

THE HUB CAP

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THE HUB CAP

The Hub Cap is published quarterly by the Wisconsin Region of the Classic Car Club of America. It is not possible without the kind help of our members. Please send your articles, photos, car histories, ideas and/or just reminiscences about the club. You do not have to be a good writer, that is what your editors are for! You may contribute to the newsletter either by mail, 619 South Main Street, Lake Mills, WI 53551, email *edfors@charter.net* or call 920-648-3067.

The opinions expressed in this newsletter are those of the authors and may or may not be those of the club, either National or Regional, nor its managers or editors. The editors reserve the right to edit any material submitted for publication. Businesses and products mentioned in articles are for informational purposes and are not to be construed as endorsements.

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Joyce Edfors, Thomas Edfors, Carl Jensen, Carrol Jensen, Ed Miller and Robert Rippberger Jr

DIRECTIONS

by Regional Director

Bill Tess

Hello Wisconsin Region Members. To begin this issue, I want to give a special and much deserved **THANK YOU** to our associate members, club spouses and regular guests who are all so vital to our activities and the total club spirit. In most of our events, the associate members, spouses or guests make up nearly half of the total attendance and without their support and enthusiasm the gatherings would certainly be far less enjoyable.



Me and my associate member, Maria, in our 1939 Alvis Sports Saloon at the Milwaukee Concours d'Elegance

For this reason, I want to promote a membership perk. For the 2019 renewal process, consider adding your spouse, or family member or regular guest to the official associate membership roster. It is so easy, just add an associate name (currently \$10) to your annual national renewal and it is done! **Bonus**, a national associate membership now gives you a complimentary (no charge) associate membership in the Wisconsin Region. An associate member can vote in both national and regional elections, will be listed as an associate in both national and regional directories and can apply for a seat on the Wisconsin Board of Managers to help direct the future of the club. It is a good decision.

As I anticipated, the Spring Driving Tour (Cannonball Run) was outstanding and even the morning rain didn't cause much concern. Thanks again to Tom and Joyce Edfors for the terrific stops and

detailed arrangements – the day will be remembered fondly. More on the drive is written and pictured in this issue, along with other interesting articles.

By the time you read this message, you will be close to enjoying the 50th Celebration Club Picnic hosted by Paul and Jan Grant at their home in Franklin, Wisconsin. Paul is our new Treasurer and along with Jan produced an innovative concept via email (no postage or printing costs incurred by the club), complete with easy-to-reply confirmation and dish-to-pass choices. The Perfect-Potluck online format will give attendees a grand (Grant) food selection without any duplication. Like all the past 49 Classic car picnics, come with a big appetite and lots of Classic car stories – past and current.

Next up it is on to the Milwaukee lakefront for what is going to be a world-class automotive event, the Milwaukee Concours d'Elegance. The weekend program includes a major presentation with a planned car tour, panel discussion and gala social on Saturday, August 4th. The formal judged Concours and Show & Glow paddock, with a vendor showcase, is set for Sunday, August 5th. If you would like to join club members in the reserved paddock area contact Herb Brumder (262-367-2386) in advance. For details visit the new website www.milwaukeeconcours.com.

The club needs your experience and guidance! The Board of Managers welcomes dedicated members (men and women) into the elected Board each year. The Board meets five times per year generally on a Thursday evening at the Summit Credit Union in West Allis. Please contact me, or any current board member, so we can begin the process for 2019. It is an experience you will surely enjoy!

Maria and I look forward to seeing you at all the exciting events planned this summer and fall. Happy Motoring!

ON OUR FRONT COVER

Herb Brumder's in his 1938 Bugatti Type 57 with passenger Brandon Butler in front of TLC Restorations in Milton, Wisconsin during our Spring Tour (Cannonball Run)
See related article on pages 10 - 12

Photo by Bob Ripberger Jr owner of TLC Restorations

THE KEN HOLLUB MEMORIAL CAR SHOW

by Thomas Edfors

Planning of a car event, be it a tour and/or a car show, can be a significant undertaking but the one thing out of any organizer's control is the weather. Joyce and I are quite aware of that with the rainy start, and morning drive, on our spring tour. So, it was with some trepidation on July 1st that we loaded our 1909 Regal(nc) on the trailer to head to the Ken Hollub Memorial Car Show, 'hosted' by our own Brandon Butler. Weather reports for days prior indicated not just rain, but serious thunderstorms. However, we and many others ignored the weather reports and drove to the Heritage Senior Living Center in Waukesha.

In the Winter 2018 *Hub Cap* (which you should all still have a copy, don't you?!) on pages 12 - 13 Brandon contributed an article regarding the show which gives a brief history of who Ken Hollub was. Please reread the article for more information on Mr. Hollub and the origins of the Memorial Show. Brandon is the lucky owner of Ken's 1930 Model A Ford Sport Coupe(nc), which was on display.

This year's show was attended by several WIRCCCA members, both showing cars and/or volunteering (including Paul and Jan Grant, sans car). It was heartwarming to see our members share their time and cars with a show benefiting such a worthy charity as all funds raised go to the Alzheimer's Association. This is a very important association and their work is most beneficial. Many of us are of the age where we have family members with Alzheimer's or dementia and know firsthand the devastation these diseases can do.

Having had a bit of bad health luck over the past three years, with new parts installed in my hips, it dawned on me as we turned onto Main Street with the Regal(nc) in the trailer that I not only had to learn how to start/drive the Regal again a few days earlier but also yearly have to relearn how to drive a truck with a trailer attached. I felt like a novice, but we made it to the exit off I-94 to Waukesha. As we were driving east we saw the sky getting lighter and as we parked, it was sunny. Someone (perhaps even Ken Hollub himself) was looking over Brandon as most show hours stayed dry and sunny, although somewhat hot. But then again, we had been living in furnace-like conditions for the past week, so this was not really a problem.



Our 1909 Regal 30 Touring(nc) - First Place American Car

While unloading our car we noted a motor home with a trailer parking at the end of the lot. It was John and Bunni Boswell and they proceeded to bring out their 1916 Model T Ford(nc). Wow, more than one brass-era car at the same show! Mike and Deb Korneli arrived in their 1959 Jaguar XK-150 S(nc), which had an unfortunate flat tire problem with difficult removal of the wire wheel issue on the way (that could be an interesting story itself). Paul Bogusz was there too with a much more modern, but very neat, Merkur XR4Ti(nc). For club Classics, George and Laurie Beyer displayed their 1928 Packard Phaeton and Carl and Carrol Jensen had their 1930 Stutz Speedster. Dick and Lee Profio came to see the show (but had to leave early). A good turnout indeed.



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*Brandon Butler and Mike and Deb Korneli's
1959 Jaguar XK-150 S(nc) - First Place Foreign Car*

There were two other Classics, both Cadillac's. One was a 1940 Sedan and the other a 1941 Coupe. Both beautiful but sorry to say neither owners were members of WIRCCCA.



*1940 Cadillac 60 Special Fleetwood
2016 Ken Hollub Memorial Car Show Best of Show winner*

Hamburgers, hot dogs and brats, all with chips included, were available and there were many items, mostly in baskets, to be raffled with proceeds to the aforementioned charity. Many simply made a donation to this worthy cause.

The threat of rain shortened the show somewhat and awards were given early. I had just sat down and was not paying attention when others around me said that I, well the Regal(nc), was number 18 and number 18 had just won First Place in the American Car Class. What a happy surprise! The

Korneli's won First Place Foreign Car and the Beyer's Won Best of Show! These awards were voted on by the general public and car participants (popular vote) which makes the awards quite special.



*George and Laurie Beyer's 1928 Packard 8 Phaeton
Best of Show*

At this point in time the sky started to look threatening. Everyone started to scatter with the open cars leading the way out. We got our car into the trailer in time to get some ice cream (and ice cream is a must at car shows and/or tours) at Culvers before getting on I-94, then west to Lake Mills. None too soon though as we hit a bad storm just east of HWY 83 and another just before our exit. But we made it home safely and were very glad we attended not only a fun but also a meaningful car show. For those who did not attend this year please plan on being there next year. All of us should tell our car friends to bring a car for display (but limited to original/unmodified pre-1987) and/or just come and experience the show. Thank you, Brandon, for all your work in making the show possible, and a great success!



WIRCCCA winners Mike Korneli, me and George Beyer

2018 ACTIVITIES

JULY 14th... Saturday Wisconsin Region club picnic, Franklin, WI *Paul & Jan Grant*

AUGUST 4th - 5th... Saturday - Sunday Milwaukee Concours d'Elegance, Milwaukee, WI
Carl & Carrol Jensen

August 12th... Sunday Botham Vineyard Car Show, Barneveld, WI

August 18th... Saturday Baird Cars, Coffee & Cookout, Mequon, WI *Paul Westphal*

AUGUST 26th... Sunday Geneva Concours, Geneva, IL

SEPTEMBER 23rd... Sunday Fall Driving Tour (destination tba) *Andy Bogusz & Brandon Butler*

OCTOBER 27th... Saturday Halloween Party, South Milwaukee, WI *John & Bunni Boswell*

NOVEMBER 4th... Sunday Annual Banquet, Meeting & Silent Auction Location tba (*coordinator needed*)

The club welcomes other proposed activities/dates for board approval - please volunteer!

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MORE TO BRANSON THAN MUSIC

by Carrol Jensen

The 65th Annual Meeting of the Classic Car Club was held in Branson, Missouri this year and Wisconsin was well represented. This departure from our typical coastal location was viewed as an opportunity for some Midwesterners to forego the flight for a driving adventure and several did!

While Carl and I have attended almost every meeting for the past 15 years, it was so great to have many members of the Wisconsin Region join us this year including George and Laurie Beyer, Mike and Deb Korneli, Bob and Barb Lorkowski and of course our Executive Director, Jay Quail. Mike and Deb were very gracious in trailering our 1925 Marmon to the event after our last-minute decision to exhibit the car at the Grand Classic®.

While I was attending to CCCA business with the National Board during the day on Wednesday, those arriving that day were able to walk right across the street to the train station and enjoy the Branson Scenic Railway that runs through the lovely area of the Ozark mountains; a 40-mile train ride at a perfect time to catch flowers in bloom.

The Hospitality room Wednesday night was overflowing with members reuniting after a long winter and we all enjoyed the camaraderie that a National event can bring. It was a great time to catch up with friends from other states and talk about the next few days. We made transportation arrangements for those that flew into the Springfield-Branson airport so they didn't have to rent a car for the 45 minute ride. They arrived in plenty of time to greet friends, pick up their name tags and registration packets for the remainder of the week.

Thursday morning started early with our business meeting to update the members on various projects and activities within the club. The results of the election showed that two new board members were voted in, David Kane and Webster Peterson, and Steve Babinsky, Walt Gosden and Vicki Zeiger were reelected. Following the membership meeting, a National Board meeting was held to elect new officers at which time I was honored to be voted in as your new President. After one more meeting dedicated to Publications



New CCCA President, Carrol Jensen, with outgoing President, Tom Jones

and Regional Websites, we headed out on buses to a fun lunch spot and tour of the Branson Farm and Auto Museum. Many of our members are/were farmers and appreciated the history of the farm implementation equipment along with great cars including many Full Classics® on display. The evening followed for MOST of the members with a wonderful dinner and show aboard the Branson Belle Showboat. Stiff winds prevented the boat from leaving the dock but everyone had fun anyway with some members participating in the show itself!

Why do I say MOST members made it to dinner? While everyone else was taking the bus to the boat launch for the dinner cruise, the Jensens thought it would be fun to drive our 5 passenger Marmon to the location of the boat because it was a beautiful sunny day with an 80+ degree temperature and it was only 12 miles away.....what could happen? Well, first we put **6** people into a "5 Passenger" Phaeton (our Wisconsin friends George and Laurie

Continued on page 8

Branson continued from page 7

and Mike and Deb Korneli joined us) and second, we grossly underestimated the hills we would need to climb in order to get to the destination. On the very last set of hills, the "Big Girl" as we call her, decided to call it quits. So while the three buses holding all other members of the club drove past us, the newly elected President of the CCCA, her husband and four friends stood by the side of the road waiting for our car to stop spewing radiator fluid and then we backed her down a hill. After we let her cool down for a while, we drove her safely back to the hotel and went to dinner on our own. I had many people texting and sending me photos and videos of the dinner cruise so that is how I know they had a good time! It was a fun conversation later that night in the Hospitality room as folks commented on our bad luck! All old car rides are fun and create memories and that is what really matters!

Friday morning started with breakfast and the Regional Relations meeting that allows all the Regional Directors to meet and discuss the challenges and triumphs of their regions over the past year. Then we headed out to lunch at a lovely country club setting before getting to spend over two hours with a personally directed tour of the Evergreen Automotive Museum, owned by member Steve Plaster. An advantage of membership in this fine organization is a tour like this through over 400 cars that range from the early 1900's all the way to new. You found Full Classic® marques of Auburn, Cord, Lincoln, Packard and Stutz along

more obscure names like Amilcar, Owen Magnetic Pathfinder and Roamer. A special treat was the "Duesenberg Room" which housed five different Duesenbergs alongside a Mercedes Benz 540K! Everyone was amazed at the diverse collection and the great stories that Steve shared about how he and/or his dad acquired the various vehicles.



L-R Deb and Mike Korneli, Carl Jensen and George Beyer with "Big Girl"

After a long bus ride back to Branson, the group took a short break and then headed out to the Regional Awards Banquet. The weather had turned windy and rainy during the afternoon and our location for dinner, the Stormy Point was aptly named as we fought high wind and horizontal rain getting in and out of the bus. This banquet is a great opportunity for the regions to bask in their

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accomplishments from the previous year for overall participation, publications, Grand Classic® or CARavan hosting and gives them time and a place to congratulate others on their success. Micky Gilley was a special and surprise guest at dinner and was gracious enough to say a few words and then take pictures with various members present.

While the Grand Classic® itself did not have a large volume of cars, it was an extremely diverse and interesting array of rarely seen fine automobiles. The list included a 1921 Daniels Brougham deVille, an unrestored 1936 Horch, a lovely 1936 Auburn Cabriolet, a 1932 Packard Convertible Coupe with a custom Louie Vuitton trunk, a 100 point 1934 Brewster and two Pierce-Arrows among others, including our 1925 Marmon that we showed for exhibition only. Cocktails, drinks and dinner was served amongst these stunning cars and the Warshawsky Award was presented to the beautiful 1937 Packard 1507 Coupe Roadster.



*Award winning
1937 Packard
1507 Coupe Roadster*

Every annual meeting creates great memories and gives members a chance to view a private collection and/or tour that the general public never gets to see. That distinction continues with our next Annual Meeting so make plans now to join us in Scottsdale, Arizona the week of January 12th, 2019 as we look forward to enjoying more time together during Auction Week!

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CANNONBALL RUN

by Maria Tess



*View of Herb Brumder's 1938 Bugatti 8 Type 57
from Carl and Carrol Jensen's 1948 6 Jaguar Saloon*

On Sunday, May 20th, the much anticipated Cannonball Run took place. The spring driving tour began at the McDonalds in Delafield with the destination being the Civil War Living History Festival in Milton, Wisconsin. The rain couldn't dampen the spirits of the thirty-plus members and guests who gathered early that morning. Only four other people (two cars) didn't make it due to the weather and a few Classics scheduled to attend were not brought out. Before long it was time to get our packets with the route sheets included and line up for the drive (Classics to the front). As is their style, Tom and Joyce Edfors planned a very scenic route on rural roads with most having a speed limit of 45mph. They always do a great job avoiding highways and busy streets.



A pink Cadillac(nc) under restoration at TLC

Most of the day's activities were centered around the Milton city square, so we parked our vehicles in a designated area and headed to the first stop. The owners of TLC Restorations, Robert "Rip" and Denise Rippberger, invited us for a tour of their facility. Upon arrival they graciously offered us a selection of sausage, cheese and crackers, coffee, lemonade and delicious homemade chocolate chip cookies. We got to see several cars in various stages of restoration and he explained how they built the business and work process. We all were impressed with the shop and the cookies!



Carl and Carrol Jensen's 1948 Jaguar from the exterior

We then split into two groups and took turns touring the Milton House Museum. The Milton House, was a stop on the "Underground Railroad". The original founder of the Milton House, and the town itself, was Joseph Goodrich. I asked the docent why the town was not named Goodrich. She told us that when the Seventh Day Adventists left their homeland they felt "Paradise Lost" and when they settled in Wisconsin they felt "Paradise Found" and therefore they decided to name the town after John Milton, the English poet, who wrote "Paradise Lost". The phrase "Underground Railroad" was used as a code. These safe sites were called "Stations" and those who assisted were referred to as "Conductors".

Being it was the Civil War weekend, we had the opportunity to go on a special tour that occurs only



Cannon firing

once a year during the festival. We were led into the cellar where chairs were set up. I really thought they were going to show a video, but instead out of a wooden door came an actress playing a female slave. Her portrayal of a slave's story and her search for freedom by means of the Underground Railroad was powerful. Then she showed us the tunnel where we walked in the footsteps of those who used this passageway so long ago. It lead us up to the Pioneer Cabin which was the tunnel's secret entrance/exit hidden below the floorboards.

There were tents set up around the encampment, one with a sutler (a civilian salesperson) selling "snake oil" and the other demonstrating some of the shackles that were used during that period. Jim Hernke's guest, Joan, got to experience a head-piece placed on her head and face and I am confident that even in the short time she wore it, she felt the demeaning and uncomfortable nature of such treatment.



Milton House photo taken on one of the Edfors' planning trips

The planned timing of the museum tours was perfect because we were done in time to walk behind the museum and watch the firing of the cannon set up as part of the Civil War Encampment. One cannon was capable of firing a distance of 800 yards! Reenactors gave demonstrations about the cannon and musket firing. Fortunately, the light rain had stopped for these outdoor events.



A sutler reenactor hawking his wares - this guy really knew his history

Continued on page 12

Cannonball Run continued from page 11

One of the women near where the cannon were located was wearing a uniform and I asked her about the role of women in the Civil War. She informed me that at the onset of the war women were allowed on the battlefield with their husbands. That practice was quickly eliminated. She then said that many women, to be near their husbands, dressed incognito and pretended to be men. She actually showed me a book with a picture of one such woman. I still haven't figured out if she was one very unattractive woman or a very homely man.

There was time before we had to be at the restaurant, so some of us ventured over to the Northleaf Winery. We experienced the four sample tasting. Carrol and Carl Jensen treated the group to cheese and crackers. Everyone agreed that the apple cinnamon cheddar was delicious. Then we headed to the Parkview Cafe which was closed to the public for the WIRCCCA. It is a wholesome family run small town business and

everyone was very pleased with their meals, which were ordered off the menu and on separate checks.

After lunch it was time to get back on the road for a continuation of our driving tour. As we left the parking lot, the Rippbergers of TLC Restorations had us each drive in front of their establishment and Rip took photos of our cars (the cover is one of these photos). It was quite a nice gesture as we bid farewell to Milton.

We continued on a very picturesque drive, part of which was around Whitewater Lake. We arrived at the quaint LaGrange General Store where a terrific selection of ice cream tempted our palates. I thought one of the more unique flavors was lemon poppy-seed. We all relaxed and enjoyed a nice social experience. From this location we all thanked Tom and Joyce for their efforts and talents to make the Cannonball Run so successful and then headed home via our own individual routes. What a tremendous way to start out the spring/summer driving season!



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EDITOR'S NOTE

The following is from a chapter from the book by Ed Miller *"Road Testing Cars of Distinction"*.

This appears by the author's permission as written and will be featured in installments over the next several issues of *"The Hub Cap"*.



Chapter Two: *Third Installment* 1935 Bentley 3½ Litre Aerodynamic Sport Saloon, body by Rippon Brothers

The fuel system starts at the rear of the vehicle with an eighteen imperial gallon capacity gasoline tank. An imperial gallon is approximately 20% greater than a U.S. gallon. Two imperial gallons act as a reserve. This reserve gasoline is contained in the same tank. A separate and longer tube is used to bring it forward. This tubing is brought into play by a switch on the dashboard. Twin 1³/₈" Skinner Union (S.U.) side-draft carburetors mix the gasoline and air. As with any other S.U. carburetor, you can entertain yourself periodically by unscrewing the top cap and adding a few drops of sewing machine oil. Twin S.U. electric pumps force gas forward. They may be operated individually or in tandem. Just like any other S.U. electric pump, if both pumps stop working, tap one or both smartly once or twice. It will get you a few miles further down the road.

The spark is provided by a twelve volt system. The distributor has an automatic advance plus a manual advance for unusual situations and for cold starting. The 3½ Litre Bentley engine is rated at either 114 HP or 115 HP @ 3,800 RPM, depending on which book you happen to be reading.

The clutch is a typical 10½ inch single driven dry plate. It is mechanically operated. The transmission is more interesting. It consists of four forward and naturally one reverse gear. The top two forward gears are synchronized. Stop rubbing your eyes, you read correctly. Only the top two gears are synchronized. This can lead to some frustration in shifting, particularly from first to a non-synchronized second using a double clutch method and then upward through the gears

without double clutching. However, Bentley Motors recommends that at a stop, the driver initially accelerate not in first but second gear. First gear is reserved for starts on your typical San Francisco street. To further confuse we colonials, the gear-shift lever and hand brake are located to the far right, fortunately so is the steering wheel.



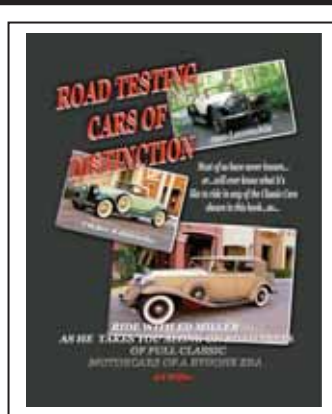
The position of the handbrake and in particular the shift lever make it all but impossible to use the driver's door for a graceful entry or exit. Notice, at the bottom of the front seats bracing that only an orthodontist could appreciate. This is the very unusual and avant-garde rake adjustment.

An open driveshaft with universal joints has needle bearings that required infrequent maintenance. The rear axle is of the uncommon full floating variety. Within the rear-end casing are off-set hypoid bevel gears which reduce the noise level. The rear-end ratio is either 4.1 to 1 or an optional and rare 3.9 to 1.

The leather encased springs and shackles are lubricated by a centralized lubricating system. A handle located under the dash should be applied once a day to lubricate numerous parts of the chassis. Occasionally inspect the "U" bracket bolts that secure the springs to the axles as they can work loose. Along with the springs come hydraulic double acting shock absorbers. The front pair of shocks are combined with a unique articulated triangular shaped tubing. Its purpose is to resist torsional displacement of the front axle during hard braking. Eighteen inch wheels are combined with 18 X 5.50 splined wire wheels, often covered by discs.

Steering is by worm and nut with a fast turning lock to lock of 2.6. A turning circle is typical of the day at roughly forty feet.

Brakes are encased in twelve inch drums. They are internal expanding mechanical brakes. 178.8 square inches of brake lining area is available to bring the Bentley to a halt. If you add the emergency brake lining area, you have 232.8 square inches. A fascinating brake feature is the brake assist. It is mechanical and complicated. It derives its power from the transmission and it would take more pages than this book to adequately describe.



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Road Testing Cars of Distinction captures the very essence of pre-WWII luxury automobiles. Unlike other books, *Road Testing Cars of Distinction*, takes a very deep dive into the engineering, driving and performance that make our Classic cars extraordinary. *David W. Johnson*

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VAPOR LOCK PROBLEMS WITH ETHANOL AND POSSIBLE MITIGATIONS

by Jim Chase, Copyright November 2017

Assistant Editor's Note:

The following article is reproduced as written. Various cars mentioned are non-classics but "nc" has not been inserted. The article is lengthy and will be printed in installments with the author's permission.

Part II Vapor Lock Problems and Fuel Pumps

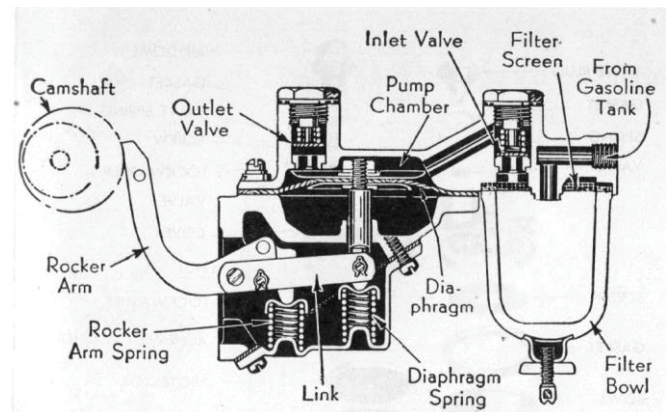
In Part I, the problems of ethanol and high temperatures in the fuel system leading to vapor lock were discussed, primarily regarding hot restart and initial running that is dominated by heat soaking of a hot engine. With the car standing still and shutdown or idling the problem is dominated by spikes in fuel system temperatures under the hood when there is little or no airflow to cool the fuel system and the fuel flow is tiny at idle, maximizing the exposure time of the fuel to the high temperatures.

The fuel pump plays a role in vapor lock for restart, hot idle and driving vapor lock. I have observed the behavior of the fuel exiting the fuel pump on engines in the process of vapor locking at hot idle by watching the fuel in a clear gas fuel filter between the fuel pump and carburetor. As the hot engine ticks over the liquid fuel in the line slowly evaporates until there is no liquid at all visible. The engine starts to slow as it leans out from fuel starvation. Suddenly over just a few strokes of the pump the filter completely refills and the process starts over again, slowly draining the line of liquid until there is none. This occurs in the same way on two different '66 Chryslers, one that has had hot idle vapor lock problems while the other never has.

Last summer I observed this in my '35 Pierce-Arrow without the hood or fenders installed, leaving the carburetor open and not as susceptible to the high temperatures when trapped under the

hood of a motionless car. A clear fuel filter was installed in the fuel line between the pump and carburetor. I controlled the water temperature to get it near to the boiling point ($>200^{\circ}$) and let it idle. The fuel bubbled and disappeared from the clear fuel filter and eventually the engine slowly leaned out and died. I repeated the test, but as it leaned out and approached stall I misted some water on top of the pump. Immediately it refilled the filter and recovered. Cooling the pump is effective. An old trick for curing vapor lock was cutting a grapefruit in half and smashing it down on top of the fuel pump to keep it cool.

After some cogitating I think I have an understanding of what happens in the fuel pump. An illustration of a typical engine mounted fuel pump is shown below.



Typical AC Fuel Pump from MoToRs manual 1948

The pump has a flexible diaphragm pulled down by the pump rod actuated by a lever oscillating against an eccentric on the engine camshaft. The diaphragm works in the same way as a piston sliding in a cylinder with two one way check valves on top. The inlet valve opens when the diaphragm is pulled down sucking fuel in. On the upstroke the diaphragm creates positive pressure, closing the inlet valve and opening the exit valve pushing the fuel out into the fuel line towards the carburetor.

The pump is a clever design, where the force for the upstroke is provided by a spring rather than being forced up by the pump rod. The spring is designed to provide the correct force to create the intended fuel line pressure, generally 3 1/2 to 4 1/2 psi. Since the engine demands for fuel vary, and are much less than the capacity of the pump, the diaphragm slowly is pushed up by the spring as the carburetor float valve opens to flow more fuel into the carburetor bowl. The actuator rod is always engaged with the lever riding on the camshaft pulling the diaphragm back down to the "bottom dead center (BDC)" on each stroke, but the carburetor float valve and the fuel trapped in the line prevents the fuel in the pump from flowing out and letting the diaphragm take a full stroke to the top of the pump. Thus the diaphragm is constantly oscillating up and down near BDC taking very shallow strokes based on the engine demand.

The check valves have weak springs on them to help them close and seal smartly. These springs force the condition that the inlet valve will only open and allow more fuel into the pump when the

pressure in the pump is a definite value less than the pressure at the inlet line – the "cracking pressure". When the pump is sucking fuel in it is both the lowest pressure in the system and hot: an obvious source of vapor.

With the capacity of the pump being 20 to 40 times the volume of liquid fuel required by the engine at maximum power in order to deal with vapor, it is clear that the pump is capable of pulling very high vacuums in the inlet line at full stroke. It is this vacuum that makes the pump able to self prime and draw fuel from the tank even with very large vapor volumes, or when completely dry.

Say a hot engine is idling with the pump nearly full of liquid fuel. The diaphragm oscillates very slightly up and down near BDC, taking very small strokes and pumping very little fuel to meet the low demand at idle controlled by the carburetor float valve opening and closing. The diaphragm is like a piston in a cylinder. When mostly filled with liquid, the liquid does not expand and all of the expansion has to take place in the small volume of vapor at the top of the pump. The downward stroke can create a large vacuum to pull liquid fuel into the cylinder.

The fuel trapped in the space above the diaphragm in the pump chamber is heated by the hot surface of the top of the pump and begins to generate vapor. When the pump is full of vapor it has to expand the entire volume of vapor above it as it pulls down, generating little suction.

The vapor exits into the fuel line displacing the liquid in the line. As the vapor exits, the pump stroke increases to meet the loss in volume. If the pump is hot enough it will boil the volatile constituents of the fuel and keep the pressure in the pump clearance space high enough to prevent more fuel from opening the inlet valve. Basically the pump is a little boiler keeping the inlet valve closed and flowing vapor out the outlet valve. As the pump generates more vapor, and as the stroke increases, the diaphragm simply rides on a cushion of vapor, unable to draw deep enough to suck more liquid fuel.

When the pump stroke finally increases to the point of sucking in a small amount of liquid fuel through the inlet valve, the incoming liquid cools the vapor trapped in the pump reducing the boiling.

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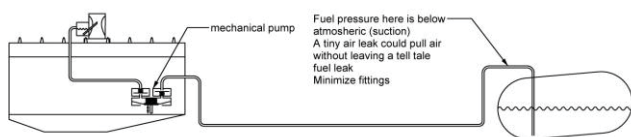
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The next stroke pulls in more liquid cooling more vapor, and suddenly within a few strokes the pump and line to the carburetor refill with liquid and the process starts over.

This helps explain the process at the low fuel flows of idle. As was seen in the temperature chart in Part 1, an engine pulling a steep grade at near maximum power has lower fuel system temperatures than at idle thanks to the cooling airflows. This is despite the much higher heat being generated by the engine at power - particularly the hot exhaust manifold. So, with lower overall fuel system temperatures why do some cars actually have more problems with driving vapor lock at high speed than at idle or restart?

The key is higher fuel flows. Volatility is the tendency for a fuel to evaporate at a given temperature and pressure. Either a rise in temperature or a drop in pressure increases the tendency to evaporate. One of the biggest pressure drops in the system is going to occur at the fuel pump inlet, where it must draw fuel around the spring loaded flat valve disk. Ticking over at idle a 350 in³ engine is going to flow an average of about ½ gallon per hour of fuel. At 140 hp the fuel flow will increase to about 19 gallons/hour. The pressure drop through the fuel system is a function of the flow squared (2 x more flow = 4x more pressure drop), When trying to draw large volumes of fuel through the inlet check valve it follows that it can create considerable suction inside the fuel pump.

The following schematic shows the typical fuel system of cars from the 1930's through '70's.



Note that when the line rises above the fuel level at the tank the pressure is below atmospheric (suction), and if there is any leak in a fitting above fuel level it could draw air instead of liquid and the line would not leave a tell-tale fuel drip. Air can leak large volumes through tiny holes and could be a factor in vapor lock.

When being driven at speed and load after a hot idle, the temperatures of the whole fuel system drop as the flow of fuel from the cooler fuel tank increases dramatically, with more volume and less exposure time to hot surfaces. The higher fuel flow, however, creates higher pressure drops in the fuel line between the tank and pump and increases the suction needed to pull the fuel from the tank. Dropping the pressure now means the fuel will vaporize at a lower temperature and can begin vaporizing some fuel ahead of the pump. When forced through the hot pump inlet and check valve it generates more vapor. At high RPM, the combination of vapor and liquid thrashes violently against the hot surface at the top of the pump, further increasing the evaporation inside the pump.

To be continued in the next Hub Cap

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