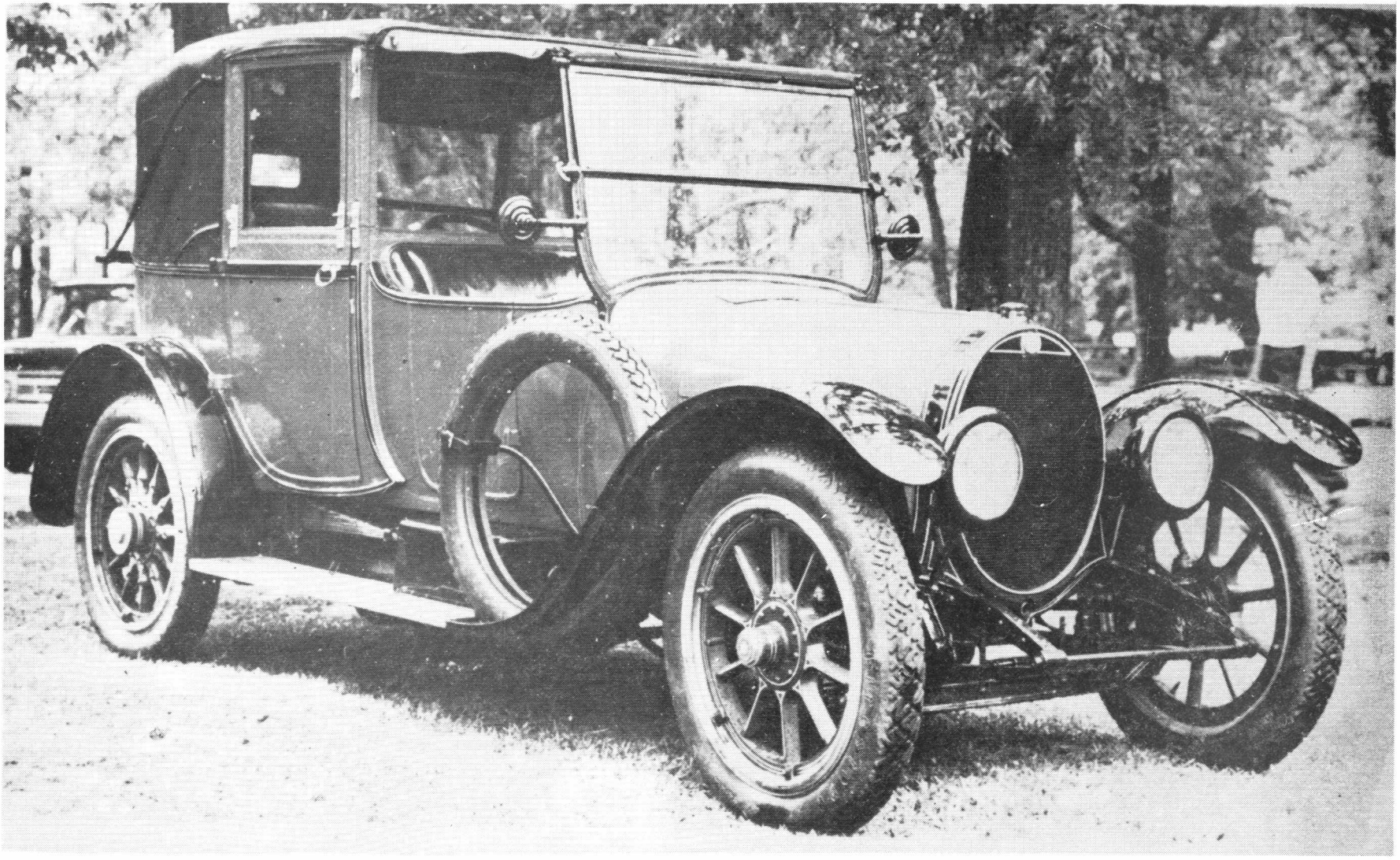
AUTOMOTIVE HISTORY Review

SUMMER, 1978 ISSUE NO. 9

CHARLES YALE KNIGHT, 1868 - 1940

The Society of Automotive Historians



AUTOMOTIVE HISTORY Review

A PUBLICATION OF THE SOCIETY OF AUTOMOTIVE HISTORIANS

RICHARD B. BRIGHAM, EDITOR

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

THE COVERS —

FRONT - Charles Yale Knight, drawing from *The Romance of the Willys-Knight Sleeve Valve Motor*, published by the Willys-Overland Company, 1926.

BACK - Lyons-Knight advertisement from the Chilton Automobile Directory, April, 1914.

INSIDE FRONT - 1919 Brewster-Knight, owned by Wendell Townsend, Decatur, Georgia.

INSIDE BACK - Handley-Knight touring car, 1921 model but actually built in 1920. Picture from *Motor Age*, November 18, 1920.

EDITORIAL COMMENT

This issue was originally planned to have a picture of Charles Y. Knight on the cover, a short article about him in the customary cover story position, with the rest of the magazine devoted to a variety of subjects, most of which had not yet been selected. Then a bonanza was presented to us in the form of a long and detailed story about Mr. Knight, written by W. Denney Freeston, Jr., and published in *The Starter,* a quarterly publication of the Willys-Overland-Knight Registry, of which Mr. Freeston is editor. His article begins on page 6, and is reprinted in its entirety by permission. Also, the cover picture is from a booklet loaned by Mr. Freeston, *The Romance of the Willys-Knight Sleeve-Valve Motor,* published by the Willys-Overland Company in 1926.

In keeping with the story on Charles Knight and his engine, it seemed logical to investigate another sleeve-valve engine bearing the name of Knight. This one was designed by a remarkable woman named Margaret Knight, unrelated to Charles Knight. Miss Knight, along with another woman, Mrs. Anna Davidson, formed the Knight-Davidson Company to build a car called the K-D, using, of course, Margaret Knight's engine. It is pictured and described in this issue.

One thing leads to another. The search for information about Miss Knight and the K-D car led us into a field of historical research jam-packed full of unconventional designs of engines with sleeve valves, piston valves, rotary valves, and a seemingly endless variety of each type. It seems that following the early success of the original Knight engine, inventors by the hundreds took to their drawing boards. Patent offices in the United States and abroad were literally deluged with applications for patents on their ideas. Many of them are pictured and described in the pages of this issue, but dozens - perhaps hundreds - more are not.

The search for a replacement for the conventional poppet valve has never stopped. In more recent times a few companies in Europe and America have put rotary valve engines into limited production, but in each case this production seems to have been short-lived. In a fascinating article in *Road & Track,* April, 1977, SAH member Jan Norbye discusses rotary valves, variable valve timing, and their possible effect on car performance and air pollution. Included in his article is a history of the development of the familiar poppet valve, which, despite its many shortcomings, has yet to be succeeded by any other type in a piston driven engine.

Of all of the non-poppet valve designs which burgeoned during the early teen years, only two really attained any degree of commercial success - the Knight Double Sleeve Valve engine and the Burt-McCollum Single Sleeve Valve engine.

.....

As a post-script to the above, the time has come to correct the record. Research on the single sleeve Argyle engine disclosed the fact that several otherwise accurate historians stated that this engine was invented by Burt McCallum, or Bert MacCollum. Actually, there were two people involved, Peter Burt, a Scotch engineer, and James McCollum, a Canadian inventor. Their patents, apparently in conflict, were both acquired by Argylls, Ltd., of Alexandria, Scotland, and the Burt-McCollum engine was born.

For a description of this engine, see page 20.

VIEWPOINT
COMMENTS OF OUR READERS

A QUESTION ON SEMANTICS

COL. EARL W. HAEFNER, GRAND JUNCTION, COLORADO

Can you shed any light on the origin of the widespread use by automotive writers and historians of the term "Marque"? Based upon Webster's Unabridged Dictionary, The American Heritage Dictionary and the new Columbia Encyclopedia, by no stretch of the imagination can one justify the semantic use of "Marque" as applied to the motor car. What prerogatives exist to give automotive writers the right to abuse the English language? Edwin Newman asks the question, "Will America be the Death of English"?

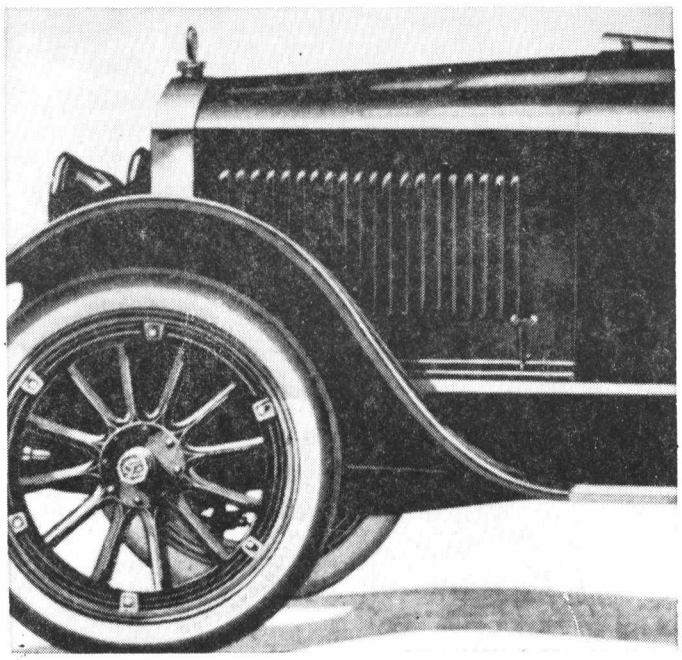
Stuart Chase in his classic "The Tyranny of Words" tells us the goal of semantics might be stated as "Find the Referent", when people can agree on the thing to which their words refer, "Minds Meet.".

One wonders how Charles (Boss) Kettering or Bill Stout would react to "Marque". One can almost hear Boss Ket asking "Why not 'Make' or 'Nameplate'?" Ket had little patience with obfuscation.

HUBCAP IDENTIFIED

RALPH DUNWOODIE, SUN VALLEY, NEVADA

The entangled M-6 hubcap offered by Harry Pulfer for identification in Issue No. 8 is a Metz 6 of 1921 (and possibly also for 1922). Here is a photo taken of a 1921 Metz 6 sales folder. Four hubcaps are shown in the folder, and under magnification each is slightly different because of an inconsistent artist. (The illustrations in this folder are not photographs). Metz 6's prior to 1921 had plain hubcaps.



ANOTHER MYSTERY

BRUCE R. LEDINGHAM, VANCOUVER, B.C., CANADA

Ralph Dunwoodie has sent me a copy of his letter to AHR identifying the M6 hubcap as a Metz 6, 1921 model. I have had that hubcap for several years, and have never been able to get a positive identification. I have several other mystery hubcaps that have only an initial or single letter on the face instead of a full name. If you'd like to include them in future issues, I will be glad to send them along.

Here is a Xerox copy of a rubbing I made of a radiator ornament which I have never been able to identify. It is made of brass, nicely finished. The S.D.N. could be re-arranged to N.D.S.; S.N.D.; D.S.N.; and probably others.

EDITOR'S NOTE: Puzzles such as these are always of interest to many of our members, and publication of them very often leads to positive identification, By all means, keep 'em coming!

MORE ON ERIE AND STURGIS

J. H. VALENTINE, CULVER CITY, CALIFORNIA

As a follow-up on the Erie article in Issue No. 8; I have found an additional reference to the Erie and the Sturgis vehicles built near the turn of the century. The following is from the Los Angeles Sunday Times, October 6, 1907:

"In the past ten years many Los Angeles machine shops have gone in to build the ideal automobile truck. The first designer of a truck was Sam Sturgis. His machine shop stood on part of the present site of the Hotel Alexandria, while the truck stood most of the time in the back yard about where the Alexandria kitchen is now located. Sturgis built the first automobile in California, which with its 40-horse-power engine was intended to be used as a tallyho or truck, but turned out to be a touring car.

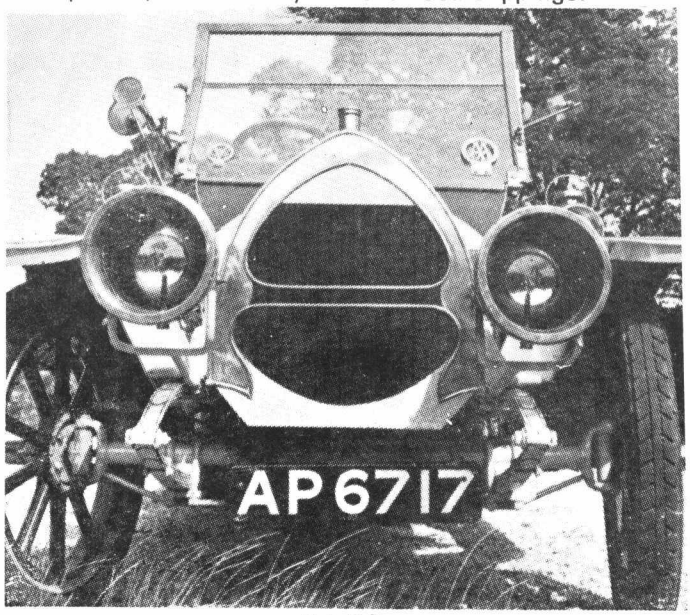
"The truck was built strong enough to carry at least ten tons and had enormous big engines, likewise

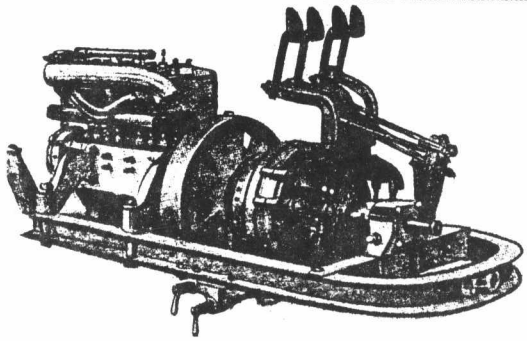
wheels. It was run once to Whittier and started for Pomona, but never got there and was finally given up after something like $10,000 had been expended in experiments. Sam Sturgis brought out the truck after building at least three distinct styles of automobiles."

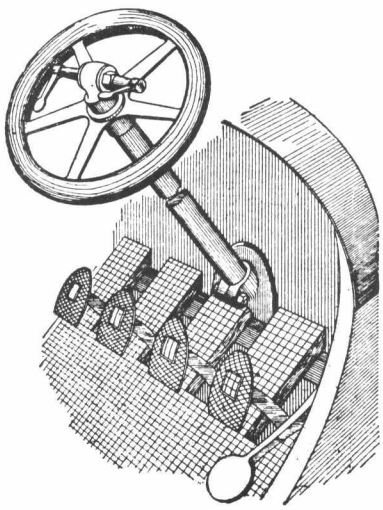
"A" FOR ADAMS

HARRY PULFER, LA CRESCENTA, CALIFORNIA

Here is a front view of the 1906 Adams car, made in England. Instead of a conventional emblem or script, the radiator shell of the Adams was made in the form of a huge letter "A". This car was operated entirely by foot pedals, as shown by the enclosed clippings.







THE FORGOTTEN CHRYSLER PRODUCTS

G. MARSHALL NAUL, GRANVILLE, OHIO

The issue on Canada strikes a coincidental note, as I have recently been delving into some of the forgotten Chrysler products which were built in Canada and the United States. Perhaps I have previously mentioned the six-cylinder Chrysler Airflow, model CY, which was really a DeSoto in Chrysler clothing. There appear to have been many other peculiarities, mostly built in either the U.S. or Canada for export in the pre-WWII era, starting about 1932. Neither Detroit nor Windsor has anything on these. Mike Sedgwick and I are working more or less cooperatively on this, as some of the Chrysler products assembled in England, or exported whole there, were weird, to say the least.

For example, the Chrysler Imperial of 1939 was sold in Great Britain as a Dodge. There was much other badge-engineering which included sending various cars to Ireland with entirely different model names. Much of this remains to be straightened out. We plan the outcome of this delving to become an article for AHR.

THE POUGHKEEPSIE FIAT PLANT

MICHAEL SEDGWICK, EASEBOURNE, MIDHURST, SUSSEX ENGLAND

I was most intrigued, as a Fiat specialist, in your photo of the former U.S. plant at Poughkeepsie as it is now.

Can someone perhaps confirm, though, that there were serious plans to manufacture Lancia automobiles in that selfsame plant, for the U.S. market. The car involved was the V-8 luxury 4-liter Dilambda, and the year was 1929, which should explain why it didn't happen. I don't think the Dilambda ever was seriously imported into the U.S.A., though it remained in production in Italy through 1937. I cannot lay my hands immediately upon the source - probably MoToR - but I am certain that but for the Depression this project might have come off.

Fiat, of course, continued to sell automobiles in the U.S.A. on a limited scale up to 1924/25, the principal model involved being the 1½-liter 501, promoted as a simple owner-drive town carriage. The parallel 2.3-liter 505 four and 3.4-liter 510 six were also available, and examples of both models are known to survive on your side of the Atlantic. There was a final fling in '24 with the expensive (it cost the equivalent of $5200 here) valve in head 519, a 4.8-liter six, but the only example currently known in the States was imported from New Zealand about 20 years ago.

EDITOR'S NOTE: The Adams was built by the Adams Manufacturing Company, Ltd., Bedford, England, from 1905 to 1914. The 1906 models included two- and four-cylinder cars, plus a V-8 model. These were controlled by a bewildering array of foot pedals which were, left to right: low speed, intermediate speed, high speed, reverse and brake (combined) and a smaller accelerator pedal. There were no hand levers. The company's slogan "Pedals to Push - That's All" seems to have been the understatement of the year.

CHALMERS-DETROIT PRODUCTION FIGURES

D. J. KAVA, BEAUMONT, TEXAS

To help settle the dust on the 1909 Chalmers-Detroit production, I submit the following figures taken from the 1909 Chalmers-Detroit annual report for the fiscal year ending June 30th, 1909.

Total shipments 3087

Total production 3047

A footnote says "The 40 difference is made up of of models prior to 1909 shipped during Fiscal Year 1909."

INFORMATION REQUESTED

DICK BRIGHAM, P.O. BOX 1306, MARIETTA, GA. 30061.

The preparation of this issue of Automotive History Review has been an enjoyable task, but it has produced more questions than answers. In the process of digging out information on a wide variety of types of valves and numerous variations on those types, I have run across the names of many makers of unconventional engines. Most of these are simply names and addresses in trade directories, principally Chilton's or Automobile Trade Directory. Usually the company's name will suggest the type of engine it is building, and occasionally the trade name of the product will be mentioned. But that is all. No pictures, no details - just a tantalizing hint.

Here are some of them:

Nichols and Wright, 38 Parkridge Street, Buffalo, N.Y. "Valveless" 8-cylinder. Listed 1912 to 1920.

C. M. Bradley Motor Co., Harvey, Ill. 1916 to 1918, and in 1919 as Bradley-Ellis Motor Co., Harvey, Ill. "Bradley Rotary Valve Engine".

Storle Rotary Engine Co., West Water St., Kewaunee, Wisc. Listed 1916 to 1918.

American Rotary Valve Engine Co., Easton, Pennsylvania. 1, 2, 3, 4, & 6 cylinders. Listed 1914 to 1916.

Wisconsin Machinery & Manufacturing Co., Canal St. and Muskego Ave., Milwaukee, Wisc. "Wisconsin Valveless" 4 and 6 cylinder. (Possibly 2-cycle marine types?) Listed 1910 to 1914. (Not related to the Wisconsin Motor Manufacturing Co., 44th Ave & Burnham St., Milwaukee.)

Balanced Valve Motor Co., 905 Vliet St., Milwaukee, Wis. 4 cylinders. Listed 1923 only.

Champion Rotary Motors Co., 661 Main St., Buffalo, N.Y. "Augustine". Listed 1923-1924.

Silent Valve Engine Company, Connersville, Indiana. "Russell Rotary Valve Engine". Listed 1912 only.

Ess Eff Silent Motor Co., 351 Ellicott Sq., Buffalo, N.Y. Also said to have made Ess Eff car. Listed 1912 only.

Semple S. Scott, Suite 1651 Marquette Bldg., Chicago, Ill. "Gasturbine". Listed 1913 only.

Ajax Motor Company, Seattle, Washington. Mentioned in many references as having built a 6-cylinder car in 1914 and 1915. Some references say it had piston valves, while others say sleeve valves, or, optionally, either type. One reference says poppet valves were also optional. Was this company working both sides of the street and also the middle?

This item from Motor Age, August 26, 1920, page 56:

The McIntyre Motor Sales Co., Kalamazoo, Michigan, successors to the McIntyre Motor Co., are entering the engine manufacturing field with two four-cylinder power plants of 4½ by 6 and 3¾ by 5½ in. respectively. The valves are of the piston type operating in a sleeve inserted into the cylinder wall. The valves are driven by connecting rods from an eccentric shaft operated by a chain drive from the main crankshaft.

Any and all information, descriptions, references or pictures will be appreciated, and will be published in the next issue of Automotive History Review..

NEWS ITEM

S.A.H. MEMBER KARL LUDVIGSEN NAMED A VICE PRESIDENT OF FIAT MOTORS OF NORTH AMERICA

The appointment of Karl E. Ludvigsen to the post of Vice President for Corporate Relations was announced on May 10 by Claudio Fenari, President and Chief Executive Officer of Fiat Motors of North America, Inc.

Ludvigsen will be responsible for a broad range of activities, including Public and Press Relations, Dealer Relations, Government and Industry Relations, Customer Relations, and Legal and Employee Relations.

He joined Fiat on May 1, after 11 years as an independent writer and consultant. He is the author, co-author or editor of 16 automotive books, several of which are considered the standard works in their fields. His books and articles have earned ten awards.

From 1961 to 1967, Karl Ludvigsen was employed by General Motors in Public Relations positions with the Corporation and then with its Overseas Operations Division. Before that he was editor of *Car and Driver* magazine for two years. Earlier, he had served its predecessor *Sports Cars Illustrated* as technical editor.

A resident of Pelham Manor, New York, Karl is married and the father of two children. He is based at Montvale, New Jersey, the headquarters of Fiat Motors of North America, Inc., importer and distributor of Fiat and Lancia cars.

CHARLES Y. KNIGHT and the SILENT KNIGHT

by Denney Freeston

Charles Yale Knight was born in Salem, Indiana in 1868. He was the son of Andrew Knight, a sawmill owner, and Sarah Botts Knight.*

After receiving his education at public school in Salem, Charles Knight went to work for the Minneapolis Tribune, rising to the position of financial editor. In 1892 he started a dairy paper in Minneapolis, but finding the industry not sufficiently well developed there to support a paper, moved to Chicago, where in 1894 he founded the Chicago Produce Daily. In the first issue of his paper he exposed the fraudulent sale of oleomargarine in place of butter. His campaign was successful and led to the passing of the Grout Act, which placed oleomargarine manufacturers under federal license and levied a tax of ten cents per pound on oleomargarine that was colored yellow in imitation of butter.*

To cover dairy activities during 1901-02, Knight bought a Knox automobile. It was an air-cooled, single cylinder, three-wheeler. In 1903 he bought a Searchmount. After many unsuccessful attempts to decrease valve pitting and silence the tappets, or what were commonly called valve jumpers, in these vehicles, Knight began experimenting with other types of valves. Having worked on the steam engine in his father's sawmill, Knight was familiar with the slide type valves used in these engines.

The following is an account of the development and early history of the Silent Knight as given by Knight himself in a paper he presented on October 15, 1908 to the Royal Automobile Club of London:

Experimental work began upon this motor five years ago last August. The first model was 3 1/2 by 4 inch single-cylinder horizontal. It was operated successfully through the use of but one sleeve, but the gear necessary to give it the proper motion was too complicated to be quiet, and this construction later gave way to two sleeves driven from an eccentric shaft. We experimented one whole winter in the shop before any effort was made to design a practical motor for car use, and when this motor was finally undertaken during the summer of 1904, the result was a four-cylinder engine, 3 1/2 inch bore by 4 inch stroke. This motor was finished in October of 1904 and put into a Panhard type car which I had driven for two years. This motor is running today in the self-same car. I drove it about 4,000 miles that winter and about 8,000 miles the next season. In fact, I was in the car almost all the time the weather would permit.

An article on the Silent Knight in the April 1906 issue of Cycle and Automobile Trade Journal indicates that the "Panhard type car" was a Type VI Searchmont touring car. The four cylinder Knight engine replaced a two-cylinder 4 x 4 motor. The article goes on to state that "Where the original engine pulled the 2,300 pound car an average of from 10 to 11 miles on a gallon of gasoline, the Silent Knight, without any particular effort at economy, averaged from 16 to 17 miles per gallon."

In his first engine, Knight reciprocated the engine cylinder block to open and close the inlet and exhaust ports; the engine was air-cooled. This design was patented but was soon discarded for the double sliding sleeve system. The design was developed with the financial backing of L. B. Kilbourne.

Continuing with Knight's account of the development of the Silent Knight:

We designed and constructed our first experimental car in the spring of 1905, this being equipped with a four-cylinder 4 inch by 4 3/4 inch motor, with practically no change in the design. This car is also in service today. I can conscientiously say that during the two seasons I drove this first motor that, after its testing out, I was never obliged once to stop on the road because of motor difficulties. My partner, Mr. Kilbourne, drove his car, the first model of the 4 inch by 4 3/4 inch, 15,000 miles the first season and about 8,000 the second. The motor car was new to him, but only twice during that time did he ever require assistance upon the road, and in neither case was the fault with the motor.

Late in 1905 we put in a plant and began the manufacture of cars. I had known enough of the troubles of the manufacturer through my contact with them as a motorist to realize its exact significance. However, we felt we had a valuable patented property, and both had a desire to acquire some sort of manufacturing business which would be agreeable and interesting. We realized the difficulty we would meet should we endeavor at that stage of our motor's development to persuade an outside manufacturer to take it on, and realized also that before it would be of negotiable value whatever it must undergo the critical test of public use.

Both my partner and myself had had advantage of wide business experience, and we did not enter the venture with any exaggerated ideas of profits. We knew how and when to discount all roseate promises of promoters' prospectuses, and realized fully that in counting cost of development we must also estimate liberally, and then probably quadruple the figure. We understood also the public's distrust of anything new in the hands of inexperienced makers, which meant that not only had we a new idea to perfect, but we must secure the confidence of the public in our ability to properly construct what we had invented, and hang on to the business, so that our patrons would not in a year or so own a car for which repairs were not obtainable.

In line with this conservative policy of development, we restricted our efforts to seven cars the first year - one for a demonstrator and six for the market. This was in 1906, and every one of these six are running today, with aboslutely no portion of the motor perculiar to our design replaced or worn out. Further, we have sold the purchasers

**Information provided by Donald R. Knight, grandson of Charles Y. Knight and a WOKR member.*

of the first two their second cars. One was sent 1,000 miles away from Chicago to Norfolk, Va., and in three seasons has been heard from but twice - once for a new spark plug bushing, and the second time for a pair of wheels, to replace those on one side, which had been smashed in a skid, caused by taking a sharp turn at too high speed.

A chassis fitted with a Knight motor was shown at the Chicago show in February 1906 and described in the February 14, 1906 issue of the Horseless Age. This is the same description as in the Silent Knight brochure reproduced herein. The car was designed by J. E. Pfeffer, who had been connected with automobile and gasoline engine manufacturers in Chicago for a number of years. The axles, transmission, drive shaft and steering gear were all made by the Garford Company.

Knight and Kilbourne are reported to have spent $150,000 by 1906. A Silent Knight competed in the 1906 Glidden Tour but did not finish. Continuing again with Knight's story in his own words:

The mechanical success of our 1906 cars encouraged us to lay down fifty for 1907. We were greatly delayed in the delivery of materials, and the panic of August of that year was upon us before we had them all finished. We put out thirty-eight I believe, of the 1907 model, and worked up the remainder of this fifty later. These cars, as well as the 1906 model, sold for $3,400, or about £700 each, and I regard as the best testimonial that any article could receive the fact that seven are owned in the suburb of Chicago, where for fifteen years I have made my home. The surprising part of this is the fact that I personally made no effort to sell one of them. They were all sold through the unconscious demonstrations which I had made driving my own creation upon the streets from season to season. As the suburb has only 18,000 inhabitants, it works out one Silent Knight for about every 2,500 population.

Practically every sale we have made has been the result of the purchasers' observation of some of our cars upon the streets. They were distinct in appearance, invariably quiet and smooth, rolling along like rubber balls; and the inquirer always got a favorable report of their operation from an owner. Late advices from my partner in America state that we have not to this day a single dissatisfied customer among the owners of our cars, and with one exception where one gentlemen desired to exchange for an electric which his wife could drive alone, we have not had a single case where a man who once owned a Silent Knight ever sold, traded, or discontinued its use.

The quotes above from Knight's speech indicate that the Silent Knight was produced from 1906 through, probably, 1908, with a total of 57 vehicles being made. Unfortunately, none is known to have survived. However, the name Silent Knight did indeed survive, being used to refer to the Knight engines in many makes of automobiles over a period of 25 plus years.

According to the July 5, 1911, Horseless Age, the Silent Knight introduced in America in 1906 "was made the subject of severe criticism, there being many crudities in its design, and the rather poor workmanship militating against its successful operation. As a result, it failed to gain a footing in this country." However, in the July 6, 1911 issue of "The Automobile", editor Thomas Fay states: "He (Knight) was evidently ahead of the state of the art, and he was unable to arouse any considerable measure of interest in this type of motor at that time." A third explanation is given in the October 11, 1911 issue of Horseless Age:

At the time the automobile industry in this country was enjoying an almost unprecedented boom, and manufacturers naturally were disinclined to discard a type of motor which they were already fully equipped to manufacture, and for which the demand could hardly be filled, in favor of one of different design which would require expensive new equipment, and on which, moreover, it would be necessary to pay a substantial royalty. One other consideration that may have influenced some of the manufactures approached was the existence of what might possibly prove to be an anticipation of the Knight patent.

Regardless of which is the more accurate analysis of why the Knight engine did not gain early acceptance in the United States, upon the invitation of the English Daimler Company, Mr. Knight sailed for England in 1907, taking a "Silent Knight" car with him. A Knight motor was installed in the Daimler factory and run everyday for six months. They then said they were interested but before committing themselves, constructed six motors and subjected them to continuous testing. At the end of three months they were convinced of the merits of the "Silent Knight" engine and took a license.

The following is Mr. Knight's own account from his speech of 1908 of how the Daimler organization became interested in the Knight engine:

I have previously stated that without some sort of record of public use behind us, we should never have got the attention of the Daimler Company. As a matter of fact, at the time we received a request from Coventry for a trial motor we had little idea of endeavoring to interest the trade upon this side in our engine. A friend of mine, who was familiar with what we were doing in America, chanced to be associated with Mr. Manville, Chairman of the Daimler Board, in a business transaction in London. Learning of Mr. Manville's connection with the Daimler, he told him the story of the Silent Knight motor. Mr. Manville was interested, and asked for printed matter in connection therewith. We were very busy at the time and sent our catalogue in a routine way. The matter seemed to interest the recipients, and they followed it up in an endeavor to induce us to permit them to test one of our motors at Coventry.

I can assure you that but for the very flattering reports which our mutual friend sent us concerning the high business standing and integrity of the Chairman of the Daimler Board we never should have considered the expensive proposition to bring a motor and car across. As the matter has turned out, I feel under deep obligations to Mr. Manville for "discovering" us, and to the Daimler organization for furninshing us with just the facility and experienc

we needed to refine what might have been termed a diamond in the rough.

It is interesting to note that years later - January 1912 - in a lecture before the Society of Automobile Engineers in New York City, Mr. Knight stated that after he had perfected his motor according to American standards, he found it unable to stand the great stresses set up in it by the fast travel possible and demanded for operation on French or British roads. It took another year of development to adapt the motor to these new conditions.

In 1908, after combining the sleeve valve principle with the best points in design as practiced in their current motor, Daimler announced that they had adopted the Knight motor. On June 6, 1908 Knight obtained British Patent No. 12355 to cover his design in that country.

The following are the advantages of the Knight engine in Mr. Knight's own words, again from his speech of 1908.

First, we have demonstrated absolute silence. Not the so-called silence which is silence by contrast only, but the genuine absence of sound when under load. People who build six-cylinder motors, by increasing the number of cylinders, secure a continuity of noise which they call silence. The only difference I can see between the noise of a well-balanced single-cylinder motor and the six is that in one it is intermittent and clearly distinct, while in the other it is continous, and therefore less objectionable to the senses. I believe I demonstrated to those with whom we have made business arrangements that the silence of this motor is different from the so-called silence of the poppet valve type.

Secondly, we claim extraordinary smoothness of operation. The sensation of riding in a car propelled by one of these motors is distinctly different from that experienced in a car where eight hammers in the form of valve tappets are continuously pounding away to produce a tremor or vibration which is felt throughout the entire car. As speed increases, the difference between the new type and the old becomes even more marked, and the sensation of riding in one of these cars over a smooth road at the rate of a mile a minute is like what, in the absence of actual experience, I imagine flying to be.

Thirdly, we claim greater flexibility; it is doubtful if this advantage should not have preceded the first two claims. Given a flywheel of average weight and regardless of compression, one can do almost as he pleases with these motors. From four and five miles an hour up to sixty without change of gear is not difficult with the standard (Daimler) 38. In fact, I may say that only a little slipping of the clutch is necessary to reduce the minimum of this claim to zero, and say from a standstill to sixty miles an hour. In traffic it performs like a steamer. Only last week your distinguished Chairman upon being given a demonstration, after requesting the driver to take a well-known hill with a surveyed grade of 1 in 9 on the direct gear, made the suggestion that he should slow down and accelerate upon the steepest portion, a feat which the motor accomplished without hesitancy. Starting on direct from a standstill is not confined to level stretches and is possible from fairly moderate grades. In short, we believe the flexibility of this motor approaches so closely that of steam as to leave very little to be desired. In my own town driving, with a gear of 3 to 1 on top and a car capable of 45 miles an hour on the level, about the only time I feel any need of changing gears is when there is necessity for reversing. I have driven one of these motors in the thick traffic of the city of Chicago for more than an hour, covering every street its full length in the most congested traffic district with the necessity of but one change, and that a reverse to escape from a pocket, and I have repeatedly driven from various points of England to the heart of London without change.

Our fourth claim, we feel, also may be misplaced, and might well come well forward. That is for reliability. We believe the motor to be as near fool-proof as any peice of power-producing mechanism that has ever been devised. But what, someone asks, will happen to this motor if it is not properly lubricated, or if the weather gets cold, and your oil is bad and gums up and sticks, and you try to start it, or if the water runs out, or in case of a thousand and one possibilities of neglect?

And in turn I ask: - What would happen to your poppet valve motor if subjected to the same sort of abuse?

My experience of eight years' driving a motor car, during which I have covered at least 100,000 miles of all kinds of roads in many countries, and my five years' experience in the motor and car manufacturing business has put me in a position to know the shortcomings of the type of motor. And I may say here that I can cite authorities upon the care of motor cars which devote pages to a recital of what may happen to valves alone, and further space to suggestions for their care. And this is not surprising when you realize that outside of nuts, bolts and cotter pins, fully one-fourth of the number of parts required to assemble a poppet valve motor comprise the valve system.

Fifthly, we claim greater fuel efficiency under normal conditions than that of the Otto type. Upon the bench we produce one horse-power for an hour with from .54 to .64 pints petrol, according to compression pressure.

Sixthly, we claim much greater working endurance. The tendency to lose power under continuous load, which is so frequently the case with the other type of motors in time, is not characteristic of this motor. There are no valves or valve seats to warp, heat, or break, or springs to weaken under continuous heavy work.

Seventhly, we claim great power and speed. In the matter of power this motor will give the purchaser anything within reason he can desire. The Daimler Company has settled upon a compression which gives slightly over 57 h.p. at 1,200 for the 38 h. p. R.A.C. rating. This motor is capable of being accelerated up to 2,500 or throttled to less that 150. This compression was chosen, not because it might not safely be exceeded and more power thus secured, but because its chassis was designed for about that amount of power. If the purchaser should desire a motor with a

little more "ginger" in it - for instance, something to climb Edge Hill on the direct - it is a matter of less than an hour to substitue heads which will very materially increase his power, but this would be beyond the limits recommended by the company for the accompanying chassis. Up to 100 lb. gauge compression the motor is as silent and flexible as at 75 lb. The only disadvantage we have found in the high compressions is the possible necessity of more frequent cleaning of the carbon from the piston heads and combustion chamber. But as this, with our construction, is a job of not over an hour for four cylinders because of the use of detachable heads, the problem of carbon is never serious, and the amout of attention necessary in this direction in a motor with polished cylinder walls is much less than that required when there is a rough cast surface above the piston travel.

In fairness, most people claim it should be pointed out that the Knight engine was not without some shortcomings. It was more expensive to manufacture, consumed more oil and was more difficult to turn over in cold weather than other engines of its period. Additionally, Knight's royalty, although it varied with the engine horsepower, averaged around $100 for each and every engine manufactured.

The Daimler Knight more than lived up to expectations. Daimler sales tripled and the company stock advanced rapidly. However, the engine was still subjected to a storm of criticism. "The new motor was only good in theory - it had not been proven - it was a freak. Why weren't poppet valve engines good enough?" The critics demanded a test - an official trial by the Royal Automobile Club, the highest technical authority on motoring in Great Britain; and a body composed of engineers for whom designers the world over have profound respect.

At first, Daimler was not interested in the test. However, the longer they thought over the idea of a test the more willing they were to enter it, but not on the terms prescribed by the Club. "No," said the Daimler people. "If we submit these engines to test, we will make it worth while and impose conditions more stringent than any ever heard of in the history of motoring. We will prove our motors conclusively, and we will set a standard that nobody

PATENTS ISSUED TO CHARLES Y. KNIGHT THROUGH 1920*

968,166. INTERNAL COMBUSTION ENGINE.
Charles Y. Knight, Oak Park, Ill. Assignor of one-half to Lyman Bernard Kilbourne, Chicago, Ill.
Filed: April 4, 1904. Issued August 23, 1910.
Cylinder block moves up and down. Engine is air cooled.

1,090,991. INTERNAL COMBUSTION ENGINE.
Charles Y. Knight, Oak Park, Ill. Assigned to Knight & Kilbourne Patents Co., Chicago, Ill.
Filed: June 4, 1906. Issued: March 24, 1914.
"- - - two telescoped sleeve valves for controlling the ports of the engine sliding axially within said main cylinder, - - -"
Forced oil lubrication at top end of sleeve.
No water cooling of block is evident.

1,129,104. INTERNAL COMBUSTION ENGINE.
Charles Y. Knight, Chicago, Ill. Assigned to Knight American Patents Co.
Original application: Oct. 10, 1908. Divided, and this application filed April 23, 1909.
Issued: Feb. 23, 1915.
Sleeves connected to eccentric shaft by small cranks. Water cooling of block evident.

1,136,143. INTERNAL COMBUSTION ENGINE.
Charles Y. Knight, Chicago, Ill. Assigned to Knight American Patents Co.
Filed: Oct. 10, 1908. Issued: April 20, 1915.
Continuation of 1,129,104.

1,072,860. EXPLOSION-ENGINE.
Charles Y. Knight, Chicago, Ill.
Filed: Feb. 4, 1910. Issued: Sept. 9, 1913
Modification of earlier engine design.

1,061,756. PISTON
Charles Y. Knight, Coventry, England.
Filed: Sept. 28, 1910. Issued: May 13, 1913.
Lower portion of piston undercut. Elastic, axially elongated split collar for retaining film of lubricant.

1,177,040 ENGINE-PRIMER
Charles Y. Knight, Chicago, Ill. Assignments to Knight American Patents Co.
Filed: Dec. 28, 1914. Issued March 28, 1916.

1,155,071 CONNECTING MEANS FOR INTERNAL COMBUSTION MOTORS.
Charles Y. Knight, Chicago, Ill.
Filed: June 25, 1915. Issued: Sept. 28, 1915.
A means for reducing sideways pressure on sleeves.

1,234,042. CIRCULATION SYSTEM FOR INTERNAL COMBUSTION MOTORS.
Charles Y. Knight, Pasadena, Calif. Assignment to Knight American Patents Co.
Filed: Dec. 9, 1915. Issued: July 17, 1917.
Cooling medium storage and circulation system.

1,305,905. MECHANISM FOR FACILITATING THE STARTING OF INTERNAL COMBUSTION ENGINES.
Charles Y. Knight. Pasadena, Calif. Assignment to Knight American Patents Co.
Filed: Oct. 17, 1918. Issued: June 3, 1919

1,350,815, IGNITION MECHANISM FOR INTERNAL COMBUSTION ENGINES.
Charles Y. Knight, Pasadena, Calif. Assignment to Knight American Patents Co.
Filed: Oct. 17, 1918. Issued: August 24, 1920

*OFFICIAL GAZETTE, U. S. PATENT OFFICE

else will attempt to equal."

They handed in such a revision of the specifications and conditions that no one could believe that they were in earnest. "You surely don't want us to submit your new motors to these rules?" said the Royal Automobile Club. "Why, it would be suicide for you - no motor ever made could stand up under such a test - we won't do it." "Yes, you will," came the grim reponse from the makers. "you will try our motors in this way or we will not hesitate to publish the fact that the Royal Automobile Club refuses to put our motors to such tests."

The result of that trial is history. Not only was it never attempted before, but no poppet valve motor has ever attained anywhere near the results of that test. The tests were run between March 15th and 28th, 1909, at Coventry and Brooklands track. The test consisted of over five days of bench running and over two thousand miles of track tests for each of the two production engines. Not only were the test results favorable, they were astounding! Engine disassembly showed no perceptible wear to moving parts; but, more important, final tests showed an increase in horsepower - 54.3 to 57.25 for the larger engine, and 38.83 to 38.96 for the smaller. (The Certificates of performance are reproduced elsewhere in this issue of the Starter.) The results of these tests, and Daimler's increase in sales, earned the Daimler Company the coveted Dewar Trophy in 1909.

Mr. Knight's experience with the Panhard and Levassor Company of France was even more exasperating. The Panhard people ran one of the Knight motors for 15 months. Every day for 400 days, this motor was submitted to continual testing. When they found that it withstood all the rough treatment they could give it, they told Mr. Knight they wanted it.

The Daimler Motoren Gesellschaft (Mercedes) concern in Germany made similar tests, the results of which were never released. However, they adopted the Knight motor, as did also the Rover Company in England, and the Minerva Company in Belgium.

From 1909 on, the sleeve valve motor made history fast in Europe, and in the two succeeding years was adopted by the following companies:

England - Daimler Company - Coventry.
Birmingham Small Arms Company - Birmingham.
Siddeley - Deasy Motor Company, Ltd. - Coventry.
London Omnibus Company - London.

France - Panhard & Levassor - Paris.
Mors Motor Company - Paris.
Clement & Bayard - Paris.
Rossel Motor Company - Paris.
Bellenger & Company - Paris.
Aries Motor Company - Paris.
Gregoire Motor Company - Neuilly.

Belgium - Minerva Motor Car Company - Antwerp.
Germain Automobile Company - Par Marchienne-au-Pont.

Switzerland - Martini Motor Car Company - Geneva.
Sigma Motor Company - Geneva.

Denmark - Automobilefabriken Thrige - Odense.

Germany - Daimler Motoren Gesellschaft (Mercedes) - Stuttgart.
Loeb & Company - Berlin.
Hersh & Company - Zwikau.
Hansa Automobile Works - Varel.

Austria & Russia - Laurin & Klement.
Reichenberg Automobilfabrik - Reichenberg, Austria.

Canada - Russell Motor Car Company, Ltd. - Toronto.
(Sub-license under Daimler of England.)

Meanwhile, the sleeve valve engine was being adopted for other purposes than passenger car use. In 1910, Daimler brought out their famous farm tractor, using the sleeve valve. The same year, the London General Omnibus Company, the greatest user of gasoline-propelled vehicles in the world, after a year of exhaustive tests, adopted the sleeve valve engine, to the total exclusion of the poppet valve type. The reasons assigned were:

Freedom from repairs.
Continuous service.
Lower cost of operation.
Lower cost of maintenance.

These conclusions were not reached until after a year's test, involving the up-keep reports of over one hundred motors. The company operated 2600 buses at the time of their decision.

Finally, manufacturers in the United States began to show some interest in the Knight engine. Pierce-Arrow built and tested a Knight engine but decided not to adopt it. Packard attempted to prove the Knight patent was not valid because a patent they owned authorized by Reeves predated it, however, they failed. Knight held discussions with Packard, Locomobile and Peerless, but nothing came of them.

The F. B. Stearns & Company of Cleveland, Ohio, introduced the first American Knight powered car on July 1, 1911. This 1912 model year vehicle replaced the model 15, 30 HP Stearns first introduced in 1909. The Knight engine had four cylinders, a bore of 4 1/4 inches and stroke of 5 1/2 inches, giving an ALAM rating of 28.9 horsepower. The actual horsepower was measured to be 64.1 at 2,290 RPM.

With the introduction of the Stearns Knight, sales of Stearns cars doubled.

Stearns completed their transition from poppet valve to sleeve valve engines in August 1912 with the introduction of the Stearns Knight six cylinder replacing the model 30.

The F. B. Stearns & Company was purchased by John Willys on December 15, 1925 and subsequently merged into the Willys-Overland Company. Between 1912 and 1925, 26,079 Stearns Knights were produced.

Production of Stearns Knight automobiles ceased in early 1930. Between 1925 and 1930 at least an additional 104,631 vehicles were produced. However, the exact number produced in 1926 and 1929 is not known to the writer.

The Columbia Motor Car Company of Hartford, Connecticut announced the Columbia Knight also in July of 1911. It had a four cylinder engine; 4 7/8 inch bore by 5 1/8 inch stroke, rated at 38 horsepower, but capable of developing 70 - 85 horsepower. It carried a sales price of $4,500, $1,000 more than the Columbia poppet valve engine vehicle of that year.

The Columbia organization was merged into the Maxwell Company, and, on August 25, 1913 the plant was closed after having produced a few six cylinder Knight engines for samples that season. The total number of Columbia Knights produced is not known to the writer.

In August of 1911, the Stoddard-Dayton Knight six cylinder automobile was announced. It was a 4 1/2 inch bore by 5 1/2 inch stroke engine rated at 58 horsepower.

Shortly thereafter, the Dayton Motor Car Company was absorbed by United States Motors. In January of 1912, both H. J. Edwards, chief engineer of the United States Motor Company and C. G. Stoddard, Vice President, resigned to form the Edwards Motor Car Company, the fourth United States Knight motor licensee. (Mr. Knight's contract with overseas licensees evidently initially limited his right to license American Companies to four concerns.)

On December 17, 1912, the Knight license of the Dayton Motor Car Company was canceled because the United States Motor Company was in receivership. A clause in the license contract gave Knight & Kilbourne the right to cancel the license when the licensee became involved in litigation. The total number of Stoddard Dayton Knights produced is not known to the writer.

In July of 1912, the Atlas Engine Works of Indianapolis, Indiana, announced that it had completed development of a Knight motor. The release went on to say: **"This concern over a year ago signed with Knight and Kilbourne securing the sole right to build these motors in America for sale to automobile concerns."** The company brought out both four and six cylinder motors with a 4 1/2 inch bore by 5 1/2 inch stroke. However, a short time later, the company went into receivership.

On October 15, 1912, the Lyons-Atlas Company was formed and bought the property of the Atlas Engine Works.

On March 5, 1913, the Lyons-Atlas Company announced that they had decided to manufacture Knight engined automobiles. A detailed description and photographs of the automobile were supplied to the trade press in July of 1913. Production ceased in 1915 with less than 77 vehicles having been produced during the two years the company was in business.

The Edwards-Knight car was announced in December of 1912. It had a 25.6 horsepower, four-cylinder motor with a 4 inch bore and 5 1/2 inch stroke. The motor used a silent chain drive for the eccentric and magneto shafts, an electric self-starter incorporated within the enclosed flywheel, dry-disk clutch carried in a separate compartment in the forward part of the gearbox, four forward speed gearbox, and worm drive in the rear axle.

The chassis had a 120 inch wheelbase and was available in two-passenger roadster, four-passenger torpedo, five-passenger touring, seven-passenger limousine and seven-passenger landaulet bodies. Prices ranged from $3,500 to $4,700.

In 1913 Knight and Kilbourne claimed that Knight sleeve valve engines were being fitted on 26 different makes of cars, including 9 French, 4 American, 4 German, 3 British, 2 Austrian, 2 Belgium, 1 Swiss, and 1 Canadian automobile company. Knights were also winning races and setting records in Europe. In the 1913 Indianapolis 500, a Mercedes-Knight, said to be a standard touring car with 9,000 miles on the chassis, finished fifth overall, averaging 70 mph.

In November of 1913, the Moline Automobile Company of East Moline, Illinois introduced the Moline-Knight. It was a five-passenger touring, priced at $2,400. The engine used a four-cylinder block casting, the first Knight licensee to do so. The motor was 4 inches by 6 inches, giving a rating of 25.6 by the SAE formula but showing 65 horsepower at 1800 rpm.

In 1913, in a public test in the laboratory of the Automobile Club of America, New York City, a Moline-Knight engine established a new world's record for length of run. The test was originally set for 300 hours, but was extended to 337 hours. Throughout the test the motor averaged 38.3 h.p. In the final hour the reading showed 53 h.p., the motor speed having been increased. It should be noted that this final reading showed a power output of more than 200% of the SAE rating.

The same year, 1913, saw the adoption of the sleeve valve motor by America's greatest user of gasoline-propelled vehicles, The Fifth Avenue Coach Company of New York City.

In 1919 the Moline Knight became the R & V Knight. A total of 4,603 Moline Knights were produced during the five years it was in production. The R & V Knight remained in production until 1924 with a total of only 4,452 cars being produced.

John North Willys and Charles Knight first met by chance on board a steamship. However, the various historical accounts disagree on where the ship was headed and the year.

Garford Co., Elyria, Ohio, drawings of Willys Knight gas tank filler cap, and radiator emblems dated 11-22-1913, and of a WK name plate dated 12-9-1913, are in the Club collection. These indicate that Knight and Willys must have met during the summer of 1912, or possibly as late as 1913,

but not 1914 as most accounts suggest.

Some accounts of W-O history say the steamship on which Knight and Willys met was bound for Liverpool, while others say they met in the Mediterranean with Willys traveling to Egypt for a vacation. Regardless, Knight was, of course, enthusiastic about his engine and urged Willys to accept his hospitality the next time he was in England and allow him to put at his disposal a Daimler car. Willys declined the offer, but upon his arrival in England sought out a leading agency which made a business of renting cars to tourists. Without disclosing his identity, Willys arranged for a 36 h.p. Daimler-Knight and chauffer. The trip that followed continued for 15 days throughout the whole of England and Scotland covering a total of 4,500 miles.

At its conclusion, Willys asked the driver how much work had been necessary on the engine. The reply was that, had any work at all been required, he, the driver, could not have attended to it, so fatigued was he at the end of each day's grind.

The answer so impressed Willys that he immediately cabled his engineers to investigate the Knight engine from the viewpoint of production. From the findings of these reports came the decision to make the Knight engine a standard product of Willys-Overland. To accomplish this, on, October 29, 1913 Willys purchased for the Willys-Overland Company the Edwards Motor Car Company of New York City, including its license to manufacture Knight engines and all patents, drawings and factory equipment, stock, etc. The entire assets of the Edwards Motor Car Company were moved to Elyria, Ohio and located in one of the W-O factories, the Garford plant. (This was the plant of the same Garford Company that fabricated much of the chassis for the original Silent Knight. Willys purchased the Company in 1912). According to the trade press, the original plan was to manufacure the two Edwards-Knight models in their original form under the name of Garford-Knight. One of the models was a four-cylinder model which had been on the market all year, and the other a new six-cylinder model. H. J. Edwards, the designer of the vehicles, went to W-O as chief engineer of the Garford factory.

Drawings in the WOKR collection indicate that Willys may never have had any intention of calling his Knight vehicle a Garford-Knight. Drawings dated only a few weeks after the purchase of the Edwards Motor Car Company show that it was to be named Willys-Knight.

Garford Company drawings indicate that 40 model K-17 and 6 model K-18 Willys Knight vehicles were to be produced during late 1913 and early 1914. The K-17 was powered by a 4 inch bore by 5 1/2 inch stroke, four-cylinder engine, and the K-18 a 3 5/8 by 5 1/4, six-cylinder engine.

A Willys Knight five-passenger touring, selling for $2,750, was announced to the trade press in January of 1914. It was powered by a four-cylinder engine, cylinders cast in pairs, with a 4 inch bore and a 5 1/2 inch stroke. Motor Specification Tables, 2nd Edition, 1925, indicates that the forty K-17's previously mentioned were the only WK's sold during 1914. In 1915, 128 WK's designated model K-19, and costing $2,475 were sold. It was not until 1916 that Willys Knights were produced in volume. During that year 12,727 model 84's were sold at $1,095.

Production of the Willys Knight ceased in 1933 with a total of around 417,370 vehicles having been produced during the twenty years.

In 1915, Brewster and Company of New York City, secured a Knight license. Brewster is the celebrated company, who for several generations turned out America's finest coach work. During the teens, their activities were confined to the production of closed automobile bodies, and in expanding their business they decided to produce their own chassis. They chose the sleeve valve engine, and the Brewster-Knight was the result. It was entirely a New York car, produced from 1915 through 1924. Between 1915 and 1919, 243 vehicles were produced, with 11 more produced in 1920 and 1921, and 10 in 1922. The number produced in 1923 and 1924 is not known to the writer.

During the 1920's a number of other Knight engine vehicles were introduced in the Unites States. These included the Handley Knight, Sterling Knight, Yellow Knight, Federal Knight, and Falcon Knight. Details on these is left to future articles.

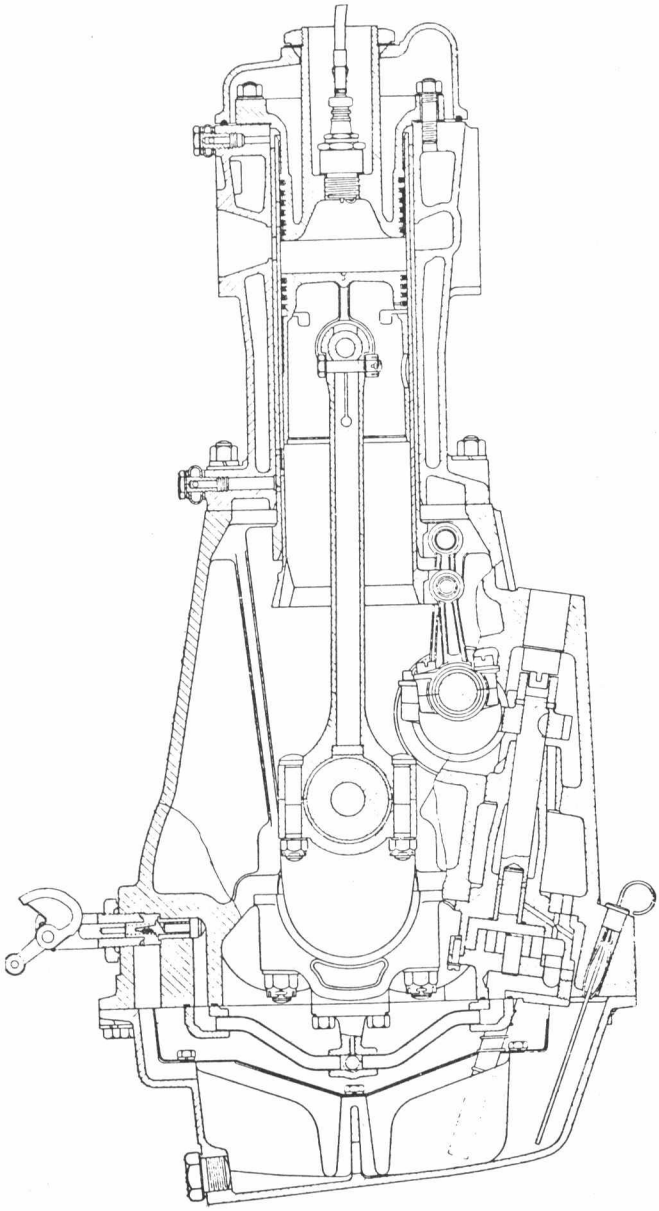
For a man with no formal engineering training, Knight's accomplishments are indeed impressive. A list of his United States patents issued through 1920 is given elsewhere in this article. Knight patents were issued in at least eight countries, and his engine built by about thirty firms and used in possibly as many as one hundred different makes of automobiles. He probably inspired the development of the single sleeve valve engine used in a few vehicles and airplanes, including the last piston airplane engine designed by Rolls-Royce, and the most powerful one they made, the Eagle of 1945. More significantly, he forced poppet valve engine manufacturers to build silence, reliability and efficiency into their engines. A 1911 article in Horseless Age gives the following insight into Mr. Knight the man.

His wonderful commercial success has not changed him in the least, and he is still as readily approached by and grants an interview to the newspaper men as in the days when he was taking his blue prints from shop to shop and fighting for recognition. He is fluent, if not a brilliant, public speaker, and scored quite a success with papers on his motor read before the British and American National Automobile Clubs.

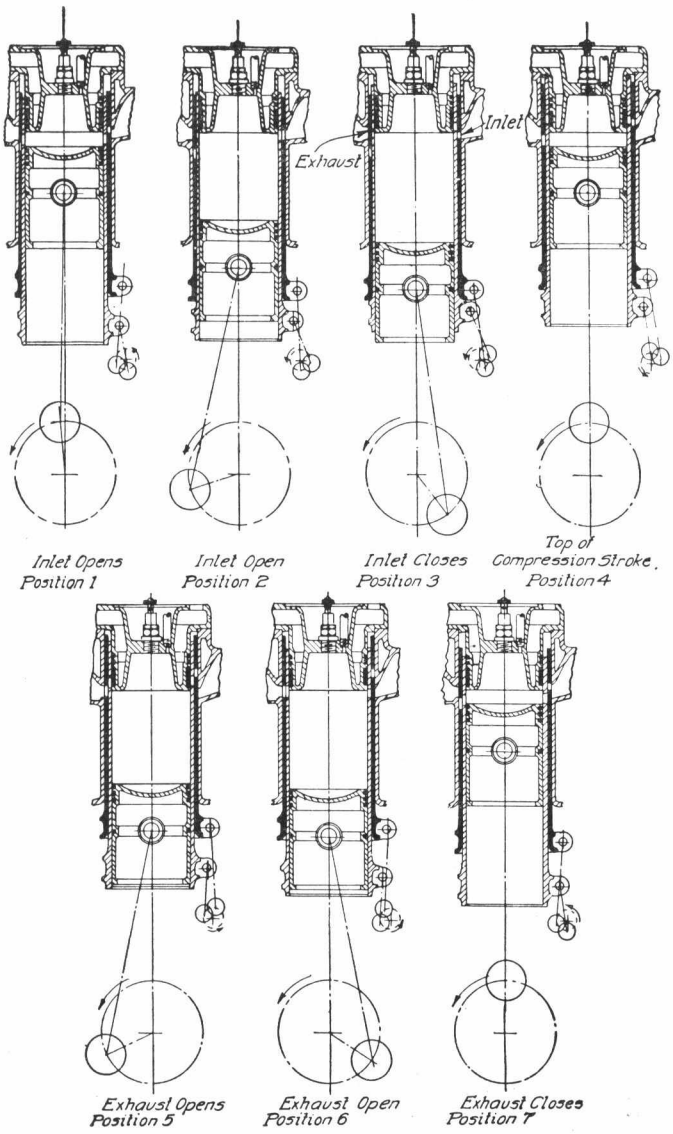
Charles Yale Knight, journalist, engineer and inventor, sold his patents and retired from active business in 1925. He died in Mendocino, California on May 4, 1940, the same year Minerva, the last automobile manufacturer to use the Silent Knight engine, ceased production.

Charles Y. Knight is one of the few men to successfully introduce a different automobile engine. He certainly deserves more recognition than he has received.

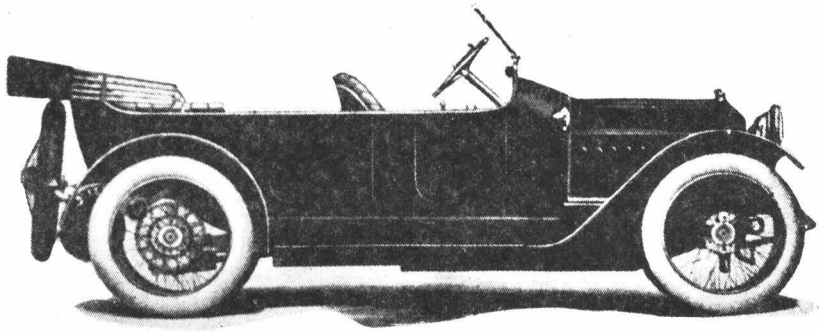
The writer wishes to thank Dr. E. G. Roberts, Director of the Georgia Tech Library, Jim Bradford, Curator, National Automotive Historical Collection, Detroit Public Library, and Club members Charlie Proctor and Charlie Weaver for their assistance in preparing this article.



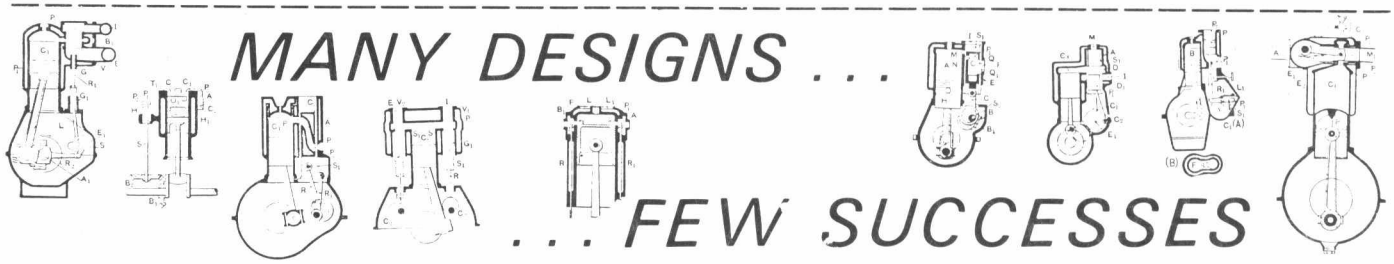
Cross section of a Willys-Knight engine



Various stages in the cycle of the Knight sleeve-valve engine



This could be a 1913 Edwards-Knight or a 1914 Willys-Knight, for the two cars were identical in all respects except the name. Only a few such Willys-Knights were built before the company released the Model 84, which was an original Willys design. One of these earliest models, a roadster painted bright red, and with a nickle-plated siren on its right running board, served for many years as the Chief's car at Fire Engine House No. 4, Toledo, Ohio.



MANY DESIGNS . . . A FEW SUCCESSES

There is an understandable tendency on the part of manufacturers of automobiles to steer clear of revolutionary ideas, especially those which cannot be offered to the buying public as optional features. In the early years of the present century the poppet valve had been exclusively used by every maker of four-stroke internal combustion engines, in spite of its tendency to be troublesome, noisy, and in constant need of adjusting, grinding, or replacement. With all of its problems, the poppet valve had apparently been accepted by that small segment of the population known as the motoring public, and no automobile manufacturer seemed interested in risking his future with an unknown inventor's sleeve valve engine.

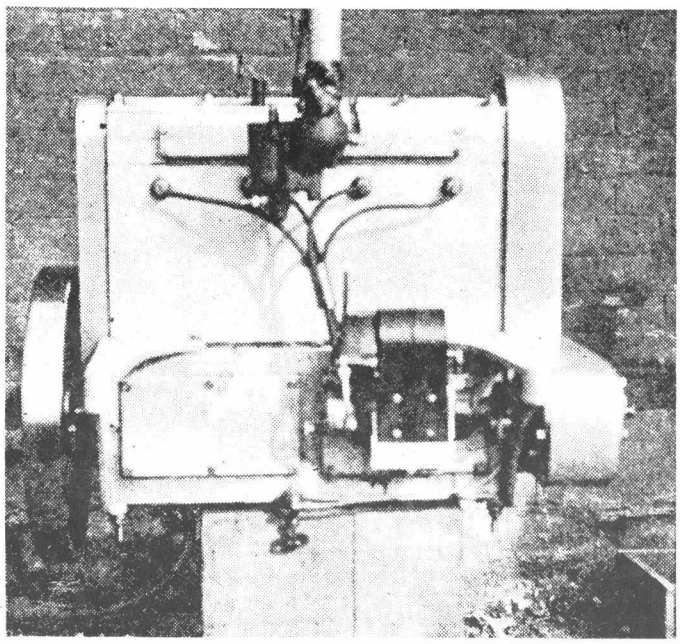
Charles Y. Knight was unable to find a licensee among the American motor car builders. He even founded his own company to build the Silent Knight car, so as to demonstrate its merits - which it did, most ably. Knight finally abandoned the American scene and went to England. There, after a painfully long series of tests and trials, and an extended period of negotiation, the Daimler Company, in 1908, committed itself to the use of the Knight Sleeve Valve Engine in all of its models.

The Daimler Knight was a complete success, and the engine proved itself worthy of all the claims made for it. This success did not go unnoticed, and by 1910 patent applications by the dozens were beginning to flood the patent offices of the United States and England. Engineers and inventors, both amateur and professional, who thought they had better ideas, submitted plans for sliding sleeve valves, rotating sleeves, rotary tubes or shafts, properly ported, which revolved in the cylinder head or block, rotary disc valves, and piston valves, singly or in pairs, placed in every possible position.

The July 13, 1911, issue of *The Automobile* included an article entitled "What Motor Inventors Are Doing - Quest For Silence in Devious Ways". This was followed a week later by another such article, "A Deluge of Sleeve Motors is Coming From Every Nation". Sir Henry Royce, of Rolls-Royce, designed a piston valve engine. D. McCall White, who later designed the first Cadillac V-8 engine, proposed his own style of sleeve valve. As Jimmy Durante later remarked, "EV-rybody wants to get into the act!"

Obviously, to design a method of opening and closing a pair of ports in a cylinder chamber is a simple matter. There are many ways of doing it, and innumerable variations on each of the ways. But to design a valve mechanism which is simple, efficient, reliable, and economical to produce is quite another matter. Of all such engines designed, only three may be said to have attained the point of series production - the Knight Double Sleeve Valve engine, the Burt-McCollum (Argyle) Single Sleeve engine, and the Mead Rotary Valve engine. The Mead engine was used in a model of the Speedwell car in 1913-14, and although many were produced, was a flat failure.

Descriptions of some - but by no means all - of these designs follows.



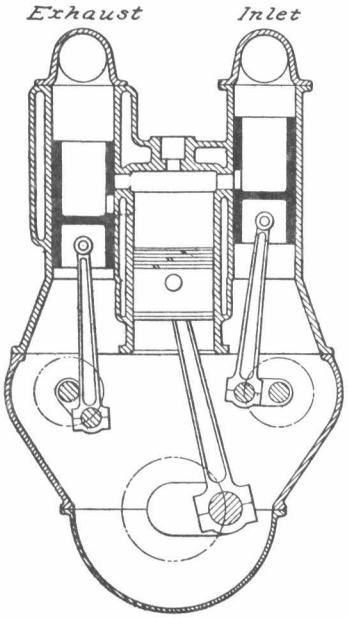
THE DICKERSON ROTARY VALVE ENGINE

This is the Dickerson Rotary Valve Engine, made by the Dickerson Engine Company, Salt Lake City, Utah, in 1921. The valve mechanism consists of a steel tube with intake and exhaust ports for each cylinder, which runs the length of the cylinder head.

Motor Age (April 28, 1921) reports that while undergoing tests at the Armour Institute in Chicago the engine was run for 20 minutes with the oil supply to the rotary valve cut off, with no apparent damage to the mechanism.

The Dickerson was one of many engines which were experimentally built with this type of valve action, none of which seem to have achieved any degree of commercial success.

THE BINGHAM PISTON VALVE ENGINE

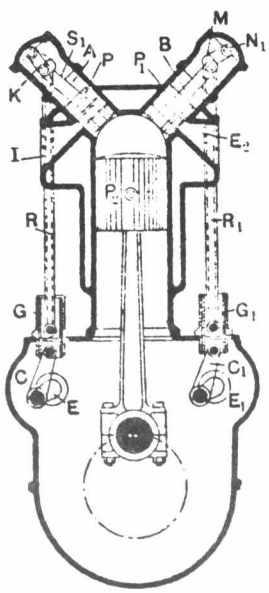


The Automobile (July 20, 1911), from which this drawing was reproduced, states that this engine was one of several piston valve types designed by Bingham of England, but does not identify Bingham as a company or as an individual associated with a company. Whether or not this engine was actually built or put to use is not specified.

The ports in the piston valves pass completely across the ports in the cylinder wall, approaching from above on one stroke of the valve, and from below on the next. Thus the valve-cranks operate at one-quarter of the engine speed. The force of the explosion is taken by the side of the piston valve, and is not transmitted to the valve actuating mechanism.

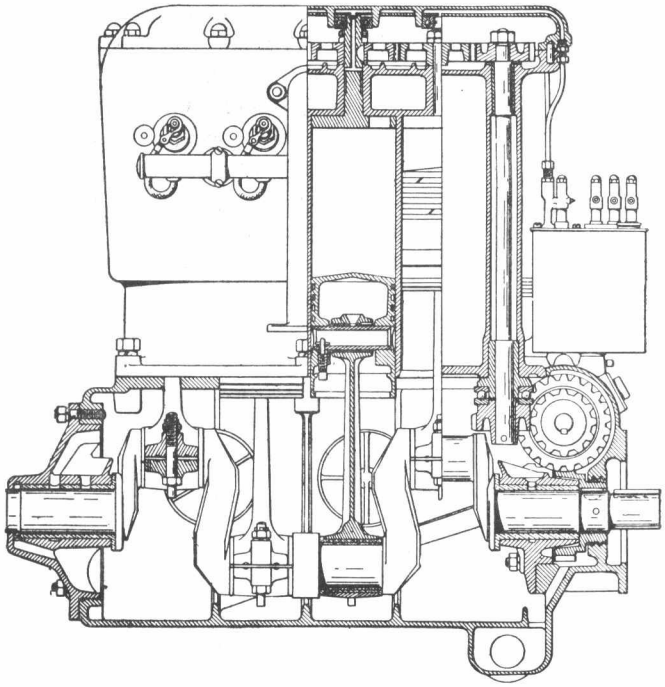
THE ROYCE PISTON VALVE ENGINE

This engine was described in the July 20, 1911, issue of *The Automobile*. It was designed by Sir Henry Royce, of Rolls-Royce, Ltd. It is probable that prototypes of this motor were made and tested, but it is unlikely that it was ever made in any quantity.



As shown in the drawing, the piston valves were located in the cylinder head, where they alternately covered and uncovered inlet and exhaust ports The full force of each explosion was taken on the exposed ends of the valves, and the shock transmitted to every part of the valve actuating mechanism. It would seem that such an engine would be in frequent need of repair.

REYNOLDS ROTARY DISC VALVE ENGINE



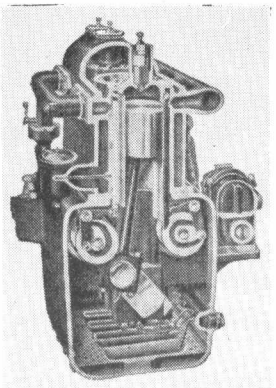
This engine was made by the Reynolds Engine Company, Detroit, Michigan, in 1912. The valve system consisted of a revolving disc at the top of each cylinder, turning on a short shaft which extended upwards through the cylinder head. Each of these rotary discs was geared to its neighbor, and all were driven by a vertical shaft at the front of the cylinder block.

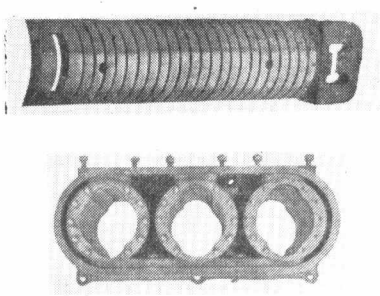
Many designs of the rotary disc valve engine have been proposed over the years, but none of them have been commercially successful. Most of them have been beset by problems of heat and lubrication.

The Reynolds Engine Company was reported as out of business in 1913.

THE FISCHER SLIDE VALVE ENGINE

The Fischer Motor Corporation, New York City, which made this engine, is listed in Chilton's Automobile Directories as having been in business from 1914 to at least mid-1916. The engine had three cylinders as shown below, but other models may have been built. The crescent-shaped sliding valves were operated by closed cams, which should have made possible quicker valve opening and closing, with longer dwell, than could have been provided by cranks or eccentrics.



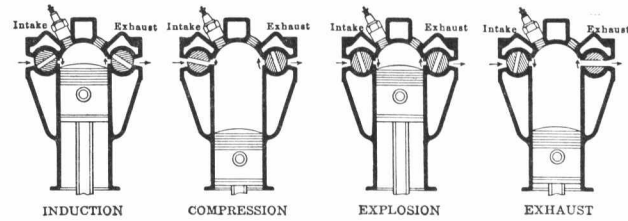


Pictures of the Fischer engine are from AUDELS AUTOMOBILE GUIDE, 1917.

THE MEAD ROTARY VALVE ENGINE

The Mead Rotary Valve Engine was one of the few unconventional automobile engines to attain anything approaching volume production. Its principal feature was a pair of ported shafts, one on each side of the cylinder block, which served as intake and exhaust valves. It was the invention of Cyrus E. Mead, of Dayton, Ohio, who in 1912 found a customer right in his own home town. The Speedwell Motor Car Company, which had operated profitably since its founding in 1907, experimented with the Mead engine in 1912 and switched much of its production to this motor in 1913 - a move which sealed the fate of the company.

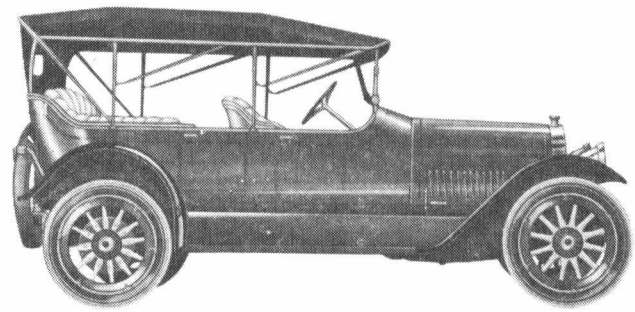
In pre-production tests the Mead engine had done well, but in volume production it proved to be troublesome and subject to frequent breakdowns. Its power output was disappointing, and it consumed large amounts of oil.



VALVE POSITIONS IN THE MEAD ROTARY VALVE ENGINE

Then, to add to the company's troubles, a devastating flood in 1913 inundated the factory, ruining stocks of completed cars and parts, and seriously damaging the factory's machinery.

Speedwell struggled through 1914, producing only a few cars and supplying parts for existing cars. In mid-1915, Speedwell was out of business, largely the victim of a hasty judgement in selecting an unproven engine design.



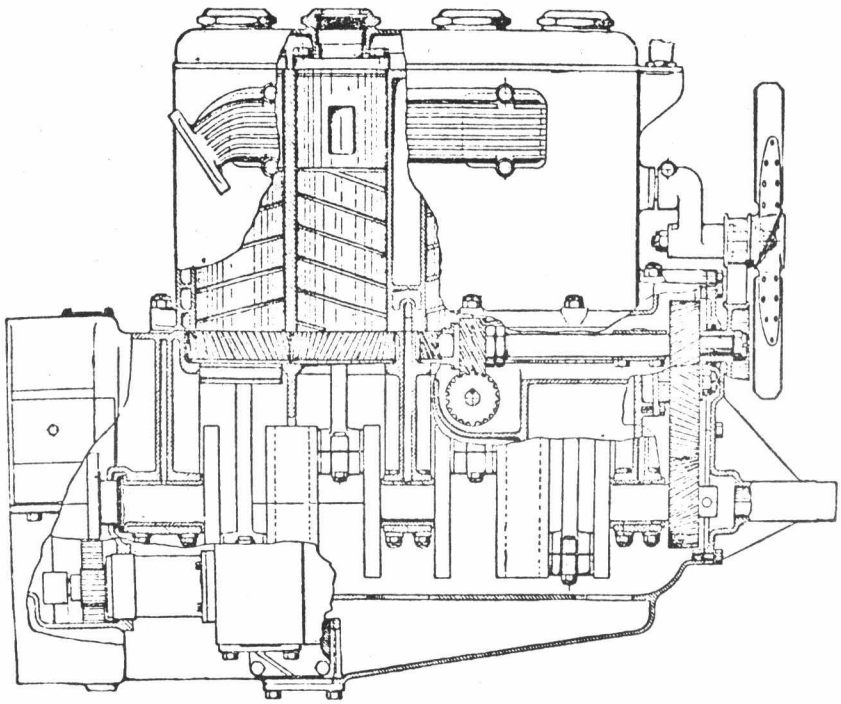
1913 SPEEDWELL CAR, WHICH USED THE MEAD ROTARY VALVE ENGINE

THE AMERICAN SLEEVE VALVE ENGINE

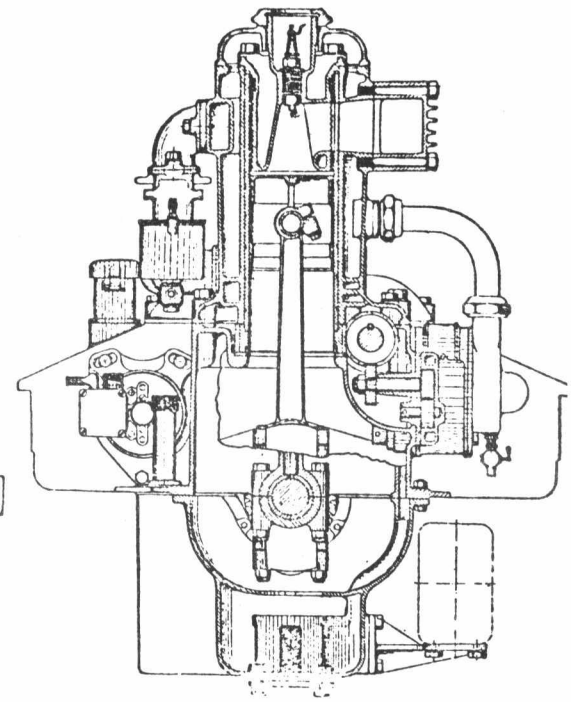
This engine was made by the American Sleeve Valve Motor Company, Philadelphia, and was shown at the 1918 New York Auto Show. The principal feature of the engine was a revolving cylindrical sleeve between the piston and wall of each cylinder. The sleeves had no vertical movement, and in rotating passed intake and exhaust ports at the proper time. They were geared together and driven by a single worm gear.

Although no automobile manufacturer seems to have produced a car using this power plant, the American Sleeve Valve Motor Company was listed in trade directories as late as 1920.

The drawings below are from *Automotive Industries,* January 31, 1918.



SIDE VIEW OF THE AMERICAN SLEEVE VALVE ENGINE, SHOWING SLEEVE DRIVING GEARS



SECTIONAL VIEW OF THE AMERICAN SLEEVE VALVE ENGINE

Experience Shows Results

A NEW CAR

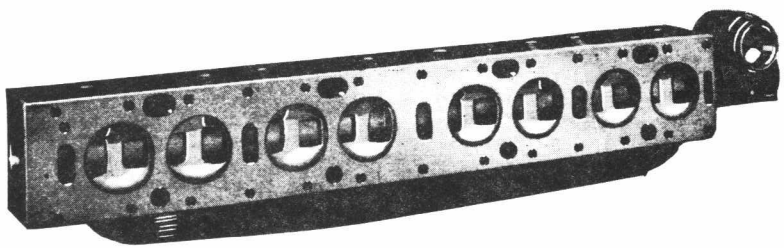
Designed and engineered by Mr. John Duval Dodge, son of John F. Dodge, President and Builder of the Famous Dodge Bros. Motor Car, producers as known of the ultra in low priced efficient automobiles, is entering the automotive field to produce an eight cylinder rotary valve automobile.

DODGESON -- A ROTARY-VALVE STRAIGHT EIGHT

The following two pages are reproductions of the pages of a brochure describing the Dodgeson Rotary Valve Straight Eight. This car was designed by John Duval Dodge, son of John F. Dodge, former president of the Dodge Brothers Motor Car Company. However, Dodgeson Motors needed more than a prestigious name in order to survive. The entire car, except for the rotary valve engine, was to be put together from components made by other manufacturers, at a time when most of the makers of "assembled" cars were having difficulty in competing with those who made their own parts. Also, the rotary valve idea certainly was not original with John Dodge, and his engine may have proved no more successful than previous designs of this type. But for whatever reason, only a few Dodgeson prototypes were built and the company lasted less than its first year - 1926.

EIGHT cylinder engines are becoming more popular every year and Mr. Dodge has seen the rapidly growing demand and has with his past automobile experience developed a new low priced straight eight car with an improved valve mechanism which he has developed and proved with satisfactory results.

The customary poppet valve that requires Excessive Friction horse power to drive owing to the compression of return springs against cylinder compression, the noisy gears and tappets which lift the valves, have been eliminated.



This new type of valve which has been adapted and proven absorbs a minimum amount of power to drive, is smooth running and noiseless, with 60% less frictional horse power.

From the accompanying photograph and description the action can easily be understood.

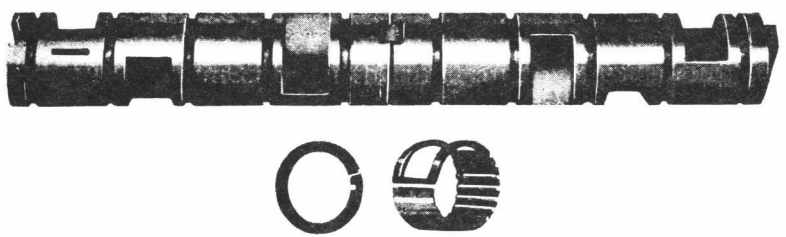
The above illustration shows the detachable heads embodying the rotary valve. This valve is revolved by a vertical shaft from the main crankshaft.

The valve chamber is situated just above the domed compression chamber of the cylinders and runs the extreme length of the head. Rectangular inlet and exhaust ports are cast vertically in the domed head to connect with the valve chamber. At 90° either side of these vertical connections are the inlet and exhaust

ports diametrically opposite, also of rectangular section which connect with the inlet and exhaust manifold respectively.

To each of the vertical ports a small by-pass is cast which rises to about half way up the sides of the valve chamber. The inlet on one side of the valve chamber and the exhaust on the opposite side, each in line with its respective port, this is known as the lag back.

This valve consists of a central shaft as shown in the photograph. Mounted on and driven by the shaft are split expansible cast iron sleeves also shown in the



photograph, having an opening that registers with the opening port cut in the shaft. Each port opening is fitted with one of these expanding sleeves and between these sleeves is fitted a fiber split ring to prevent leakage between the sleeves.

As the valve revolves the inlet port registers with the inlet manifold, also with the vertical passage into the cylinder, which allows a charge of volatile matter to be drawn into the cylinder. On the compression stroke the lag back, which we referred to previously, allows the pressure to leak between the valve shaft and the expansible sleeve. This pressure expands the sleeve against the valve chamber, which prevents leakage at the time of explosion.

Dodgeson Straight Eight

SPECIFICATIONS

MOTOR	Special Dodgeson design having 4 point suspension. Supported between the channel section of the side rails by rubber shock insulators set in specially designed brackets. Rubber shock insulators and a composite body which absorbs any telegraphing of motor through the frame and absorbs all road shocks and rumble. No bolts or pins required.
CYLINDERS	Eight in line. 2½ in. bore: 5 in. stroke. Cast integral with the upper half of crankcase and bell housing.
CYLINDER HEAD	Detachably, embodying the rotary valve as a complete unit.
TOTAL PISTON DISPLACEMENT	196.34 cubic inches.
S. A. E. RATING	20 H. P.
B. H. P.	72 at 3000 R. P. M.
PISTONS	Lyanite. 3 rings. Split skirt.
CRANKSHAFT	Extra heavy. 5 bearings, 2 in. dia. Single steel forging, 4—4 type heat treated and balanced statically and dynamically.
VALVE	Special Dodgeson rotary design. Overhead rotary fitted with expanding sleeves and fiber rings.
CONNECTING RODS	Drop forged duro metal 9 in. between centers with large crankpin bearing diameter, Babbit lined.
PAN	Pressed steel fitted with oil strainer, baffle plates, oil sump, and oil gauge.
BEARINGS	Babbit lined, bronze backed. Line reamed in crankcase fitted with force feed, oil connection.
CARBURETORS	Dual carburetors. One for each bank of four cylinders, cross connected giving equal distribution.
GASOLINE FEED	By auto pulse pump from gas tank at rear of frame.

LUBRICATING SYSTEM	Gear pump, high pressure driven off rear vertical shaft force feed to all main bearings and delivered to valves through a by-pass giving positive flow but without pressure. Pistons and piston pins lubricated by splash system.
STARTER AND GENERATOR	Single unit, chain drive at the front end of cylinder block. Chain adjustable by eccentric bushing and locking device. Made by the North East Electric Company.
COOLING	Centrifugal impeller enclosed in the front end of cylinder block, with special anti-freeze features.
ELECTRICAL SYSTEM	Single unit, North East.
FIRING ORDER	1-6-2-5-4-7-3-8.
WIRING SYSTEM	Single wire system using frame as ground return.

GENERAL

FRAME	Of strong rigid construction made by the A. O. Smith Co., 6 in. deep channel, well-braced with cross members.
CLUTCH	Made by the Long Mfg. Co. Single plate, 10 in. diameter in fly wheel.
TRANSMISSION	Made by the Detroit Gear & Machine Co., in unit with motor. Selective type, 3 speeds forward and one reverse. Ratios: 3.11-1—1.7-1 and 1-1. Reverse: 3.78—1.
PROPELLER SHAFT	Enclosed type. Lubricated universal. Made by the Spicer Mfg. Co.
DRIVE	Hotchkiss.
FRONT AXLE	Made by the Salisbury Axle Co., I-beam section.
REAR AXLE	Made by the Salisbury Axle Co., semi-floating. Spiral level drive.
SPRINGS	Front and rear semi-elliptic 36 in. long front, 51 in. long rear. Supported to the frame by rubber shock insulators to eliminate all rattle and vibration. No shackle bolts or lubrication required.
BRAKES	Lockheed hydraulic brakes on all wheels. Emergency external contacting on transmission.
STEERING GEAR	Gemmer No. 80.
WHEELS	Artillery.
RIMS	Firestone.
TIRES	Balloon 31 x 5.77.
WHEEL BASE	116 inches.

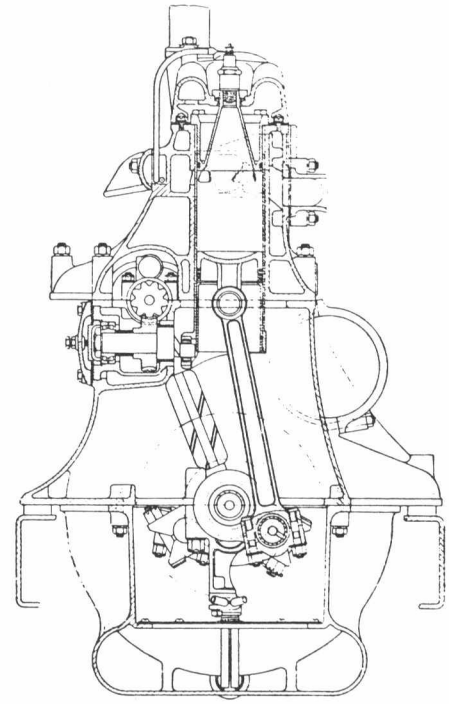
The Burt-McCollum Single-Sleeve Valve Engine

In 1909, not long after the Daimler Company had adopted the Knight double sleeve valve engine, Peter Burt, a Scottish engineer, applied for a patent on a design for a single sleeve valve motor. At about the same time a Canadian inventor, James McCollum, designed an engine with a single sleeve valve. There appeared to be a patent conflict, but this was easily resolved when Argylls, Ltd., of Alexandria, Scotland, acquired both designs. The result was a product known as the Burt-McCollum Engine.

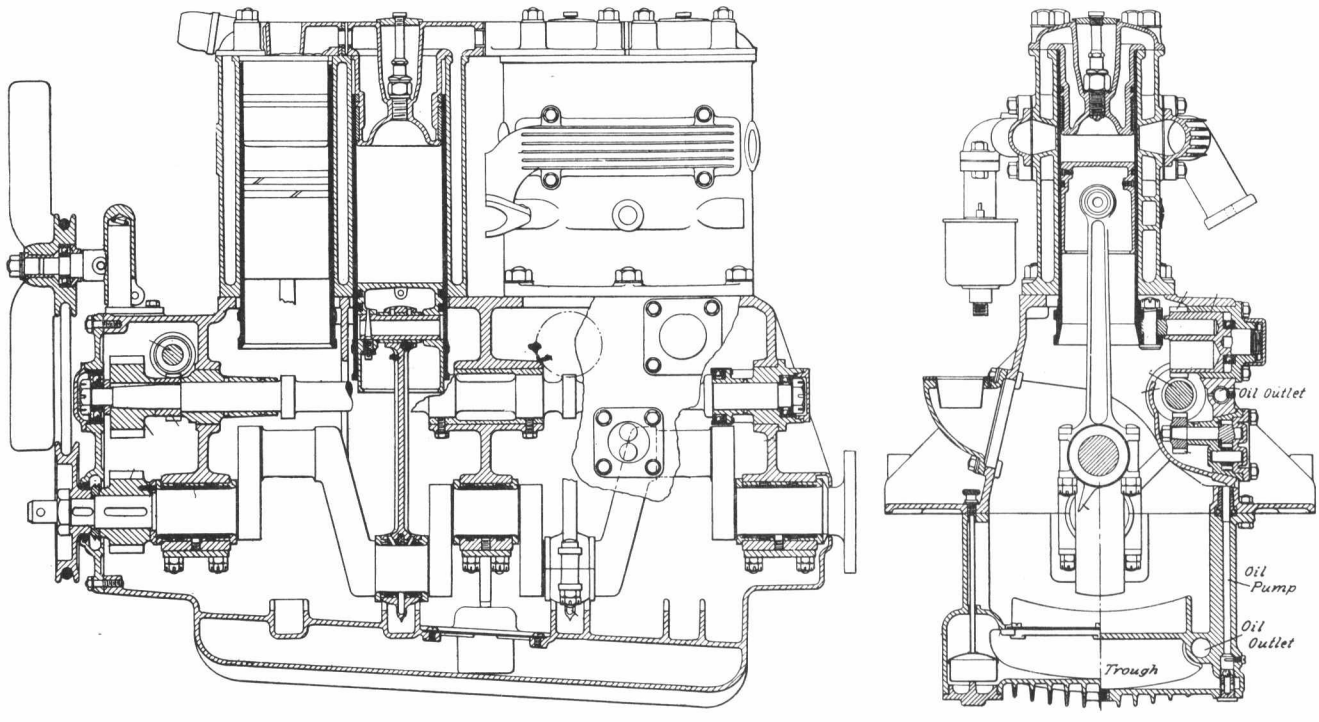
The single sleeve valve moved both vertically and horizontally, driven by an ingenious yet simple combination of a gear and pin which moved the sleeve and its ports in an elliptical path and caused the inlet and exhaust ports to open and close at the proper time. The efficiency of this engine was said to have compared very favorably to that of poppet valve engines of the time.

Although more cars and engines of Knight's double sleeve design were built during its years of use (1905-1939), the Burt-McCollum design remained in production for a much longer time. 14- and 18-cylinder air-cooled radial aircraft engines using this single sleeve design were made by Bristol-Siddeley until at least 1960, and perhaps later.

Argylls, Ltd., entered receivership in 1914, and the patent rights reverted to Peter Burt. During the years of World War I there was no activity in the market for sleeve valve engines, but after the armistice in 1918 the Burt-McCollum patents were bought by Wallace, Ltd. The engine, now generally known as the Argyll, or Argyle, was used in one model of the Vauxhall car from 1925 to 1927. The American firm of Continental Motors acquired the world's rights to manufacture and license the Argyle engine and, in 1925, organized British Continental Motors, Ltd., in London.



SINGLE-SLEEVE-VALVE ENGINE USED IN THE VAUXHALL CAR



Four Cylinder Single Sleeve Valve Motor Manufactured by the Argylls, Ltd., of Alexandria, near Glasgow, Scotland.

Cylinder Dimensions—101 x 130 Millimetres.

From "The Gasoline Automobile", Volume 1, by P. M. Heldt, 1912

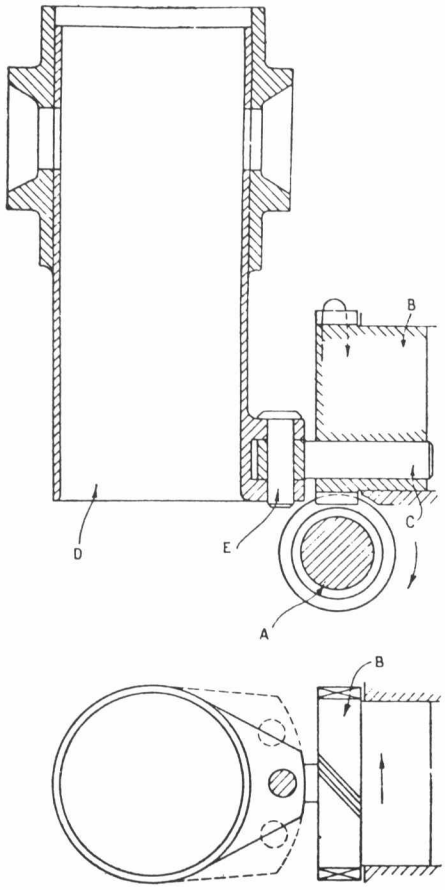


DIAGRAM OF SINGLE-SLEEVE-VALVE ENGINE VALVE GEAR

The valve action of the Burt-McCollum engine is as follows:

A sleeve inside the cylinder is free to move, and the piston reciprocates within this sleeve. By suitable mechanism this sleeve is constrained to move in such a manner that any point on the sleeve traces a path of elliptical form. The gearshaft A is driven at crankshaft speed from the crankshaft by silent chain or other suitable means. This gearshaft engages with the sleeve crank-gear B, through spiral gearing, as the axes of A and B are at right angles to one another. The sleeve crank-gear B is geared to run at half crankshaft speed, and carries a T-headed sleeve crankpin C, which is attached to the sleeve-valve D by a pin E and held between lugs on the sleeve. The sleeve crankpin C is free to rotate and to move endwise in the sleeve crank-gear B and can swing sidewise about pin E between the sleeve lugs. Thus the rotation of crank-gear B imparts to the sleeve a motion that is partly rotary and partly reciprocating.

This description of the valve actuating mechanism and the accompanying diagrams are taken from a pamphlet on Sleeve-Valve Engine Development, by W. Ferrier Brown, member of The Institution of Automobile Engineers, London, published in December, 1925. Copies of the pages of this pamphlet were loaned by W. Denney Freeston, Jr., of the Willys-Overland-Knight Registry, Inc.

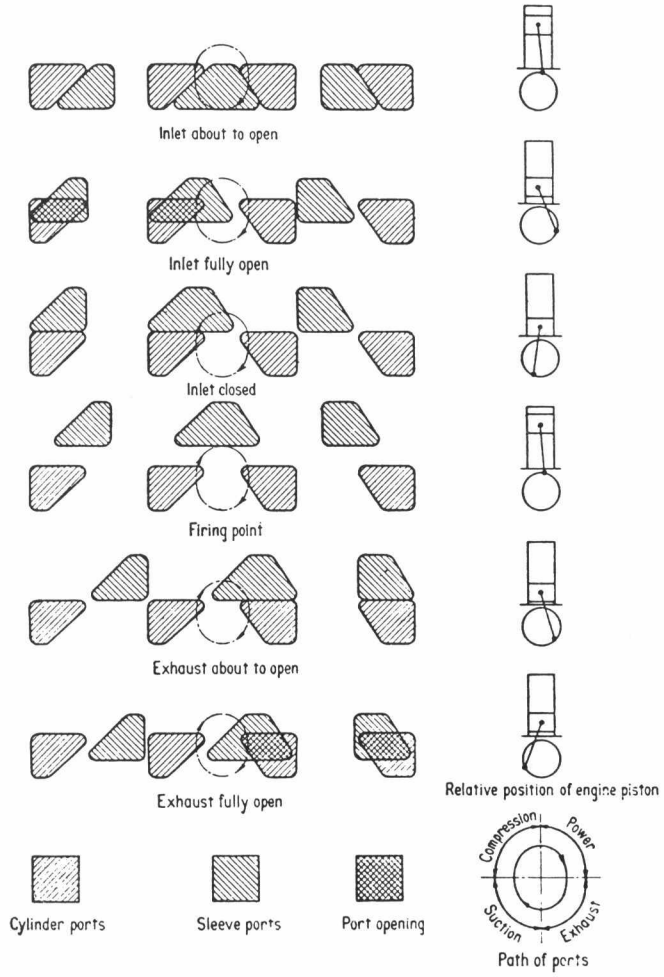
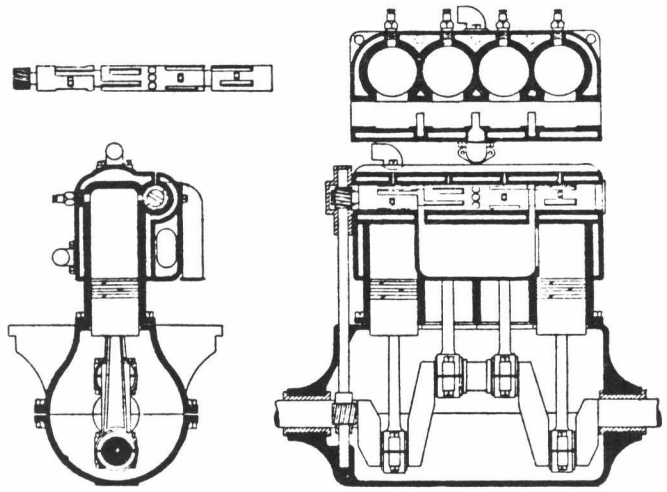


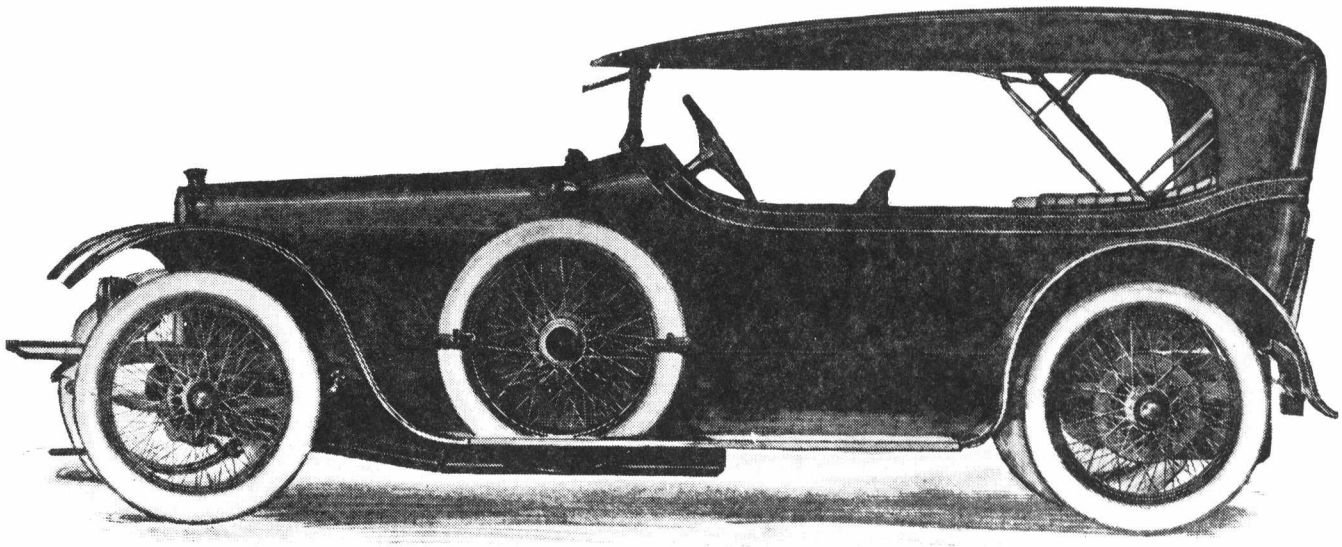
DIAGRAM OF PORT POSITIONS, SINGLE-SLEEVE-VALVE ENGINE

THE WALKER ROTARY VALVE ENGINE



The Walker Rotary Valve Engine was the design of W. N. Walker of Rome, New York, who built this engine early in 1912. As shown in the above drawing, the valve system consisted of a tubular shaft, driven by gears from the crankshaft at one-quarter engine speed, mounted at one side of the cylinder block and running the length of the engine. The Walker was just one of a great many engines designed along these lines, none of which were particularly successful commercially.

Drawing from "The Automobile", June 13, 1912



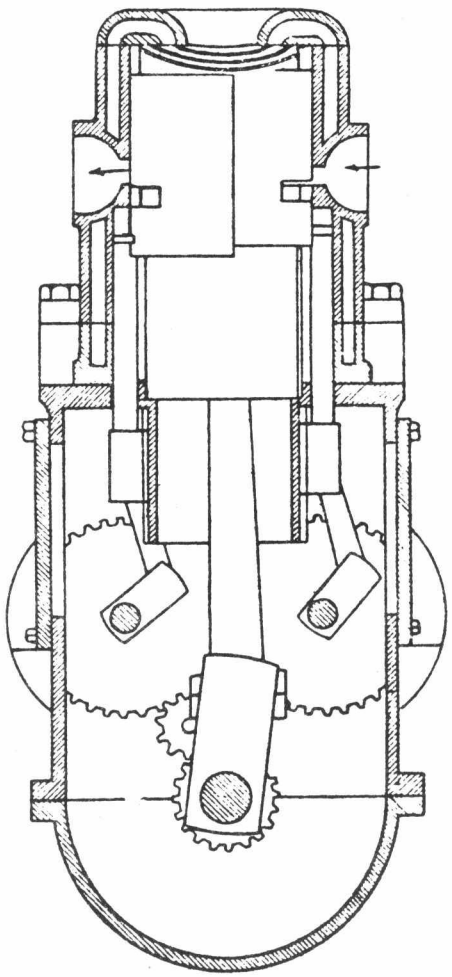
The K-D Car . . . "the other Knight"

The K-D Motor Company, Brookline, Massachusetts, was founded in 1912 by Miss Margaret E. Knight (unrelated to Charles Y. Knight) and Mrs. Anna F. Davidson. The company's product was a four-cylinder car with a sleeve-valve engine designed by Miss Knight.

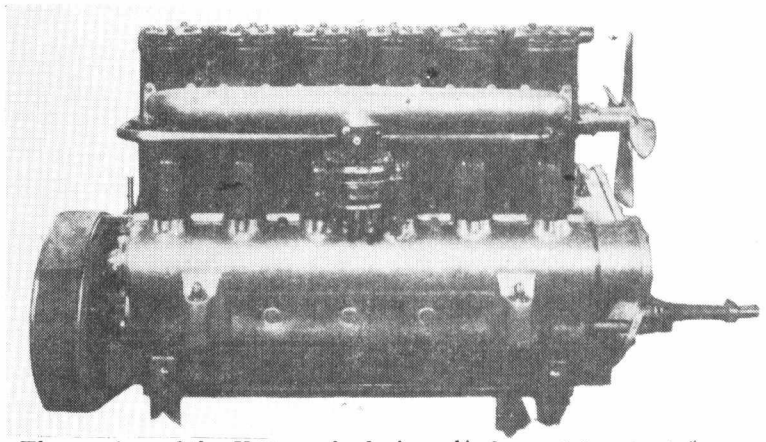
For 1913, a new model, pictured above, was displayed at the Boston Auto Show. It was powered by a large six-cylinder engine, and priced at $6000. Rudge-Whitworth wire wheels were standard equipment. It is unlikely that more than a few K-D cars were built during the short life of this company, which ended in 1913.

The principal feature of the K-D engine was the pair of crescent-shaped valves, the inlet and exhaust valves together forming a complete sleeve, with about one-sixteenth of an inch clearance between the two halves, which operated within water-jacketed surfaces. The valve timing was such that the ports were fully open when the piston was at top dead center, thus giving the longest possible time in the open position, but with quick opening and closing.

Miss Knight was a prolific inventor. In 1871 she developed and marketed a machine for making and folding square bottomed paper bags. A list of her inventions shows that her talent as a mechanic was most diversified. It is said that she obtained no less than 87 patents, both domestic and foreign. for inventions applying to rubber, cotton, and shoe manufacturing.



This drawing, from British Patent No. 15445-12, issued to Margaret E. Knight, clearly shows the method of operation of the valves which consist of two ported half-sleeves moved by crank mechanisms driven by spur gearing from the crankshaft.



The engine of the K-D car had six cylinders of four inch bore, six inch stroke, which produced 90 H.P.

THE DIFFIDENT ZIEGLER, OF DISTINCT DOCUMENTARY DEFICIENCY

by MAX GREGORY

The discipline of historical research, and the making of claims based upon such research, rests heavily on documented evidence, and indeed some suggest that claims cannot be made unless supported by some documentary matter. However, the case for verbal evidence cannot be totally ignored. The case of the early Australian Ziegler motor vehicle may be seen as an example where the verbal evidence is paramount due to a dearth of documentation, there being only two undated and unnotated photographs in existence. The essence of this verbal account is here presented, and the opinion of members is sought regarding the weight of validity which can be given to a record which has been handed down in this way.

The writer is a late-comer to the ranks of those who have searched for contemporary references to the Ziegler, having been preceded by the Science Museum of Victoria, who hold the engine and boiler said to have come from the vehicle, Mr. N. Smith of the Veteran Car Club (Victoria), and Mr. B.M. Ziegler of Sydney, a grandson of the builder. All of these earlier parties have made their findings available, and the writer has scoured some of the more obscure publications of the Warrnambool district for this period. Some of these, judging by the unseparated pages requiring the attention of the paper knife, had lain undisturbed since publication.

The verbal account, to a large extent, is that which was given to the Science Museum in 1954 by a group of interested persons from the Warrnambool district when they presented an engine and boiler to that Institution in the belief that they were relics of some historical significance. These long-time residents of the area were Messrs. J. Timms, L.F. Trigg and L. Wallace, none of whom have been able to be interviewed by this reviewer. They were, however, interviewed by Mr. N. Smith in about 1962. These men of Warrnambool were then very old and in poor health but their story, nevertheless, retained its essential form. Other references, supplied by the Warrnambool Historical Society, are from the Warrnambool Shire *Book of Many Things* and the Centenary issue of the *Warrnambool Standard* newspaper of March 22, 1947, both of which would, naturally, have had the same verbal origins as the other accounts.

Thus we are left with this void which should, ideally, be filled with a contemporary press item, some comment or even a mere passing mention of the vehicle. About the furthest that time can be rolled back is to the first decade of this century, and that in respect of two existing photographs of the machine. One picture was obtained by Mr. R.H. Holden of Geelong in about 1911. He was, at the time, an apprentice lad of mechanical bent, on that occasion visiting his father who was serving a tour of duty in his position as a Customs Officer at Warrnambool. Mr. Holden later had a motor business in Geelong and became a prominent member of the Geelong Historical Society. The other photographs, showing a group of early motorists, tends to date itself at around 1905 by the style of one of the tricars of that period. This photo came into the hands of the Warrnambool Historical Society in more recent times and was badly damaged by having been folded, leaving three heavy creases down through the print. This has, in this instance, been largely rectified by a photographic artist.

While there is no documentation relevant to the vehicle, it is clear that its maker, Johannes August Ziegler, was resident at Allensford, a small town a few miles east of Warrnambool, prior to the indicated time of the machine's construction. In the year of 1888 Ziegler with his wife, Pauline, and others, made three patent applications concerned with the preservation of milk and the manufacture of milk powder. These were Patent Application No. 5714 of March 21, 1888, for "An improved method of preserving milk, to be known as pure powdered milk, and also a machine for the manufacturing the same". Also No. 6114 of August 29, 1888, was for "Preserving liquid milk" and No. 6115 of August 30, 1888, was for "A method of condensing milk to a dry powder". The region, a favorable one for dairying, was, at that time, in an expansionary phase of development and was building up an export trade in dairy produce to England.

Due to the lack of contemporary documentary references to the vehicle, the date of construction has not been able to be established and, no doubt due to the verbal nature of the record, various dates, ranging from 1889 to 1898 have been mentioned from time to time. The 1898 may lie with the possible later vehicle mentioned afterwards, and the 1889 could be a typographical error of it. However, the date quoted by the prime sources to the museum, and in the Warrnambool Shire *Book of Many Things*, is 1892, and these first-hand recollections also state that the construction of the vehicle was facilitated by the manufacture of the engine and boiler by the firm of Dobson & Parkinson of Lava Street, Warrnambool, and the construction of the bodywork and wheels by Alec Robinson's Carriage Works in Fairy Street, Warrnambool. Now, by either some sort of co-incidence, or because the old-timers really remembered it like it was, a survey of the business houses of Warrnambool reveals that the years of 1892 and 1893 constitute the only period when both of these concerns were active. In 1891, for example, Alec Robinson was in a partnership arrangement with F. Morse who was shortly to withdraw to set up his own enterprise in Lava Street. Similarly, the firm of Dobson & Parkinson had passed out of existence by 1894, being supplanted by A. Dudley Dobson's Warrnambool Engineering Works in the same street. Thus, there is this conjunction, during 1892 and 1893, of the date stipulated for the Ziegler vehicle's construction and of the only period when both of the cited firms were operating in the town.

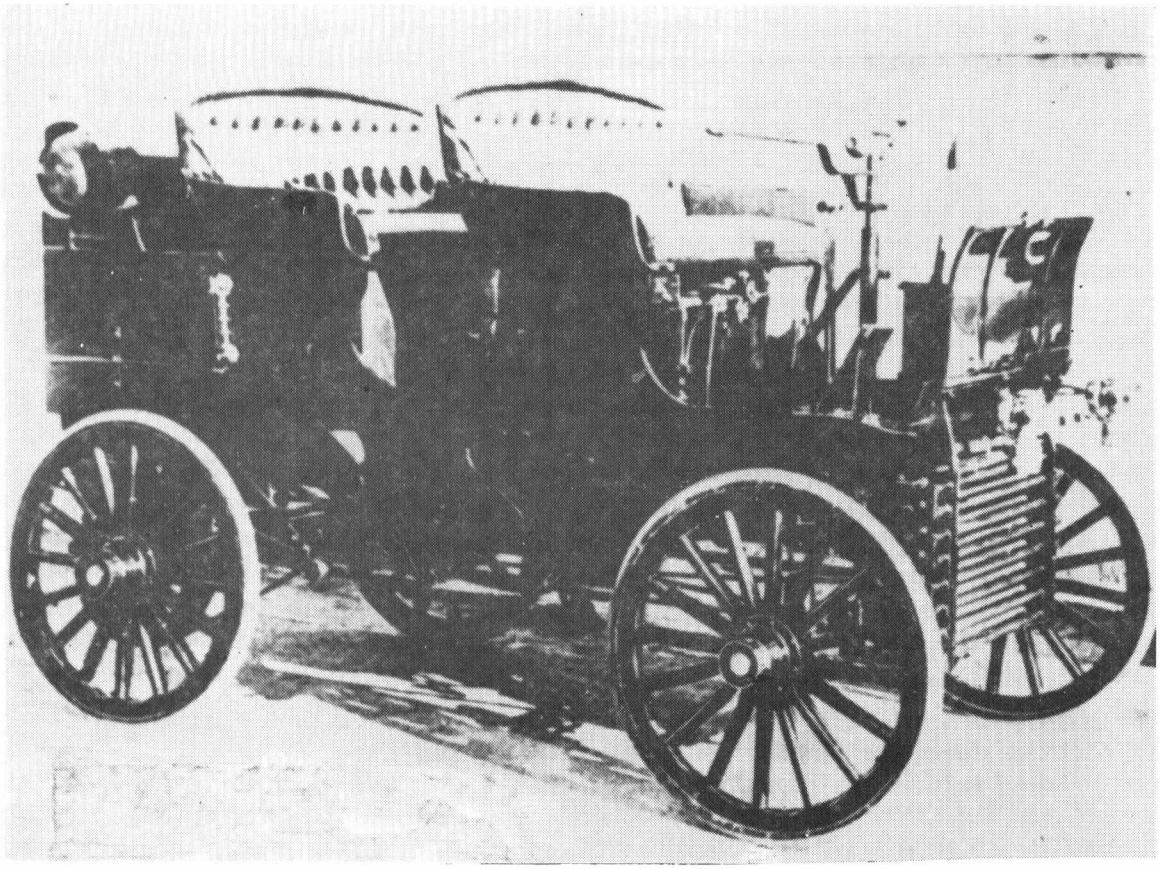
While this writer tends to the view that the clarification of these points serves to corroborate the date and details of the contributing firms as recalled by the verbal sources, it is not acceptable to the Science Museum of Victoria which has a policy that a contemporary documentary record must be available before it will make any firm statement. While there is no doubt that this is a wise policy on its part, it also seems that in this case, where the existence of the vehicle is not subject to challenge, the noted conjunction should be seen as being a confirmation of the verbal account. Although the record has been so largely conveyed to the present via the verbal medium, it is nontheless quite a full account of the vehicle, its origins and its fate, also of the builder and his life and times.

J.A. Ziegler was a man of Austrian origin with engineering training. He migrated to Australia and settled at Allansford, near Warrnambool, on the south coast of Victoria's Western District, where he conducted an ironmongery shop and engaged himself in matters of agricultural engineering. The patent applications dealing with milk processing are indicative of this, and other endeavours which have been mentioned are the dehydration of potatoes, water boring, well sinking, pumping installations and the maintenance and repair of all manner of machinery used in agriculture and the processing of produce.

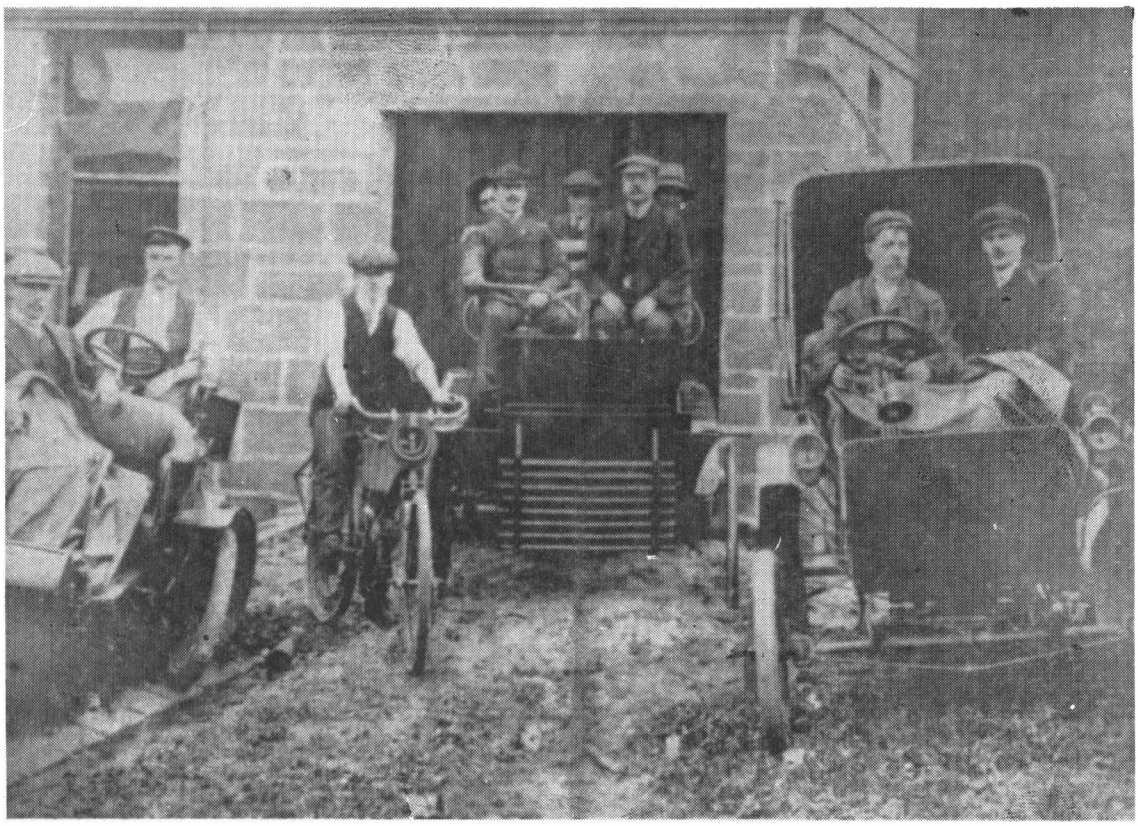
He is said to have procured the plans and drawings of a steam buggy from Germany which had been designed as a horse replacement unit with no thought of achieving speeds of more than about 12 m.p.h. (20 km./hr.). Construction is reputed to have taken two years, no doubt with work done on a spare-time basis. This could provide a clue to the lack of Press notice — its appearance after all that time may have been regarded as an anti-climax.

The boiler, which puts one in mind of a porcupine, contained water in a canister of some 13 inches (33 cm.) diameter and 18 inches (46 cm.) in length. Its outer surface had attached a large number of projections, each about 3½ inches (89 mm.) in length, which would, no doubt, have been intended to increase the absorption of heat. The engine, a double-acting single-cylinder unit having a bore of 3½ inches (89 mm.) and a stroke of 5 inches (127 mm.) with link motion reversing gear, was underneath the rear seat and drove the Sarven-type wheels by chain. Steering was by tiller and a feature of the driver's position was a mirror mounted near his right foot to allow a watch to be kept on the boiler water gauge which was fitted alongside the rear seat. No doubt any overtaking or following traffic would have also been visible, thus making Ziegler a prime claimant to being the first to use a rear view mirror on a motor vehicle.

Although, as mentioned earlier. the casting of parts, the boiler making and the



This view of the Ziegler steamer clearly reveals its layout and the disposition of the mechanical components. The rear-view mirror, to be seen at the base of the control column, allowed the driver to keep watch on the boiler water gauge which can be seen alongside the rear seat.



This photograph of an early motoring group could well have been taken about 1905, as the type of tricar on the left with steering wheel and forecarriage was a short-lived style. J. A. Ziegler is seen at the tiller of his early steam buggy.

wheelwright's and carriage maker's tasks were undertaken by the specialists in Warrnambool, all other tasks and the assembly were carried out by Ziegler in his workshop at the rear of the Allansford premises. The vehicle was successfully run and, indeed, used for a number of years to carry him about the district in the course of his business The service life of the steamer is unknown, but it was probably more than ten years before it was broken up. The power plant went into a boat and the wheels and axles were incorporated into a milk delivery vehicle in the township of Camperdown.

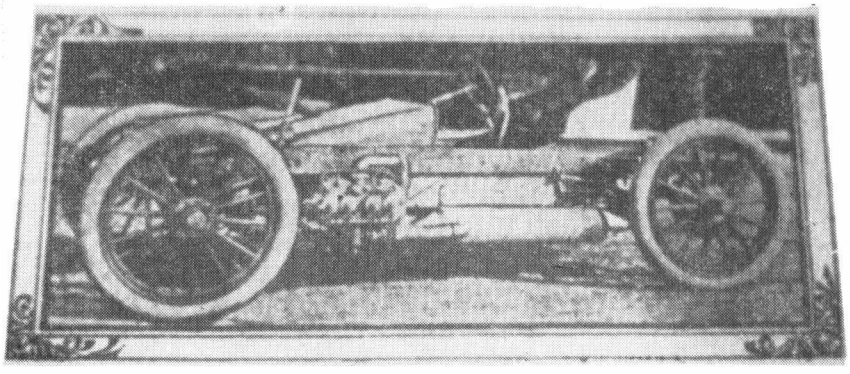
A further interesting chapter to the Ziegler affair is the story that he also built another similar machine, except that it used a two-cylinder engine, in 1898 and that it was driven to Adelaide in South Australia where it was purchased by a doctor there. If any substantiation of this event is found, it will place Ziegler in a sound position for recognition as the first in Australia to build a motor vehicle for commercial sale.

At some point prior to World War One Ziegler moved to Melbourne where he suffered greatly from the intense anti-German sentiment fostered by wartime propaganda. His business was ruined so, in the post-war years he moved, with his son's family, to the Smithton district of north-western Tasmania where he stayed until his return to Melbourne not long before his death in 1928. His aptitude in the field of engineering has been passed on to his descendants who, to the third generation have been, and are, involved with engineering in one form or another.

After many years service the boat in which the Ziegler power unit had been used eventually became derelict on the banks of the Curdies River. From there the engine and boiler were retrieved by the interested people who were aware of their historical significance. It is quite likely that without the concern and the testimony of these people the story of this early initiative of Johannes Ziegler, once common knowledge in that area, may well have been largely, or even entirely, lost.

The big question about this whole episode is just why the Press of that time apparently boycotted Ziegler and his efforts, as the prime sources say that the vehicle caused a sensation when it was revealed. Just whether this sensation was hostile or not was not stated. On the other hand, it is true that a lack of press coverage does not prove that an event did not occur, as most people can think of instances, of their own experience, when events were not reported by the media. All this, however, still leaves us with the unresolved role for the verbal historical record, especially of those days before tape recorders.

A PEEK AT THE NEXT ISSUE



This is the Stewart-Garbutt racer of 1904, and the factory in which it was built as it appears today. These and several other pictures are part of two extremely interesting articles contributed by J.H. Valentine, "our man in Los Angeles", which will be published in the next issue of this magazine.

The Stewart-Garbutt story includes a description of this unusual car and its enormous but very low speed engine (would you believe 350 r.p.m.?), an account of its accomplishments, and a mention of its later life as a non-racing family automobile.

Mr. Valentine's second article is about some previously unlisted cars made in Los Angeles, with pictures included. It makes one wonder about how many such unlisted makes are waiting to be discovered in cities and towns across the country and around the world.

A TALE OF TWO UPTONS

by Donald J. Summar

There seems to be a popular misconception that the touring car shown at the New York Automobile show in January, 1904, by the Upton Machine Company of Beverly, Massachusetts, was manufactured with only minor changes by the Upton Motor Company of Lebanon, Pennsylvania, in 1905. Actually, the vehicles were quite different in many respects. The only direct connection between the two firms and the automobiles they built was in the person of Colcord Upton.

Colcord Upton designed a planetary transmission for automobiles in the late 1890's and received his first patent in May, 1900. The Upton Machine Company was organized that year in Beverly to manufacture the transmission, although production had been carried on in a small way since sometime in 1898.

The firm built three one-cylinder automobiles in 1901, primarily as test-beds for the Upton planetary transmission. Commercial manufacture of automobiles began in the summer of 1902 when a 4-cylinder touring car was introduced, along with 2 and 4-cylinder trucks.

Colcord Upton resigned as vice president and general manager of the Upton Machine Company in July, 1903, six months before the 1904 Upton (also known as the Beverly) was shown in New York City. The 1904 machine was basically an improved model of that produced in 1902-1903 in very limited numbers. One important change was the use of a large honeycomb radiator in place of the coiled pipe cooler previously used.

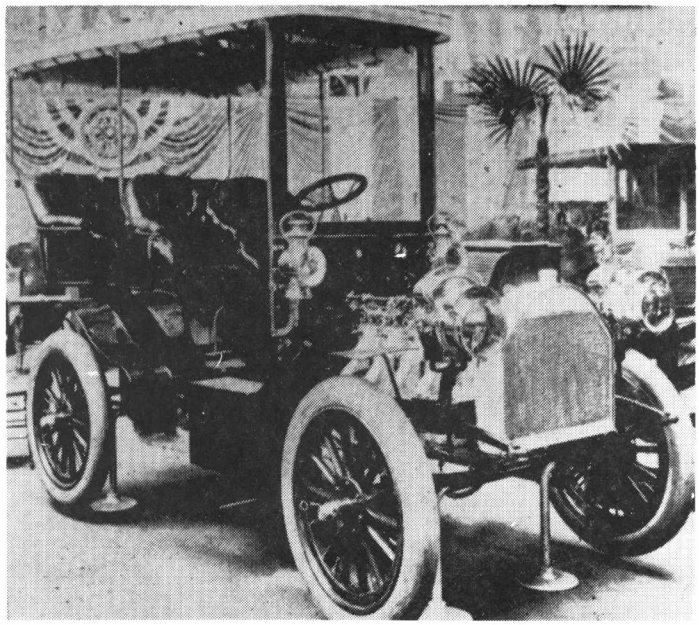
After leaving the Beverly firm, Colcord Upton organized the Upton Gear Company in New York City, where he manufactured transmissions for a time. By September, 1904, he was in Lebanon, Pennsylvania, manufacturing automobile water pumps under the Upton Motor Company name. Mr. Upton designed a touring car, the first of which was completed in 'anuary, 1905, in time to be exhibited at the New York Automobile Show at Madison Square Garden.

It was at the 1905 New York Automobile Show that the last known interaction between the Upton Machine Company of Beverly and the Upton Motor Company of Lebanon took place. In the fall of 1904 the Upton Machine Company had reserved a large space in "Exhibition Hall" (the basement) of Madison Square Garden, presumedly for showing its 1905 machine, while the Upton Motor Company had reserved a very small space on the main floor, presumedly for the exhibiting of water pumps. However, when the show opened, the Upton Machine Company had no exhibit and the Upton Motor Company showed its first touring car in the large space in "Exhibition Hall".

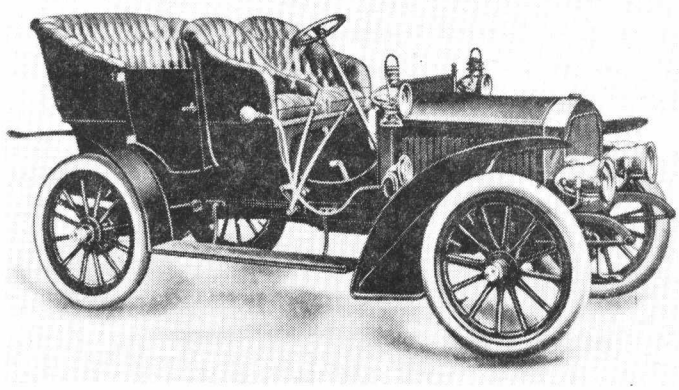
The Upton Machine Company had apparently ceased efforts to manufacture automobiles some time in 1904, though plans for a 1905 machine must have been dropped late in 1904. I can find no evidence of automobile production by the firm later than a trade journal reference in April, 1904. In September, 1905, the firm was reorganized as the Beverly Manufacturing Company, and in January, 1908, the buildings and equipment of that firm were purchased by the Cameron Motor Car Company of Brockton, Massachusetts, at which time the firm was building only Upton transmissions.

In Lebanon, the Upton automobile was made by the Upton Motor Company and its successor, the Lebanon Motor Works, until early 1907, when the business failed. Colcord Upton lived in Lebanon during that period, and I have been unable to find any subsequent connection between the firms in Lebanon and Beverly. The arrangement at the 1905 auto show may have been worked out between Colcord Upton and the officers of the Beverly company.

A comparison of the 1904 Upton and the 1905 Upton, both of which owe something to Colcord Upton, reveals just how dissimilar they were. The features which are considered include the engine, transmission, chassis and body, final drive, controls, and headlights. In this contrasting of the features of the two cars I have consistently referred to the Beverly product as the "1904 Upton", and to the Lebanon product as the "1905 Upton".



1904 UPTON, MADE IN BEVERLY, MASS., ON EXHIBIT AT THE NEW YORK AUTOMOBILE SHOW, JANUARY, 1904. (Photograph courtesy of Free Library of PHiladelphia)



1905 UPTON, MADE IN LEBANON, PENNSYLVANIA. (Courtesy Lebanon County Historical Society & Henry Westenberger)

ENGINE

The 1904 Upton used a 4-cylinder water-cooled 20 horsepower engine of the firm's own manufacture. The engine had a bore and stroke of 4 x 4½ inches, separately cast cylinders, and a cam-actuated low-tension make-and-break ignition system of the firm's own design. This Upton featured an overhead camshaft for the inlet valves, a 5-bearing crankshaft, and a crankcase cast to provide individual sections for each throw of the crankshaft.

The 1905 Upton used a 4-cylinder water-cooled 30 horsepower engine with a bore and stroke of 4¼ x 4¼ inches, and pair cast cylinders. Engines were presumedly supplied by Continental, for that firm filed suit against the Lebanon Motor Works (successors to the Upton Motor Company in August, 1905) to recover funds owed on engine sales to Upton. The engine had high tension ignition by Lacoste magneto and coil.

TRANSMISSION

The 1904 Upton employed the Upton planetary transmission with two forward speeds and reverse. A side lever controlled the forward speeds, while a foot pedal engaged reverse, disconnecting the forward gears at the same time.

The 1905 Upton had an Upton sliding pinion transmission with three forward speeds and reverse. It was connected to the engine by a foot-pedal operated cone clutch. This transmission, apparently developed by Colcord Upton at the Upton Gear Company in New York City, was made in the Lebanon factory.

CHASSIS AND BODY

The 1904 Upton, on a 90-inch wheelbase, weighed 2500 pounds. It was fitted with a 4- passenger rear-entrance tonneau body of aluminum, and came equipped with a fixed canopy top and glass front for $4,000.

The 1905 Upton, with a 100-inch wheelbase (98-inch on the prototype) weighed 2,000 pounds. It was fitted with a 5-passenger "King of the Belgians" body, apparently made of wood (based on inventory of factory contents in February, 1906), and was priced at $2.500. A folding top cost $200 extra.

FINAL DRIVE

The 1904 Upton had a short driveshaft from the planetary transmission to the countershaft, with final drive by dual chains. The 1905 Upton employed a driveshaft from the sliding pinion transmission to the bevel-gear rear axle.

OTHER FEATURES

The 1904 Upton had left-hand drive and left-hand control, while the 1905 Upton reverted to right-hand drive and right-hand control. The 1904 Upton had headlights which turned with the front wheels, while the 1905 Upton and later Lebanon-built products do not appear to have enjoyed that feature.

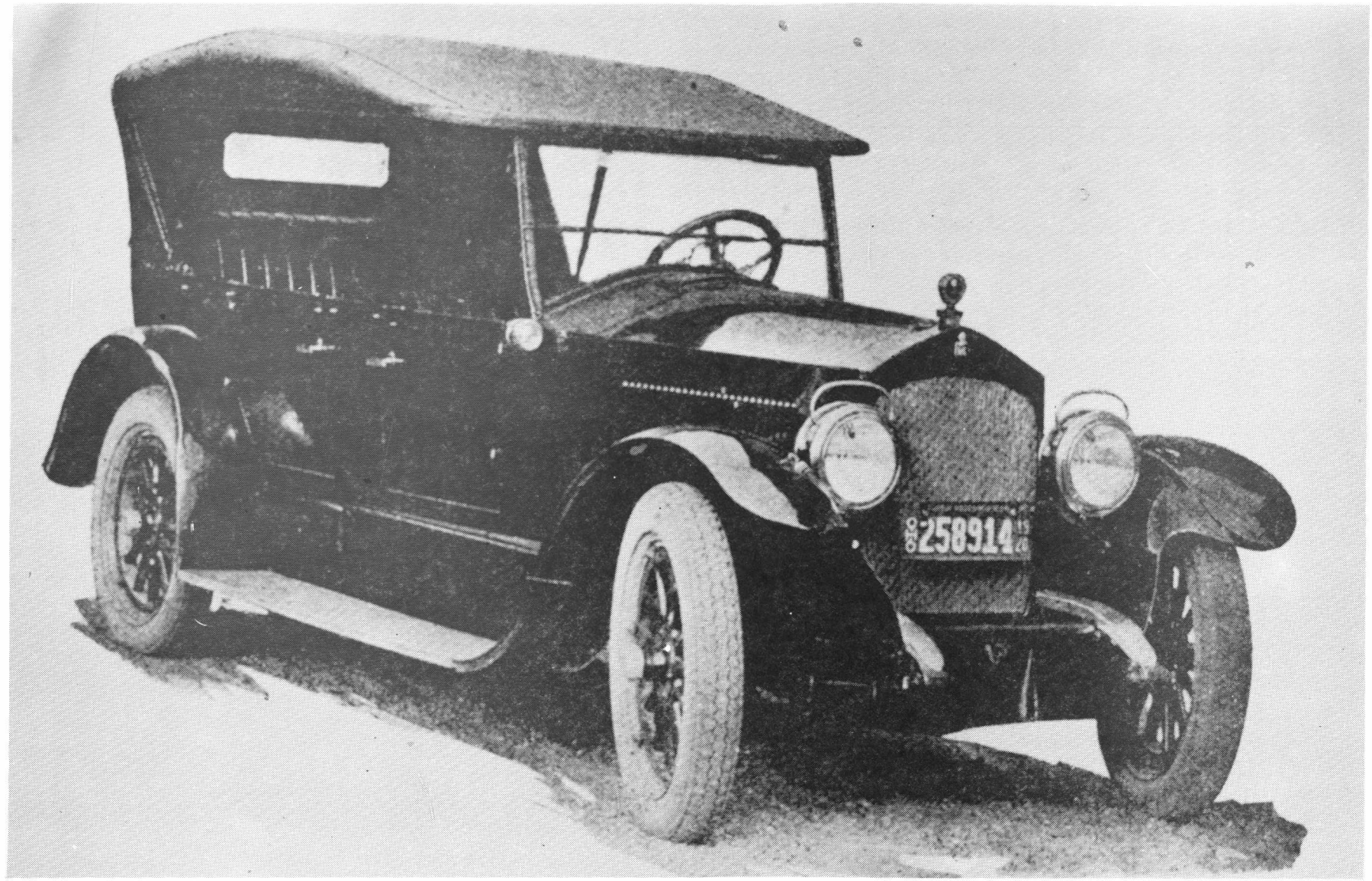
Based upon this examination of the features of the two automobiles and the career of Colcord Upton, it would seem that the cars were not related except in their basic concept, common to most cars of the period, and that the two corporate entities were not related except through the person of Colcord Upton. Certainly the car built in Beverly in 1904 was not of the same design as that produced in Lebanon in 1905.

FOR ARTICLES CONTRIBUTED TO THIS ISSUE, WE THANK THE FOLLOWING AUTHORS:

W. DENNEY FREESTON, JR., Atlanta, Georgia
CHARLES Y. KNIGHT and THE SILENT KNIGHT. Denney Freeston is the editor of THE STARTER, the quarterly club publication of the Willys-Overland-Knight Registry, from which this article is reprinted. (He's not an SAH member, but I'm working on him. Ed.) President of the WOKR Registry is David Bell, who is a member of SAH.

AUSTIN MAXWELL GREGORY, Drouin, Victoria, Australia
THE DIFFIDENT ZIEGLER, OF DISTINCT DOCUMENTARY DEFICIENCY. Max Gregory has been a frequent contributor to the SAH publications. He has done a great deal of research on the cars of Australia, particularly the very early ones, the results of which he regularly shares with the rest of us through his writings.

DONALD J. SUMMAR, Lancaster, Pennsylvania
A TALE OF TWO UPTONS. Don Summar's specialty has always been research into the history of cars made in Pennsylvania, and the factories in which they were made. Many of his well illustrated articles have appeared in these pages, and also in the pages of the SAH Newsletter.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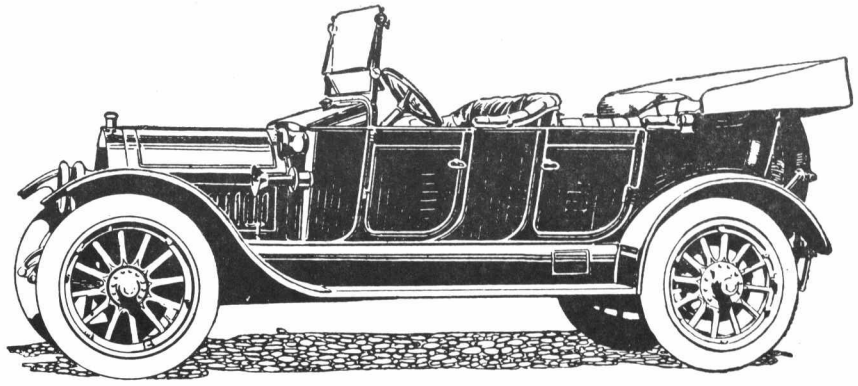

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