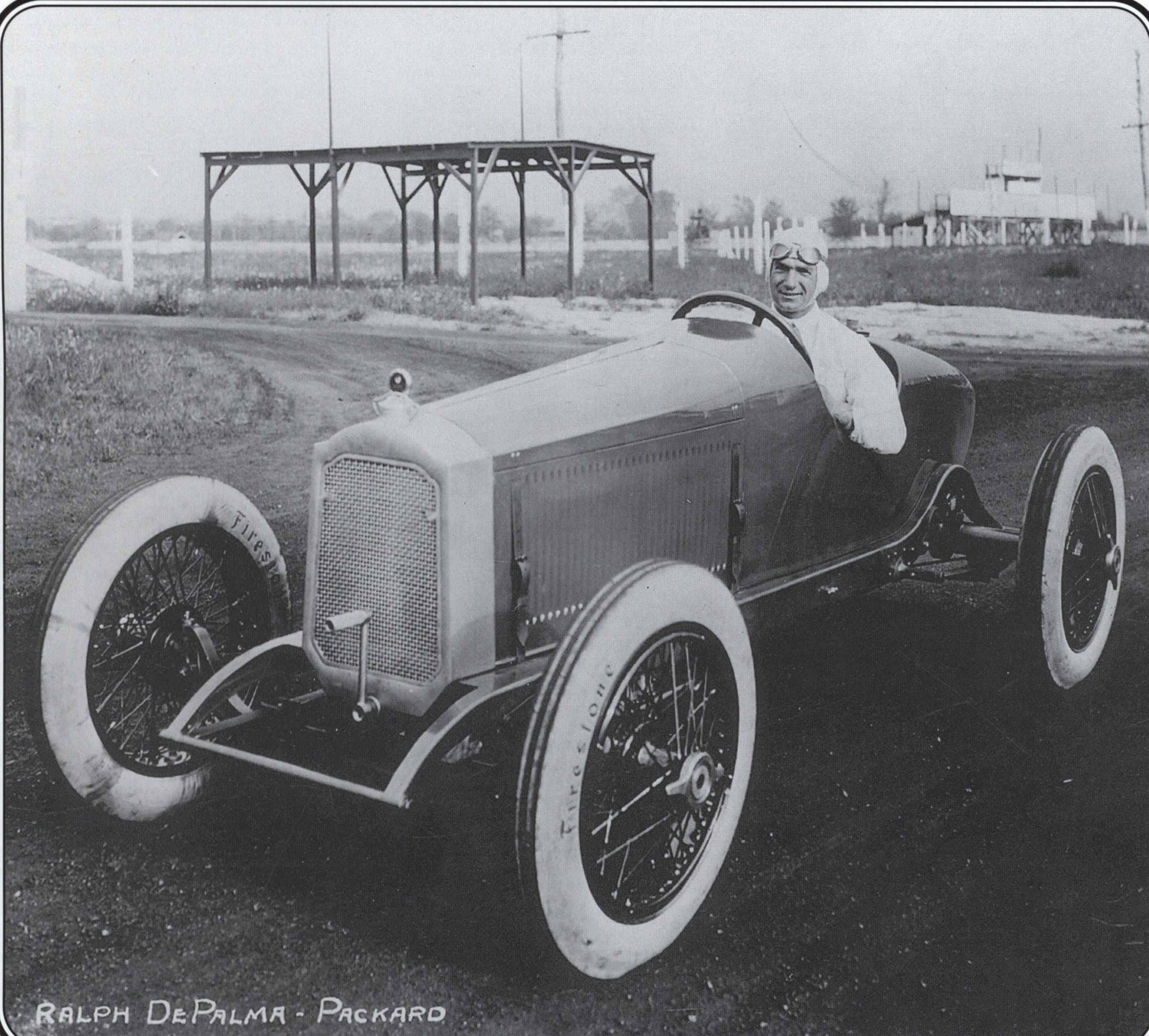
AUTOMOTIVE HISTORY REVIEW

Winter 1999 - 2000 Issue Number 35



A PUBLICATION OF THE SOCIETY OF AUTOMOTIVE HISTORIANS, INC.

EDITOR'S NOTES & LETTERS:

It is an irony of history that automotive and aviation technologies developed on parallel tracks of time. Only 14 years separate the Cugnot Fardier of 1769 and the Mongolfier Brothers' ascension of 1783. Only 17 years separate the Benz machine of 1886 and the Wright Flyer of 1903. It's no surprise, then, that some manufacturers of land machines have also produced flying machines and their engines.

Several examples of the aviation interests of auto manufacturers form the theme of this issue of the *Review*, "Flyin' High: Some Auto Manufacturers Who Took to the Air." "Some" means, alas, we could not include all such manufacturers in the few pages that we have. Members who attended the SAH dinner in Paris in February 1999 were treated to short talks on this subject by *Jules Heumann* (Hispano-Suiza), *Grahame Orme-Bannister* (Armstrong Siddeley), and *Sinclair Powell* (Franklin).

We carry the theme forward in this issue, beginning with *Robert J. Neal's* "By Land, by Sea, by Air — by Packard!" Robert has been interested for many years in the non-automotive engines of the company, and submitted this material to us in January 1997. I regret that it has taken so long to publish it. While we lagged, much of it appeared in two issues of *The Packard Cormorant* but Robert has the consoling thought that there is not much overlap in readers. Robert is the author of Packards at Speed, and Master Motor Builders.

Coincidentally, at almost the same time, former member David G. Styles, Ph.D., sent in "Alfa Avio" and "Riley's Venture Into Aviation," as well as the layouts, that we are using. David won the Society's Cugnot Award for As Old as the Industry (1982) and its Award of Distinction for Sporting Rileys: The Forgotten Champions (1988). His latest work on Riley is Beyond the Blue Diamond (1998). David has also previously appeared in the *Review* with "The Riley Cycle Company" (Issue No. 22, p. 15) and "Riley Nine: The Wonder Car"(Issue No. 28, p. 19), as well as authoring a recent book on the Datsun 240Z. I appreciate David's patience and helpfulness.

During 1998, *Grahame Orme-Bannister* asked if we would be interested in an article on Lord Kenilworth. Grahame's draft had concluded that Kenilworth's influence on aviation was even greater than on automobiles. With this issue in mind, I asked him if he could recast it with emphasis on the man's contributions to the aircraft industry, and the informative "John Davenport Siddeley" resulted.

The companies covered in this issue manufactured motor vehicles before getting into the aero business. I regret that we haven't been able to cover the converse, companies that began with aviation and branched out into the automobile world, such as Aero of Czechoslovakia, BMW of Germany, and Bristol of England.

The final article is a 1995 inheritance from my predecessor as editor, Kit Foster, "The Plymocoupe," by *Curt McConnell*. This is the interesting story of the use of an early '30s auto engine in an airplane, a quixotic adventure as it turned out. With the recent announcement of the phasing out of the Plymouth brand in '01, the article is our coda to a sturdy marque.

Finally, with the thought that there's no such thing as too many book reviews for our members, No. 35 offers contributions by *Ferdinand Hediger, Keith Marvin*, and your editor.

Once again, my thanks to *Pat Chappell* and *Kit Foster* who have proofread this issue with our goal of zero defects in mind.

———Taylor Vinson

LETTERS TO THE EDITOR:

GM Chairmen (No. 33, Fall 1998)

I was delighted to get a "sneak preview" of what is an engaging and insightful issue of *AHR* (thanks in no small part to the lead article!). Being an avid student of General Motors history, it is always wonderful to see others celebrate it and give it its due.

———John F. Smith, Jr.
Chairman and CEO
General Motors Corp.

I thought this latest *AHR* was particularly good, especially the piece about GM chairmen by Wm. P. MacKinnon. He applied everything a good historian should: an original thesis based on personal observation, experience in the situation itself, and a conclusion based on knowledge, research, and careful thought.

———Michael Lamm
California

I still think that Mr. MacKinnon's GM piece is heads and shoulders above anything else that has come out of our two Conferences. Maybe it's not "history" but it sure as heck is background from the very highest places.

Fred Roe
Massachusetts

Harlow Curtice, Harley Earl, and the '48 Buick That Wasn't (No. 33, Fall 1998)

I never knew Richard Stout. He probably retired or moved on by the time I got [to GM Styling] in 1957. My first assignment involved the headlight mechanism on the Cadillac Cyclone. The Cyclone was to be Harley Earl's gift from the corporation upon his retirement.

Working more or less directly for Mr. Earl was indeed an interesting experience for a rather young engineer without any previous association in the car design business. My immediate boss was a fellow named Harry Mackie. He was a very laid back guy and his assignment was to create the flip top canopy mechanism. This was the major design feature of the car. The next important task involved the pop-out sliding doors. Tony Lapine was assigned to this project. Tony Lapine, as you many know, went on to BMW and then to Porsche as their styling chief. I think the 928 was more or less his baby. He is now retired and still lives in Europe.

———Jud Holcombe
New Hampshire

Parade Car (No. 34, Spring 1999)

Today I received an E-Mail from Ron Whealon, Editor at the John F. Kennedy Library at Boston, Mass., expressing interest in "Parade Car." I sent him off a copy of Issue Number 34 this afternoon.

——John Christie
Indiana

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Taylor Vinson, Editor

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Front Cover: Ralph De Palma, in one of three Packard-built and powered 1923 Indianapolis 500 cars (furnished by Robert J. Neal, courtesy John Conde)

Rear Cover: Rear cover of a c1927 catalogue "What Customers Think of Their Armstrong-Siddeley" (from the editor's collection)

Acknowledgments: Robert Neal and David Styles furnished the illustrative materials for their articles, Mr. Neal's courtesy John Conde. Curt McConnell provided the photos of the Plymocoupe wreck courtesy Lloyd Jarman. The photo of the 1935 Plymouth and the Plymocoupe was furnished by the National Air & Space Museum. The editor provided the illustrations for Grahame Orme-Bannister's article, the introductory ad for Mr. Neal's article, and the photo of the 1934 Plymouth engine.

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By Land, By Air, By Sea — By Packard!

Less well known than its motor car engines, Packard, according to **Robert J. Neal**, *deserves to be remembered for its aircraft and marine engines as well, and the contributions they made to the well-being of the legendary company.*

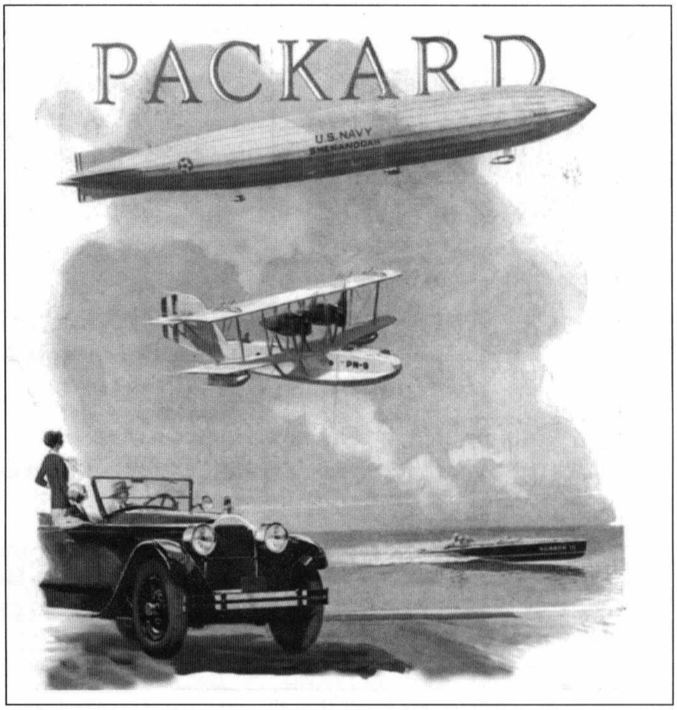
The Early Years of 1916 to 1933

Were the non-automotive engines of Packard a financially important product of the company? If not, could they have been? How well accepted were they and how much revenue did they produce? Just how much energy and attention did the company put in this field of endeavor? Did they or could they have had a major effect on Packard history?

These are questions Packard historians have up to now neither asked nor answered. A study of them is certainly in order and two major 1995 publications on Packard history have brought to light the possibility that this product line could have been a major one for Packard and could have had a significant impact on Packard's financial picture and thus its history.

The Fall of the Packard Motor Car Company by James A. Ward is the product of an exhaustive study of Packard's decisions and finances and those internal and external circumstances which affected it, primarily during the last 20 years or so of its existence. From this study Ward draws a set of conclusions which are well worth the reading by all automotive historians and particularly by Packard historians. But, as with any such study, they are conclusions based on observed sets of "cause and effect" conditions. The more of the involved circumstances which are known the more likely are the conclusions to be correct.

Packards At Speed by the author of this article was part of the result of an equally exhaustive study of the inception, design, production and uses of the non-automotive engines of the Packard Motor Car Company. The remaining part of that study has recently been published as Master Motor Builders. This study has brought to light a great deal of material which has never before been available to historians. Extensive knowledge of Packard's efforts, successes and failures in this area might lead historians to some slightly revised conclusions as to "how things might have been different if" in regard to the fall of Packard. The full story is in the new book, but in this article the author will try to at least give the reader a good idea of just how significant a portion of Packard's business this endeavor was or might have been.



First let us define the term "non-automotive engines" as applied to the study of Packard's financial survival. Here we are talking about airplane, marine and industrial engines. Packard was and is primarily known as a producer of high class automobiles. However, during certain periods of time in some circles it was also known for its outstanding engines other than automotive.

Packard's first serious interest in non- automotive engines was in airplane engines and was as a result of the start of the First World War. War had begun in Europe in 1914 and many in America foresaw the possibility that this country would eventually be drawn into the conflict. Among them were a number of people at Packard, including its president Henry B. Joy. Joy persuaded Packard's board to authorize development of an aircraft engine and in the fall of 1914 set the engineering department upon the task.

Head of that department was Jesse G. Vincent. Vincent had been hired in 1912 as chief engineer by the company's vice president and general manager, Alvan Macauley. He was elevated to the position of vice president of engineering on February 15, 1915. Vincent had completed the task of putting together a staff of capable aircraft engine designers (which included himself) by the spring of 1915 and design of their first such engine was complete by November. This engine, a V-12, was built to test the design and was completed in February of 1916 with a displacement of 299 cubic inches (which was too small for actual aircraft use) so that it could be rapidly exposed to exhaustive testing under high stress conditions in a race car. 300 cubic inches displacement was the current racing limit established by the A.A.A.

The engine was successfully raced from April 26, 1916 (a special race car was constructed by Packard in which to test it) until September 20, 1919 in this country. The car was then sold by Ralph DePalma, who had purchased it from Packard in 1916 and campaigned it on the racing circuit. It was subsequently raced in Europe until late 1922.

Between the building of this first engine and May of 1917 four more airplane-type engines were built by Packard for development and testing. A second 299 engine had been built followed

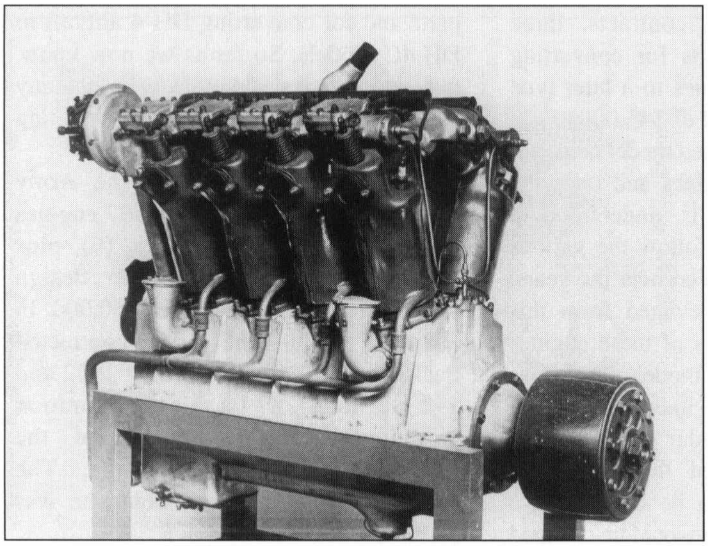


Fig. 1 - The First Liberty engine to be built – Liberty 8 No. 1. This engine is now in the NASM of the Smithsonian.

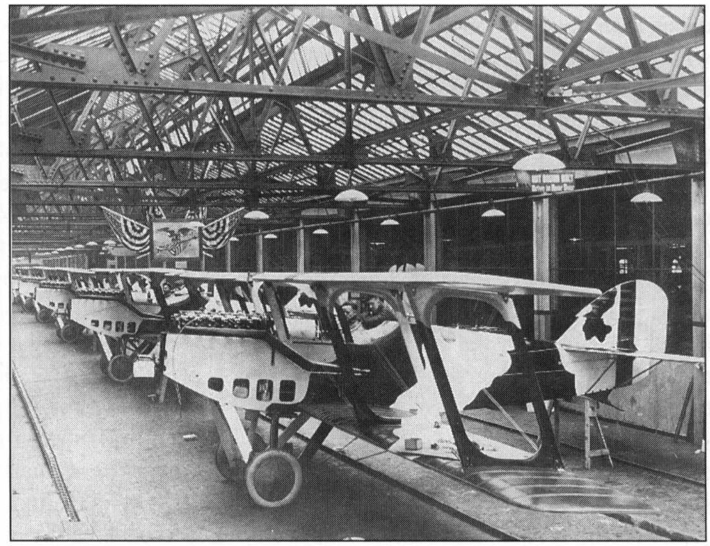


Fig. 2 - Packard production line for LePere LUSAC-11 aircraft in late 1918.

by three engines of 905 cubic inch displacement, each of the last three being of slightly different design. The second 905 engine was also tested in a race car.

The United States entered World War I on April 6, 1917. It was not until then that the United States military establishment had any significant funds with which to pursue the building of an Air Service. The country was not prepared in any way to participate in a major conflict, either on the ground or in the air. The Army established an Aircraft Production Board whose duty it was to establish goals in the design and production of military airplanes.

Under the direction of this Board, Packard's Jesse Vincent and the Hall-Scott Motor Car Company's Elbert J. Hall were brought together in Washington, D.C. to lay out a design for a standardized series of airplane engines which could be mass produced by the automotive manufacturers of this country. Both men were well known as being among the most able engineers in the field of engine design. The initial design work was done between May 30 and June 4, 1917.

The standardized design made it possible to produce engines of sizes ranging from four cylinders to 12 cylinders using many interchangeable parts, thus increasing production speed and reducing costs. This would result in engines ranging in power from 135 to 420 h.p. Although engines of 4, 6, 8 and 12 cylinders were contemplated and designed, initial test engines were built only in 8 and 12-cylinder configuration as an immediate need for 4 and 6-cylinder sizes was not contemplated. As it turned out the 4 and 6-cylinder sizes were built on an experimental basis only as no need materialized for engines of that size. The 12-cylinder type was put into mass production by several companies, Packard among them. The 8-cylinder version was built on an experimental basis only until late in the war when 5,000 were ordered to be built by General Motors and 3,000 by Willys-Overland (Fig. 1). However, production had barely started when the Armistice was signed on November 11, 1918. At this time all production contracts were canceled resulting in a total production of only 15 engines by General Motors and none by Willys-Overland.

The contract to finalize the design and produce six 8-cylinder and five 12-cylinder experimental engines, which would become known as Liberty engines, was granted to the Packard company in 1917 at a price of $249,159. This was the first significant income the company derived from the business of producing non-automotive engines. From this point the company received several contracts to produce Liberty 12 engines as well as a large contract to produce several types of military airplanes designed by French designer Captain LePere. By the end of the war, Packard had produced a total of 6,863 Liberty engines which gave them a gross income of about $44,295,500. This amounted to about 18% of all the aero engine business of this country during the war.

Thirty eight LePere airplanes of various models were built by early 1919 when the Army Air Service terminated these contracts (Fig. 2). These contracts included considerable initial design costs prior to the production of only 38 airplanes of an intended 1,000 or more so the cost per airplane was far higher than it would have been had the contracts run to completion. These contracts produced a gross income of $1,172,974.

This World War I aircraft-related production and sales was Packard's first taste of significant income from this type of activity and the company liked what it saw. It had grossed $45,468,474 from mid-1917 to about the end of 1918 with the majority of that income being produced during 1918. Packard's highest annual gross sales up to that time came in 1916 and had been $35,495,087 – all from production of automobiles and their parts. One can see why the company would be interested in remaining in the aero engine and possibly the airplane business.

As one might expect, immediately after the war was over Packard announced the availability of a commercial version of the Liberty 12, the 1A-1650. Priced at $4,500 each, an estimated 80 were sold between 1919 and 1922 when it was last listed as available. All were sold in the commercial market. Total income of these was thus $360,000.

Following the war, Packard immediately started the design of several new airplane engines ranging in size from a 180 h.p. V-8 to a 550 h.p. V-12. In addition, it designed and built a small biplane powered by the 180 h.p. engine and declared its intention to market it if sufficient interest was shown. Interest never materialized however and Packard withdrew from the airplane market before it ever entered it. The company did retain the airplane for several years however and used it for testing engines.

Although Packard began immediately to advertise new engines on the commercial market there were few sales. The prime source of sales would be to the military. Packard's largest engine was too big to be salable in the private sector as there were few civilian airplanes in use at that time large enough to require it. Its smaller sizes faced insurmountable competition from military surplus engines sold off by the thousands at dirt cheap prices on the civilian market.

Even in the military market at which it was primarily aiming, Packard (and all other airplane engine manufacturers as well) faced direct competition from the thousands of excess Liberty 12 engines left in the military inventories after the end of the war. The government had already paid for these engines and was not going to spend much money on new designs as long as it felt it could manage with the older but not yet totally obsolete Liberty. Congress forced both services to operate in a very austere mode by keeping appropriations at a minimum. Both the Army and Navy continued to use the Liberty engine in active service and even to design new airplanes around it until as late as 1928.

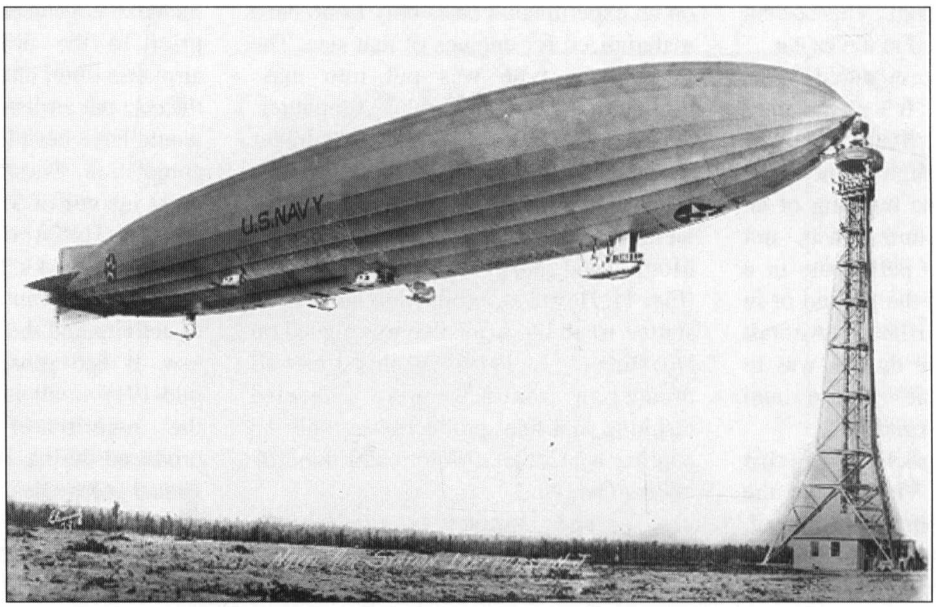


Fig. 3 - Navy Airship Shenandoah ZR-1 at the Lakehurst Naval Air Station in 1923. Powered by six Packard IIU-1551 engines.

The Army's Engineering Division expressed interest in Packard's designs and placed an order on November 4, 1919 for a lot of ten experimental engines of three models, 1A-744, 1A-1116 and 1A-2025. The con-tract amount was $178,039. Two addi-tional engines and other work was contracted toward the end of the first one at an additional cost of $29,695. These en-gines were all completed and delivered by the end of September of 1920, the total value being $207,734. Within a month of final deliveries from these contracts, three more engines plus parts for converting one of the earlier engines to a later type were ordered for a total of $45,000.

Packard assigned model names to its non-automotive engines and once the system of doing so is understood it becomes very easy to follow the various series of engines produced over the years. The company rarely deviated from this system. Let us take one of these engines and explain how the model name was derived: 1A-744. The 1 indicated the first design of this particular engine. If a revision were made of this engine of sufficient magnitude to be considered a new model the first digit would be changed to 2. The A indicates this is an Airplane engine. Had this been a Marine engine the letter would have been M. The 744 indicates the displacement in cubic inches of the engine. In most cases this number is the displacement to the nearest cubic inch. In some later models the number would be rounded to a close but nicer sounding figure. Two of note were the 1A-2500 which displaced 2540 cubic inches and the 1A-1500 which displaced 1498 cubic inches. The 2A-1500 displaced 1530 cubic inches but retained the 1500 designation.

January of 1921 brought a production order for twenty five of the latest model engine, the 1A-1237, for the sum of $249,625. In addition some $50,000 in orders for the new 1A-825 model were placed during 1921 plus an estimated $100,000 in Army contracts for parts and for converting DH-4 aircraft to DH-4C models. So far as we now know, this was the last time Packard did any work directly related to airplane building or major modification.

In 1922 and 1923 the Army continued to order both 1A-1237 engines (15) and 1A-2025 engines (6) plus various spare parts and other design services for a total of about $260,000. In addition to this, the Army contracted Packard to manufacture during 1922 and 1923 a total of 16 W configuration 18-cylinder aircraft engines of the Engineering Division's design. The estimated value of these contracts was $240,000.

Packard was also successful in interesting the Navy in new engine design and was awarded a contract to design and build 13 6-cylinder 300 h.p. engines for use in the soon to be built lighter-than-air ship "Shenandoah" (Fig. 3). Designated 1A-1551, these were delivered in 1923 at a price of about $16,000 each. With spares, design work and a single cylinder test engine the total contract amounted to an estimated $225,000. In addition the Navy also ordered an estimated ten 1A-1237 engines during 1923 and about five were sold on the commercial market. This amounted to some $135,000 in sales.

Thus from 1919 through 1923 Packard sold an estimated 163 aircraft engines and other related services which amounted to gross sales of $1,872,359. Even though this was not a large number of engines nor a sig-nificant income for four years of work, it represented a strong entry into the military water-cooled aero-engine market. The only other competitors for this business at the time were Wright, Curtiss and the Air Services' Engineering Division which had designed the 18-cylinder W-1 and W-2 models that were about the largest engines under consideration. Both of the engines had been contracted to be built by Packard even though they were not

Fig. 4 - Packard marine engine ad, 1923.

designed by Packard engineers. Wright had two engine types, the Hispano-Suiza based H which developed between 300 and 400 horsepower and competed with Packard's 1A-1237 and the T-2/T-3 series which were in the 500-600 horsepower range. The H engines were based on a 1915/1916 design and although greatly improved upon since then were becoming obsolete and of less power than future needs indicated. The T-2 was being discontinued from service use in favor of the later design and more reliable T-3. Curtiss was selling its excellent D-12 which was a 400 to 450 horsepower engine. Packard's sales during the period probably represented about one third the military sales of engines in this class.

Colonel Vincent (Jesse Vincent had been commissioned in the Army Air Service during World War I and reached the rank of Lt. Colonel. Shortly after the end of the war he was promoted to the rank of Colonel in the Army Reserve Officers Corps. He was invariably addressed as Col. Vincent by his associates from that time until his death in 1962.) became quite interested in getting Packard into the marine engine business in 1921 and introduced its first engine, the 1M-1551 patterned after the Navy's 1A-1551.

From 1922 through 1923, Packard had five different marine engine models on the market and grossed sales in this area of business of about $613,500 (Fig. 4).

Packard undertook a major redesign of its line of airplane and marine engines in 1924 which resulted in the introduction of its 1500 and 2500- size airplane engines and the discontinuance of all other models. The revolutionary DR-980 air-cooled radial Diesel was added in 1928. The marine line had, for the most part, been marine versions of airplane engine designs and all but two models of these were also redesigned. The DR-980 was one of Packard's few deviations from its standard model designations. "DR" stood for Diesel Radial.

At first things began to look good for potential sales of airplane engines to the services. With the introduction and testing of the new 1500 and 2500 engines both the Army and Navy showed considerable interest and the military was beginning to receive significant appropriations with which to purchase newly designed engines and aircraft. Early in 1925 Packard received a government contract in the amount of $3,737,000 for 1500 and 2500- model aircraft engines, the largest single contract for aviation material authorized since the end of the war.

Packard's principal competition in the military aero engine market still came from Curtiss and Wright. Curtiss had gone through a series of engine designs which led to the very successful 1145 cu in D-12 in 1922. The V-1400 was added in 1925 but then replaced by the V-1570 Conqueror in 1926. Wright had produced several versions of the Hispano-Suiza V-8 during and after WW I and the larger models competed with Packard's 180 to 300 h.p. engines built in the 1919 to 1923 era. After 1923, Packard's only

June of 1940 brought an even more formidable challenge to Packard. The British and U.S. Armies requested the company to produce the Rolls-Royce-designed Merlin aero engine in large quantities. It accepted and actual production began just a year later (Fig. 7). This occupied the other three fourths of Packard's manufacturing capacity. New facilities were built and all existing facilities were converted entirely to military production of these two engines by early 1942.

By the end of the war 12,115 PT engines and 55,523 Merlins had been built. In less than five years this business had grossed $1,030,390,000. Profits from that business were about $17,576,000, amounting to a profit of only about 1.7% of gross business. The reason behind this was that the government directly controlled profits during the war and profits allowed any company were based upon those they had made on operations during the few years prior to the war. Thus those who had been doing well just prior to the war did well from war work. Those who had been struggling were forced to continue to do so. It hardly seemed fair, especially to those who did so much to help the war effort and who in many cases devastated their manufacturing facilities regarding their normal line of products in the process. The purpose was to prevent profiteering from war work.

That five-year gross was about the same as the company had grossed from all sales in the years of 1922 through 1939, which included the Depression years and four years of heavy losses. From about the same gross during those years, Packard's profits were $113,633,412. Instead of emerging from the war years in a good position to resume the automotive business the company found it was in worse shape than before the war. Packard had done the allied forces a tremendous service and were very instrumental in providing war winning material but certainly did not profit from it.

The end of the war brought an end to Merlin production and also to the 4M-2500 PT engine. Packard went back to automotive pursuits but also made every attempt to stay in the aero and marine business. Piston aero engines of large size were soon to be a thing of the past. World War II had ushered in the era of the jet engine and the piston engine within just a few short years would power only light planes. Packard could see this and made no attempt to carry on with development of piston aero engines. Instead it obtained a series of government development contracts for jet engines. From the middle to the end of World War II the British, Americans and Germans all were developing jet powered aircraft and all three had them flying by the end of the war, though only Germany was using them operationally.

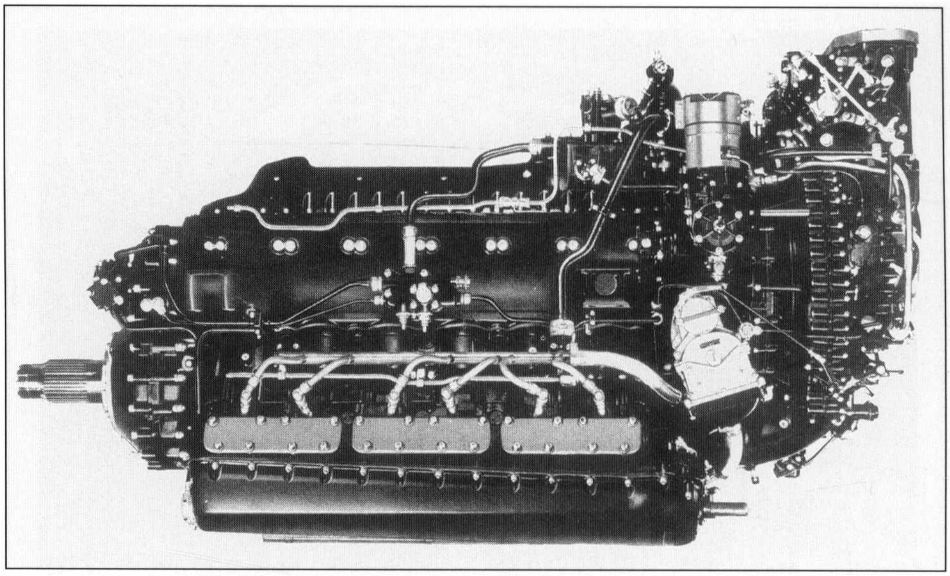


Fig. 7 - Packard-built 55 Rolls-Royce Merlin engines during World War II. This model, The Merlin 38, was used in British aircraft.

The U.S. was very interested in continued development of the jet and contracted Packard to design a light, simple and expendable jet engine of about 2,000 lb. thrust, with weight not exceeding 1,000 lb. It was intended to be used in missiles. Very shortly the thrust requirements were doubled to 4,000 lb. but the weight limit remained at 1,000 lb. Designated the XJ-41, development of this engine began in 1945. In 1946 Packard engineers working on the project came up with an idea for improving propulsive efficiency which they proposed to the Air Force as potentially a new and improved engine for airplane use. They called the design a "ducted fan" engine but later developments of the theory were termed turbo-fan. A development contract was given Packard for the engine which was designated the XJ-49.

Work on these contracts continued until January 1949 when the U.S. military drastically reduced aero development contracts because of an austerity program. They decided to restrict such programs to the large, well established aero engine makers and terminated Packard's research contracts. Several 4,000 lb. thrust XJ-41 and one 10,000 lb. thrust XJ-49 engine had been built. Packard had derived about $31,300,000 from the contracts but now appeared to be completely out of the aero-engine business.

After the end of the war, Packard had continued to develop its PT engine and sold the Navy a number of 5M-2500 versions of the World War II model as well as a small quantity of a new 16-cylinder version called the 1M-3300. This had grossed the Company about $2,865,000 in 1946 and 1947 but after that time the Navy ceased to consider the PT boat as an up-to-date weapon and had no further need for high- power gasoline marine engines.

By 1947, however, Packard had reentered the commercial marine engine market it had left in 1933 by introducing two small engines aimed at pleasure speed boats and cruisers up to about 40 feet in length (Fig. 8) . Known as the 1M-245 and 1M-356, about 3,300 of them were sold from 1947 to 1951 when because of slow sales the line was dropped. The venture had grossed some $3,120,000 but the company couldn't seem to compete with the large number of other marine engine builders with product offerings in the same range of power and price. Besides, 1950 brought a number of other projects on line which probably seemed to hold better promise for profits.

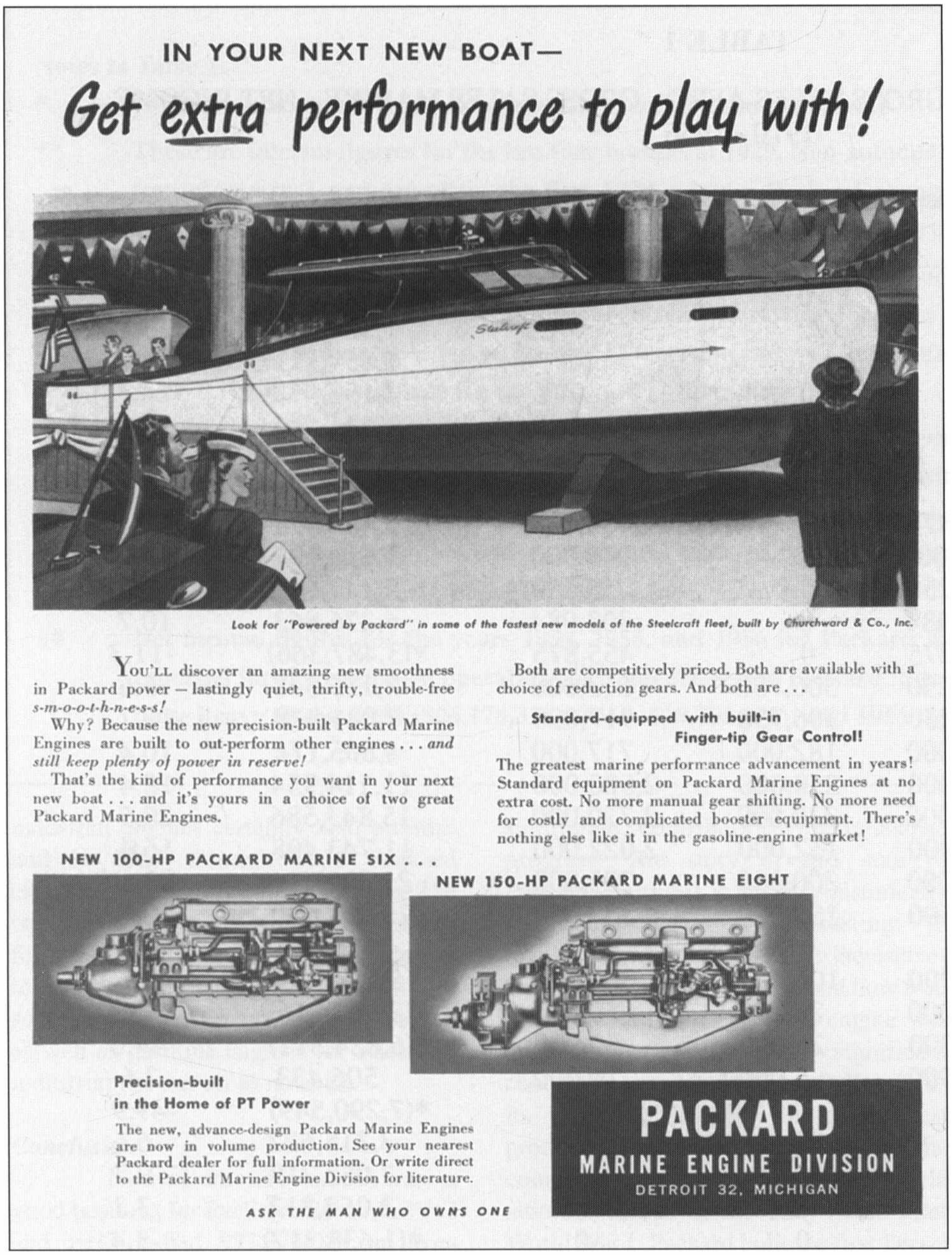


Fig. 8 - Postwar Packard marine engines.

Two other small-engine developments came to fruition. Packard sold a commercial version of its 6-cylinder auto engine to the White Truck Company for use in light trucks, and delivered about $1,685,000 worth of them between 1950 and 1955. Packard also introduced an industrial engine in 1950 called the 1D-327 but the effort was not successful at all and the engine was withdrawn from the market in 1951 after only $300,000 in sales.

More significant than these commercial ventures in terms of potential income were two military contracts which were the result of the U.S. entry in the Korean conflict. Actually both were initiated before the country was involved in Korea but became suddenly militarily important and were escalated after North Korea invaded South Korea in June of 1950.

The first was the result of a 1947 study contract for the development of a lightweight Diesel engine for the Navy. Called the "142 Series" for its per-cylinder displacement, the first engine was completed as a 6-cylinder Diesel-driven 250 KW emergency generator and called the 1D-850. This engine was completed in 1950 and was followed by models in 6, 8, 12 and 16-cylinder configurations. The principal use for these engines was in non-magnetic mine sweepers where they provided both propulsion and electric power generation. The engines were constructed almost totally of non-magnetic stainless steel, bronze and aluminum. Actual production got under way in late 1952, but in the meantime, the Korean War had wound down considerably and construction urgency abated. Mid-1953 saw construction schedules stretched out as a result with final deliveries being made in 1954.

In 1950, Packard decided to get back into the jet engine business by subcontracting production of the GE J-47 engine which had been adopted as the Air Force's prime propulsion unit. The current demand by the service exceeded GE's production capacity and Packard had prior jet experience which put them in a good bargaining position for such business. It received a study contract just 20 days before the outbreak of the Korean War and a production contract for 6,000 engines on February 9, 1951.

It took some time, of course, to set up production facilities and by the time it got under way in the summer of 1952, production rates, which had been initially scheduled at 500 per month, had been reduced to 250 per month, again caused by the reduced activity in Korea. A permanent cease fire was signed on July 27, 1953. Barely after the 250 requirement was met, production was cut by 40%. Eight months later it was further cut to 25 per month and remained at that level until the contract was terminated in June of 1955. Of the original contracted 6,000 engines, only about 2,500 were delivered and there seemed no prospect for further orders.

During 1955 and 1956, Packard managed to get contracts for about $15,000,000 in repair parts for J-47 and J-57 engines but that was the last of its business in that product.

All of Packard's military business was coming to an end just when it needed it most. The automotive business had become a struggle for leadership between the "Big Three" and that factor coupled with numerous other circumstances had put all the independent manufacturers in trouble. From 1951 through 1954 about 31% of Packard's gross income was from non-automotive sales and during this period it was almost entirely military contracts. The company was undoubtedly making more profit during those years from non-automotive than automotive sales.

Although building an ongoing jet engine business would not seem a likely prospect for the company, a future business in Diesel and perhaps gasoline to have been pretty much a "cost plus" operation. The tax scheme used during the war, intended to prevent profiteering from defense contracts, had limited Packard's profits to between one half of one percent, and 2.1 percent of gross income. With the end of the war, that system was discarded, and profits of 7 to 8 percent were regarded as fair for business. Packard's 1953 profit on government contracts was about 8.34 percent. Many of its contracts during the postwar years were noted in the board minutes as to what was the company's fee: 7.5 to 8 percent, when stated. We can therefore, with reasonable accuracy, determine the profits made on military contracts if we know the amounts of business involved, and in most cases, we do.

The figures show that, in its final years, Packard's non-automotive business probably kept the company afloat longer than it might have been, and might have been its salvation had its government contracts continued. The point is well made by the fact that during the 11 years from 1946 through 1956, Packard made a profit of $31,591,757 on non-automotive engine sales while losing $71,231,694 on the sales of automobiles

TABLE 2

PROFIT AND LOSS FOR THE YEARS 1946 TO 1956 DIVIDED BETWEEN AUTOMOTIVE AND NON-AUTOMOTIVE BUSINESS

year	non-auto profit	auto profit	gross profit	taxes	net profit	notes
1946	$1,945,517	($5,660,004)	($3,714,487)	($5,650,000)	$1,935,513	*
1947	659,840	(2,159,149)	(1,499,309)	(2,600,000)	1,100,691	**
1948	521,840	24,267,599	24,789,439	9,680,000	15,109,439	
1949	42,512	13,363,530	13,406,042	5,700,000	7,706,042	
1950	265,808	7,346,540	7,612,348	2,450,000	5,162,348	
1951	1,238,592	9,855,468	11,094,060	5,500,000	5,594,060	
1952	5,296,734	7,335,529	12,632,263	7,014,000	5,618,263	
1953	11,861,996	579,000	12,440,966	7,000,000	5,440,966	
1954	6,359,234	(48,093,765)	(41,734,531)	(15,556,216)	(26,178,315)	***
1955	1,449,124	(32,332,625)	(30,883,501)	(1,178,408)	(29,705,093)	***
1956	1,950,560	(45,733,817)	(43,783,257)	(465,000)	(43,318,257)	***
Totals	$31,591,757	($71,231,694)	($40,317,574)	$11,894,376	($51,534,343)	

Notes:

* **1946 – The company received a tax refund of $5,650,000 on 1944 and 1945 federal taxes resulting from a carry back of 1946 operating losses and unused excess profits tax credits. It also collected $256,637 on war contract settlements which is accounted for in the non-auto profit column. Thus it had a net profit of $1,935,513 even though it had a gross operating loss of $3,714,487. To that it added $2,900,000 set aside in reserves for such contingencies and reported in the stockholders statement for the year that $4,835,513 was added to reserves.**

** **1947 was a similar year to 1946 and the company operated at an overall loss of $1,499.309. Because of these losses it had a tax rebate of $2,600,000 which gave them a net profit of $1,100,691.**

*** **1954-55-56 Figures for these years include Studebaker after August of 1954. Any government contracts in force at Studebaker after that time were for truck production and any proceeds from them are included under automotive profit.**

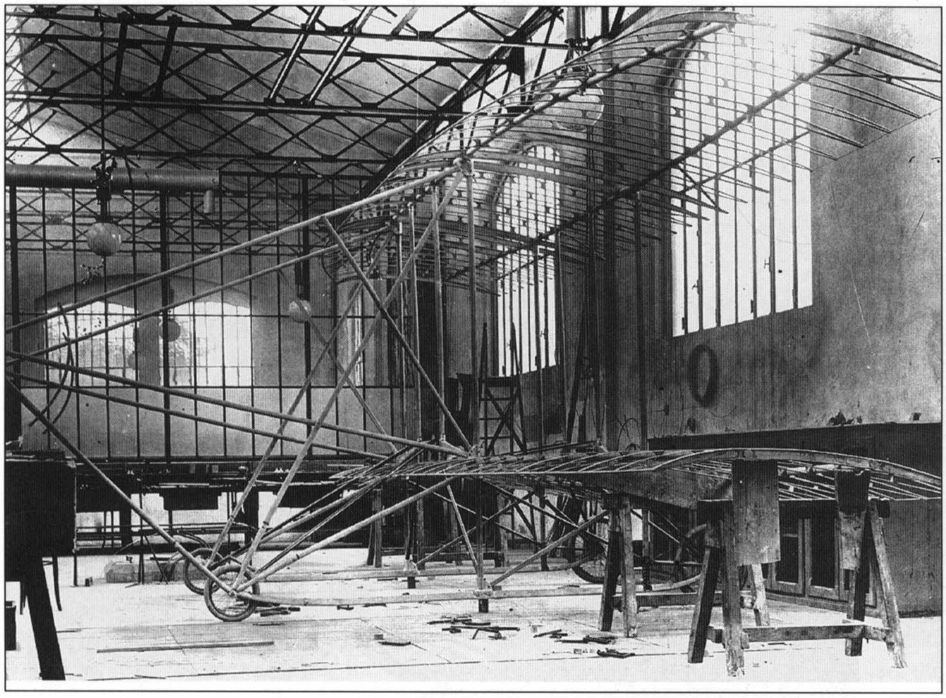
ALFA AVIO

*Few people realize the major contributions made by Alfa Romeo to the history of Italian aviation. Here, **David G. Styles** sets out to put the record straight.*

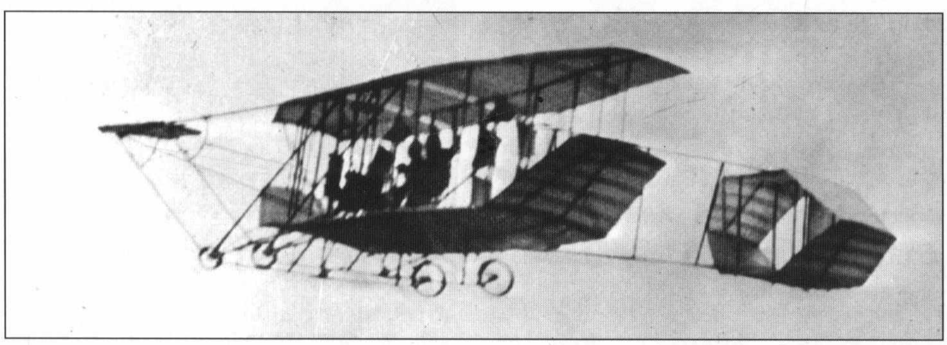
Giuseppe Merosi's ALFA and Nicola Romeo's Alfa-Romeo companies were full of the magic of many industrial activities in addition to motor cars. Very few motoring enthusiasts seem to realize just how involved the Portello car maker was in aviation, especially aero engines. The original ALFA company (Anonima Lombarda Fabrica Automobili) was into aero engines almost as quickly as it was into cars, the first being a 24 horsepower, built in 1910 and installed into Antonio Santoni and Nino Franchini's biplane under the patronage of the company, in whose workshops the machine was assembled.

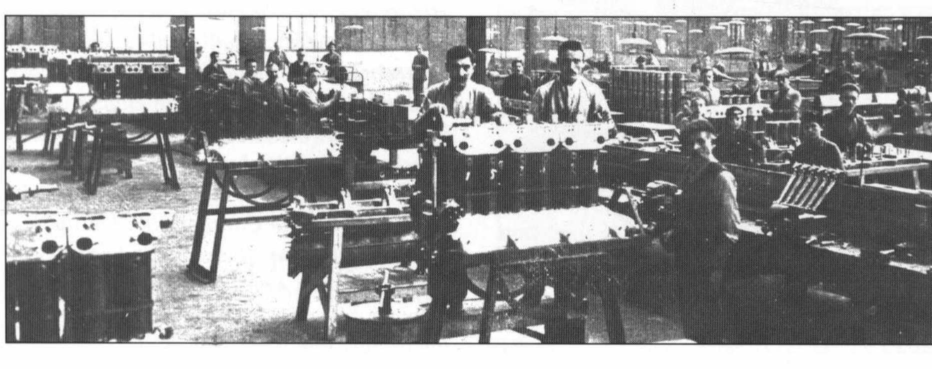
This biplane was built to compete in a flight across the Alps and its builders were both employees of the ALFA Company. It is said by some to be the first all-Italian aircraft to fly a respectable distance. Franchini was a pilot and an accomplished racing car driver. Santoni, on the other hand, was a surveyor and an accomplished engineer and it was he who brought the aeroplane from the drawing board, developing both aircraft and power unit. The engine, supercharged by Santoni, was installed as a 'pusher', with two belt-driven propellers behind the pilot, similar to the Wright biplane, but shrouded for safety. At 2,200 r.p.m., it produced 42 b.h.p. and survived in the aircraft when the machine became a trainer at Milan's Taliedo airport. The ultimate fate of the aircraft is unknown, but it was seen about the airfield several years later and no doubt was lost in the flotsam and jetsam of airfield scrap.

During the Great War of 1914-18, the Company produced, under contract, the Isotta-Fraschini 160 h.p.V4B 6-cylinder in-line water-cooled engine, for installation in the Macchi M5, a single-seat flying boat fighter biplane based on the Austro-Hungarian Lohner L40 aircraft. This also used a pusher engine, mounted under the center-line of the upper wings, with the radiator and starting handle in the front. Having a top speed in level flight of 118 m.p.h., the aeroplane was quite remarkable for the fact that, despite being a flying boat, it



Above: Antonio Santoni and Nino Franchini's airframe in the process of being built in one of ALFA's workshops in the former Italian Darracq factory at Portello. The tailplane portion has not yet been added and the wing tips have yet to be fitted, but the basic shape is there. Below is a 1910 newspaper picture of the aircraft on its second flight, with both Santoni and Franchini aboard. The ALFA engine is mounted just ahead of the lower wing leading edge and the twin propellers are positioned on either side and to the rear of the crew seats.The bottom picture shows Isotta-Fraschini aero engines in construction in ALFA's shops. These workshops were very large and at this time had mostly earth floors. The tiled and concrete floors of the large manufacturing facility came much later.





was fully aerobatic in the terms of those days.

The Caproni Ca3 three-engined heavy bomber was an early application of the twin-boom airframe design and was quite advanced in a number of ways. This machine perfected the use of three engines, a feature almost identifiable with Italian aircraft, while the twin-boom was synonymous with Caproni at that time. The Ca3 was powered by the Isotta-Fraschini V4B, many made by ALFA. The rear gunner had the worst of the deal in this craft, as he stood on a platform above the central engine, which was a pusher.

By 1917, the Company was producing the 250 h.p. Isotta-Fraschini V-6 liquid-cooled engine, which was installed in the later development of Macchi's flying boat, the M7, as well as a development of the Caproni heavy bomber.

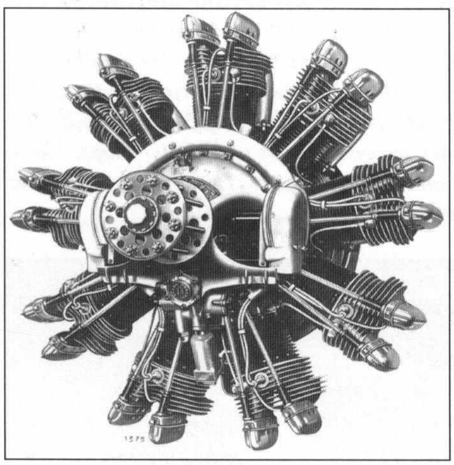
Alfa Romeo won the world motor racing Grand Prix Championship for 1924, and immediately thereafter the Italian Air Ministry awarded the Company a contract to build, under license from the Bristol Aeroplane Company, the 420 h.p. Jupiter 9-cylinder air-cooled radial aero engine. This was the engine which in Britain powered such aircraft as the Gloster Gamecock, the Hawker Woodcock and later the famous Bristol Bulldog fighters. Within three years, another license-built British engine, the Armstrong-Siddeley Lynx 7 cylinder air-cooled radial of 220 h.p. was in production by Alfa Romeo. This engine powered many Italian aircraft, including Bredas and Capronis, which saw service in the Second World War.

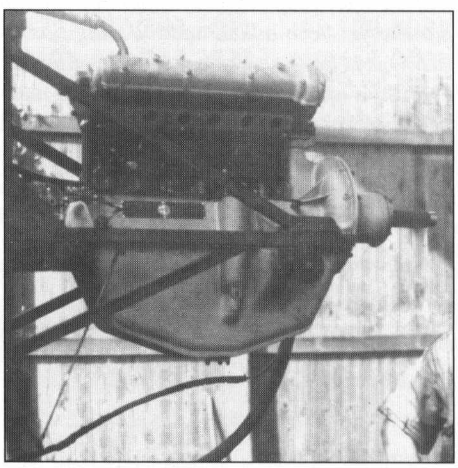
By 1929, Alfa Romeo was manufacturing the Colombo types S55 4-cylinder and S63 6-cylinder light aircraft engines, which were so successful that the Milan company bought out the small aero engine maker. Both engines were air-cooled, the smaller producing 85 h.p. and the larger yielding 130 h.p., and were used to power such military aircraft as Breda, Caproni and Macchi training machines.

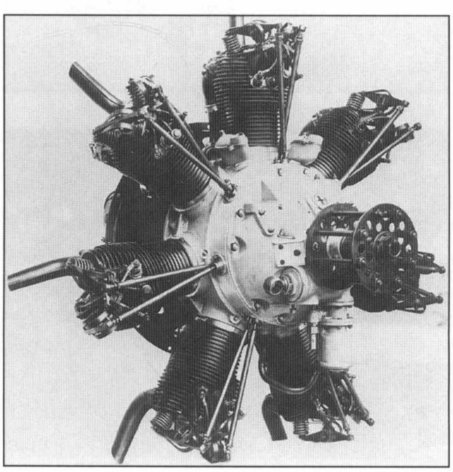
One example of a Caproni Model 100 light biplane was powered in 1931 by a supercharged Alfa Romeo 6C 1750, instead of an Alfa Romeo-built Colombo S55. Being a car engine, the 1750 was designed to run at higher speeds than most purpose-built aero engines, so a reduction gear of 3:1 was used to produce a maximum airscrew speed of 1,400 r.p.m. In aero form, the 1750 was fitted with an enlarged wet sump and was tuned for maximum torque, rather than speed, yielding 80 b.h.p. at 4,200 r.p.m. The radiator was front-mounted, with a plated shell and an Alfa Romeo badge in full view. Unfortunately, that project never reached production, so only one Alfa-Caproni was built.

Alfa Romeo's first indigenous radial aero engine was the D2C 30, a 240 h.p. 9-cylinder supercharged single-row radial, introduced in 1931 to power the Caproni 101 tri-motor bomber/transport aircraft which was the mainstay of Italy's Ethiopian campaign in the 1930s. This was another aeroplane, and engine, which saw service in the Second World War, especially in the desert campaigns of North Africa. The Germans used several commandeered examples right up to the end of their campaign in Italy.

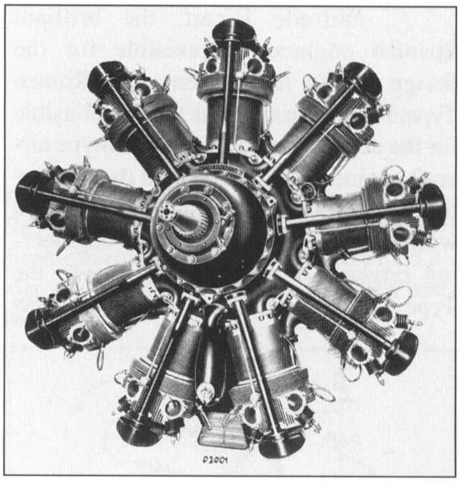
The de Havilland Aircraft Company was the next British manufac-



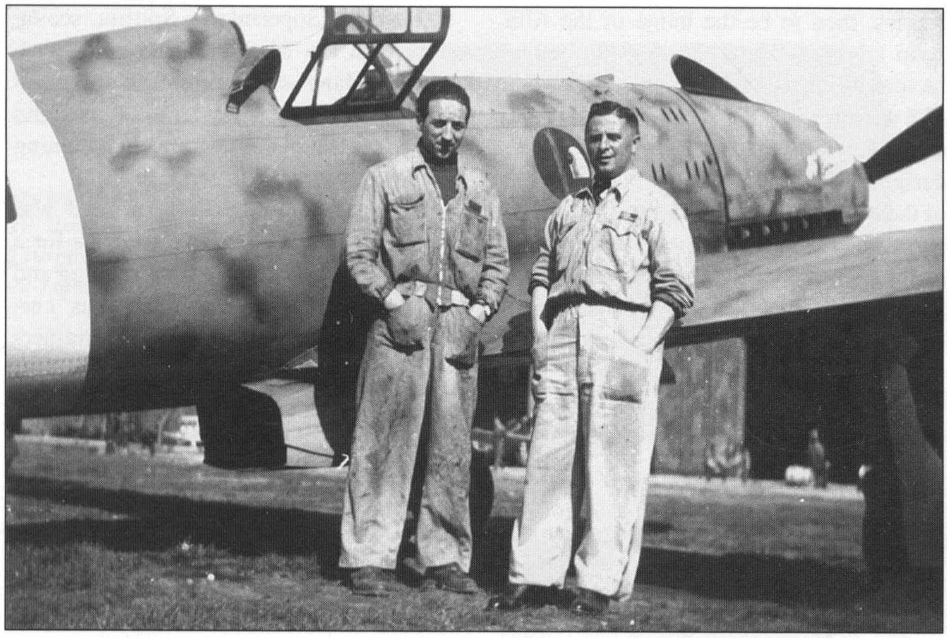




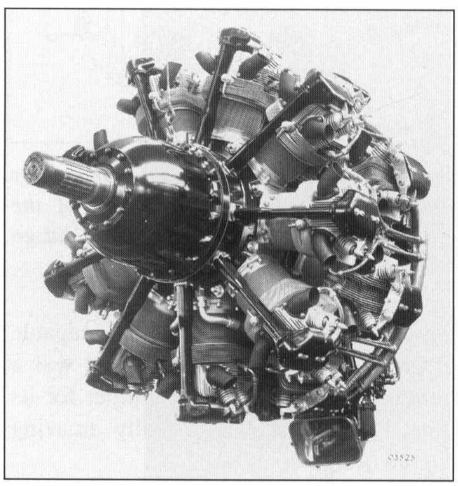
Top: Antonio Ascari climbs out of his P2 racing car, having won the Italian Grand Prix, securing also the World Championship for Alfa Romeo. As a result of his victory, the company was appointed by the government to manufacture license-built Bristol Jupiter radial aero engines for Italian military aircraft. The engine above on the left is actually an Alfa-built development of the Jupiter, while the engine immediately above is the Alfa Romeo 1750 developed for the Caproni 100. On the left is an Alfa Romeo "Lynce", the license-built version of the Armstrong-Siddeley's seven-cylinder "Lynx", a very successful early lightweight radial.



Bristol's Mercury was a fine aero engine, so Alfa Romeo secured the license to manufacture it for the Regia Aeronautica, which was looking for a suitable engine for the Savoia-Marchetti SM series of tri-motor transport and bomber aircraft types. It became the Alfa Romeo Type 126RC and this picture shows the Alfa version of the engine.



The Macci MC202 "Flogore" was Italy's answer to Britain's Spitfire and Hurricane and Germany's Messerschmitt ME109. This picture shows a prototype MC202 after an early test flight with an Alfa Romeo-built Daimler Benz DB605 (Type 1000 RC41-1) inverted V-12 engine.



The magnificent Alfa Romeo 135RC 18-cylinder double-row radial, which had its origins in the Bristol Mercury. Whilst the engine suffered numerous teething problems, when it did finally find its way into service in 1943, it was to prove a thoroughly reliable and efficient power unit.

turer to license production to Alfa Romeo in the Thirties, with two engines, the Gypsy Six 6-cylinder 185 h.p. and the Gypsy Major 4-cylinder 120h.p. units. Both were air-cooled and were used to power training aircraft such as the Caproni Ghibli, the Nardi Type 305, the Saiman Model 202, and the SIAI Ambrosini Type S7. The smaller of these two engines became Type 110 I and the other Type 115 I. Both were of inverted design with the crankshaft at the top, in line with growing practice.

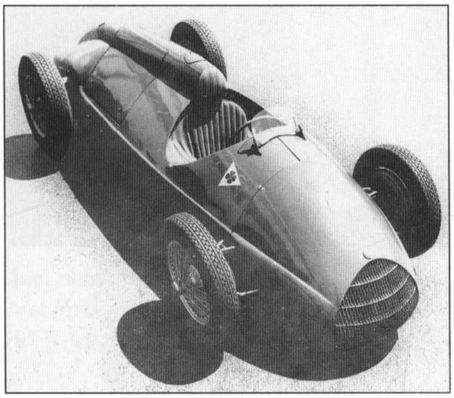
Once again, in 1936, the Italian Air Ministry secured a license from the Bristol Engine Company (as the engine division of the Bristol Aeroplane group was now known), to produce another British radial aero engine. This time it was the Mercury, which was being used in several British high-performance aircraft of the day, such as the Gloster Gauntlet and Gladiator fighters. Among the Italian types powered by the Alfa Romeo Type 126 RC (as the license-built Mercury was known) was what must have been the most famous tri-motor of the Regia Aeronautica, the Savoia Marchetti SM79. A team of three SM79s, named the 'Green Mice', flew from Rome to Rio de Janiero, a distance of 6,120 miles, at a speed of 248.5 miles per hour. This was just one of many new time and distance records flown with that aircraft. The Cant tri-motor Z506 seaplane, as well as the Savoia Marchetti SM 75 and 81, was also powered by the 126 RC 34 series engine. One Cant Z506B Airone gained fame during the Second World War as the only aeroplane ever to be seized by prisoners of war in an escape attempt when a group of RAF prisoners successfully flew it to Malta.

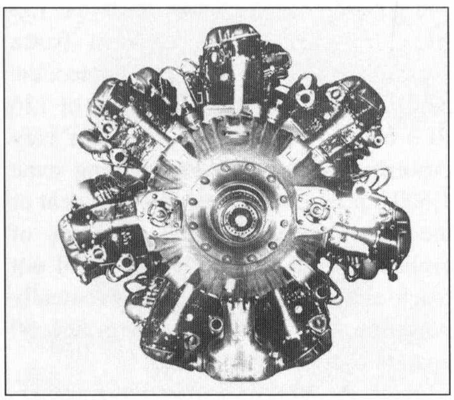
Introduced at the 1937 Milan Aero Show was a new and adventurous Alfa Romeo radial. This was a double-row 18-cylinder known as the Type 135 RC. Designed by the eminent Isotta Fraschini engineer, Giustino Cattaneo, the new engine was essentially a pair of 126 RCs banked together to produce a very powerful unit for the time, yielding some 1,600 h.p. at 2,400 r.p.m. Development of the new engine presented all kinds of problems, with the result that it did not reach aircraft use until 1943, eventually powering the Savoia Marchetti SM 90 and the Cant Z 1018 bomber.

By 1939, a higher-powered version of the 126 RC had been developed, to be known as the 128 RC, which produced over 1,000 h.p. This version of the Italian-built Mercury engine proved immensely reliable and was retrofitted to large numbers of Savoia Marchetti SM 79s, as well as all new production aircraft of that model. The same 9-cylinder unit powered the SM 75 and 82 transport aircraft; one SM 75 flew from Rome to Tokyo and back in 1942. When the SM 95 four-engined transport aircraft was built after the war, the same Alfa Romeo 128 RC engine was used to power it, speaking volumes for its performance and reliability.

In the Spring of 1940, Alfa Romeo opened a new factory site, specifically for the production of aero engines and their installation into partially assembled aircraft. This plant was later to gain fame as the home of the Alfasud car; it was, of course, Pomigliano d'Arco, near

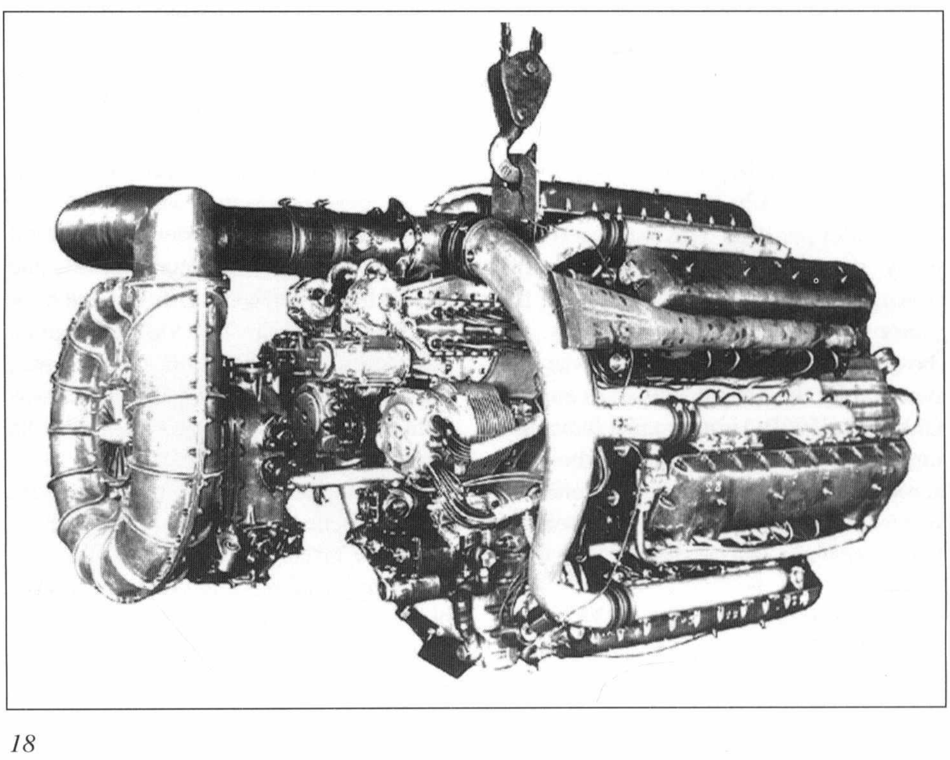
Naples, then to be the home of the Alfa Avio Division. Here, the quantity manufacture of license-built Daimler Benz DB 605 inverted V-12 fuel-injected aero engines was undertaken, with the type designation 1000 RC 41-1. About 1,500 of these units were built, to power the new generation of Italian fighter aircraft, such as the Macchi MC 202 and the Reggiane RE 2001. These fighters were the Italian contemporaries of the Messerschmit ME 109 and the Supermarine Spitfire, seeing service in the Mediterranean and North Africa. Many such aircraft were fitted with their Alfa Romeo-built engines and flown straight out of the airfield adjoining Pomigliano d'Arco.



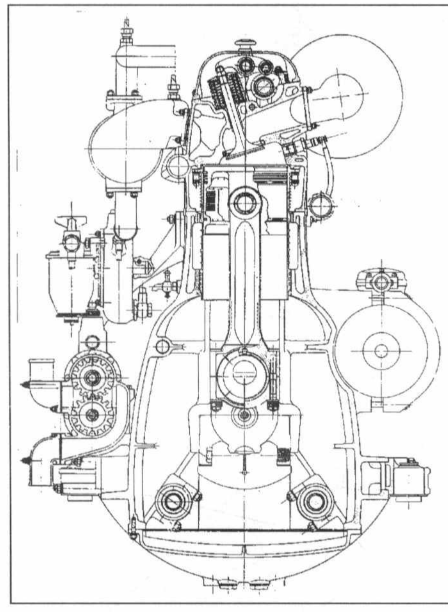


Also during 1940, a need was identified by the Regia Aeronautica for a slightly higher-powered light training and communications aircraft than was currently available from the range of trainers of that time. So Alfa Romeo decided to produce a super-charged version of the license-built Gypsy Major 4 cylinder engine, to be called the 111 1G. The design power output of that engine was increased by 15 per cent, to 138 h.p. at 2,300 r.p.m., and the resulting unit was installed into the Saiman 202 monoplane, an ideal aircraft for the role of light trainer and squadron or station 'hack'.

Above left is the magnificent, but never raced, Alfa Romeo Type 512 Grand Prix car, built in 1940 for a Grand Prix season that never began. Even so, it was a significant engineering development, for its engine was to be two-stage supercharged and Wifredo Ricart took much of the work carried out on the 512 across to his aero engine design, the Type 1101, pictured left and below. The end view shows the quite small frontal area of the engine, whilst below can be seen the huge turbo-supercharger and its related pipework. Had the engine reached production, it would have been one of the most powerful engines of World War II.



Wifredo Ricart, the brilliant Spanish engineer responsible for the design of the magnificent Alfa Romeo Type 512 racing car, was also responsible for the design of a couple of prototype aircraft engines. Neither reached the production stage, but the second of the two is worthy of mention here for the engineering prowess of its creation. It was the Type 1101, designed in 1942, a four-row



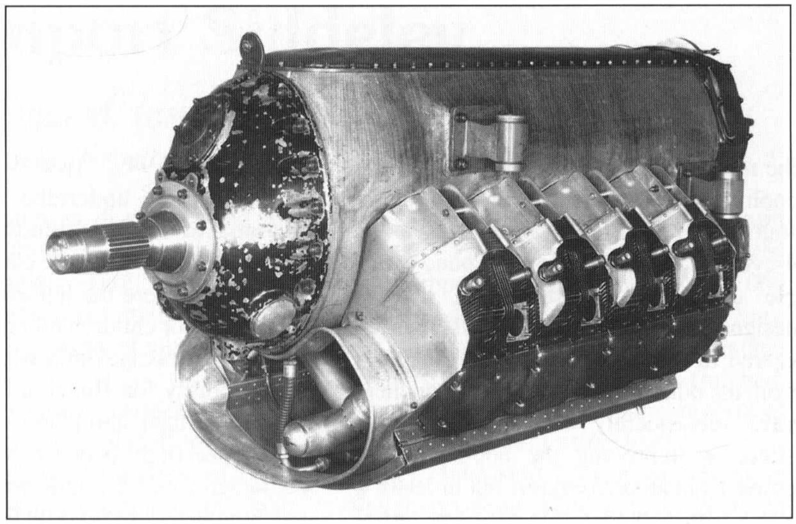
The Marine engine which was created by Wifredo Ricart from one seventh of the mighty 1101 aero engine. This unit did go into production after the war.

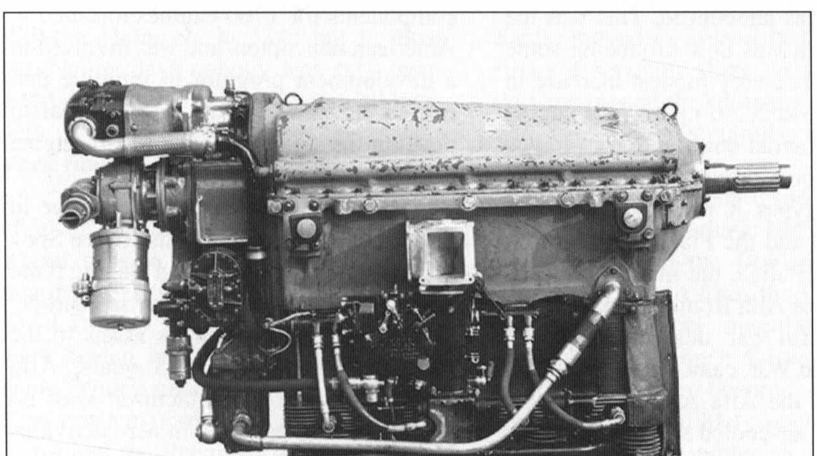
liquid-cooled 28-cylinder radial, capable of providing over 2,000 h.p. That was a thoroughly amazing power output for its time, coming from an equally amazing engine design concept.

Wifredo Ricart came to Alfa Romeo in 1939 with brilliant credentials and, if rumor is to be believed, upon the recommendation of General Franco. He became Director of Special Studies and Project Development and very soon created his idea of the successor to the Type 158 Grand Prix car, in the form of the rear-engined, two-stage supercharged Type 512, placing that project into the hands of others while he concentrated on his ideas for a revolutionary aero engine.

The Type 1101 had many features which were far ahead of their time and it may be that the failure to understand the significance of those features was a key reason for the engine not reaching production. For example, being liquid-cooled, the engine did not need to have each bank of cylinders offset from

This is the Alfa Romeo 121RC-14, designed and developed by Dr. Orazio Satta Puliga. Being just short of 10 litres in displacement, the engine produced 215 h.p. at 2,250rpm and was very highly regarded as an efficient and easy-to-maintain power unit.





Above: Bonzi and Lualdi are ready for take-off on their epic flight to Rio de Janeiro aboard the Ambrosini S.1001 light aircraft. Note that the aircraft's rear seat space has been taken up entirely by fuel tanks. The power plant installed in the Ambrosini was an Alfa Romeo 110ter, illustrated on the left. This engine proved to be immensely reliable as a light trainer power unit.

board to set up limited production facilities. The third prototype, a four wheeler with a more orthodox , but still flat, single-cylinder engine worked extremely well. Herbert Austin had driven one with great success in the RAC 1000 mile Reliability Trial in 1900. He now began to think about volume manufacture, but the Wolseley company could not afford to finance it.

Another company keen to get into motor car manufacture at that time was Vickers Sons & Maxim, who were engineers and armaments manufacturers. It was agreed that they would buy the motor and machine tool interests of the Wolseley Sheep Shearing Machine Company, and in 1901 they formed the Wolseley Tool and Motor Car Company, located in a factory at Adderley Park, Birmingham and managed by Herbert Austin.

Very soon afterwards, with the support of friend and banker Lionel de Rothschild, John Siddeley approached Vickers to manufacture his car. They were sympathetic and offered him facilities at the original Maxim factory at Crayford in Kent. The first Siddeley cars were shown at the Crystal Palace Show in 1903, and promoted by a 5000-mile, RAC-observed, reliability run driven by John Siddeley. The marketing of the cars was done by the Siddeley Autocar Company from its own offices in London.

In 1904 John Siddeley got involved in motor racing as opposed to promotional endurance runs. He built a 100 h.p. Siddeley car for Lionel de Rothschild to compete in the elimination trials in the Isle of Man for the 1905 Gordon Bennett Trophy race, which was to be run in Auvergne, France. However, the car, driven by Sidney Girling, suffered a collapsed wheel and crashed quite badly. It was not selected for the British team but ironically two Wolseleys were. One was driven by the Hon. C. S. Rolls, who came in eighth.

The production Wolseley cars, however, were not a financial success and soon the Siddeley cars were outselling them. The Vickers directors thought at least part of the problem was Austin's stubborn insistence on staying with horizontal engines when all the successful designs, including Siddeley, had adopted vertical cylinder layouts.

In 1905 Vickers bought out the Siddeley Autocar Company and retained John Siddeley as Sales Manager of the Wolseley Tool and Motor Car Company with new amalgamated headquarters in London. This was all too much for Herbert Austin who resigned to form his own company. He had seen the writing on the wall and, even before resigning, had found a disused factory at Longbridge, Birmingham and done preliminary design work on his first car. He showed drawings of the first Austin car at the Crystal Palace Exhibition in November 1905. It had a four-cylinder vertical engine. The first prototype ran in April 1906; how times have changed.

Meanwhile, John Siddeley had been made General Manager of the Wolseley Tool and Motor Car Company. Initially both the horizontal and vertical engines were still made, the smaller horizontal-engined cars being marketed as Wolseley, and the larger vertical engined cars being sold as Wolseley-Siddeley. But despite the excellent performance of the new cars, and the high regard in which they were generally held, the new amalgamated company lost money for four straight years.

The Vickers board began to lose patience. Not only was the Wolseley Tool and Motor Car Company losing money under John Siddeley's control, but the press frequently referred to the cars simply as "Siddeleys". Relations got progressively worse and in the spring of 1909 John Siddeley secretly applied for a job with the Deasy Motor Car Manufacturing Company. He was accepted and resigned from the Wolseley company. Subsequent investigation by Vickers established that company overheads were far too high and a drastic reorganization was started. This mainly meant consolidating the Crayford operations with those at Adderley Park.

Captain Henry H.P. Deasy was born of a wealthy Dublin family and his early life was that of an army officer, explorer and adventurer. One of his adventures was driving a Swiss Martini car up the track of a Swiss rack mountain railway in 1903. This achieved wide publicity and Deasy started importing Martini cars into the UK. The Martini company was already controlled by a British company owned by Captain Deasy.

In 1905, with financial help from some of his wealthy chums, including Sir Richard Waldie-Griffiths, another Australian sheep farmer, he formed the Deasy Motor Car Company. They bought the lease of the historic Parkside factory site in Coventry and opened a sales office in London. This was quite separate from the Martini company, which later went back under Swiss control.

However, the new company seems to have been beset by disasters from day one, with frequent board room rows between Deasy and the chief designer Edmund Lewis, who had previous experience with Rover and Daimler. Captain Deasy resigned in 1908. Edmund Lewis was later demoted to consultant and John Siddeley brought in to sort the mess out. He was initially appointed joint managing director, but within a year he was in sole charge and the company fortunes began to improve.

Up until 1910 Wolseley were still selling cars as "Wolseley-Siddeley" while Deasy was now selling "J.D.S-Type Deasy" cars. The use of the name Siddeley became the subject of legal wrangling until Wolseley decided to drop it. The Deasy cars then became known as J.D.Siddeley-Type Deasy.

At this stage virtually all the components were brought in and Parkside was little more than an assembly plant. In 1911 John Siddeley started negotiating with Daimler for the supply of Knight sleeve valve engines, and by 1912 all the Deasy cars were fitted with them. One journalist said they were as quiet as the Sphinx, which prompted John Siddeley to adopt the famous company emblem which followed him to later marques. John Siddeley, however, was not yet satisfied; in the same year he put a proposal to the board that the Deasy Motor Car Company should manufacture its own engines. The board agreed and approved funds to equip a new machine shop. This was to prove a crucial decision in the dark days ahead.

Also in 1912 the company name was changed to the Siddeley-Deasy Motor Company, which reflected the control he now had. To promote the Siddeley-Deasy name, a 24-30 h.p., 6-cylinder, Knight-engined car undertook a 15,000-mile, RAC- observed, reliability run at Brooklands. It took two months, at 300 miles a day, at an overall average speed of 35 miles per hour.

In the same year John Siddeley set up Stoneleigh Motors to make light cars and commercial vehicles, and in 1913 he acquired the Burlington Carriage Company to gain control of body work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ARMSTRONG SIDDELEY MOTORS LIMITED
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London: 10, Old Bond Street, W.1.
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The Largest Manufacturers of Six Cylinder Cars in Europe.
ARMSTRONG
SIDDELEY
EIGHTEEN 6-CYLINDER
18·30
MADE BY THE MEN WHO MADE SIR ALAN COBHAM'S AERO ENGINE

manufacture. The expansion of the Siddeley-Deasy Motor Company was accelerating apace when events in Sarajevo changed world history and plunged Europe into a bloody four-year war.

Initially John Siddeley began to slow down the business as the younger men left to join the war effort. Then suddenly an order was received for 100 Stoneleigh lorries for military use in Russia. More orders for lorries and staff cars were received and suddenly the factory was struggling to cope. John Siddeley then made another decision which was to profoundly change the future of the company.

In 1915 military aviation was in its infancy and there was no established British aircraft industry capable of coping with the rapidly increasing wartime demand. Indeed, there was no firm in the country that had an acceptable aero-engine designed, let alone one ready for production. Siddeley-Deasy already had a new engine production facility, John Siddeley now got board approval to extend the factory to build aircraft, and was thus able to tender successfully for Government contracts to build both aircraft and engines, one of only six companies able to do so. Initially Siddeley-Deasy manufactured aero engines to the designs of the Royal Aircraft Factory at Farnborough, but by the end of the war was manufacturing engines under its own name. The Siddeley Puma was being made at the rate of 600 per month. When John Siddeley joined the Deasy Motor Car Company in 1909 there were about 200 employees, at the end of the war there were over 5000. Thus was the foundation laid for aero engine production.

In 1917 a government inquiry into inefficiencies at the Royal Aircraft Factory was sufficiently damning that the design and construction organization was largely dismantled in favor of private contractors. It was renamed the Royal Aircraft Establishment in 1918 and its efforts focused purely on research.

Many of the top engineers left and joined private companies. Three of the them, Major F.M.Green, John Lloyd and Sam Heron joined Siddeley-Deasy. Sam Heron was a top engine designer and, among other things, had pioneered the sodium-cooled exhaust valve.

First priority for the new team was to modify the 6-cylinder water-cooled B.H.P. (Beardmore Halford Pullinger) Adriatic engine which John Siddeley had undertaken to manufacture. This engine, in a much modified form, finally went into production late in 1917 as the Siddeley Puma (see Appendix). It became the mainstay of the British bombing force in the DH.4 Biplane, and ultimately was produced in greater numbers than any other aero engine in England.

Then the team was set to complete the development of the promising RAF.8, 14-cylinder double-row air-cooled radial engine that it had been developing at Farnborough. This was a completely new departure in design, developed into the first supercharged aero engine in the world to go into production. However John Siddeley insisted on several specific major design changes which Sam Heron completely disagreed with. This developed into a major row and Sam Heron resigned and took his talents to the Wright Aeronautical Corporation in America. Heron was replaced by the Italian-born S.M.Viale, who was more diplomatic in fending off John Siddeley's interference, and the engine was eventually launched in 1922 as the Jaguar.

John Siddeley had already decided at the end of the war that he wanted to stay in the aviation business, but he really needed a partner to set up a new company to do it properly. He initially talked to Daimler, but negotiations failed. He then contacted Armstrong Whitworth.

Armstrong Whitworth had been a car manufacturer in its own right from 1906 to 1915 but, of more relevance now, it had been a sub-contractor during development of the Puma aero engine and there was a good working relationship between the two companies. Negotiations were successful and in 1919 a new company was formed called the Armstrong Whitworth Development Company. This company bought all the shares in the Siddeley-Deasy Motor Car Company and then set up a new subsidiary called Armstrong Siddeley Motors, which incorporated the motor and aviation interests of Siddeley-Deasy. John Siddeley was made managing director of this company. He was not however elected onto the board of the Development Company, this being blocked by Sir Glynn West, who controlled Armstrong Whitworth. There was clearly a personality clash.

John Siddeley had also become very enthusiastic about the future of civil aviation, and in 1920 he bought Whitley Aerodrome and set up a flying school. In the same year he proposed to his own and the parent board that a new and separate aircraft company be established. This was approved and the Armstrong Whitworth Aircraft Company was registered.

The company was initially based at Parkside, but in 1923 the production was moved to Whitley. The design team remained at Parkside until 1926 and then followed the manufacturing side. This left Armstrong Siddeley as a dedicated motor car and aero engine company. In later years the Whitley site was occupied by Rootes and Chrysler, and eventually in 1988 became the research and development division of Jaguar Cars.

In 1919 Armstrong Siddeley was the first British company to introduce a new model car after the war. The 30 h.p. Siddeley Six, said to owe much in design to the American Marmon, was a success after a slow start and remained in production up until 1932 with total production of some 2700 cars. The main problem was supplying sufficient bodies. The Bristol Aeroplane Company was one sub contractor used to overcome the shortages. The company also received royal patronage from the Duke of York, who became King George VI in 1936.

In the early Twenties the recession was still biting and John Siddeley was keen to boost sales by securing more military work. Vickers was a key player in the armaments market and was already an old friend of John Siddeley. Puma engines had been tried in a new Vickers tank, not entirely successfully, so development work was started on new air-cooled engines. Stoneleigh light cars were resurrected in 1921 but were not successful and dropped again in 1924. However by 1924 things generally were picking up and in 1925 new model cars were introduced, the workforce expanded, and the company was again running at full stretch. They were not typical of the UK motor industry however, most of which was still having a rough time.

In 1926 John Siddeley initiated another company restructuring. He had been kept off the board of the Armstrong Whitworth Development Company by Sir Glynn West, and was not therefore aware in detail of the happenings in the parent

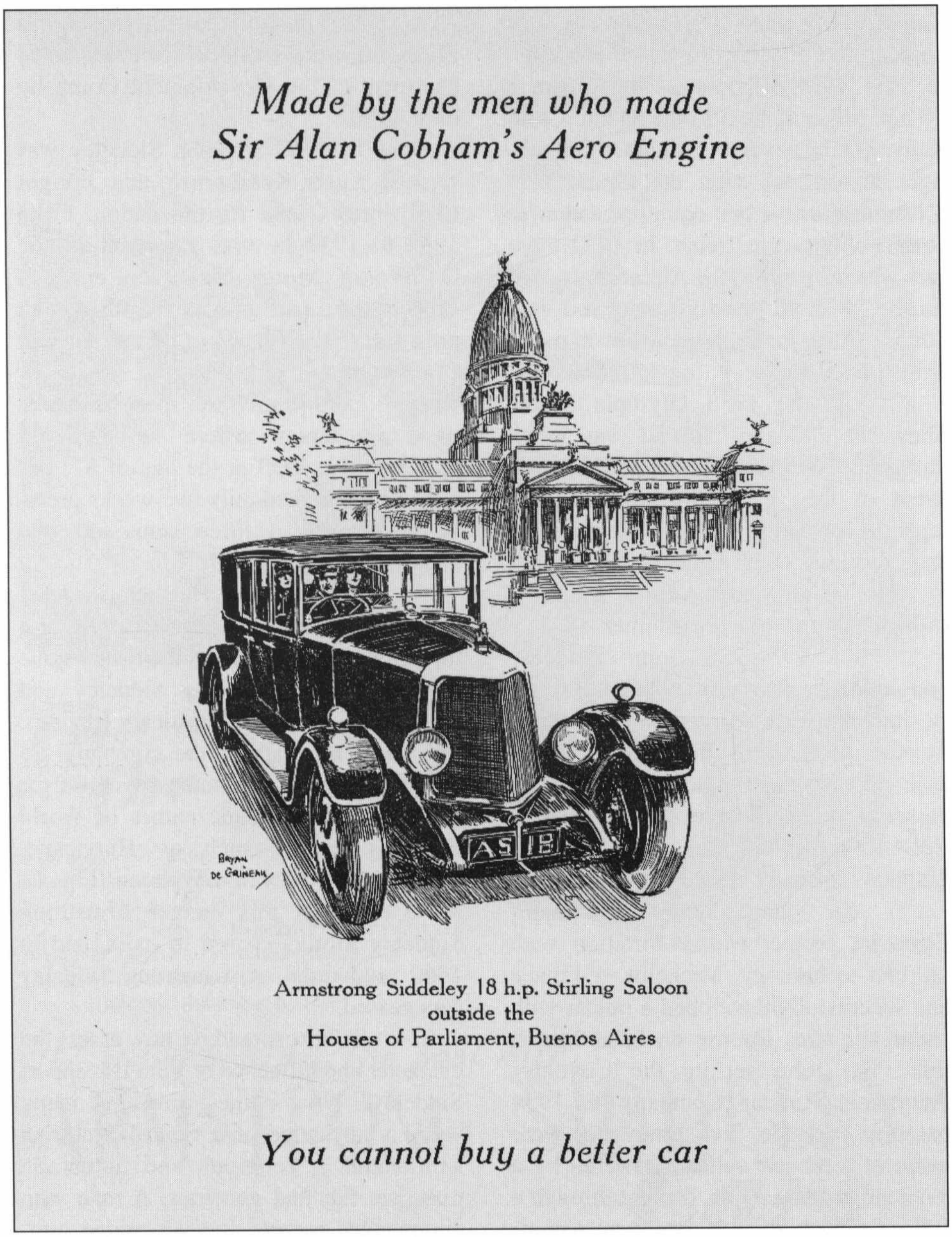

Fig. 2 - From the c. 1927 catalog, "What Customers Think of Their Armstrong-Siddeley."

company. He suspected however that profits from Armstrong Siddeley were being used to support a mismanaged Armstrong Whitworth. He eventually got himself elected to the board of the Development Company in 1926 and his worst fears were confirmed.

With personal support from the Midland Bank, John Siddeley offered £1.5 million for the Armstrong Whitworth Development Company on the condition that Armstrong Whitworth would not make either cars or aeroplanes in the future. Reluctantly Sir Glynn West had to accede because of the poor financial position of Armstrong Whitworth.

In 1927 John Siddeley changed the name of the company to the Armstrong Siddeley Development Company. Although there was now no direct link to Armstrong Whitworth, John Siddeley negotiated the rights to continue using the Armstrong name. To add to the confusion, Armstrong Whitworth was itself taken over by Vickers in 1928 and a new company called Vickers-Armstrong Ltd. registered. This is still the name outside the old Maxim factory at Crayford. About this time, Armstrong Siddeley began to advertise that it made "Cars of Aero Engine Quality" (Fig. 2).

John Siddeley's next venture involved the Wilson epicyclic, pre-selector gearbox. The history of the technology goes right back to the Wilson-Pilcher car in 1901. In its long history both Armstrong Whitworth and Vickers had already been involved, the latter seeing the military potential. It was not patented however until 1922, and the rights were then sold to Vauxhall Motors, who did some development work on it. When General Motors took over Vauxhall it showed no interest in the Wilson gearbox. Colonel W.G.Wilson then had a legal battle with General Motors and, against the odds, won back control of the patents.

John Siddeley saw the potential in the patent and in 1928 he and Wilson set up Improved Gears Ltd., with the intention of licensing the technology. The full potential of the Wilson system was not realized, however, until Daimler took out a license and coupled the Wilson gearbox with the Daimler fluid flywheel and smoothed out some of the harshness of the purely mechanical system. Improved Gears negotiated a reciprocal license for the fluid flywheel but then Daimler, without consultation, patented the gearbox/flywheel combination and started blocking supplies of flywheels.

In 1934 Improved Gears Ltd. changed its name to the Self Changing Gear Trading Company. In one form or another, gearboxes based on the Wilson patents became widely used. ENV Engineering made them, Riley used them in big numbers, ERA used them, so did hundreds of London Transport buses made by AEC. Military uses were also developed by Vickers, mainly in tanks for which Armstrong Siddeley had also now developed successful air cooled engines.

Peter Hooker Ltd. was a London based company who had built the French Gnome aero engines under license during the war. It subsequently developed a technology for forging aluminum alloy pistons, which it supplied to Armstrong Siddeley. When Armstrong Siddeley won a large order for Jaguar engines after the war, Peter Hooker Ltd. went into receivership and thus prejudiced piston supplies.

Hooker's works manager, W.C. Deveraux, proposed to John Siddeley setting up a new forge to make the huge numbers of pistons required. Siddeley lent Deveraux the money needed to buy back the hammers and tools from the machine tool company, Alfred Herbert Ltd., who had bought them from the Receiver. They then established a new factory at Slough under the name of High Duty Alloys Ltd. The company became very successful in the field of high performance, lightweight metals and remains so today.

Throughout the 20-year period between the wars there was increasingly intense competition in the aero engine market between Armstrong Siddeley and Bristol, who were broadly in the same market sector. This tended to get personalized as between John Siddeley and Roy Fedden, the innovative designer at Bristol who also had an automotive background, most notably with Straker Squire.

Bristol slowly gained market advantage and in the early Thirties the aero engine side of Armstrong Siddeley was beginning to flag as most of the designs in production were getting near the limits of their development potential. John Siddeley was blamed in part because of his rigid attitude towards engineering detail. He was seen as setting very high standards of quality and reliability, but being somewhat conservative and resisting innovation. The problems were compounded by Siddeley being involved in a serious road accident in 1931 and being absent from work for nearly a year. However, Imperial Airways chose Armstrong engines for its new "Atalanta" mail and passenger-carrying plane, designed to operate from Cairo to Capetown. Each aircraft was equipped with four air-cooled motors of 340 h.p.

Around this time two of his sons, Cyril and Ernest, were made directors of Armstrong Siddeley Motors. Cyril became Sales Director in 1928 and stayed with the company right through to 1952. Ernest had been to the US in 1919 to study American motor industry developments. He was made Manager (Cars) in 1929 and a Director in 1932. He only stayed with the company until 1937, becoming unhappy with things after his father left in 1935. The third son, Norman, was something of a rebel and went to live in South Africa, but remained in the motor trade.

In 1932 John Davenport Siddeley was awarded a knighthood for his contribution to the mechanical development of the armed forces. That same year, Armstrong Siddeley Motors Ltd. was again a leader in an important aero engine development – the introduction and successful testing of a two-speed supercharger unit. The advantage of this device was that it enabled best possible power to be used from the engine, both at ground level and at operational altitudes.

In the early Thirties Armstrong Siddeley cars began to appear in the long distance rallies that were becoming very popular and generated a lot of publicity. In 1931 S.C.H. (Sammy) Davis drove a 20 h.p. Silver Sphinx in the Monte Carlo Rally. While never a contender for outright honors, he won the Grand Prix d'Honneur for the best equipped and most comfortable car to finish. In 1932 three cars were entered in the Alpine Rally. All finished without penalty marks and won Glacier Cups. Prizes were also won in the British RAC Rally.

At the 1933 Olympia Motor Show the Siddeley Special was introduced and was considered the motoring event of the year. This advanced car replaced the aging 30 h.p. Siddeley Six and contained much light alloy technology from High Duty Alloys. Malcolm Campbell was an early customer.

In 1934 Sir John Siddeley bought the freehold of the Parkside factory site along with adjacent land occupied by other companies. This secured the site as a major industrial location. The site passed to Bristol Siddeley in 1960, then to Rolls-Royce when it acquired Bristol Siddeley. It finally closed in 1994.

Sir John Siddeley's last major industrial project was a flirtation with railroad technology. Michelin in France had successfully developed a railcar with pneumatic tires for use on local branch lines. Sir John set up the Coventry Pneumatic Railcar Company in 1934 based at Parkside. Two prototypes were made of a 56-seat railcar, powered by a V-12 aluminum engine, driving through a Wilson transmission. Trials were technically successful, but a conservative railway industry declined to adopt them. The track maintenance gangs hated them because they could not hear them coming.

By 1935 Sir John Siddeley was nearly 70 years old and thinking about the future management of his business empire. The aero engine business was still in decline, but Sir John still had one more surprise up his sleeve.

In July 1935, having failed to do a deal with Handley Page, Sir John Siddeley concluded a deal with Tommy Sopwith of Hawker Aircraft to set up a new company called Hawker Siddeley Aircraft (Fig. 3). This company would acquire the entire share capital of the Armstrong Siddeley Development Company, and half the ordinary shares of Hawker Aircraft. Hawker had already acquired the Gloster Company and Bristol Aeroplane. Sir John did not become a director of Hawker Siddeley but remained chairman of the Development Company until 1936.

In 1937 Sir John Siddeley was created Lord Kenilworth and bought Kenilworth Castle for the nation. From 1937 to 1939 he was President of the Society of Motor Manufacturers and Traders. He had previously also been president of the Society of British Aircraft Constructors.

Lord Kenilworth spent his retirement in Jersey where he died on November 3, 1953 at the age of 87. His wife Sara had died only two weeks previously. They had three sons and two daughters.

In 1959 the Hawker Siddeley Group, for whom cars had never been a top priority, amalgamated the aero engine businesses of Armstrong Siddeley and Bristol to form Bristol Siddeley Engines. The main interests of the company are made clear from the names it chose for the early postwar cars, names of World War II aircraft such as Hurricane, Lancaster, Whitley and Typhoon (Fig. 4). As a result of this merger Armstrong Siddeley Motors ceased to exist, and in 1960 production of Armstrong Siddeley cars ceased.

So how should we now assess the character and influence of John Davenport Siddeley? What comes across in many ways is an image of a typical Victorian gentleman. A religious and autocratic man, yet fair and generous. A man who commanded respect and yet prided himself on knowing his workforce individually and who would acknowledge the least of them in the street. A very ambitious and hard working man, and an excellent organizer. Above all a man of vision who could assimilate other people's ideas, build on them, predict trends and position himself to take advantage of them.

In later life he became a considerable public benefactor. Apart from buying Kenilworth Castle for the nation and endowing it with a generous maintenance fund, he gave £10,000 to Cambridge University for aeronautical research, and £100,000 towards the rebuilding of Coventry Cathedral after the second world war. He was also a major benefactor of Coventry Hospital.

To commemorate the coronation of King George VI in 1937, he donated £100,000 to the Fairbridge Farm Schools

Fig. 3 - The Hawker Siddeley "Lancaster" Bomber

in Canada and Australia which trained young immigrants to become farmers. Immigrant Australian farmers do seem to have had a strange affinity with the early British motor industry.

John Siddeley was very good at promoting his own products by means of demonstrations and endurance runs, even entering works cars in international rallies. He does not, however, seem to have been a particularly competitive man in the sporting sense. He was never directly involved in motor racing apart from making one car to order for a friend.

He was not a formally trained engineer and yet clearly had an instinct for good design, without himself being technically creative. He set very high standards of quality and reliability, but was accused of being conservative and resisting innovation. He was not a good listener and he did like to be in control. Overall he probably had a more lasting impact on the aircraft industry than the motor industry.

Appendix : The Aviation Products

John Siddeley had his first exposure to aviation products during his time with Wolseley, although the extent of his direct involvement is not clear. The first recorded Wolseley aero engine was in a Voisin biplane in 1909, when it won prizes for distance and height at an air-show in France. Wolseley then went on to make larger engines for airships for both the British and Italian governments. In later years they were best known for the Viper engine, which was the Marc Birkigt-designed Hispano V-8 built under license.

The influence of the first world war on the fledgling aircraft industry cannot be over estimated. There was virtually no industry before the war, and yet it is recorded that in the four years of the war the British Government alone bought over 58,000 aero engines. At the end of the war most military contracts were summarily terminated and the new aircraft industry left floundering.

The other major influence was the expertise available from the Royal Aircraft Factory at Farnborough. The roots of this establishment go back to the H.M. Balloon Factory set up in Farnborough in 1905. The scope was quickly extended to airships and man-lifting kites, S.F.Cody being appointed Chief Instructor of Kiting in 1906. Attention soon turned to powered flight, with the focus sharpened in 1909 when Bleriot landed in a field near Dover and demonstrated that England was no longer an island.

Flying competitions proliferated, many centered on the Brooklands Motor Racing track, the inside of which had been made into one of the country's first permanent aerodromes. Many army officers competed privately in the new sport and began to see the military potential, particularly for artillery spotting. They started experimenting at army locations, but were told explicitly by the Government to stop. They continued anyway, and eventually common sense prevailed and the Army Aircraft Factory was established in 1911 at Farnborough under the control of Col. Mervyn O'Gorman. In 1912 the Royal Flying Corps was set up as a separate entity and the name of the Farnborough establishment changed to the Royal Aircraft Factory to acknowledge the wider significance of aviation. Col. Mervyn O'Gorman established a scientific basis for developing aeronautics at Farnborough which is still valid today. The early contribution of Farnborough to aviation technology remains greatly underrated.

In August 1912 a Military Aeroplane Competition was held which was won on points by S.F. Cody in his clumsy Type V biplane powered by a salvaged Austro-Daimler engine. It was decided however

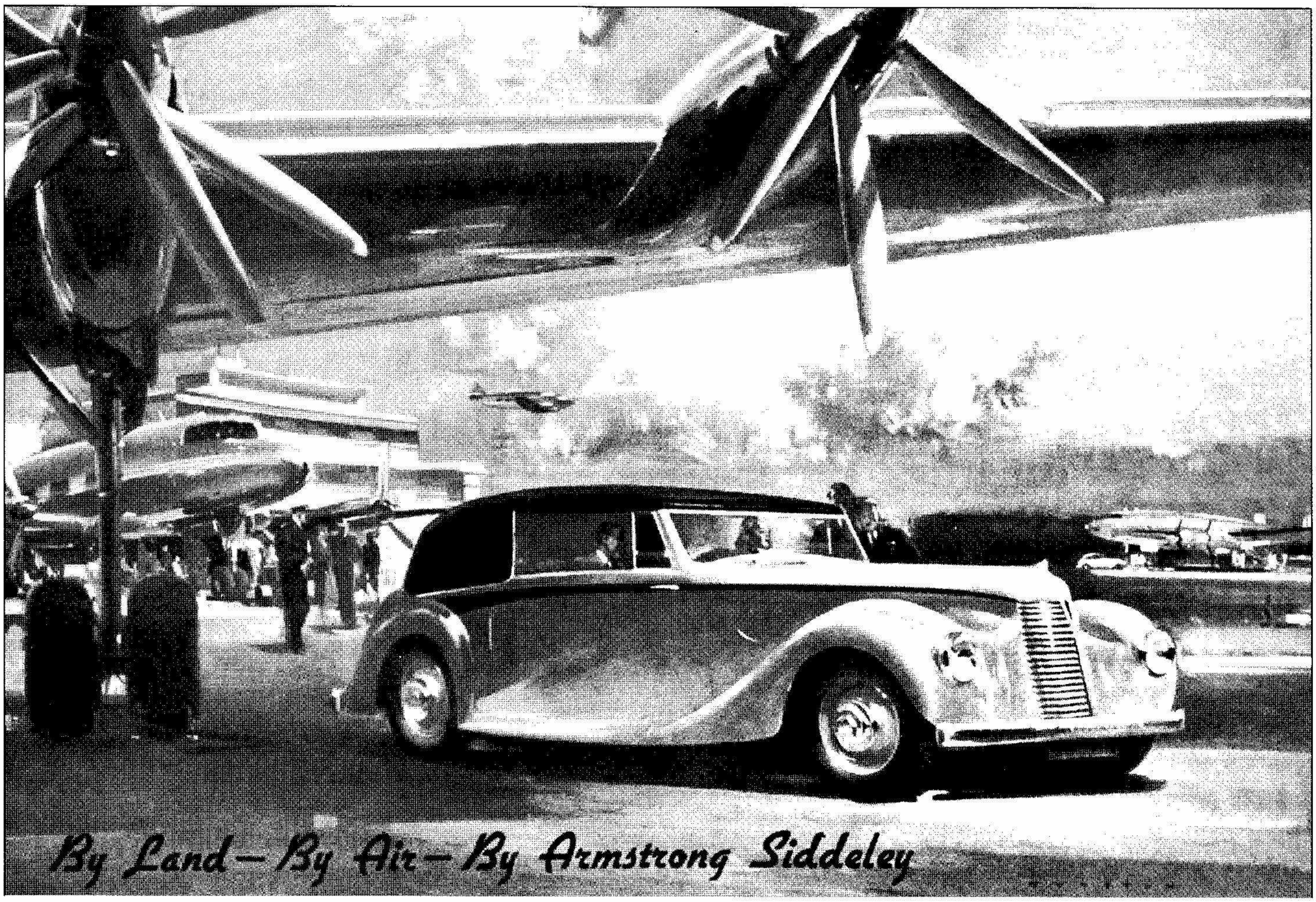

Fig. 4 - The postwar Armstrong Siddeley "Hurricane" car.

to adopt the BE2 aircraft built by Geoffrey de Havilland at Farnborough and powered by a Renault engine. A top priority at Farnborough was then to design a replacement engine.

The first aircraft to be built by Siddeley-Deasy at Parkside were 100 Farnborough-designed RE.7 reconnaissance biplanes ordered in early 1916, to be followed by the later RE.8, of which over 1000 were built before the end of the war, many powered by Siddeley engines.

Before the setting up of the separate Armstrong Whitworth Aircraft Company in 1920, Siddeley-Deasy had limited involvement in airframe design. When John Lloyd joined the company from Farnborough he brought with him plans for a modified RE.8 biplane. This was developed into the Siddeley RT.1 which first flew in late 1917. It created little interest and only three were built. The first in-house design was the SR.2 Siskin fighter aircraft which first flew in 1919. This excellent design was not initially successful, only three being built, but it achieved success some years later as an Armstrong Whitworth product. The third Siddeley-Deasy design was an ambitious bomber project called the Sinaia, powered by two V-12 cylinder engines. Only one ever flew, in 1921 under Armstrong Whitworth management, but it was underpowered, there was no government interest, and the project was eventually abandoned.

The first government aero engine contracts for Siddeley-Deasy were awarded in the summer of 1915. The first engines built were the Farnborough designed RAF.1a, 90 h.p., V-8, air-cooled design based on the Renault V-8. These were unreliable and underpowered and were soon replaced by the 150 h.p., V-12, air cooled, RAF.4a. After some redesign at Parkside these became quite successful and powered the RE.7, RE.8 and BE.12 aircraft. The War Office had given Siddeley-Deasy an order for 300 of the engines, to be delivered at the rate of 10 a week, together with spare parts.

The first engine subject to major design input at Parkside, and sold under a Siddeley proprietary name, was the Puma. The history of this engine is complicated and throws up yet more names with automotive connections. Its ancestry can be traced back to a 120 h.p., 6-cylinder, water-cooled, Austro-Daimler engine designed by Ferdinand Porsche, which was first seen in the UK in an Etrich monoplane in 1911 when it competed in the Circuit of Britain. The plane crashed but the engine was salvaged and subsequently used by S.F.Cody in the 1912 Military Airplane Competition.

Arrol-Johnston Ltd. of Dumfries, an associate company of William Beardmore & Sons, undertook to build the engine under license. The outbreak of war in 1914 complicated matters and made the need more urgent, but still by the beginning of 1916 the engines were not up to expectation. Captain Frank Halford was seconded from the Royal Flying Corps in France to sort the mess out and soon improved the reliability and got the output up to 160 h.p. Production was still too slow however and the War Office con-

TABLE 1 - Aero Engines Produced by Armstrong-Siddeley

Year Introduced	Family Name	Configuration	Max. Power Developed
1920	Lynx	7 cyl. single row	225 h.p.
1920	Ounce	2 cyl. horizontal	45 h.p.
1922	Jaguar	14 cyl. double row	400 h.p.
1926	Genet	5 cyl. single row	80 h.p.
1926	Mongoose	5 cyl. single row	155 h.p.
1927	Leopard	14 cyl. single row	800 h.p.
1929	Panther	14 cyl. double row	700 h.p.
1931	Serval	10 cyl. double row	340 h.p.
1932	Tiger	14 cyl. double row	860 h.p.
1935	Cheetah	7 cyl. single row	420 h.p.
1935	Deerhound	21 cyl. triple row	1400 h.p.

tracted Crossley Motors in 1917 as a second manufacturer.

The Royal Flying Corps meanwhile had already asked for a more powerful engine and Frank Halford was also asked to design a new unit based on the Beardmore engine, and capable of eventual development to 300 h.p. This would be a private venture financed by Sir William Beardmore. This resulted in the 200/230 h.p. B.H.P. engine which first flew in August 1916. The initials derived from Beardmore/Halford/Pullinger, the latter being the works manager of Beardmore. A new company called Galloway Engineering was set up to make the new engine, which was called the Adriatic.

There were production problems, both in numbers and performance, and Galloway could not meet the ever increasing wartime demand. Siddeley-Deasy was therefore offered a contract to build Adriatic engines at Parkside at the rate of 50 per week. John Siddeley was assured the technical problems were all sorted out, but the prototype production units performed so badly that he asked to be relieved of the contract. The engine was supposed to run for 50 hours, but after 49 hours, the valves dropped in. He was persuaded to continue on the basis that he could make design changes. This was the first problem he handed to Major Green, Sam Heron and John Lloyd when they arrived from Farnborough in January 1917. The redesigned engine was called the Puma, which was by now no longer interchangeable with the B.H.P. Adriatic from which it was derived; only the bore and stroke remained the same. Frank Halford was not amused.

After the water-cooled, in-line Puma and its derivatives, Armstrong Siddeley aero engines were almost entirely air cooled radial engines. There were many families spread over the years from 1920 until the second world war. The above table is an attempt to summarize the various engine families, but can only be indicative because of the complexity of all the derivatives, such as blown and unblown versions of the same engine.

The last engine in volume production was the Cheetah which went right through World War II in various forms. Over 40,000 of this reliable workhorse engine were produced and they powered such aircraft as the Avro Anson, Bristol Bulldog, Airspeed Oxford, de Havilland Hawk Moth, Handley Page HPR.2 and Percival Provost.

Armstrong Siddeley is not the only British car company to have been involved in aero engines. Apart from those mentioned in this article the following companies have offered aero engines at some stage: Alvis, Blackburn, Coventry Victor, Humber, Napier, Rolls-Royce, Sunbeam, and Riley.

W.O. Bentley designed rotary, as opposed to radial, engines during the 1914/18 war. He saw the huge potential for aluminum pistons in military aircraft. Commander Briggs, a perceptive senior Admiralty engineer, secured a commission for him as a Naval officer and sent him off to convince the likes of Rolls-Royce and Sunbeam to adopt the new technology. They did. When Bentley convinced Briggs that he should be given facilities to design his own engine, he was given facilities at Humber and designed the successful BR.1 and BR.2 engines.

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RILEY'S VENTURE INTO AVIATION

***David G. Styles** takes a look at how one of Britain's greatest pre-World War II car makers ventured into the world of aviation in a bid to serve King and Country up to and including the Great War of 1914-18.*

Those familiar with the name of Riley in the world of automobiles will recall that the Coventry company made some of the finest British cars of sporting inclination in their day. Few, though, will be aware that Riley became very much involved in the world of aviation during the 1914-1918 War.

Before the Great War, the Riley Cycle Company became a car maker by the familiar route of first making bicycles, then adding single-cylinder engines to them to create motorcycles. Then came another wheel to create the handlebar-steered forecar, a steering wheel made them tricars and before you could blink an eye, there was a fourth wheel on the road and Riley were making cars. In their 40 years as a family business, the Riley brothers made some of the finest small cars in Europe, as their record in racing, rallying, hill-climbing and international expeditions will tell you.

Percy Riley, recognized in history as the mechanical genius of the family, set up the Riley Engine Company in 1903, at the age of just 20, with the aim of eliminating the family's dependence on foreign engine designs (de Dion) and outside suppliers (the Motor Manufacturing Company Ltd, Cudell and The Cycle Components Company).

Riley's first venture into things military came not long after the turn of the century, when several bicycle makers were involved in an experiment being carried out to investigate the value of using bicycles in the South African Wars. King Edward VII had just ascended the throne and several regiments of the British Army, including the Royal Warwickshire Regiment whose depot was Budbrooke Barracks on the outskirts of the town of Warwick, quite near to Riley's home town of Coventry, were detailed to investigate the use of bicycles as a practical alternative method of transport, in certain applications, to the horse.

Following on from that, by early 1903, a Riley "Moto-Bi" was made ready to do service with King and Country and a year later a 3-1/2 horsepower machine, powered by a Riley-made engine, was offered to the War Department. But the door to military contracts was still firmly closed.

In 1909, Riley gained its first real breakthrough in its quest for military business, by winning a place in that year's War Department Trials, after a senior Army officer had seen a Riley Ten performing in the Irish Trial. Even at this, Riley didn't secure a worthwhile order, only three cars being taken for further evaluation. After this, the firm gave up its quest to supply vehicles to the armed forces and began to look at developing generators, using the 12-18 and 17-30 engines as suitable power units which were possessed of quite good torque and weren't too fast-running.

This is Percy Riley, third son of William Riley Jr. and the inventive genius of the Riley family.

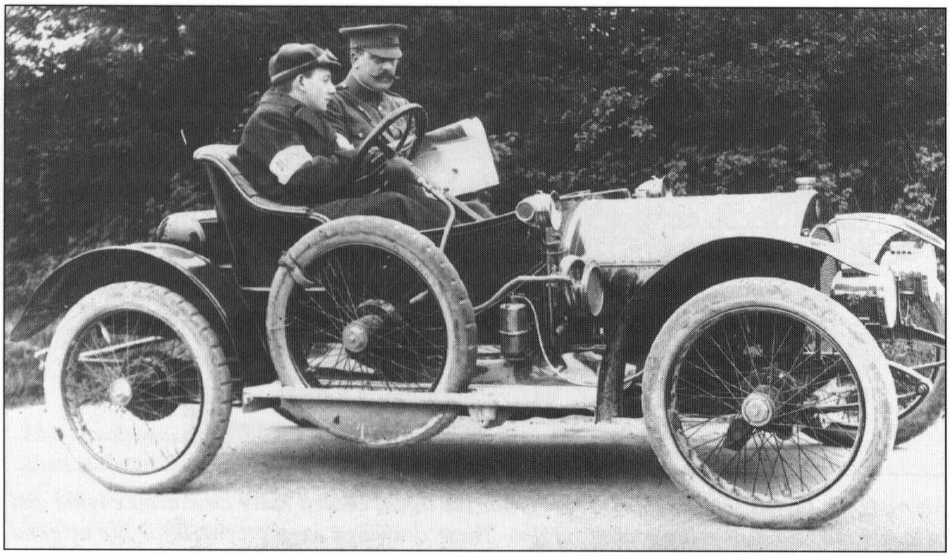
The "Kaiser War", as the Great War of 1914-1918 was sometimes known, witnessed the most productive period of Percy Riley's military developments. Aero engines greatly interested him and when the Gnome seven-cylinder 50 h.p. rotary engine was first revealed in 1908, he looked at other design ideas as alternatives. From the beginning of his interest, Percy was clearly concerned about having a great mass of metal, the crankcase and the multiple air-cooled cylinder barrels positioned around it, rotating with the propeller.

When Percy Riley was ready to look at engines for powered flight, he came to realize that the one organization best able to fund the development of his ideas was the War Department, for it was spending more money on aviation development than any other body, public or private. Before the first decade of the new century was over, Cody had built his "Army Aeroplane Number 1," the first British Military fixed-wing aircraft, Bleriot had flown the English Channel, the Gnome 50 h.p. was in production and the Italians, Antonio Santoni and Nino Franchini were soon to put their first aeroplane in the air, powered by a four-cylinder water cooled ALFA engine of 24 h.p. rating. Now, Percy Riley was ready to sit at his drawing board and put his own ideas on paper.

The reason the rotary aero engine won such early popularity was the seven-cylinder Gnome's immediate success and thorough reliability. It had a high power-to-weight ratio, vital in early aviation, and ran cooler as a consequence of its rotation. So the scene of international aviation was set for some time. And the engines which would influence that scene for almost ten years would be French engines, beginning with the Gnome, then the le Rhône of 1913, the Monosoupape of 1914, and the Clerget of 1916.

It was this French domination of the aero-engine scene, combined with his own natural engineering curiosity, which spurred Percy Riley on to develop his ideas. The early Gnome engine had used a single pushrod-operated exhaust valve and an automatic inlet valve built into the crown of the cast iron piston, with fuel being fed into the crankcase down the hollow crankshaft and drawn up into the combustion chamber through the piston itself.

The le Rhône used pushrod operated overhead inlet and exhaust valves and so one of Percy Riley's earliest inventions, the mechanically-operated inlet valve, was employed in a rotary aero engine. These were the two principal engine types upon which Percy concen-



Stanley Riley and his British Army officer companion do some route-checking on the 1909 Army Trials aboard a Riley Ten.

trated his attention, for the Monosoupape was not yet upon the world, nor the Clerget and later British engines.

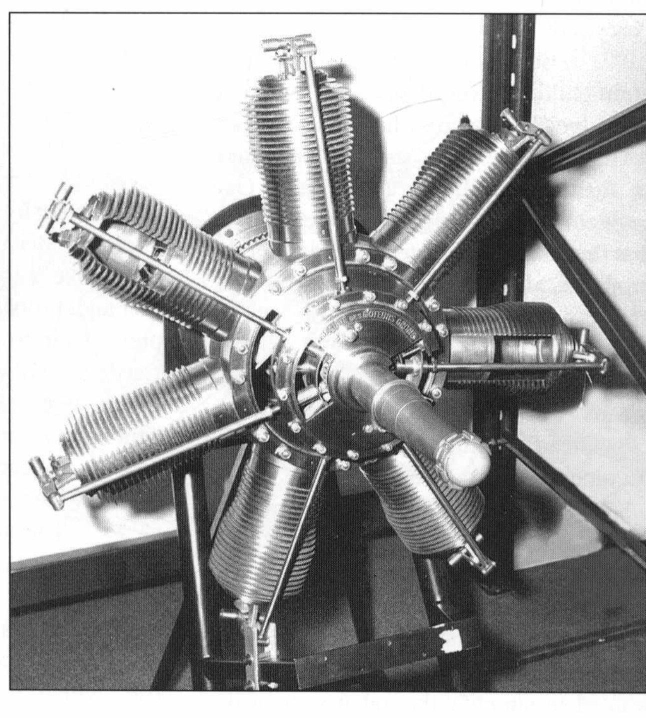
Riley's prime concern was to achieve two features different from these early rotaries. Firstly, he wanted to eliminate the need for the major mass, of crankshaft and cylinder barrels, to rotate, thereby eliminating the gyroscopic forces and the turbulence drag, to say nothing of high oil consumption. Secondly, he saw a need for reducing the frontal area of an engine to facilitate better streamlining of engine cowlings and thus, better aircraft performances, though he still favored "round" aero engines. The result of Percy Riley's labors was, perhaps ironically, the subject of a patent published in August 1914, days before the Great War started. It was two types of cross-head engine design featured in a single patent (number 18204, approved on August 1, 1914). The first was a two-stroke and the second a four-stroke. They were novel in the extreme, though neither design found its way into an airframe.

The common features of the two designs included a deep crankcase, behind which lay the eight cylinders of both engine types, placed parallel to the longitudinal axis of the crankshaft. The number of cylinders was also an unusual feature in rotary or radial aero engine designs, since odd numbers of cylinders were the normal practice. The connecting rods had large diameter spherical ends, which sat in sockets at both ends, the outer connected to the piston, the inner to a cross-head, which in turn was mounted on a single crank-pin, angled from the crank-disc at the driving end, with its other end connected on the rotating axis by means of a gimbal, to the driven shaft at the rear. Balls and sockets, or gimbals, have often been used in more recent times as the connection between connecting rod and piston in model aero engines, but not in many full size engines.

Bridging the rear ring of the cross-head was a lateral shaft, fixed to the ring at each of its ends. The crank-pin passed through its center and it was mounted in two bearings to smooth the motion of the shaft in the cross-head, since it did not rotate. The crank disc had a wedge-like recess in it to accommodate the inclined cross-head, further aiding the conversion of reciprocating motion to rotary motion. The Patent illustration and the cross-section drawing give you some idea how it all comes together.

The two-stroke engine used four firing cylinders and four pumping cylinders in its operation. Fuel/air mixture would pass into the pumping cylinders through an overhead disc-valve, which was rotated by an eccentric on the rear driven shaft. Next, as the valve closed and the crankshaft rotated, each piston in turn would force the mixture into a holding chamber from which, on opening of the valve over the neighboring firing cylinder, it would pass into the combustion chamber to be ignited and exhausted into the atmosphere. The effect was to cause the cross-head to continue its cycle and thus the rotary motion.

The four-stroke unit used the same mechanical principles, but now all eight cylinders were firing cylinders, with overhead-positioned poppet valves. These were operated through rockers and pushrods by individual cams, which were each attached to an individual gear rotating at right-angles to the rear end of the crankshaft, upon which was mounted the main driving worm gear for all the valves. The other major difference was that the four-stroke engine was air-cooled, whereas the two-stroke was water-cooled. In both engines, there were numerous benefits, according to the designer, of having two shafts extending from the engine. In



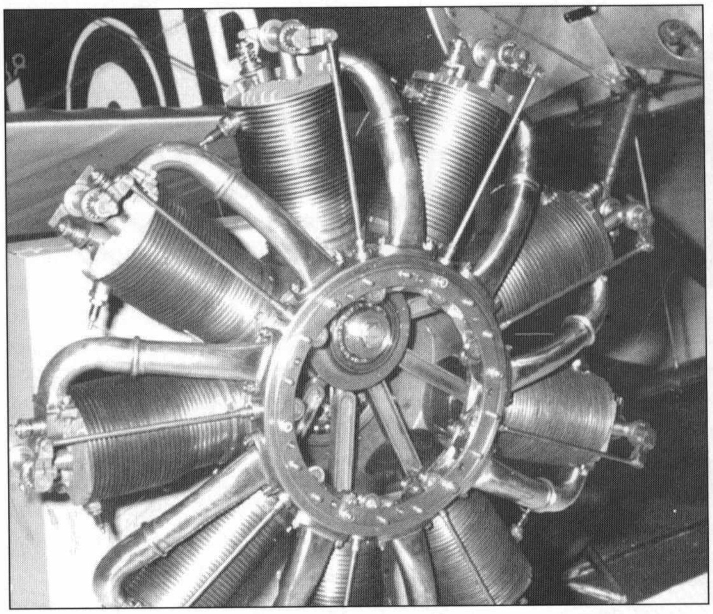
The seven-cylinder Gnome was the first reliable rotary aero engine. Its inlet valve was placed in the crown of the piston, as seen on the right, with compression holding it firmly closed on the firing stroke.

Clerget engines too, for it did extensive work under sub-contract to Gwynnes of Hammersmith. This work was carried out by the Riley company some two years before Captain W.O. Bentley RN fitted aluminum alloy pistons to his Admiralty AR1 (which popularly became known as the Bentley BR1, but was in fact nothing more than a re-vamp of the Clerget 110, commissioned by the Navy). That Bentley was not the first to fit aluminum pistons to aero engines is confirmed by Jane's Aircraft of the First World War, which quotes that contemporary press reports refer to aluminum pistons being fitted to Clerget engines in 1916. They were Riley pistons.

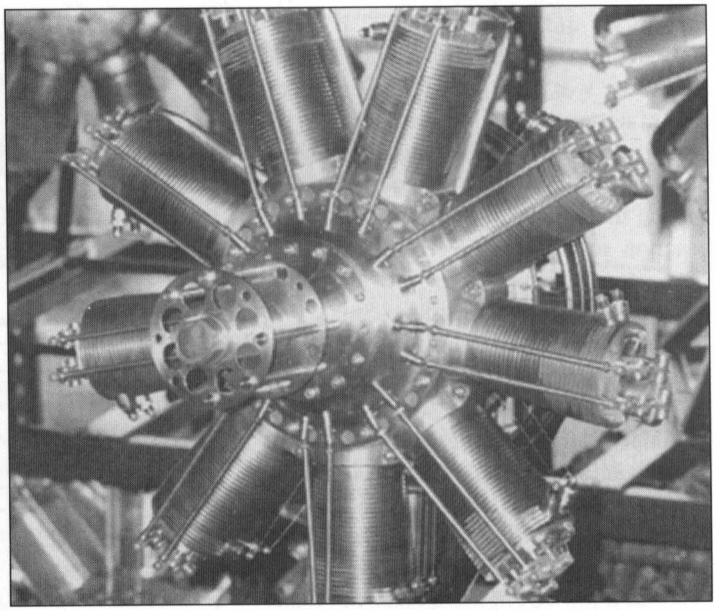
Two independent notes from a squadron in the field are of interest here. The newly-formed 208 Squadron RAF (formerly 8 RNAS) was on the Western Front during the German offensive of late winter 1917-18. That squadron was flying Bentley BR1-powered Sopwith Camels from La Gorgue when the Portuguese line collapsed. On the morning of the 9th of April, the weather was foul, with dense fog preventing flying. So Squadron Commander Christopher Draper (later famous as the "Mad Major", for flying his Auster under London Bridge) had the squadron's 18 Camels pushed into the middle of the airfield and set fire to them in order to prevent the aircraft falling into German hands.

208 Squadron was re-equipped with Clerget 130 h.p. machines and in a report to his senior field commander, Wing Captain CL Lambe, Draper observed that, while the Clerget Camels were slower and had a nominally lower operational ceiling, they were more maneuverable and much more reliable than their Bentley-engined predecessors.

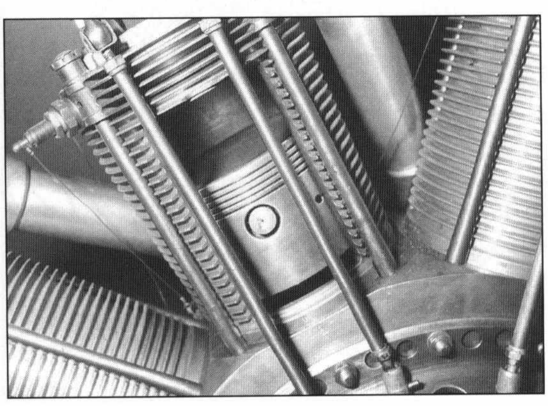
A young Royal Flying Corps officer, Lt Harold Goodwin RFC, was one of few army pilots to be posted to the strength of an RNAS squadron on the Western Front. Upon arrival at Naval Eight, Goodwin was appointed engineering supplies officer and so was very close to the operational problems of the engines in the Squadron's Sopwith Camels and the parts that were needed to keep them going. He endorsed Sqn Cdr Draper's view that the slightly lower engine speed and higher torque output of the Clerget engine made it very much more reliable than the Bentley BR1 and endowed aircraft so powered with greater maneuvrability, which more than compensated for the marginally lower operating ceiling. Lt Goodwin also confirmed that pistons fit-



This is an 80 h.p. le Rhône, with the nose casing and propeller shaft removed, showing the multiple connecting rods attached to a single master rod. The induction manifolds were made of copper and when polished were an instant identification feature of this engine type. It was one of these engines with which Percy Riley first experimented with in the development of aluminum alloy pistons.



The Clerget 130 h.p. was license built in Britain by Gwynnes of Hammersmith in West London. They sublet the manufacture of both engines and components. Riley sub-assembled for Gwynnes and also was given development work, mainly associated with pistons. This came about because of Riley's experiments with le Rhône engines and alloy pistons and the alloy pistons in the Riley crosshead engine design.



An alloy piston in a Bentley BR1. Note the piston has five very slender rings, which were prone to breakage, both in installation and service.

ted to and replaced in Clerget engines had the scripted letter "R" inside a circle stamped on their crowns. Admiralty labels also confirmed, according to Goodwin, that the manufacturer of those pistons was the Riley Engine Company Limited.

Now, Stanley and Percy Riley had worked together to devise alternatives to solid alloy pistons and it was they who came up with a split skirt to allow closer tolerances between piston and cylinder barrel, but Harry Rush and Riley (Coventry) Limited were named as the joint patentees of the new piston design covered by Patent Number 139351, dated April 22, 1919, which was developed out of the huge experience the Riley Companies had gained in their wartime work.

This new piston featured four vertically-cut slots in the skirt, which came down to the position of the groove for the bottom ring and were then cut horizontally so that, as the ring groove was cut, the resulting tongues of metal were pressed in to avoid the groove being cut across them. By this means, there was a pair of pressure pads acting against the ring, when the engine was running, to keep the ring pressed against the wall of the cylinder, while still allowing for movement consistent with the expansion and contraction of the piston itself.

Riley also became involved, just after the Great War, in laminated disc wheels, which again were derived directly from the Company's experience in producing aircraft wheels. Two patents were registered, the first, Number 143360, on 11th April 1919 and the second, Number 150795, on 4th June 1919. The wheels designed under these two patents resulted from attempts to resist the side impact forces on a wheel from aircraft landings and the considerable forces generated when an aircraft didn't land squarely.

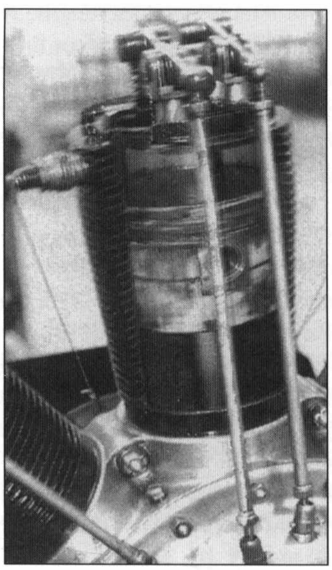
This letter "R" was found stamped on the crown of pistons that Riley made and fitted into Clerget rotary aero engines during the Great War.

Bearing in mind the fact that most aircraft wheels of the Great War period were fabric covered wire type, based very much on the principle of car wheels of the day, it was something of an innovation to introduce a laminated steel disc type which, it seems, is what Stanley Riley did in early 1917. No design material survives, but the Royal Aircraft Factory did experiment with steel disc wheels, though didn't seem to make much progress – weight was one of the problems. These two patents feature a slightly different approach to resolving the same side-force problem.

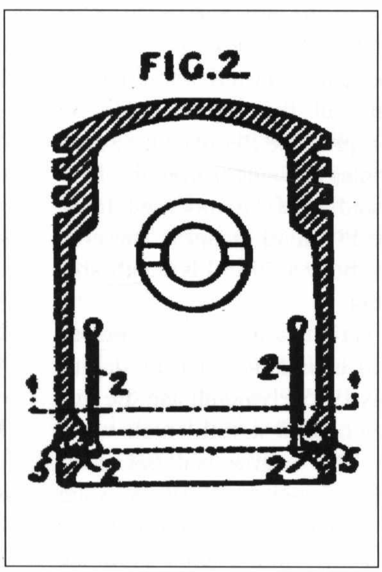
The first of the pair, 143360, used either riveting or welding as the joining medium for discs of reducing diameter being combined to increase the stiffness of the wheel closer to the hub, where the disc of the wheel was dished to provide some "spring" to absorb vertical shock loads. Another feature of this patent was the facility to remove the outer rim lip to ease the fitment of tires, but that didn't seem to progress at all, so the welded one-piece rim went into production.

The second Riley Disc Wheel patent, Number 150795, resembled more closely the original idea conceived, but not progressed, by Stanley Riley. Here, the discs took the same form, in that discs of reducing diameter joined together to provide the spring effect where it was needed close to the rim, but stiffening closer to the hub to prevent damage. But this time, the discs were riveted with a washer or spacer placed between them to maintain a gap between each lamination of discs, the idea being to increase the "spring" of the wheel and so better absorb shocks. However, it did not work satisfactorily on cars, so the idea was abandoned.

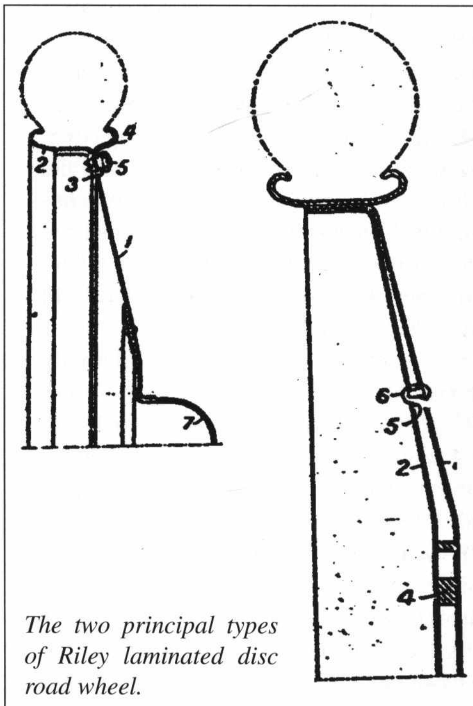
In the new post-war age, new Rileys had been designed, for the first time ever by someone outside the Riley family. But with the "War to end all wars" over, Riley's aviation ventures ended.



The alloy pistons in this Ruston Proctor-built Clerget have three quite thick upper rings and one thin one close to the gudgeon pin, typical of Riley.



The Riley alloy piston which became the subject of British Patent 139351 Of 1919.



The two principal types of Riley laminated disc road wheel.

THE PLYMOCOUPE

__Curt McConnell__'s story of a 1930s hybrid, an airplane powered by an engine manufactured for use in one of the low-priced three.

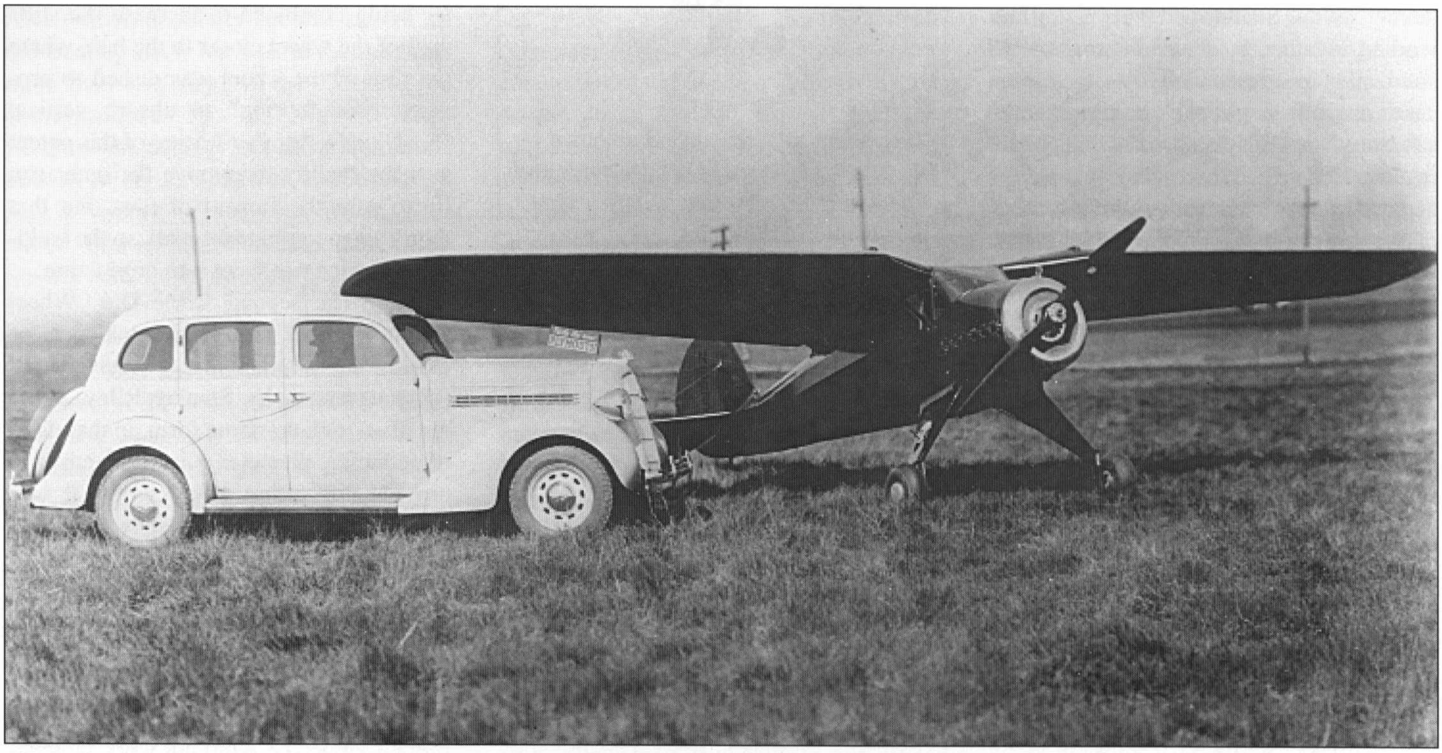


Fig. 1 - Plymocoupe with 1935 Plymouth.

Chrysler Corporation might have become a purveyor of aircraft engines had not an experimental Plymouth-engined monoplane crashed during a 1936 long-distance flight across Alaska.

Ole Fahlin, known for his propeller designs, and airplane designer Swen Swanson, teamed up in planning the airplane for Fahlin Aircraft Co. of Marshall, Missouri. The high-wing, two-passenger plane was officially called the SF-2 – the "SF" stood for "Swanson-Fahlin" – but it was quickly dubbed the Plymocoupe because of its power plant. Nicholas-Beazley Airplane Co. in Marshall built the plane.

Fahlin and Swanson originally designed the Plymocoupe for a US Government-sponsored contest challenging manufacturers to build a safe, cheap "everyman's" or "flivver" airplane. One advantage to the Plymocoupe was that its Plymouth engine could be bought for $130 apiece in lots of 100, according to *American Aviation Historical Society Journal* (Vol. 11, No. 3, reprinted in the November-December 1969 *Plymouth Bulletin*, p. 14). The *Journal* contends that the designers built three SF-2 Planes, though only two used Plymouth engines. If true, the fate of the other two planes remains undocumented.

A two-to-one reduction gear bolted to the Plymouth six-cylinder engine (mounted backwards), to drive the propeller at half the engine speed, or about 1,800 rpm. The Plymocoupe sported the portholes and side trim of the 1935 Plymouth, and used, in modified form, some of the Plymouth gauges. The nose of the plane bore a 1935 Plymouth ship ornament (Fig. 1).

In various articles about the airplane, Fahlin maintained that the engine was from his 1935 Plymouth car, the first year Plymouth used a full-length water jacket. The 1935 engine had flat sides, which were the outer walls for the water jacket. But photos of the distributor side of the Swanson-Fahlin engine show the shape of the cylinder bores, indicating the absence of a full-length water jacket, so it appears the engine was actually a 1934 or 1933 Plymouth six (see sidebar).

Regardless, a 1936 attempt to fly the plane from Anchorage to Seattle without stopping would be "the longest flight ever made with an automobile engine," claimed the *Anchorage Daily Times*.

"As I remember, the engine had an aluminum head and pan," according to Lloyd Jarman, co-author of the 1969 book Alaska Bush Pilots and a longtime aviation writer. Plymouth's optional aluminum head boosted the normal compression ratio slightly. "The airplane was very good looking with no excess 'baggage' out in the wind," Jarman wrote in a November 1986 article titled "Prop, not Record, Broken on this Flight."

In the summer of 1936, a group of Seattle civic boosters, the "Seattle Washingtonians," gave pilot Russell Owen the financial backing he needed to attempt a non-stop 2,400-mile (by land) flight from Anchorage to Seattle. Boosters raised the money by selling one-dollar souvenir postcards; they "will be the first quantity of mail of any volume to go from Alaska to the United States by airmail," backers claimed. "In case of a crackup en

Fig. 2 - Se-As-Ka crashed Sept. 28, 1936 during a forced nighttime landing at Juneau. The auxiliary fuel tank is visible inside the cockpit.

route, Pilot Owen says he will get the cards to the nearest post office if possible," the Anchorage newspaper reported.

"Russ was an old-time airline pilot who flew many years for [Walter] Varney [Airlines], which later merged with United Airlines. He free-lanced for several years before the flight from Anchorage," Jarman wrote.

The nonstop flight "is to be more than a heroic stunt by Pilot Owen," according to a June 17, 1936 *Anchorage Daily Times* editorial. "It is a concerted attempt to draw the attention of the nation to the fact that Alaska has no air mail service and that there is no insurmountable physical barrier to prevent such service." Owen chose an airplane powered by an automobile engine "to give this flight national interest. So many people are acquainted with automobile engines and are hopeful for the day when airplanes can be produced and sold like automobiles that this flight will be given more than ordinary attention," said the newspaper.

Some accounts say Russ Owen bought the airplane, but Jarman contends Owen borrowed the Plymocoupe from Fahlin. Owen shipped it to Alaska, where he modified the airplane to carry extra gasoline and oil for his record-setting attempt. Owen renamed the SF-2 the Se-As-Ka in light of his plan to fly it non-stop to Seattle from Alaska. A freight train delivered the plane to Anchorage on June 17, 1936. He had the side of the airplane painted to read:

Se-As-Ka
The Flying Automobile
Seattle-Alaska
Last Airmail Frontier
Trail Blazed by
The Seattle Washingtonians

The new air mail route was needed because the Seattle post office was receiving 300 pounds of Alaska-bound mail daily, said C.W. Bloom, president of the Washingtonians.

According to other *Anchorage Daily Times* articles, Owen filled Se-As-Ka with enough gas for a 23-hour trip but expected it to take just 16 to 18 hours. "One of the nation's outstanding navigators has charted the course," the newspaper added. Owen piloted the Plymocoupe from the right seat and, on the left seat, placed a spare fuel tank formed in the approximate shape of a seated person.

"I saw the tank several times in Juneau and guessed its capacity to be at least fifty gallons," Jarman said. The tank may have been bigger or Owen could have supplemented it with another auxiliary tank. Regardless, when it took off July 5th for a flight that was turned back by fog, Se-As-Ka was carrying a total of 82 gallons of fuel, the *Times* reported.

That was after Owen drained off ten gallons because the plane wouldn't fly with the heavier fuel load. Even so, "for almost an hour the ship circled the field while gaining altitude. Pilot Owen said the engine became overheated if he climbed too fast but that once leveled off [at 1,400] feet the ship cruised at 90 miles an hour with ease."

According to specifications from the American Aviation Historical Society article, the Plymocoupe weighed about 1,600 pounds, had a wingspan of 32 feet, an overall length of 17 feet, 9 inches, a cruising speed of 104 mph, a top speed of 120 mph, a landing speed of 42 mph, a flying ceiling of 16,000 feet and fuel consumption of four gallons per hour. It had a standard 17-gallon wing-mounted fuel tank, allowing the plane to stay aloft about four hours.

"Russ provided a copper tube through the windshield to the oil tank filler. Extra oil was carried in a rubber hot water bottle which was filled and squeezed to put the oil in the tank, which held six quarts," Jarman wrote.

Plans called for Owen to land in Seattle on July 4th. He was a day late, and spent only four hours aloft on July 5th before fog forced him to return to Anchorage. Bad weather was one thing. It would take Owen three more months to overcome another barrier – the US Government. The day after Owen's flight, a federal aeronautics inspector sealed Se-As-Ka's propeller and hood to prevent further flights. The government alleged that Owen's July 5th flight "was made without authority of the federal department of commerce, without weather reports and without the pilot holding a license to fly," the *Anchorage Daily Times* reported.

Fig. 3 - Damaged and with its wings removed, the Plymouth-engined airplane sat for about three years in "Shell" Simmons' hangar. The hangar and airplane were destroyed in a fire.

Owen finally prevailed and was allowed to take off again from Anchorage's Merrill Field at 9:15 AM on September 28th, following a five-hour wait for fog to clear. The plane lumbered down the runway after Owen received weather reports "showing conditions favorable all the way from Anchorage to Ketchikan, a situation aviators consider unusual," the *Anchorage Daily Times* reported.

"The airplane was 100 per cent overloaded on takeoff in Anchorage. Owen said the flying and handling was very good," Jarman wrote.

Owen was just south of Cape Spencer, Alaska, when his malfunctioning oil gauge began fluctuating. But, according to Jarman, "he had plenty oil. It was getting late – I think it was about 10 or 11 at night, just getting dark. The gauge was fluctuating and there was no place to land anywhere near where he was. I don't know how he found the Juneau airport, even, because it isn't very easy to find – it's between the hills."

What's more, the airport at that time had no lights for a night landing and Owen had never landed there before – day or night. With no lights to guide him, Owen missed the runway by a mere 20 feet, landing in a nearby ditch, or depression, left when dirt was removed to build the runway.

Damage to Owen's plane of many names – variously known as the SF-2, Plymocoupe (also Plymacoupe and Plymo-Coupe), the Flying Automobile, and Se-As-Ka – included a splintered propeller, crumpled cowling, and collapse front landing gear.

"Crash Wrecks Se-As-Ka, Owen Unhurt," read the *Anchorage Daily Times* headline over a September 29th Associated Press article from Juneau. "The pilot, wedged into a tiny space amidst gasoline tanks, was unable to free himself and was compelled to remain in an upside down position until aid arrived." The AP story blamed a failed "gas line gauge" for forcing the emergency landing at the Juneau field. But "luck was with Owen when he cracked up. Pilots pointed out that a spark could have ignited the plane and turned it into a blazing tomb for the aviator who was hardly able to move."

Owen apparently suffered no more than minor injuries, if any at all, but did not fly again after the Juneau crash. As some consolation, Owen may have been the first person to fly non-stop from Anchorage to Juneau, said Jarman, who took hundreds of photos of Alaska airplanes in the heyday of the bush pilots. Jarman was on hand to photograph the plane the morning after the crash (Fig. 2), and he helped remove the Plymocoupe's wings so the craft could be trucked the nine miles to a hangar owned by Sheldon "Shell" Simmons (Fig. 3). "It was very well built. It was a nice airplane," Jarman said.

"To Owen it was his last chance as an aviator," the *Times* editorialized the day after the crash. "He had been stripped of his pilot's license in the States and was no longer in a position to engage in the work he loved. His only hope for a comeback . . . was to blaze the trail for the light craft of a new design over the hazardous coastal route from Alaska to the states. . . . Had he been able to accomplish all this before the days grew short he might have made the flight successfully. It was when darkness closed in on him over Juneau that the encountered the trouble which proved fatal to his flight."

Shortly after the crash Owen, trying to make the best of a bad situation,

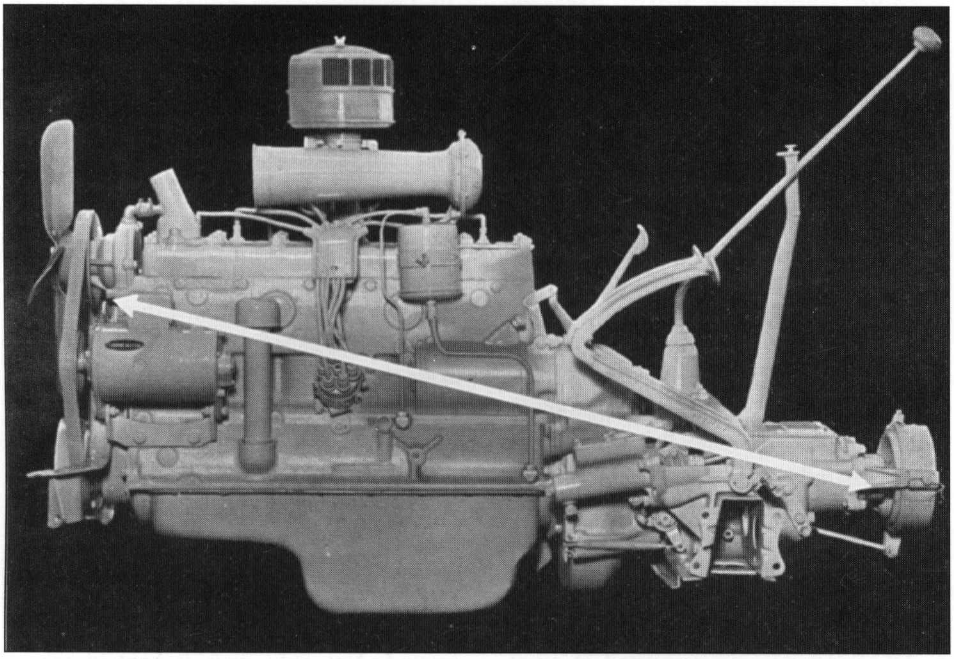


Fig. 4 - The 1934 Plymouth Six engine.

sent a humorous telegram to the Seattle Washingtonians to break the news. the telegram read: "'SE-AS-KA' on her 'ASKA' in Alaska." Owen died in Seattle on August 17, 1962.

Jarman said the plane had been stored in Shell Simmons' waterfront hangar for about three years when mechanics, welding a strut on another airplane, accidently started a fire that burned the hangar to the ground, destroying the Plymocoupe.

Owen apparently wasn't as eager to break the news of his crash to the owner of the plane, Ole Fahlin. Jarman says Fahlin had heard rumors but did not know for sure the fate of the airplane until 1979, at a meeting of early aviation enthusiasts.

"I guess Russ never contacted him and he [Fahlin} didn't exactly know where the airplane was. He didn't know who to contact or where it [the plane] went or anything." Owen had his photographs with him when he spotted Fahlin at a 1979 meeting of OX5 Aviation Pioneers.

"He was sitting in a booth in a restaurant and I came up with the pictures and I said, 'Ole here's your airplane,' and he just about cried, because he had never heard what happened to it."

PLYMOUTH SALES LITERATURE FOR 1934 DESCRIBED THE ENGINE AS:

L-head type. Bore, 3 1/8 in.; stroke, 4-1/8 in; displacement 201.3 cubic inches; S.A.E. horsepower, 23.44; developed horsepower, 77 with standard compression and 82 with aluminum head. Full force-feed lubrication by positive gear pump to all crankshaft, camshaft, connecting rod bearings and timing chain. Spry from metered hole in each connecting rod lubricates cylinders and valve mechanism. Oil capacity, 5 quarts. Crankcase ventilation with air cleaner. Oil Filter. Four-bearing counterweighted crankshaft. All crankshaft and connecting rod bearings steel-backed interchangeable precision type. New T-slot aluminum alloy pistons with 4 piston rings. Alloy valve seat inserts. Engine suspended in Floating Power rubber engine mountings.

Book Reviews

***La Hispano-Suiza, Vol. 2- El Vuelo de las Ciguenas 1916-1931** by Emilio Polo, 1999. 516 pages, many b&w illustrations. Hardcover. 8.25 x 12.25 in. ISBN 84-920031-2-X, published by Wings & Flags S.G., C. Caracas 6, E-20810 Barcelona, Spain. Price in Spain, approximately 15,000 pesetas.*

When the first volume of La Hispano-Suiza became available in 1995, it was hailed by many experts as one of the outstanding marque biographies. However, it contained only the early history of the famous make from its origins in 1899 until 1915. Though quite interesting and covering new ground, many an enthusiast of classic cars awaited the second volume on the most famous model, the H6, and its variations. Volume 1, costing $150, was not the kind that one buys on impulse, and, despite its acknowledged excellence, sales were not exactly overwhelming. This means that there will probably not be an English-language version of Volume 2.

Like Volume 1, the new book is carefully printed on heavy art paper, solidly bound in linen, and comes in a cardboard protective slipcase. Hundreds of pictures richly illustrate the book. Mostly original photographs and documents of the period were used. The author, Emilio Polo, had access to and the support of the Hispano-Suiza company in Spain, and made good use of it. Whereas in Volume 1 many of the old photographs were printed in sepia, all pictures in the new book are black and white, probably for reasons of cost. Most of the pictures have not been published before and will provide a wealth of information, even if the Spanish text might be difficult for some.

The book is comprised of 17 chapters with an introduction by *Jules M. Heumann* of San Francisco, president of the Hispano-Suiza Society and member of SAH. The activities of both the Spanish and French companies are described in detail and in chronological order. In addition to the automobiles which account for the bulk of the contents, Volume 2 includes commercial vehicles, and, in aviation, the aeroplane engines, the famous "Flying Stork" squadron of World War I, and the much-publicized long-distance air treks of the post-war period.

The major attention is devoted to the masterpiece of Marc Birkigt, the development and improvements of the fabulous Hispano-Suiza H6, introduced at the Paris Salon of 1919. All the most fashionable French coachbuilders and many of the renowned companies in Europe and the U.S. offered their open and closed bodies on this superb chassis. Although the reader will have seen some of these coachbuilt cars before, there are still plenty of hitherto unknown cars illustrated. Additionally, there are pictures taken in the factory, at Concours d'Élégance in Paris and many European resorts, as well as a fine selection af advertisements and some factory drawings. In addition to the models produced in France and Spain, there is detailed information on the production of cars under license by Skoda in Czechoslo-vakia, and the works in Argentina. The sporting efforts, notably by Dubonnet, Bablot and others, as well as the 24-hours match against a Stutz in Indianapolis, are covered as well.

The technical specifications, modifications, and improvements of all models and types are presented in great detail in the catalogue section of 130 pages. Here again, numerous pictures show the typical examples of these beautiful cars. Detail or section drawings illustrate the finer technical points of the design. At the end of the book, a 40-page section lists the most prominent coachbuilders and the chassis numbers of the various production series and models, the customers names and delivery dates.

There are a few typographical errors and some of the pictures are perhaps not as sharp as desired. I also missed a proper index and a list of the sources for the pictures and literature used. Small shortcomings in a great book. We now await with some impatience the final Volume 3 which will cover the mighty J12 and the late efforts of the Spanish works.

—— Ferdinand Hediger

***MG – Aus Liebe zum Sportwagen** by Hagen Nyncke and Halwart Schrader, 1999, 223 pages, liberally illustrated with black and white and color photographs. Hardcover. 25 x 28 cm. ISBN 3-7679-0484-5, Published by Copress Verlag GmbH, Munich, Copyright Rover Deutschland GmbH. Price in Germany, DM 98.*

To celebrate the 75th anniversary of the marque MG, this beautiful new book was commissioned by Rover Germany. It is the first complete history of the famous British sports car "par excellence" in the German language. The team of authors is highly qualified for this task. Hagen Nyncke, born in 1958, is one of the leading specialists in MG history. He not only owns a large archive of documents and pictures, but has driven thousands of miles at the wheel of various MGs. Halwart Schrader, born in 1935, has published many books and articles, especially on British automobiles. From 1973 to 1985, he published the first German magazine on veteran and vintage cars. His reputation as a writer and historian has long been established in Germany and abroad.

With dozens of books in English on MG and the history of the company, enthusiasts may wonder why they should be interested in the new German book. There are several good reasons. The most important is that it truly covers new ground. Not only does it contain many photographs published for the first time, but it offers a competently written and illustrated history of MG in Germany before World War II. Germany was the most important European export market for MG before 1940. Test reports and descriptions of new models that were published in German motoring magazines are reprinted. MG cars were successfully raced in many events from local hill climbs to record-breaking runs on the autobahn. Most of the fine period photographs are black and white, of course, but there are some rare early color shots included of Major Gardner and his record car of 1939. Hundreds of pictures from 42 collections and archives were viewed and the best selected for printing. On a few pages, 35 modern color photographs are included, showing a wide variety of MG cars from the early 14/28 to the latest MGF.

A brief summary of the contents will confirm why it will not only appeal to dedicated MG enthusiasts, but also nicely complements old classics like McComb's MG. The chapters include "The MG Midgets, Magnas and Magnettes," "Supercharged Racers," "MG in Germany: The early years (1932-1934)," "Bobby Kohlrausch, a life for the motorsport," "Goldie Gardner, Heinz Mölders and the Offenburger racing association," "The war years," "MG Specials made in Germany," and technical specifications of all production models, 1924-1999.

The large size of the book allows a most attractive layout and optimal presentation of the vast number of illustrations. Printing, paper, and binding are of the highest order. This is a book that every connoisseur will love to have, and I therefore unconditionally recommend it. Whether it will be published in English is not known.

——Ferdinand Hediger

Wilhelm Maybach – König der Konstrukteure – zum 150. Geburtstag *by Dr. Harry Niemann, 1997 (2d ed.), 308 pages, liberally illustrated with black and white photographs, some color. Hardcover. 10.5 x 9 in. ISBN 3-613-01717-2, published by Mercedes-Benz Archiv Edition/Motorbuch Verlag, Stuttgart. Price in Germany, DM 98.*

To anyone only remotely interested in the history of the motor car, Wilhelm Maybach must be known as the designer realizing the ideas of his master, mentor, and partner, Gottlieb Daimler. He is also the man who, together with Emil Jellinek, created the early Mercedes cars. This book, launched in 1997 in an enlarged second edition, is a very detailed biography of Maybach and his work.

Wilhelm Maybach was born on February 9, 1846, and orphaned at the age of 10. He was brought up by Gustav Werner, a teacher and priest, who also had a small factory where he completed his apprenticeship as a draftsman.

In 1865, Maybach met Gottlieb Daimler, who immediately appreciated the potential of the young man. A few years later, Daimler was appointed as a manager by the famous Gasmotorenfabrik Deutz and he immediately hired Maybach. The internal combustion engine was still in its infancy. Maybach learned quickly, became chief engineer, and fulfilled his early promise. In 1876, he travelled to the United States where he met William Steinway, the renowned piano manufacturer in New York, who in later years would produce the "American Mercedes."

Several years later, in 1882, Daimler left Deutz after lengthy quarrels with the board of directors (especially Langen and Otto) mainly on patent matters. Maybach followed him to work as Daimler's engineer in Cannstatt until 1887. During this period, the idea of a fast-turning, light, gasoline engine, suitable to propel a road vehicle, was developed. In 1885, the world's first motorcycle, the "Daimler Reitwagen," was completed and successfully tested. One year later, in 1886, the first motorized car was presented. When the Daimler Motoren Gesellschaft was registered in 1891, Maybach became responsible for design and development of its products. Many of the important improvements were his personal contributions, but the patents were invariably filed and paid for Gottlieb Daimler. The founder did not concern himself much with technical matters, and busied himself with handling the various licensing agreements in France, England, Austria, and elsewhere.

Towards the end of the century, a sportsman by the name of Emil Jellinek turned up at the factory to order some cars. He sold them to wealthy customers, mainly on the fashionable Côte d'Azur in France. By 1900, he was the most important customer of the small company, purchasing about one-third of the annual production of 89 cars. In the spring of this same year, Gottlieb Daimler died. Jellinek asked Maybach to furnish him more powerful, faster, and lower-slung cars to compete more successfully in sporting events, and make them more attractive to his wealthy customers. Jellinek became a member of the board and the new model created for him bore the name of his daughter, Mercédès. The 35-h.p. car was launched at Nice's Speed Week and was a great success. New racing cars of 40, 60, 90, and 110 h.p. were presented at short intervals, successful competitors in many national and international events, but these pressures took their toll on Maybach, who fell ill in 1903 and took a long time to recover. Gottlieb Daimler's sons, Adolf and Paul, were eager to assert themselves, and in 1907, Maybach left the company to which he had contributed so much for over 20 years.

The book devotes a separate chapter to Maybach's oldest son Karl, born in 1879. Father and son established a company in 1909 to build airship engines for Count Zeppelin, with Karl as its technical director. Wilhelm Maybach was financially involved, and acted as a consultant for some time. After World War I, the Maybach Motorenbau of Friedrichshafen began to produce car engines as well. Apart from Spyker in Holland and Magirus of Ulm, no other auto company seemed interested, and Maybach decided to build its own. From 1921 onward, the company offered expensive and luxurious passenger cars, the Maybach W3 and W5 with big six-cylinder engines. In 1930, a new model with a V-12 engine was launched, which was later called "Zeppelin." It was certainly one of the finest cars available in Europe between the two wars. In the late 1930s, it was supplemented by the SW38 with an in-line six.

Wilhelm Maybach died in 1929, having received many honors late in life. He was posthumously inducted into the Automotive Hall of Fame, Dearborn, in 1996.

The hardbound book is very nicely produced with hundreds of interesting pictures, drawings, facsimiles of documents and four double-page color reproductions of Carlo Demand paintings of early Daimler and Mercedes racing cars in action. The text is completed by an index of persons and subjects, a list of literature and detailed information on the tremendous amount of original source material gathered from the Maybach archives of Heilbronn, Stuttgart, and Friedrichshafen. Regrettably, the book is available only in German. Nevertheless, it will certainly appeal to any automotive historian as an important book on the early development of the motorcar and the internal combustion engine.

——Ferdinand Hediger

Benz & Cie – zum 150. Geburtstag von Karl Benz *by Mercedes-Benz AG, Stuttgart-Untertürkheim, 1994. Responsible Editor, Dr. Harry Niemann. 296 pages, 492 illustrations, many in color. Hardcover. 8.5 x 11 in. ISBN 3-613-01643-5, published by Motorbuch Verlag, Stuttgart/Mercedes-Benz Museum, Archiv Edition. Price in Germany, DM 98.*

This is another book published in the range of "Mercedes-Benz Museum/Archiv-Edition." To make it quite clear from the start, I consider it an excellent work, certainly one of the most important books on early motorcar history that I have seen in a long time. Not less than a dozen authors have contributed texts and selected nearly 500 illustrations from the factory archives.

This is hardly the place to restart the discussion as to who "invented" the modern automobile. It is generally accepted that many brains and hands contributed to the ultimate development of a reliable and affordable motor car. Independently Karl Benz and Gottlieb Daimler, not to forget Wilhelm Maybach, had the tenacity to work and fight for their ideas and to make them a success. The book does, of course, leave no doubt that their efforts are considered the most important.

On opening the book, the reader is greeted by a double-page full color print of a painting by Carlo Demand, which evokes the drama of the 1923 Grand Prix of Europe, Monza, with a sensationally-advanced mid-engine teardrop Benz racing car just being passed by one of the supercharged Fiat 805s.

The first chapter is a detailed history of the first and oldest motor car company from the beginning until the merger with Daimler in 1926. Then follows a biography of Karl Benz and the tale of the famous, secret tour in 1888 of his wife Bertha, with two sons, from Mannheim to Pforzheim and back. This courageous exploit is said to have considerably supported the efforts of her husband, who was facing difficulties of all kinds with his early vehicles.

When Karl Benz and his sons Eugen and Richard left Benz & Cie in 1903 after quarrels with the board of directors, they decided to build a new factory in Ladenburg, near Mannheim. The new company, Carl Benz Söhne, was founded in 1906. The activities of this nearly forgotten marque which produced about 350 passenger cars from 1909 to 1923 are well covered.

On 50 superbly illustrated pages, the development of passenger and touring cars of Benz & Cie is presented. However, a complete list of the technical specifications, the production life, and production figures of the various models would have been helpful. As it is, much of this information has to be ferreted out of the text.

The racing history of Benz & Cie is perhaps the most attractive chapter of the book. Not only does it contain many hitherto unpublished pictures and drawings, but it also offers information on the lesser known Benz racing activities. You will find not only the famous "Blitzen Benz" and "Tropfenwagen" but also many details of early racing performances.

Three dozen pages are devoted to the development of stationary and ship diesel engines by Proper l'Orange in the Benz company and the considerable production of commercial vehicles, buses, trucks, and tractors for civilian and military use. Benz & Cie was also very active in the field of aero engines from 1907 until 1922. Did you know that Benz had built the biggest successfully flight-tested engine by the end of World War I? It was the huge V-12, OHV-engine type BZViv with a capacity of 45.5 litres (2,777,cu. in.), delivering up to 675 h.p. and 1600 rpm.

Inside information on the daily work, social plans, apprenticeship and training, factory regulations, and the political activities of the staff are not common in publications on the history of a company. Early efforts to win customers for the motor car in Germany and abroad, and the long list of sales offices and representations give interesting insights as well.

"Benz & Cie – their public relations and advertising" is the last chapter, with many wonderful pictures of early advertisements, sales literature, and posters, mostly in full color. The appendix contains 18 color photos of Benz cars in the Mercedes-Benz museum, the pictures and biographies of 23 persons closely linked to the management and history of Benz & Cie, and, finally, a bibliography listing some 80 titles of publications.

I always felt that in the past the "Benz angle" in the Mercedes-Benz history was less prominent than the Daimler part, and now, of course, it has ceased to exist as part of the company's name. Despite its lack of a comprehensive list of technical specifications and a register, the book contains a wealth of new details and information.

——Ferdinand Hediger

Somewhere in Time *by John Velliky. 40 pages, approx. 70 b&w photos. Ringbound with soft covers. 11 x 8.25 in. ISBN 0-8187-0316-4, published by Dodge Brothers Club. Available from John Velliky, 21710 Edison St., Dearborn, MI 48124. $26.50 plus $4.00 shipping and handling (Please make check payable to "DBC Somewhere in Time Booklet").*

Somewhere in Time is one of those off-the-beaten track sort of publications which doesn't surface all that frequently but which can be — and this one is — a *pièce de résistance* to special-interest historians, in this case to the 1910-19 enthusiasts in general and Dodge Brothers car lovers in particular.

Published by the Dodge Brothers Club, it is a collection of rare, historic photography relating to the Dodge Brothers' earlier days. The collection was filed in albums by C. W. Matheson (1871-1940), former Vice President & General Sales Manager of the firm. The photos themselves, some faded, are all of considerable interest in studying the first years of Dodge Brothers. Many notables of the time appear in them as well as long forgotten executives of the motor car company and those who were otherwise connected with it in one way or another.

What Somewhere in Time represents is a valuable connection with a marque which exists today, a book we owe to the foresight of a company officer who collected and filed the material with this idea in mind, summarizing the events and those connected with them by a camera, during a period which would otherwise have been largely lost. The Dodge Brothers Club and Mr. Velliky should be commended for putting this material together and making it available for all to see.

—-Keith Marvin

Industrial Designer: The Artist as Engineer *by W. Dorwin Teague, produced by Beverly Rae Kimes. 252 pages. More than 400 b&w photos. Hardbound. 8 x 10 in. ISBN 0-9667313-C-1. Available from Autoroad.com or Beverly Rae Kimes, 215 E. 80th St., New York, N.Y. 10021, $39.95 plus $4.00 shipping and handling (Please make check payable to "Dorwin Teague").*

Dorwin Teague at 88 is a Renaissance man of our time, a da Vinci who has, in a multi-faceted and interesting life, worked at many trades and mastered virtually all of them. Son of one of the fathers of industrial design, Dorwin Teague designed the almost legendary Marmon Sixteen, still regarded by many as the aesthetic pinnacle of classic car design, featuring such innovations as concealment of the radiator cap, addition of skirted fenders which hid the axles and brake mechanisms in the front elevation, and the partial integration of the trunk into the body which, he explains, "was new, at least, for America." Teague was also instrumental in designing the Marmon Twelve which failed to proceed beyond the single prototype when Marmon ceased production.

His expertise has included designs for buildings at the 1939-40 New York World's Fair and is broadly based: he holds nearly 100 U.S. patents. Teague remains available for consultation and further assignments in industrial design. Automotive designers come and go. A few stand out. A handful tower above them. And Dorwin Teague is one of them. This is his story.

—-Keith Marvin

Note: For more on Dorwin Teague's career, read his "A Sports Car for Edsel Ford," *Automotive History Review* No. 29 (Fall 1995), p. 18.

The New Beetle *by Matt de Lorenzo. 96 pages. 80 color and 5 b&w photos. Hardbound. 8.25 x 9 in. ISBN 0-7603-0644-3. Classic Motorbooks, P.O. Box 1, Osceola, WI 54020-0001. $12.95 plus $4.00 shipping and handling.*

The new VW Beetle: a pretty car it is, compact, beautifully conceived in design, and, in my personal opinion, a thoroughgoing queen of the open road. I fear, however, that it will never approach the success of its predecessor, the air-cooled Beetle, introduced to the U.S. in 1949, whose ubiquity places it as a rival to the Model T in popularity.

The New Beetle is an excellent introduction as to what the reincarnated "Bug" is all about. The text relates the seed which evolved into an idea, through the design stage, the concept car of 1994, and finally its production launch in 1997-98. The six chapters cover the ground succinctly with a brief history about the success of the original Beetle. The written word is nicely balanced with superb color photographs. Driving impressions wrap up the story.

From a strictly personal viewpoint, I found the most interesting part of the book in its yet-to-be born convertible model, as I owned three of the originals in the '60s and '70s. They were not only practical and comfortable, but fun cars to drive. The New Beetle convertible prototype was first shown in Geneva in 1994 and, if rumors are correct, may go into production in another two or three years. In the meantime, at least one custom coachbuilder is providing convertible treatments of the New Beetle.

I recommend The New Beetle to all readers, both for the enjoyment of a pleasant read and for the promotion of the awareness of the new car's historical image.

——Keith Marvin

CLASSICS ON THE STREET, an automotive odyssey France 1953 *by Robert Straub, 1998, 288 pages, 120 black-and-white photographs. Softbound. 8 X 8 in. ISBN 087233-121-0. Published by William L. Bauhan. Available from Barton Distribution, P.O. Box 1052, Wilton, NH 03086 Price $33.95 postpaid US residents, $35.95 outside US.*

One day in 1998, I remarked to a friend that of all the times and places in my life the one I would revisit first would be Paris, August 1953, to refresh my memory of the cars on the streets. Less than two weeks later, *Jud Holcombe* dropped by with a copy of *Robert Straub*'s book.

Jud had known Bob when they were both at the GM Design studio, along with *Karl Ludvigsen* who wrote the foreword to this book. Bob went on to become an independent industrial designer, and is now retired and living in Baltimore. Friends convinced him that he ought to make a book out of the albums of photos he took during his work session at the École des Beaux Arts in Fontainebleau during the summer of '53. This book is the happy result, 120 full-page photos of exotic cars that Bob saw around France (and a few in England), with the facing page providing a descriptive text. He cheerfully acknowledges a fixation on old Delages, of which there were a surprising number to be seen. We must remember that virtually all the cars shown were built before 1940 and survived World War II, no mean feat in a time of requisitions, battles, and bombing. Bob not only discusses each car but also identifies the more common postwar ones in the background, such as Ford Vedettes, Simca Arondes, and, of course, Tractions and 4CVs. The backgrounds are city streets, or, more hauntingly, cars resting under trees in parklike settings.

The photos have been enhanced and clarified by the latest techniques. The book is nicely laid out and easy to hold. There are several typos in the text, but, as far as I could tell, only two minor misidentifications. With respect to one, in spite of what the owner told Bob, Renault isn't known to have made a 1940 Reinastella.

So buy it, get out your records by Chevalier and Piaf, pour yourself a glass of vin rouge, and settle in for a memorable evening.

——Taylor Vinson

CRUISE IN: A guide to Indiana's automotive past and present *by Dennis E. Horvath and Terri Horvath, 1997, 83 numbered pages + 30 pages of Appendices and Index, no illustrations. Softbound. 5 1/2 X 8 1/2 inches. ISBN 0-9644364-2-6, Published by Publishing Resources, a division of TRG The Resource Group, 9220 N. College Avenue, Indianapolis, IN 46240-1031. Price $16.95, postage extra.*

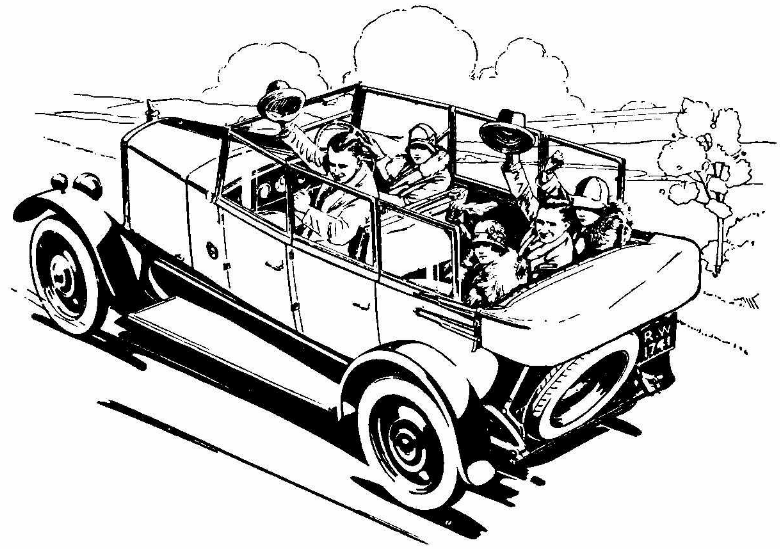
Although fate decreed that I be born in West Virginia, my own choice would have been Indiana, where the moon is bright tonight along the Wabash, the frost is on the punkin', and Stutzes, Marmons, Auburns, Cords, Duesenbergs, Coles, Premiers and their brethren still roam U.S. 40 at night.

A lot from these legendary years that we love to think about is capsuled in "Cruise IN", a guide written by *Dennis E. Horvath* and Terri Horvath which takes the reader from town to town in the Hoosier State, pointing out the automotive history of each and the aspects of the motor industry that may still operate there. The information include "roadside attractions" like museums and once-private mansions now open. Brief histories of many of the makes are set out, as well as sidebars dealing with personalities and automotive-related historical events.

This principal section is followed by a chapter of annual auto events taking place in the state, and appendices titled "Milestones in Indiana Automotive History," "Primary resources," "Bibliography", "Indiana-built automobiles sorted by city," and "Indiana-built automobiles sorted by name." These include the current vehicles manufactured there: the Hummer, Subaru Legacy, and Isuzu Trooper. The Horvaths don't pretend to be perfect and I spotted one omission right away, the Zagato-bodied Elcar electric car of the '70s which was headquartered in Elkhart, but all in all, this is a heck of a value and a book that is nicely produced.

—-Taylor Vinson

The cars of aero-engine quality



Armstrong Siddeley 14 h.p. Cotswold Tourer

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