant in the early '20s, and remembered well that they did build one Falcon which he remembered seeing out on the streets of Newark. He also recalled seeing one additional body which was never completed into a finished car. Needless to say, the single Falcon was all hand made.

From Willard J. Prentice, 2419 Chetwood Circle, Timonium, MD 21093
In the article in Issue No. 14 (p. 5) of the *Automotive History Review* on "The Packard Electric Company of St. Catherines, Ontario," the authors describe the early activities of the Packard brothers. According to the article, James Ward Packard in 1896 made a trip to New Brighton, Pennsylvania, northwest of Pittsburgh, "and examined Dr. Booth's motor carriage at the works of Pierce Crouch Engine Company."

In *The Motor Age* for 9/12/99 the firm is referred to as "Pierce & Crouch," New Brighton, and its engineer is identified as W. Lee Crouch. *The Horseless Age* for 4/5/99 states that W. Lee Crouch built the gasoline motor for Dr. Booth's carriage, Youngstown, Ohio. A photo of this car is on page 77, "The American Car Since 1775."

It is interesting to note that subsequently Mr. Crouch became interested in steam-powered cars and built a prototype which he tested in Pennsylvania in January 1899. The car had wire wheels and was steered by handlebars like a bicycle.

Later that year Crouch, in conjunction with a Mr. Clark who became president of the firm, organized the Crouch Automobile Manufacturing and Transportation Company with office and factory at North Avenue and Oak (now Howard) Street, Baltimore, Maryland, and advertised (*Horseless Age*, 9/20/99) that "We are now ready to take orders for the New Model Crouch Steam Carriage, a practical road machine." The factory was said to be 100 by 125 feet in size, with three stories and basement. It was reported that machines would be built "for any speed desired." Unlike the prototype, the production model had hickory wood wheels with 32-inch solid rubber tires and was steered by tiller (*The Automobile Review*, 12/99). The car had an aluminum body which kept the weight down to only 750 pounds.

How many Crouch cars were sold is not known, but by February 1900 the firm was in financial trouble, and a judge had appointed receivers. *Horseless Age* for 2/21/00 reported that "the concern had no adequate backing, and was mismanaged."

Later (3/7/00) *Horseless Age* reported that the Columbia Motor and Manufacturing Company of Washington, DC, had purchased the Crouch plant and would manufacture steam vehicles of all sizes. By June it was reported that seven vehicles were already in use, and the company was also building an 18-passenger coach for use in Washington. The runabout sold for $750 without condenser and $1,000 with condenser.

By year end, however, the company seems to have faded from the picture. One report said the Stanton Manufacturing Company had taken over the assets.

Whether more than seven cars were built is not known. Mr. Sterling Walsh of Hampstead, Maryland, is restoring an early steamer which closely resembles the description of the Columbia and may be one of the original seven built in Baltimore.

From G. Marshall Naul, 534 Stublyn Road N. E., Granville OH 43023
The reprinted listings of *The Union List of Serials* in AHR No. 13 are from an early edition of this masssive compilation. The most recent edition with which I am familiar is the Third, published in 1965. This has improvements over the earlier, as it does have cross-references to early magazine/journal titles, lacking in the original edition. One of the weaknesses of this compilation is the listing of magazine/journal holdings by the individual libraries by volume number. The volume number does not easily relate to the year of publication.

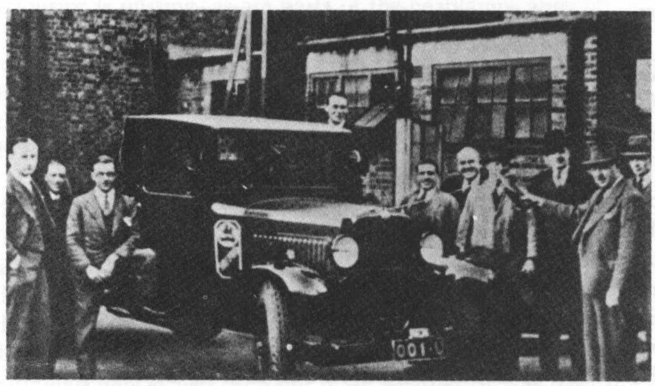
Furthermore, the *List* does not include *all* titles held by a given library, nor does it include all periodical titles. I know of at least one obscure periodical, the only one of which is retained in the Boston Public Library, but is unlisted. Finally, one major weakness of the *List* is the lack of an index by subject, so that a search for titles relating to the automobile must be done on nearly a line-by-line basis.

There are invaluable references available to contemporary periodicals in *Ulrich's International Periodical Directory* published by Bowker. This massive book covers the world and is well indexed by subject. However, for the general subject of automobiles, it is necessary to look under Transportation *and* under *Hobbies.* This index gives information on at least 400 periodicals relating to automobiles and kindred subjects. There is a companion to the above, also published by Bowker, entitled *Irregular Annual and Serials,* which covers serials published less than four times a year. I have picked up ex-library copies of these two in used bookstores for $1 or $2. In the process of developing the material accompanying Max Gregory's Crompton material I acquired an extensive listing of the photos available from the Science Museum in London that pertains to Land Transport. I will be glad to make these lists available to any member who might want to use them.

From Michael Sedgwick, Flat 1, June Cottage, June Lane, Midhurst, West Sussex, GU29 9EL, England
Max Gregory is dead correct as far as he goes on British Chevrolet and Bedford trucks. (AHR 14, page 14)

The British Chevy came in ½-ton and 1½-ton forms, corresponding approximately to the 1929 American series AC/LQ and AD/LR. Apart from right-hand steer and a 'Made in England' logo around the bow-tie badge, the vehicle was identical to the native US species, though 1930 1½-tonners were sold as Chevrolet-Bedford Model-U trucks. An example of the smaller type with ice cream vendor's body is to be seen in the Mahy Collection Museum at Houthalen, Belgium.

These Chevrolets, the panel van and the 1½-tonner with single rear wheels, were made and marketed in Britain without change throughout calendar 1931, though as far as I can make out they were not in any way updated to 1931 US specification. Nor, for that matter, were AE series Chevrolet passenger cars either assembled or marketed in U. K., the passenger line ceasing as far as we were concerned with the AD series and not resuming until early '35, when Canadian-built Standards and Masters were imported. The next U.K. assembled Chevrolets



Editor's note: An error in layout in AHR 14 resulted in the photo accompanying Mr. Gregory's letter being rendered meaningless. The right side of the photo was cropped so that Sir Laurence Hartnett's figure complete with raised bottle of champagne as referred to in the letter, and the reason for the photograph's existence, was totally eliminated. Here it is again, presented properly.

(cars and trucks) we got were the '39s, and these were put together, not at the Vauxhall plant in Luton nor yet in the Hendon works, but in a new purpose-built factory in the dock area at Southampton.

Bedfords proper began in '31 with a *two-ton* chassis featuring twin rear wheels and a four-bearing *pressure lubricated* motor, made as Series WHG (short goods), WLG (long goods), WHB (14-passenger bus) or WLB (20-passenger bus). All had four-speed transmissions, and supplemented rather than supplanted the 'British' Chevrolets.

For 1932, the Chevrolets were phased out (though they had shared the Vauxhall Motors stand at the Commercial Vehicle Show in London in November 1931) and replaced by parallel Bedford models with Vauxhall designed motors, the VXC/VYC 12-cwt (=½-ton) panel and the WS 30cwt (=1½-ton) truck. Both wore plain disc wheels of six stud type with single rears. Motor in the VXC and WS was shared with the existing 2-ton vehicles, though the VYC van used the smaller 21 liter unit fitted to home market editions of the Vauxhall Cadet passenger car. (The Bedford unit was regular equipment for export.) The 1½/2-ton range was continued with minimal change thru the 1935 model year before giving way to new Stepney Acres designs, but the half ton van was still being made as late as 1939, still looking very like a '30 Chevy panel, though new Vauxhall motors and wire wheels arrived in 1934.

I hope this clarifies the production status of these two makes in the period Max Gregory's letter refers to.

From Ronald J. Putz, 201 Salzburg Ave., Bay City, MI 48706-5317

Keith Marvin's excellent research into the confusing matter of the two "Falcons" prompts me to submit a quaintly written article on yet another "Falcon". It appears in *The Motor World* October 12, 1905, page 118. I quote it in full:

Falcon Swoops Down on Bay City.

W. F. Flynn is a young man who firmly believes in judicious advertising. Flynn is the Michigan lad who invented the "Falcon motor car, simple in construction, silent and marvellously swift in operation. The motor indicates a power heretofore believed impossible of attainment in an engine of this size and weight, which permits the running gear of the machine to be constructed on heavier lines in order to overcome severe shock incidental to fast driving. In addition to this feature there are a number of special features found in no other machine." Flynn wants to locate in Bay City, Mich., and as paid advertising requires considerable outlay, Flynn decided to take a lot of newspaper reporters for an outing. The result is very apparent, for in commenting editorially on Mr. Flynn's intended stock company a Bay City paper says: "Any one having money to invest in a legitimate industry which promises reasonable large returns from the outset will certainly find it to their advantage to confer with the secretary of the Board of Trade. Bay City should certainly leave no stone unturned to secure this industry."

I doubt if Mr. Flynn ever really got into production here, as I have been unable to locate records of *any* Falcons made here.

Further notes on this Falcon from Ralph Dunwoodie:
From HA, 9-20-05, p. 349: "F. W. Flynn, Youngstown, Ohio, manufacturers of the "Falcon" car, is considering the removal of his factory to Bay City, Mich., where he is endeavoring to interest local capital." My only other reference on this is to F. W. Flynn in 1903 as he is 'organizing to manufacture'.

NOTES AND CORRECTIONS TO THE PREVIOUS ISSUE, NUMBER 14.

A combination of circumstances caused certain problems in layout, photo positioning and captions, and proofreading, in #14. The following notes are an attempt to clarify some of these errors.

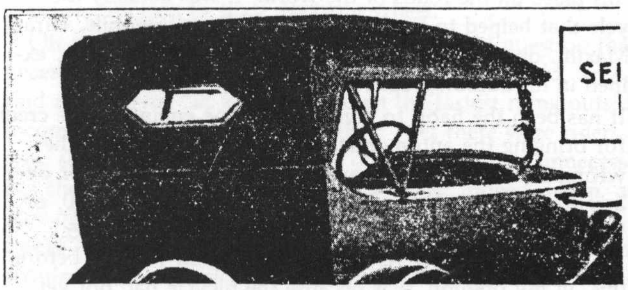
The photos in the Twyford story are out of sequence. On page three, column one, the upper photo should have followed rather than preceded the lower one, while the photo on page four should have preceded the third photo on page three. On page four the date in the first line of text should be 1906, not 1905. We call attention to the very interesting supplementary Twyford information in the letters columns of this issue.

In the Packard Electric article the captions of the two lower photos on page six are transposed.

The entries from Branhams Automobile Reference Manual that are mentioned in "A Confusion of Falcons" on page eleven as being reproduced as part of the article were left out. To complete the story, they are shown here.

The material headed "References for Researchers" beginning on page fifteen is properly presented up to the point on page seventeen where the line appears "The following contributed by Ralph Dunwoodie". The entries from this point on were not intended to be a part of this issue and include duplications of the preceding material as well as non-alphabetical notes that inevitably will be duplicated as part of future instalments as we continue to present further alphabetical listings from 'B' onward.

HALLADAY Motors Corp., The, Newark,



Serial Number on dash. Motor Number on left side case, as shown above. (Rutenber Motor used.)

Year	Model	N. A. C. C. H.P. Rating	Cyl.	Bore and Stroke	
1920	20-21-22-23-24	23.44	6	3⅛x5	2100
1921	Manhattan	23.44	6	3⅛x5	
1921	Artcraft	23.44	6	3⅛x5	210001
1922	Changed to Falcon.				

ABOVE FROM 1923 EDITION: 1924 BELOW

Serial Number on dash. Motor Number on left side c case, as shown above. (Rutenber Motor used.)

Year	Model	No. Cyl.	Bore & Stroke	N.A.C.C. H.P. Rating	Type of Body	Shipping Weight	Se
1920	20	6	3⅛x5	23.44	5-Ps. Tour.	2,750	2100(
	21	6	3⅛x5	23.44	2-Ps. Road.		
	22	6	3⅛x5	23.44	5-Ps. Tour.		
	23	6	3⅛x5	23.44	4-Ps. Coupe		
	24	6	3⅛x5	23.44	5-Ps. Sedan		
1921	"Manhattan"	6	3⅛x5	23.44	5-Ps. Tour.	2,750	210000
	"Artcraft Special"	6	3⅛x5	23.44	5-Ps. Tour.	3,050	
1922	Out of Business.						

The Automobile's Bicycle Heritage

Charles E. Duryea astride a bicycle of his own design.

It has been said there is scarcely any single invention which owes its existence to any one man. While the idea for an invention may spring from one fertile mind, its realization and practical development is almost always dependent on the suggestions and progress of others. To no similar contrivance does the automobile more owe its development and success than to the bicycle. The technology which had been developed in making bicycles was to be the foundation of the car industry.

Ironically, although the cyclist today must battle with cars for his place on the roads of the world, it was actually the bicycle that helped to launch the age of the automobile. Hiram P. Maxim, one of the most active of automotive pioneers, explained in his autobiography:

> It has been the habit to give the gasoline engine all the credit for bringing the automobile — in my opinion this is the wrong explanation. We have had the steam engine for over a century. We could have built steam vehicles in 1880, or indeed in 1870. But we did not. We waited until 1895.
>
> The reason why we did not build road vehicles before this, in my opinion, was because the bicycle had not yet come in numbers and had not directed men's mind to the possibilities of long-distance travel over the ordinary highway. We thought the railroad was good enough. The bicycle created a new demand which it was beyond the ability of the railroad to supply. Then it came about that the bicycle could not satisfy the demand which it had created. A mechanically-propelled vehicle was wanted instead of a foot-propelled one, and we know now that the automobile was the answer.[1]

Probably the bicycle's most profound contribution to the automobile's success was the public interest in road improvement that it stimulated. To be useful, a highway vehicle manifestly must have an adequate highway system. The lack of good roads became noticeable in the 1870's and rose increasingly after the introduction of the "safety" bicycle in 1885. The safety bicycle was of universal appeal; it could be ridden by men, women and children, and in the 80's and 90's it put people by the thousands on the roads of the Western world. Bicyclists soon became conscious of the inadequacies of their highway system and raised a clamor for something to be done.

Before the bicycle there had been no great pressure for good roads. Horses were relied upon to cope with the difficulties of bad ones whether in the city or the country. City people who could not afford a horse used streetcars, whose tracks made smooth streets unnecessary. But horses and streetcars were not bicycles. In order to achieve the freedom and the economy for which the machine was touted, it was mandatory that streets and country roads be as level as possible. Consider the plight of the members of the San Francisco Bicycle Club who in 1880 made the long trip round the south end of San Francisco Bay. "This was only possible in the spring or autumn," wrote one of them to an English magazine, "when the condition of the roads allowed it. The rainy winter months convert the earth roads into bottomless quagmires, and the long rainless summer months reduce them to a condition of dust that precludes riding. We can always find 10 or 20 miles of good riding, however, in the vicinity of Oakland, and we are thankful for small favours." From the very outset then, cycling fans were outspoken advocates of street and highway improvements which interested neither horsemen, traction owners, nor railroad tycoons.

For more than two decades, the League of American Wheelmen, organized in 1880 by a consolidation of bicycle clubs, sounded a clarion call for good roads and bicycle sidepaths. Bicycle builders as well realized all too well the potential impact of better roads. Colonel Albert A. Pope, addressing a convention of the National Carriage Builders Association in 1889, said:

> ". . . The question of most particular interest, today, to you and me, as manufacturers and merchants, in this whole question of good and bad roads is *what is the effect on our business?* . . . It must be clear to any man that good roads mean thrift, liberality, and wealth."[2]

As it became apparent that great sums of money were needed, cyclists were forced to realize that highway improvement was a political matter, because the burden had to be laid on the taxpayers. Therefore, the cyclers moved as an organized group to put pressure on legislators. Across the nation they pushed for the election of men who could be counted on to vote for improved roads. As early as 1891, OUTING magazine called upon the entire body of wheelmen to refuse their votes to candidates who were unwilling to support the good-roads program, and it called upon both political parties to put planks in their platforms advocating such improvements.

These monumental efforts began to bear fruit as state after state enacted local road-aid laws, led by New Jersey in 1891. By 1893, the year the Duryea car made its appearance, pressure from the bicyclists induced Congress to appropriate $10,000 for a Bureau of Road Inquiry in the Dept. of Agriculture to study and advise on improved methods of highway construction. This was the forerunner of the Bureau of Public Roads and of the federal highway program.

With the decline of the bicylce craze that began in 1897, it was hoped that automobile owners would continue the cause, and they did. However, the car was a thoroughly aristocratic vehicle in its infancy, a rich man's toy, and improving highways for the wealthy was not as attractive an example of democracy. Nevertheless, the road-improvement program would continue to roll on the impetus given it by the cyclists.

Besides roads on which to ride, the early cyclists wanted to make traveling more comfortable and pleasant. Cyclists were among the first to routinely take short trips into the country, and they needed help to prevent becoming lost. Frequently road signs were either missing or illegible, and maps presented meager and often inaccurate information. The result was that bicyclists were frequently at the mercy of rural people who were not above deliberately giving wrong directions to "city slickers."

WHEN YOU BUY, BUY SOMETHING GOOD OR DON'T BUY.

The AMERICAN IDEAL RAMBLER is something distinctly good. It is not the cheapest in price but the cheapest in the end. It sells for $65 and is worth every cent of it. It is made of the *best imported weldless steel tubing*, is fitted with ball bearings and has the renowned Rambler spring frame which makes every jolt a delightfully easy one; it is adjustable in every part, is suitable for either boy or girl, or for lady of light weight and small stature, and every wheel is backed by a reputable guarantee.

It makes **A SUBSTANTIAL HOLIDAY GIFT,** one which will last for years after most of the cheap cast-iron crocks called "children's bicycles" have gone to smash. Steel will tell. Catalogue on application.

GORMULLY & JEFFERY MFG. CO.
BOSTON. CHICAGO. WASHINGTON.

Rambler bicycles, made with "the best imported weldless steel tubing" in 1891, were the predecessors of Rambler cars that began to be produced in 1902.

The confusion, fatigue, and disgust that resulted from such encounters moved the League of American Wheelmen to recommend that its members keep accurate logs of their trips noting both distance and direction exactly. It is possible that the cyclometer (odometer) was developed partly for this purpose. These logs were later compiled into road guides. The widespread use of road signs was organized, and traffic signals were devloped as well. Furthermore, the very numbers of cyclists were responsible for forcing a drastic overhaul of the traffic-control systems of American cities and bringing some order out of the chaos that controlled the nation's streets.

In addition to introducing thousands of persons to individual and independent mechanical transportation, the bicycle proved the value of many materials and parts that were subsequently taken over by the automobile designers.

As the bicycle craze swept the country, for example, an awesome demand was created for the steel tubing used in the manufacture of frames. For some years American bicycle makers were entirely dependent on English production for the tubing, and the mills of Birmingham spat out the miles of hollow pipe that American makers absorbed. In fact, the American consul in that city reported in 1895 that the United States bicycle industry took the *entire* output of the mills, and that tube-making shops were springing up all over England to capitalize on the market.

Until the 1890's the demand for millions of feet of seamless steel tubing could not be met due to the slow and tedious tube manufacture methods used. Pipe had traditionally been made by folding over a flat piece of iron or steel into the shape of a cylinder and welding the edges together into a seam running its entire length. Such pipe was too heavy for bicycles. Experiments had been carried on since 1845 to manufacture seamless pipe, but without marked success until the 1890's. In the process finally developed, a hole was pierced through a solid round section of white-hot steel, thus forming a hollow interior without a seam.

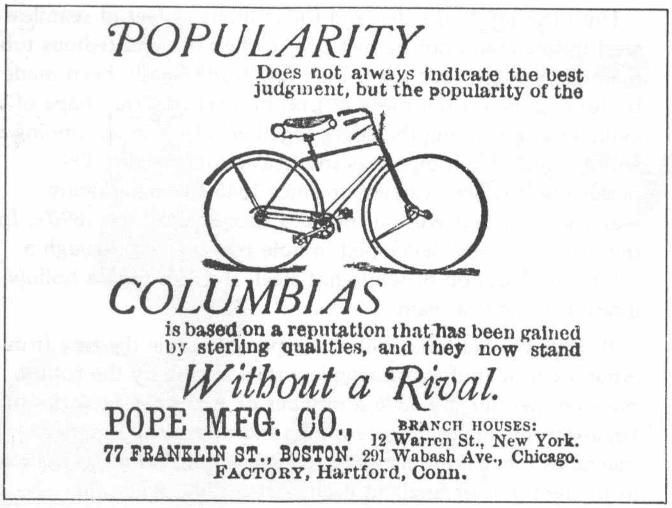
In 1895 the National Tube Company became the first firm in America to manufacture seamless steel tubing by the rotary piercing method. By 1896 a number of American factories had begun producing seamless tubing, and improved American machines for making it began to replace English machines even in the factories of England itself. After 1900, when the automobile appeared on the scene and as its popularity increased, the market for bicycle tubes decreased. The automobile had an even more profound effect than the bicycle on the tube business. First, the steel tubing had to be of a higher quality to withstand the greater demands imposed by weight and speed. Secondly, the rapid increase in automobile production created a corresponding demand for gasoline, which stimulated expansion of the oil industry and opened up a large new market for such pipe.

In the pre-automotive age, as the bicycle became more popular and city streets became dueling grounds between horse-drawn vehicles, pedestrians and cycles, all fighting for the right of way, many cyclists came to realize the desirability of brakes. The first boneshakers used a lever and block of wood which was brought against the rear wheel by means of a string that was tightened by twisting the handlebars, an awkward arrangement at best. Later high-wheelers had a small lever-type brake that used friction to slow the front wheel.

Off hand, it would seem that nobody would question the necessity of having some kind of a device that would, as was said at the time, "at least slow down the fastest thing outside a locomotive, if not stop it altogether." Yet there were riders who stoutly maintained that not only were brakes unnecessary, but they added useless weight to the cycle. Indeed, when, as part of a program to regulate bicycles and insure "public safety" from them during the 1890's, New York City moved to require brakes on cycles, the cycling fraternity hooted at the idea claiming it would promote even less safety by removing the incentive for riders to learn to properly jump off!

Generally in those days when a cyclist wanted to make a stop, he simply got off as quickly as he could. Dismounting was a regular part of the training in the riding schools. The expert cyclist learned to dismount either to the left or the right and in some instances over the rear wheel — or so the theory went. One is left with the inescapable feeling that a good deal of dismounting was head first over the front wheel. The favorite way to slow down on steep grades was to backpedal. In some emergencies the rider put the sole of his shoe against the front tire and braked with that.

It was in this drive for a better alternative to stopping that the modern brake drum and shoe was developed. This American-made invention consisted of a steel leather-lined drum that encircled the axle of the rear wheel. By means of a hand lever the lining of the drum was forced against the axle, and the resulting friction slowed the bicycle. The final solution, the coaster brake, came as the bicycle craze was beginning to decline just before the turn of the century. The principle of



Colonel Pope's Columbias of 1891 were the foundation of an empire that expanded into automobiles before the century ended. The Columbia name can still be found on present day bicycles.

mechanical drum brakes would soon be borrowed and used on automobiles for decades to come.

Although driving chains had been conceived and crudely built since the 15th and 16th centuries, it was in 1864 that an Englishman, James Slator, patented a driving chain which can be regarded as the first step in developing a precision chain strong enough to drive bicycles. Slator's advances were made possible by application of stronger steels and new tooling methods. In France, a 'Bicylette' with the first chain-drive was designed by Andre Guilmet and manufactured by Meyer et Cie in 1868. Later another Frenchman, G. Juzan, developed his "Bicyclette Moderne" in 1885. It had two wheels of equal size, with a chain drive to the rear. Another advance was made by an Englishman, J. K. Starley, who made his "Rover Safety" bicycle in 1885. This machine also had a chain driving to the rear wheel as opposed to the front wheel, which was tried with mixed results on a few high-wheeler bikes of the period. The application of the roller-type driving chain, which appeared on the Osmond bicycle of 1896, increased the smoothness and efficiency of the drive to the rear wheel, and the earlier block-type chain gradually became obsolete.

Thus began the era of the modern bicycle, with Coventry, England, and Ohio as the centers of the chain manufacturing industry. And from the bicycle developed the application of the chain-drive principle to motorcycles and cars. Nowadays precision chains are among the most reliable parts of industrial machinery.

Attempts were also being made at this time to improve the drive by use of other forms of transmission. As far back as 1882, shaft drive and bevel gearing had been developed for the adult tricycles then being built. The use of a shaft drive, or differential would later be used on the Columbia, Pierce, and Acatene bicycles. Overall, however, the shaft drive for bicycle propulsion made little headway once the improved roller chain came into use.

Bicycle makers were also the first to experiment with variable-speed gears, various forms of freewheeling, and gear-shifting devices. Such experiments included one device that was a tricky pedal that would bend and so lengthen the foot crank on the downstroke, thus increasing the power. Frank Bigelow of New Jersey patented a gear system that had two different sized sprockets mounted on either side of the frame; power was shifted from one sprocket to the other through the hollow shaft connecting the pedals. Another inventor came out with a gear consisting of a circular plate driven by pedals; power was taken off the plate by a roller which in turn transmitted its motion to the rear axle. Gears could be shifted by moving the roller in toward the center of the plate or out toward the edge. Pope came out with a sprocket that had its teeth set on a detachable rim; one could merely put on a set of larger or smaller teeth. One of the most advanced cycles was the New Whippet of 1897. It was fitted with a freewheel, a rim brake, and a four-speed gear. Although almost none of these gearing experiments was successful, the seeds of later developments in this area were sown from the hub of the bicycle.

Ball bearings found one of their earliest uses in the bicycle of 1880 and perhaps earlier. The bushings then used on forks and axles would soon wallow out. Ball bearings insured even and much reduced wear. As their value became apparent, more and more effort was put into improving them. Colonel Albert Pope, for example, who would later build the Columbia automobile, did extensive metallurgical testing, including crushing bearings to determine the amount of friction they could tolerate. Roller bearings were likewise developed.

No doubt one of the most important contributions of the bicycle to the automobile was the pneumatic tire. The combination of the pneumatic tire and the hard surface road was indispensable to the success of the motor vehicle. Without both, highway travel could have never competed with rail transport in the ease of making a journey.

John B. Dunlop, an Irish Veterinarian, 1888–89, while trying to make it possible for his son to beat his friends on his tricycle, perfected the idea of an air-filled tire and tube. Despite the criticism and ridicule Dunlop's invention occasioned, the increase in speed and comfort it afforded quickly established its value, and the pneumatic tire rapidly gained acceptance in the United States and Europe during the 1890's.

It was natural that automobile manufacturers would look to the pneumatic to do for them what it had done for the bicycle; that is, provide greater speed with comfort and safety. This conclusion was arrived at after repeated attempts to perfect various types of solid rubber and cushion tires had failed and it became obvious that compressed air was the most efficient form of elastic cushion and that the quickness of its reaction was increased in proportion to the increase in volume and pressure. Due to weight and stress it became apparent the automobile required a stronger tire and tube. Subsequent advances included wire edges invented by A. T. Brown and G. F. Stillwall of New York in 1892, and cord reinforcement, the invention of John F. Palmer of Chicago, also in 1892. The first American-made tires designed especially for automobile use were manufactured about the middle of 1896 by the B. F. Goodrich Co. at the expense of the Winton Co. of Cleveland, Ohio. These first automobile tires were constructed of 19 plies of cotton fabric and were very crude in design. They represented the first real clincher automobile tire built in America and marked the beginning of its development for automobile use.

The bicycle industry of the 1880's and 90's was the first of any size in which assembly-line mass production was intensively applied to the building of a high-quality product. The magazine SCIENTIFIC AMERICAN in 1891 described the Overman Works in Chicopee, Mass., manufacturers of the Victor Bicycle, as a marvel "almost unique" not only in the use of assembly lines but in the arrangement of all the processes involved "so that every motion of the mechanic or the machine counts in the production of the finished article and no energy

At the same time in 1897 that Pope boasted of controlling the production of nickel steel tubing for bicycles his factories in Hartford were just beginning to build automobiles.

was uselessly expended." One could hardly describe a modern automobile plant more accurately. Much of Henry Ford's later success would be due to such systematized production.

In spite of numerous production advances, the demand for bicycles by the 1890's had increased to the point that large makers, to meet their orders, had to resort to subcontracting, another instance of anticipating the automobile industry. Watch factories began to make cyclometers, a knitting-needle factory got busy turning out spokes, and manufacturers of rubber hose turned themselves to the production of tires.

A striking illustration of the preparative role of the bicycle is the long roster of men and companies who moved from one industry to the other; prominent on the list are Morris and Austin in England, Opel of Germany, and France's Peugot. Among pioneer U.S. builders were Charles E. Duryea, Alexander Winton, Colonel Albert A. Pope, H. A. Lozier, George N. Pierce, John and Horace Dodge, as well as Stearns, Willys, Jeffrey, and the Duesenbergs. It's also interesting to note that Orvill and Wilbur Wright were bicycle manufacturers in Dayton, Ohio, before they turned their attention to the challenge of flight.

Building bicycles was one thing, selling them presented a new set of challenges. In meeting those challenges, bicycle makers predated their automotive conterparts in marketing techniques as well. With the fierce competition of over 300 companies by the 1890's, the bicycle industry was the first to establish an extensive sales force and it was among the earliest to offer guarantees for its machines.

In addition, the cycle makers created the system of planned obsolescence to stimulate sales, the idea of concealing models until they could be unveiled at the cycle shows, and the ballyhoo and the hard sell that were later a part of the automobile business. The NEW YORK TIMES in 1895 took notice of the growing practice of American cyclists to purchase new models in the spring, sell them the following fall, and then wait for the new cycles that would be shown in January. Directly, the newspaper accused the industry of fostering this rotation by rendering the old machines stylistically out-of-date through the introduction of changes that bore little relationship to the performance of the bicycle. The NEW YORK JOURNAL noted as well in 1897 that moving the sprocket back and forth, putting double crowns on the front fork, and changing the diameter of the tires served no useful purpose but to line the pockets of the manufacturers with money. In a cartoon, a cowboy was pictured talking to a stranger in the main street of a Western town.

Stranger: "This is a hustling community, isn't it?"
Cowboy: "I should say not, I'm going to move next week. Why, the people jist elected a man for mayor that rides last year's wheel."[3]

The Overman Wheel Co., a few miles up the Connecticut River from the Pope factories in Hartford, later figured in the early years of the automobile industry with its own Victor steamers and then as A. L. Riker's workshop in the development of the early gasoline Locomobiles.

A small problem was created for dealers by the practice of planned obsolescence. To get the public to buy the new models every year, a dealer frequently had to take the old one in trade and then had to sell the used machines. And in 1895, buying a secondhand bicycle was no less tricky than buying a used car now. The MINNEAPOLIS TRIBUNE said that the average American knew almost as much about buying a used bicycle as he did about buying a horse — nothing! Whereupon the paper proceeded to give some advice on how to buy a used machine. It warned the prospective purchaser to beware of any wheel that did not show the "blush of maiden modesty unmarred." The customer should inspect the saddle, a good place to show signs of wear. Above all, the purchaser should keep in mind that the plainer the bicycle the better, because accessories were just things to get out of order.

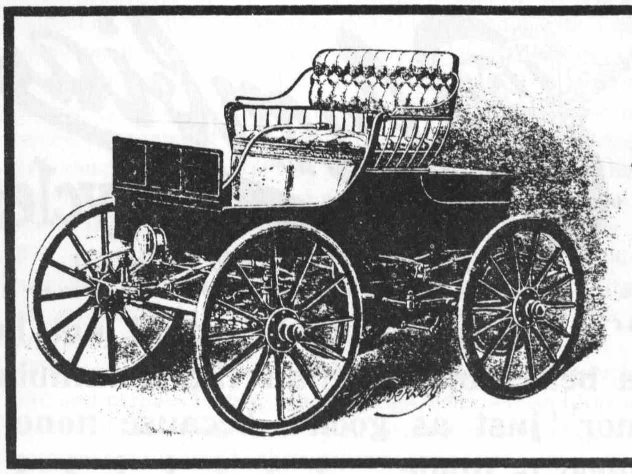
As bicycle prices plummeted in the summer of 1897, dealers made frantic efforts to cut their losses by unloading high-priced cycles at a 40% discount on the grounds that they were "shop-worn," a tactic that was the antecedent of "demonstrators" and "executive cars" by automobile companies. And when it came to trade-ins, those who had really paid high prices for machines in 1896 could expect almost nothing for them a year later. Sound familiar?

Like today's auto industry, bicycle makers realized the advertising potential of racing successes, and so sponsored contests and competing teams. Indeed, many well-known bicycle racers of the early days ultimately became famous in the automobile racing field, Ralph De Palma and Barney Oldfield probably being the best known of the converts.

Directly and indirectly the bicycle had a decided influence on the introduction, perfection and ready acceptance of the automobile. By giving the ordinary man a taste of the fun to be had from a personal means of transport, his appetite for more (sophistication) was whetted. The mechanical, manufacturing and marketing innovations developed in its heyday continue to have far-reaching effects on modern transport.

Unfortunately collectors, historians, and the public continue yet today to narrowly view the automobile concept as springing forth almost solely from the minds of Benz, Duryea and Ford, tending to see the bicycle as a "clever machine making its way alone into the popular favor rather than a single part in a great and wide-spread move in transportation which it was . . . privileged to lead."[4] We would do well to remember that the first foreign-made car in the United States, exhibited at the Chicago World's Fair in 1893, was hardly more than two bicycles trussed together and driven by a Daimler engine mounted on the connecting framework!

One wonders what the reaction of an early cycle maker would be if presented his mechanical grandchild. No doubt awe and astonishment, but probably a good measure of pride and sense of contribution as well.



Waverley Electromobile

Model 18. $1000.

A new departure in electric vehicle construction; light, safe, noiseless, odorless, clean, durable, comfortable, simple in operation. Battery guaranteed for two years. In no other vehicle are all these desirable qualities combined.

Wheels, thirty-four inches
Tires, one and five-eighths inches, solid rubber
Speed, three to sixteen miles per hour
Height of body from ground, twenty-seven inches

We can make prompt shipment of this model. Reliable agents wanted in unoccupied territory. Catalogue illustrating 18 models for two 2c. stamps.

AMERICAN BICYCLE COMPANY
Waverley Factory, Indianapolis, Ind.
NEW YORK SALESROOM - - - 943 EIGHTH AVENUE

1. Horseless Carriage Days, H. P. Maxim, Harper & Bros., N.Y. 1936. pp 4–5.
2. Quoted in Combustion on Wheels, David C. Cohn, Houghton Mifflin, Boston, 1944. p. 10.
3. New York Journal, January 2, 1897.
4. Outing, March 1900, p. 461.

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Book Talk

NISSAN/DATSUN A History of Nissan Motor Corporation in U.S.A., 1960–1980 by John B. Rae, 331 pp., 38 photographs, 2 appendices, list of sources, 14 pp. of references by chapter, index, ISBN 0-07-051112-8, McGraw-Hill, New York, 1982. $19.95.

The remarkable surge of Japanese automobile imports is one of the recent changes which have shaken the American automobile industry. The contrast between the 2,400 Datsun cars sold in the United States in 1960 and the 472,252 in 1979 shows there was a story to tell. John Rae has told it. Scholarship usually lags far behind events. This happy exception covers a time period many of us know from experience.

John Rae richly merits the description "dean of automotive historians" given him in a note in the text and on the dust jacket. He has written a rags to riches account. These always fascinate us but often suffer from distortion. This is an objectively written well researched serious work with tables and graphs to illustrate.

It is business history at its best. It is more than a history of Nissan corporation and its success in selling Datsun vehicles here. It is also a study of the American automobile market in these two decades. What happened to that market after the Eisenhower era? Students of that problem will find the book invaluable.

How did this Japanese manufacturer build its sales from the trickle of 83 in 1958 to the later flood? Rae sets out the administrative steps in distribution, organization, advertising, etc. Initially matters were informal with Mr. Katayama the first head of the Western Division trying unsuccessfully to sell cars himself and delivering cars to dealers. More complex is the issue of why Datsun (and Toyota) ran away with the import market. Rae lists good reasons for Datsun's success. Heading the list of factors in a 1978 new Datsun buyers survey was cost/value followed by fuel economy, the two accounting for seventy one percent. The early recognition of the need for good service, low prices, the turn to economy cars when Americans finally realized there was a fuel crisis, the delay of the most important European importer, Volkswagen, in bringing out a new model, in addition to Nissan's sound business practices are all elements.

There may be other factors less capable of objective demonstration. The growth of ideas and the presence of emotion are harder to get on a graph. Two threads in these categories may merit further investigation, the idea that cars should be different from Detroit products, and the emotion that the familiar is better. The first expressed itself in the growth of a market after world war two for cars of superior handling qualities and smaller size. This produced an articulate segment of the automotive press. *Road & Track* magazine may be the best example. It may be suggested that once imported cars became accepted in the decade 1950–1960, it was easier for Datsun and other Japanese cars to make gains. They were cheaper, smaller, and more economical in a now accepted mode. They also appealed to a group of buyers (Datsun sports car buyers excepted) to whom higher standards of steering, braking and controlability were less important and to whom the more American feel of Japanese cars was emotionally reassuring.

Here is further illustration that automotive history has become a serious intellectual pursuit. May it stimulate further exploration of American business history after the second world war and greater advances in our understanding of the automobile in our culture.

W. F. Robinson, Jr.

Since we have presented a bicycle article in this issue it is only fair that reference be made to the automobile's other competitor, the horse. This particular horse has adjusted quite well to the motor age and travels in style in an Alfa Romeo, about 1950.

MINOR ENGINE MANUFACTURERS

By G. Marshall Naul

Two major suppliers of engines to the automotive industry have been covered in earlier articles.[1] The less well-known builders of stock and custom engines for automobiles are numerous and date from the beginnings of the auto industry. Unfortunately until about 1912 very few automobile manufacturers were sufficiently candid to acknowledge the use of standard parts in their products, particularly engines. In those early times it was thought that the maker who built all of the parts of his product built a superior product. Later, in the period of the "assembled car" from about 1912 to the mid-twenties the use of standardized parts of known reliability and reputation was recognized to have advantages over "home-made" and unproven assemblies, and identification of component parts from outside sources in advertisements and specification tables became common. The historian's job then becomes much easier.

The following information is believed to be reliable but admittedly incomplete. Added information or clarification would be most welcome.

The listing of manufacturers is alphabetical by trade name except where rearranged slightly to allow a long entry to appear in a continuous column. The manufacturer's name and address and the years in which the company was active is then listed. Engines are listed by model designation, number of cylinders, bore and stroke, valve arrangement and horsepower, where known. This is followed by a column of makes of autos, models and years in which the specific engine was used. Only those engines which are identified as having been used in production models have been considered.

There are many suppliers of engines whose products have not been acknowledged, and possibly some whose models were never used. For example, there were 88 automotive engine builders listed in Chilton's Directory for July, 1916, but only a quarter of those can be traced to actual use in a production model automobile. All information in parentheses ( ) is subject to revision and may be only an estimate. One final note concerns a few duplications of engine models. This is caused by the early manufacturers' use of one model designation to cover a number of engines of a common design, with changes in bore and stroke only.

1. "Lycoming's Famous Powerplants and Their Numerous Customers" The Best of OLD CARS Vol. 1, pp 353–5
"A Brief History of the Continental Engine (sic) Company" Special Interest Autos, No. 38, Jan-Feb 1977, pp 28–33.

AMCO - Amco Motor Co., Norwalk, Conn. (1916-17-)

	6	3.00 x 5.00	L		American A	1917
					Cameron	1917

ANSTED - Ansted Engineering Co., Connersville, Indiana (1920-26)

M	6	3.3125 x 4.5	OH		Lexington	1924
					" Concord	1925
					Lexington 6-50	1926
C	6	3.25 x 4.5	OH		Lexington T	1921-2
					Lexington 23	1923
					Durant B-22	1922
F	6	3.3125 x 5.25			Lexington Minute Man	1924-5

ATLAS - Atlas Engine Works, Indianapolis, Indiana (1909-11-)

	4	3.75 x 4.5	L		Hudson	1909-10

BEAVER - Beaver Manufacturing Co., Milwaukee, Wisconsin (1903-14-)

6B	6	4.00 x 5.00			DeSoto	1914
					Luverne 7-60	1916
6A	6	3.75 x 5.00			Meteor 6-45	1914
4B	4	4.00 x 5.00			Meteor 36	1914
(ML)	4	3.50 x 5.00			Interstate T	1916-8
	4	4.75 x 5.00			Traveler 36	1913
	4	4.375 x 4.75			Luverne 540	-
	4	4.375 x 5.25			Luverne 545	-
CL	6	3.50 x 5.25		68 hp	Severin Spec.	1921

**BUDA - Buda Foundry & Manufacturing Co.
Buda, Illinois (1881-1897)
Harvey, Illinois (1897-1908)
The Buda Company, Harvey, Ill. (1908-)**

WU	4	3.75 x 5.125	L		Argonne	1920
					Biddle H	1915-19
					B-1	1920-22
(WU)	4	3.75 x 5.125			Hassler	1917
	4	4.50 x 5.50			FAL Greyhound	1913
O	4	4.125 x 5.50			Henderson	1914
CTU	4	3.75 x 5.25			Hermes	1920
QU	4	3.75 x 4.5			Hudson	1909-10
	6	3.00 x 4.00			Jeffrey Chesterfield	1916
	4	4.25 x 5.00			Lenox D	1916
	6	3.50 x 5.00			Lenox O	1916
	4	3.75 x 5.00			Meteor	1915
	6	3.75 x 5.00			Meteor	1916
(SS)	6	3.75 x 5.50			National Highway	1916-7
					Owen Magnetic	1916-9
-	6	3.50 x 5.25			National Highway	1916
LS or LSU	6	3.50 x 5.125			Pneumobile	1914
--	4	4.50 x 5.50			Spaulding H	1915
Q or QU	4	3.75 x 5.50		35 hp	Tribune	1913-4
--	6	3.10 x -?-			Carroll	1920-2
--	6	unknown			Ben Hur	1916
RU,V or VU	4	3.50 x 4.125			Vulcan	1915

COLONIAL - Colonial Motors Co., Detroit, Michigan (-1915-8-)

--	V8	3.0 x 5.0	L	62.5 hp @ 2500	Yale M	1918
					Majestic	1917

FALLS - Falls Machine Co. (1912- ca. 1920)
Falls Motors Corp. (ca. 1920-1926)
Sheboygan, Wisconsin

C	4	4.0625 x 4.50	L	Colby	1912
N	6	3.00 x 4.25	OH	Elgin	1917
				Grant K	1917
				Grant G	1918
				Hollier 186	1917
				Hollier 196	1918
XM	6	3.125 x 4.25	OH	Mai bohm B	1919-22
R or R1		3.125 x 4.25	OH	Elgin H	1918-9
X9000	6	3.125 x 4.25 37 hp @ 2000	OH	Kelsey GF	1921
				Moon 6-42	1921
				Premocar 6-40A	1921-3
				Velie 34	1920-3
				Washington	1921-2
				Courier	1922
				Fremont R-6	1922
				Handley 6-40	1923
				Farner A	1922-3
				Elgin K	1920
				Elgin K-1	1921
				Elgin K-7	1922
				Gove	1920-1
T8000	6	3.125 x 4.25	OH	Apperson 6	1923-4
				Cla-Holme	1922
				Courier D	1923-4
				Dort 20-25	1923
				Dort 27	1924
				Elgin 6	1923
				Elgin 25	1925
				Farner A	1922-3
--	6	2.875 x 4.25		Grant	1916
--	6	3.50 x 4.50		Grant H*	1920

*later used Walker engine

FARMER - Farmer Manufacturing Co., (1914-16-)
Detroit, Michigan

--	4	3.50 x 5.00	SOHC	41 hp Farmack	1916
				Drexel 5-40	1917
--	4	3.50 x 5.00	DOHC	Drexel 7-60	1917

G. B. & S. - Golden, Belknap & Swartz Co.1910-24
Detroit, Michigan

A	4	3.25 x 3.375	Perfex	1912-4
			Harding*	1911
B-31	4	3.75 x 4.25	Monitor 4-30	1916
			R, C	1917
			Bell	1917-8
			Detroiter F	1916
			Economy 64-36	1918
			Erie 33	1916
			Hackett 4	1917
			Hatfield H	1917-9
			Laurel 35	1917
			Mecca	1916
			Moore 30	1916-9
			Olympian	1918
			Pennsy	1918
			Pilgrim	1918
			Princess 4-36F	1917-8
			Pullman 424-36	1917
			States	1918
S	4	3.75 x 4.25	Amco	1921
SS	4	3.75 x 5.00	Bell PM	1919-20
			Moore 30	1920
--	4	3.75 x 4.50	Laurel 50	1920

* Canadian make

FERRO Ferro Machine & Foundry Co., (1915-17)

V8	3.00 x 3.500	OH	Jackson Wolverine	1917-8
			Briscoe 8	1916
V8	2.625 x 3.75	OH	Scripps-Booth D	1917
			Scripps-Booth H	1918

LE ROI - Milwaukee Machine Tool Company, 1916
LeRoi Company 1917-1923
Milwaukee, Wisconsin

2C	4	3.125 x 4.50	Ams-Sterling	1917
			Astra	1920
			Birch 30	1921-2
			Partin-Palmer	1916-7
			Seneca O	1918
			H	1919
			L	1920-1
			L,O	1922
			Sterling A	1921-3
C	4	3.125 x 4.25	Frontmobile	1917

LEWIS - Lewis Motor Corporation (-1916-8-)
Detroit, Michigan

--	6	3.375 x 5.00	L	Comet Six	1917
--	6	3.50 x 5.00	L	Comet C-50	1918
--	6	3.50 x 5.25		Jones 26B	1917
--	6	3.50 x 5.125		Jones 26A, B	1918

MASON - Mason Motor Car Co. (-1916-8-)
Flint, Michigan

--	4	3.6875 x 4.00	OH	Scripps-Booth G	1918

MILWAUKEE - Milwaukee Motor Company (-1908-16-)
Milwaukee, Wisconsin

--	4	2.875 x 4.00	Trumbull 16-B	1916

MODEL - Pittsburgh Model Engine Company (1915-8)
Pittsburgh, Pennsylvania

--	4	4.4375 x 5.125	Briscoe 4-38	1916

(Some confusion may exist as there was the Model Gas Engine Works of Peru, Indiana.)

PERKINS - Massnick-Phipps Manufacturing Co.,
Detroit, Michigan (-1916-18-)

R	V8	3.25 x 5.00		Abbott-Detroit 8	1916
R	V8	3.125 x 4.50	L	Yale K	1917
				Vernon 818D	1918
P	V8	2.75 x 4.50	34 hp	Detroiter D	1915
				Vernon 817B	1917
--	V8	3.125 x 4.00		Partin-Palmer 8-45	1916
--	V8	3.125 x 4.25		Detroiter F-8	1916
C	4	2.75 x 4.00		Fischer	1915
				Vernon 417A	1917
D	4	3.125 x 4.00		Vernon 418C	1918

SUPREME - Supreme Motors Company, (1920-23)
Warren, Ohio

S-4	4	3.375 x 5.0 40 hp @ 2150	Globe B-10	1921
			Innes	1921
			Adria	1921-3

TURMO - Turner & Moore Manufacturing Co.,(1912-21-)
Detroit, Michigan

--	4	3.375 x 4.75	Detroiter	1912-3
O	4	3.00 x 5.00 28 hp @ 2400	Moore 30-F	1921
			Eco	1920

HERSCHELL-SPILLMAN - The Herschell-Spillman Motor Co., North Tonawanda, N. Y.-1904-1925-

--	4	4.00 x 4.00	T	Berkshire A	1905
--	4	4.00 x 4.50	T	Berkshire D	1906-7
--	4	4.75 x 5.50	T	Berkshire B	1906
--	4	4.6375 x 5.50	T	Berkshire E	1907-12
--	6	4.6375 x 5.50	T	Stilson	1909-10
				Berkshire F	1912
--	4	4.50 x 5.00	T	Herschell-Spillman	1904
--	6	4.00 x 5.00	T	Midland	1913
4101-S	6	4.00 x 5.50	T	Standard E	1916-7
				Charter Oak A	1916
				Singer	1916-7
				Geneva	1916
				Roamer 6-90	1917-9
--	V8	3.25 x 5.00	L	Ross 8	1916
				C	1917
				Daniels 8	1916-9
				B	1918-9
				Douglas	1918
				Murray 70-T	1917-8
				Standard F	1917
				G	1919
--	V8	3.00 x 5.00	L	Drummond B-17	1917
		74 hp @ 2600		Standard E	1916-7
--	6	3.25 x 5.00		Forster*	1920
7000	4	3.50 x 5.00	L	Bell 4-32	1921-2
		35 hp @ 2100		American C	1921
				Birch 44	1921-2
				Champion KO	1921-2
				Climber 4	1921-2
				Commonwealth 42	1921
				Curtis 4-45	1921
				Dixie Flyer HS70	1921-2
				Harvard	1921-2
				Hatfield A-42	1921
				Lorraine 21T	1921
				Sterling B	1921
				Tulsa	1921-2
11000	6	3.25 x 5.00	L	American C	1921
		58 hp @ 2050		American D-66	1922
				Ace L	1922
				Bell 6-50	1921
				Birch light Six	1921
				66	1922
				Climber 6	1921-2
				Crow-Elkhart S63-	1921
				Huffman Six	1921
				Pilot 6-50	1921-2
				Pan-American 6-55	1921
				Raleigh A-6-60	1921-2
				Southern Six	1921
				Sterling B	1922
				Vogue 6-60,6-55	1921-2
90,91	6	3.50 x 5.00		Climber 6	1923
				American D-66	1923-5
				DuPont C	1923
				Kurtz Automatic	1923
				Pilot 6-56	1923-4

JENKS - Port Huron Construction Co., (-1916-7-) Port Huron, Michigan

--	4	3.50 x 4.00		Regal E	1916
--	V8	3.00 x 4.50	L	Regal F	1916-7

NORTHWAY - Northway Motor & Mfg. Co. (-1910-25-) Detroit, Michigan. (GM subsidiary)

--	4	4.125 x 4.75		Jackson Olympic	1913
39	4	4.25 x 5.25		Cole 4-40	1914-5
				Oldsmobile D-54	1914
47	4	3.50 x 5.00		Oakland 36	1914
				Oldsmobile 42	1914
				Paterson 4-32	1915
				Cartercar	1915
				Oakland 37	1915
				Jackson 34	1916
				Oakland 38	1916
				Oldsmobile 43	1916
40	6	4.25 x 5.25		Cole Big Six	1915
				Oldsmobile 55	1915
--	6	2.875 x 4.75		Oldsmobile 45B	1920
				30	1924
				Six	1927
				Oakland 6-54	1925
				Six	1926-7
49	6	3.50 x 5.00		Oakland M-48	1914
				49	1915
				Cole Six	1915
				Jackson 6-48	1915
				Paterson 6-48	1915
108	6	2.8125 x 4.75		Oakland 32	1915-6
		39.5 hp @ 2000		34	1917
				34B	1918-9
				34C	1920-1
				6-44	1922-3
				6-54	1923
				Oldsmobile 37	1918
				37A	1919-22
				Scripps-Booth 6	1919-21
--	4	3.00 x 5.25		Oldsmobile 43A	1921-2
				Sheridan Four	1921
200	V8	2.875 x 4.75		Jackson 8-48	1915
				Oldsmobile 44	1915
				45	1917
				45A	1918
				46,47	1922-3
309	V8	3.50 x 4.50		Cole 8-50	1915
		76 hp @ 3000		8-60	1917
				870	1918-21
				890	1922
311	V8	3.50 x 4.50		Cole 890	1923
				Master	1924-5
--	6	3.50 x 5.00		Cole Sensible Six	1915

ROCHESTER, ROCHESTER-DUESENBERG - Rochester Motors Corp., Rochester, N. Y. (1919-1924)

G	4	4.00 x 6.00	OH	Argonne	1920
				Meteor K	1919-20
				Kenworthy 4-80	1920-22
				(Wolverine S	1921)
G-1	4	4.25 x 6.00		Meteor R	1921-22
				Shaw	1920
				ReVere	1920-23
				Roamer D-4-75	1920-24
				Richelieu	1922-23
G	4	4.25 x 6.00		Argonne	1920
				Meteor K	1919-20
				Kenworthy 4-80	1920-22
				Premocar Spl.	1921
				(Wolverine S	1921)
--	6	3.375 x 5.00	OH	Mercer	1923-5
(--	6	3.50 x 5.00		Carroll C	1921)

RUTENBER - Rutenber Motor Company -1902-
Western Motor Company -1903-1912
Rutenber Motor Company 1912-1924-
Marion, Indiana

--	4	4.625 x 5.00		National	pre-1907
				Springfield	1907
				Halladay	1908
				Glide	1908
				(Lexington	1912)
--	6	4.50 x 6.00		Speedwell	1907
--	4	4.75 x 5.00		Jewel 40	1908
R	4	4.50 x 5.00		Auburn 40-N	1912
				Halladay	1907-13
R	4	4.00 x 4.00		Auburn 30-L	1912
				Burg	1912
X	6	4.125 x 5.25		(Auburn	1912)
				Halladay	1912-3
				Luverne 60	1912
				Nyberg	1912
27	4	3.75 x 5.50		(Auburn	1912)
28	6	3.75 x 5.25		(Halladay	1912-6)
--	4	4.25 x 5.25		Lambert	1917
20	4	3.50 x 5.00		Interstate	1915-6
22	6	3.00 x 5.00	L	Auburn 6-38	1916
				Halladay R-2	1916
				Glide Light Six	1915-6
				Madison T	1916
				Marion K	1916
				Paige 6-36	1916
25	6	3.125 x 5.00	L	American B	1918-20
				Bush EC6	1921
				Crow-Elkhart	1919-20
				Columbia Challenge	1922
				Geronimo A-45	1918-21
				Glide 6-40	1917-20
				Halladay	1918-22
				Marion-Handley	1917-8
				Madison	1917-21
				Metz M6	1921
				Paige 6-38	1917
				6-40	1918
				Pan-American G-5	18-20
				Roamer	1917-8
				Waltham 6	1921-2

WISCONSIN - Wisconsin Motor Mfg. Co. 1910-28
Milwaukee, Wisconsin

--	4	5.25 x 7.00	T	Disbrow B	1916
--	4	5.10 x 5.50	T	Disbrow A	1916-8
CAU	4	3.75 x 5.00		Dispatch G	1916-18,21
A or AU	4	4.75 x 5.50		Stutz C	1916
				Stutz R	1917
				Wasp 2011	1921
UU	4	4.25 x 6.00	L	Jacquet	1921
Y	6	3.375 x 5.00		DuPont C	1925
				DuPont E	1927
				McFarlan SV	1925-6
--	4	3.625 x 5.50		HCS	1921

Wisconsin engines also used in Brunswick, Collinet, Corinthian, Cutting 1910, King Midget and SJR. Further details needed.

STERLING - Sterling Motor Company, (-1916-8-)
Detroit, Michigan

--	4	3.00 x 4.25		Harvard 4-20	1916
				Scripps-Booth C	1916
				Harvard 2T	1917
				4-30	1918
				Monroe M-3	1917-8

TEETOR, TEETOR-HARTLEY - Light Inspection Car Co. (pre-1912), Teetor-Hartley Motor Corp., (-1912-1914-) Hagerstown, Indiana
(A division of Perfect Circle Co., Sold to Ansted Engineering Co., 1918.)

--	4	4.375 x 5.00		American Underslung	1912
--	6	4.50 x 6.00		American " 644	1914
			T	McFarlan X	1916-8
				127	1918
				90	1919-20
T				Pilot 6-45	1921-4
--				75	1915
BB	6	3.50 x 5.25	T	Pilot 55	1915
--	6,	4.00 x 6.00	T	Pilot 6-60	1913,15-6
				McFarlan 6-T	1916
--	6	3.00 x 5.00	L	Pilot 6-45	1916
--	6	3.875 x 5.25	T	Pilot 6-55	1916
C	6	3.875 x 5.375	T	Lexington	1915
--	4	3.875 x 5.00	T	Auburn 4-38	1916
				Empire 45	1916-7
				Lexington 4-KA	1916
--	6	3.125 x 5.0	L	Auburn 6-39	1917
				Pilot 6-45	1918-9

WALKER - H. J. Walker Manufacturing Co.,(1920-23)
Cleveland, Ohio

6C	6	3.0625 x 4.50	43 hp @ 2400	Grant H	1920
--	6	3.125 x 4.50		Kelsey	1922

WEIDELY - Weidely Motors Company, 1913-1924
Indianapolis, Indiana

--	6	3.625 x 5.25	OH	Premier-Weidely	1915
--	6	3.625 x 5.50	OH	Owen Magnetic	1915
				Premier Six	1914
--	6	3.125 x 5.00	OH	Chalmers 6-60	1915
C	V12	2.875 x 5.00	OH	Hal 21, 21A,25	1916-8
				Austin	1917-20
				Pathfinder 2B,3B	1917
				Kissel Double 6	1918
				Singer 20	1920
				Ambassador	1921
				Colonial	1921
		(*engine modified)		Heine-Velox*	1921
--	4	3.625 x 5.00	OH	HCS Series 3	1920-3
MAT/MB	4	3.75 x 5.50	CH	HCS Series 4	1922-4
R	6	3.25 x 5.00	OH	Auburn 6-63	1923
RS	6	3.375 x 5.00	OH	Stutz 690	1924

George B. Weidely was a founder and chief engineer of Premier Motor Co. He branched out into engine building in 1913. Weidely Motors over-extended its inventory purchases for a Stutz contract which was cancelled in 1924, bringing the company down. A legal suit, outcome unknown, followed.

Cowboy's Dream Car Works Like a Horse on Famed Texas "King Ranch"

Automobile Facts October, 1950

ACCORDING TO the Texas tradition of doing everything in a big way, the fabulous King Ranch of the Lone Star State should have a fabulous ranch car—which it does.

Automotive engineers spent six months designing and custom-building an all-purpose vehicle to meet the tough requirements of ranch boss Richard Kleberg.

Kleberg wanted a car rugged enough to chase game and cattle across the rough, dry mesquite country at 60 miles per hour, powerful enough to plow through sand dunes, and luxurious enough to transport ranch visitors in high style.

The result is a dream luxury car, with some of the performance characteristics and durability of a truck. It does the work of several cow ponies, with additional touches of comfort and convenience that old-style men of the West never dreamed of.

A wrangler's seat, complete with an airplane-type safety belt, is mounted on the right front fender for use at roundup time. Triple gun holders are built into the body on each side of the driver's seat, and a demountable, stainless steel game holder is attached to the left side of the hood.

Water is scarce as are filling stations on the Texas plains, so the car is equipped with an over-sized radiator, water storage tanks, and an extra-large fuel tank.

Communication with the ranch house is maintained by two-way radio telephone. A power winch is concealed behind the front bumper and grille. Ammunition is stored in compartments under the front and back seats.

The water tank fits in recessed racks under the front fenders. Demountable clear plastic side curtains, a fabric convertible top, and an adjustable, tinted windshield protect the car's interior from weather.

Extra-heavy gauge steel is used in the body, tires are oversized, and special brakes are sealed against sand and dust. The car has three extra inches of ground clearance, and underside parts were given special protective treatment. Cast-aluminum running boards are impregnated with Carborundum for sure footing. Doors and other parts also are made of aluminum to reduce weight.

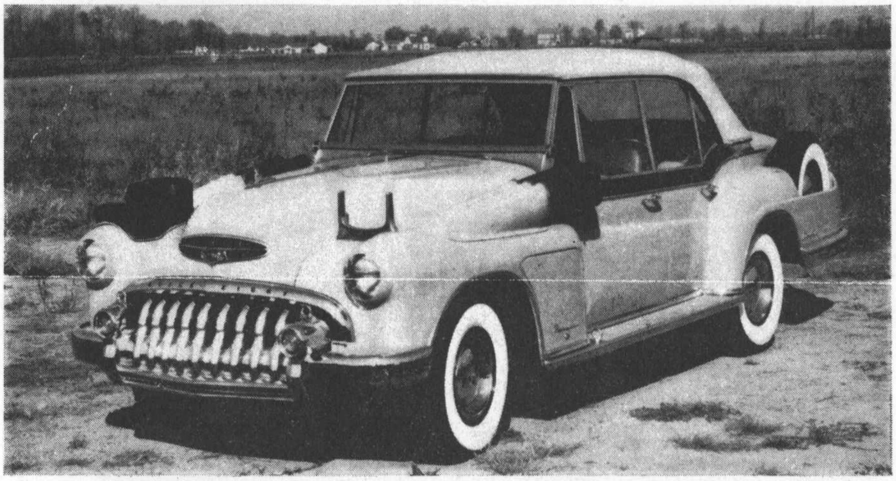
An altimeter, a compass and a tachometer are mounted on the specially-designed dash. A hydraulic power mechanism assists steering through heavy sand. Two spare wheels are mounted in channels in the rear fenders, which also carry radio antennae. The rear trunk compartment, larger than normal, contains tools in leather holders. A complete refreshment bar and ice box are concealed in the rear passenger space.

Silver-trimmed handrails are mounted on the dash and the rear of the front seat for passengers to grasp when the going gets rough.

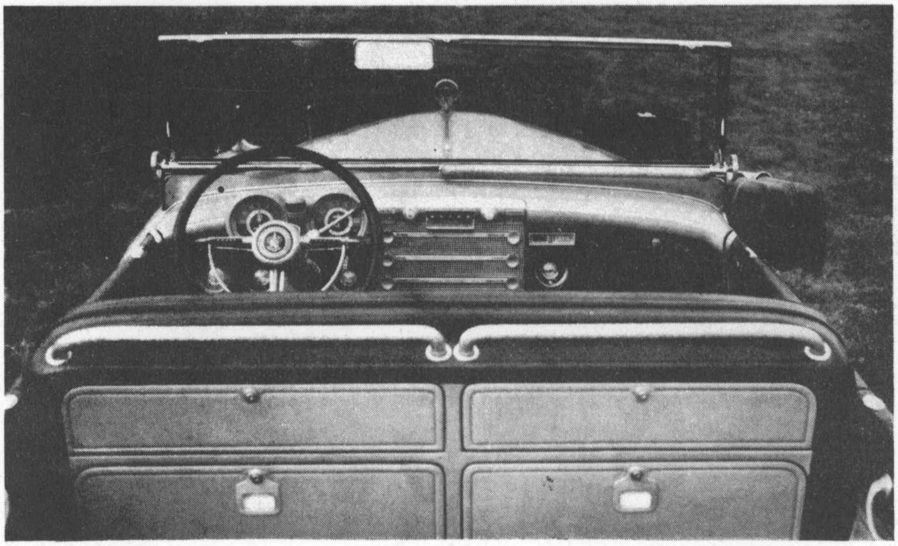
The name "El Kineno", colloquial Mexican for King Ranch, is engraved on each side of the car, and a "Running W"—the ranch brand—is worked into the hood ornament.

The floor—you guessed it—is covered with calf hide.

Wrangler's seat, game holder and gun holsters distinguish this special ranch car.



Silver hand rails and refreshment compartments are convenient for passengers.



Automotive History Review
837 Winter Street
Holliston, MA 01746

Fall 1982
Issue No. 15