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Brougham Owners Association

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Our schedule for 2002 submissions will be as follows:
December 1st for the Winter issue to be mailed December/January

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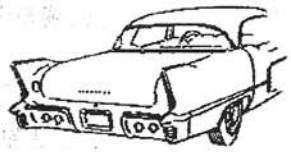
During the past few months we have had a rough time with all our communication systems starting with some inside and outside phone wiring problems. Due to the problems, our fax went down and is still down until I can find a way to have the manufacturer clear the voice mail section of the unit. False signals also disabled our answering machine which left us without a clue as to who was calling. To top it all off, I was notified that the computer had a worm or virus of some sort. Well, I am pleased to say that the phone now works, we have a new answering machine, and whatever the worm or virus was is gone. Just a reminder, since I work crazy hours in the car business Sunday evening is the best time to call. I will do my best to get back to you if you leave a message, but it may take a while. Dues will be mailed after this issue is mailed and I ask that you take a few minutes to send in your dues. The holidays will be here soon and dues I know will take a back seat. We are about to enter our fifteenth year and with your help this little group will keep going. We are looking forward to working with Mike Brooks on updating our web site. Mike has the know how and we have the information to make this the definitive Brougham database. We hope that you will help us by sharing photos, technical data, without the risk of letting any of the material out of your hands. Most everything can be scanned and sent electronically and, with digital cameras, photos can readily be shared. There are endless possibilities in this project. Let's pull together again and make this one happen. Have a great Thanksgiving and dig up some contributions for the last issue of the year.



Till next time,

ON OUR COVER

Our cover car this issue is the magnificent Dakota red Brougham #107 owned and restored by Robert Werner of Dayton, Ohio. We have featured this car in the newsletter as well and only wish that the pictures (from a newspaper) would have reproduced better. In addition to the prizes listed in the article, #107 was the 1st place winner at this years CLC Nationals. Having been a judge at several CLC National meets I know haw tough they are on Broughams. Congratulations are in order for Bob and the staff that completed such a great restoration. #107 should give the public a real understanding of what the great American automobile was all about. AWD

Concours d'Elegance

Event presents masterpieces of engineering and style

By JOHN BRUNING
For Wheels

Automotive elegance was evident at Sunday's Boonshoft Concours d'Elegance in Dayton. Rarely seen automotive excellence was there for the discovery all over the grounds of the Boonshoft Museum of Discovery.

Vintage Cadillacs and BMWs were the featured marques, and less well-known brands, such as Hupmobile, Allard, Watson and Auburn, added to the exotic nature of the show.

On the hot, dry, near-end-of-summer day, crowds filled the tree-shaded display area, ogling the style, chrome, colors and mechanical aspects of vehicles ranging from flamboyant to beautifully simple.

"I was overwhelmed to get three awards at the concours," Robert Werner of Washington Twp. said.

His 1957 red Cadillac Eldorado Brougham took Best of Show, Judges' Choice and Best of Class. Werner, whose family has a history of involvement with Cadillacs, was joined at the concours by his daughter, Katherine, and son, Matthew.

"We thoroughly enjoyed the day, talking with other exhibitors and visitors to the show, and seeing all the other great cars on display," Werner said.

"Concours guests had an opportunity to talk with me about Cadillac and its 100-year history," Werner said. "The concours is a great way to raise money for the museum, and the location is very nice for a display area."

Bob Morris, proprietor of Morris Auto Restoration in Bellbrook, spent nearly three years working on Werner's Eldorado.

"We've worked on a lot of nice cars over the years, and Bob Werner's is one of the best," said Morris. "It's appropriate that the car won so many awards because it's a very unique, very rare car, and because this is the 100th anniversary of Cadillac."

Show organizer Skip Peterson said 123 cars were registered for the event, which was the sixth annual. Race cars and custom-built street rods were featured.

White-Allen Auto Group presented the event. All proceeds from the event are donated to the Boonshoft Museum of Discovery. To date, nearly a quarter of a million dollars has been donated to the museum.

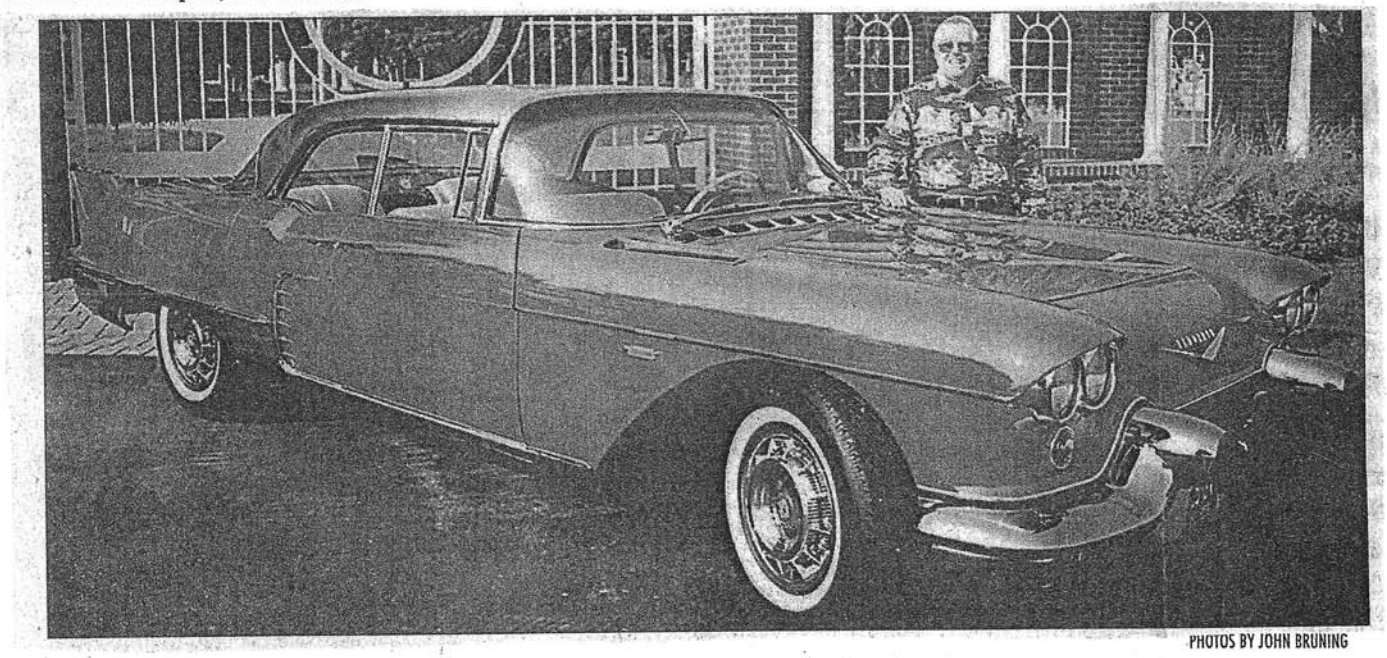
Following are the categories and awards given at the sixth annual Boonshoft Museum of Discovery Concours d'Elegance, held on Sept. 8. AE = Award of Excellence

Judges' Choice
Robert Werner, Washington Twp., 1957 Cadillac Eldorado Brougham

People's Choice
Frank Cek, Cleveland, 1933 Auburn Speedster

R.H. Grant Best of Show
Robert Werner, Washington Twp., 1957 Cadillac Eldorado Brougham

Cadillac, 1947-1977
Winner: Robert Werner, Washington Twp. 1957 Cadillac Eldorado Brougham



PHOTOS BY JOHN BRUNING

▲ The 1957 Cadillac Eldorado Brougham owned by Robert Werner of Washington Twp. won both the R.H. Grant Best of Show award and the Judges' Choice award.

➤ Concours d'Elegance

continued from page 1

King of the road: 'WOW!'

By JOHN BRUNING
For Wheels

People tend to react the same way when viewing Robert Werner's 1957 Cadillac Eldorado Brougham. They stand frozen in place, stare wide-eyed and repeatedly say, "Wow!"

Sharply finned and with shiny, chromed, cast aluminum, torpedo-accented bumpers and a stainless-steel top, the Dakota Red, four-door hardtop commands attention and admiration.

"My car has just completed a three-year restoration and had its first showing at the Concours d'Elegance in Cincinnati," the Washington Twp. resident wrote in nominating his car for Wheels of the Week. In Cincy, the car won Best in Class.

After the restoration by Morris Auto Restoration in Bellbrook, Werner is ready to drive and enjoy the car and show it to others.

"They did an outstanding job, very meticulous," Werner said.

Bob Morris and his staff, including Barry Broerman, treated the car like the king of the road it is.

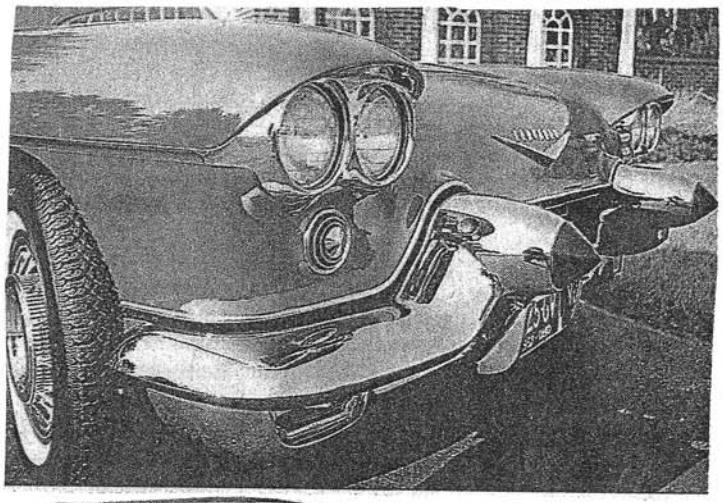
Werner has applied to display the car at Dayton's Concours d'Elegance on Sept. 8, at the Boonshoft Museum of Discovery.

"It's a rare and special car, and I want people to know about it in this, the centennial year of Cadillac," Werner said.

Classic cars, especially Cadillacs, have been a big part of Werner's life. His father, Calvin J., had a lengthy career with General Motors, concluding as the general manager of the Cadillac Motor Car Division in Detroit.

Werner's identical twin brother, Charles, was a classic car enthusiast until his death at age 19. Werner carries on the family tradition and is retired from a sales and marketing position with GM locally.

Like the mythical, opulent land of El Dorado it is named after, the car is rare and ultra luxurious.



Only 400 were produced in 1957, hand-made at about one per day. Another 304 were made in '58, and that ended the run. About half of the total of 704 is estimated to be in operational condition today.

Known as the "Cadillac of Cadillacs," the Eldorado Brougham was GM's response to Ford's Continental Mark II. The Eldorado sold for the then-astronomical price of $13,074, and GM lost $10,000 on each car. The Mark II sold for $10,000.

GM innovatively utilized 1950s technology for the car's many features, resulting in a high-maintenance car.

It has a 325-horsepower engine and power *everything*, plus luxury touches.

And the bearing of royalty.

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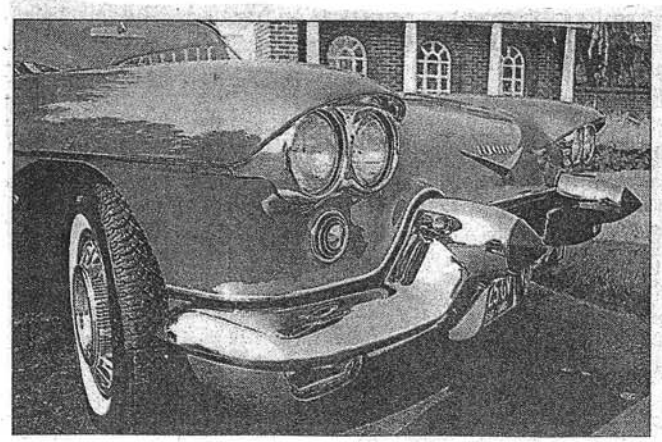
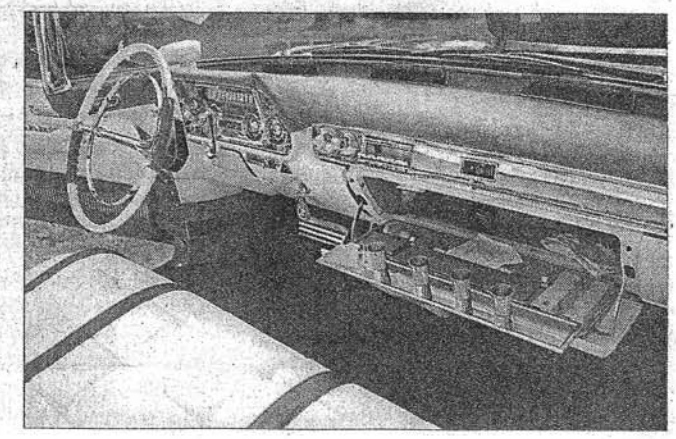




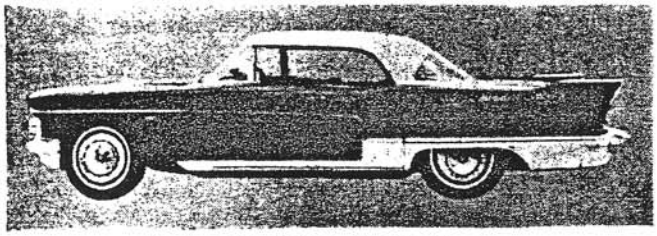


Fig. 6—1956 Cadillac Eldorado Brougham

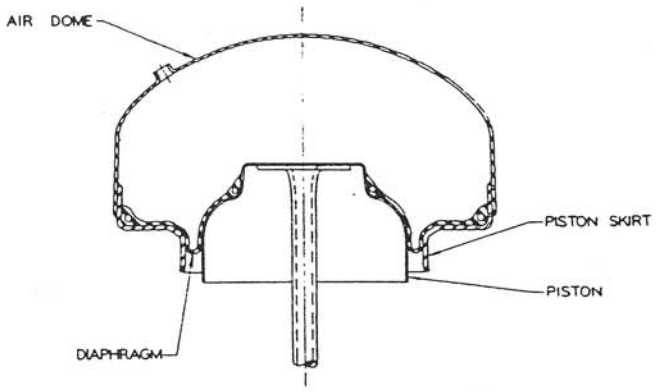


Fig. 7—Early design of front air spring

unloading portion A-E of the curve.

In the example shown, the upper curve is calculated and found to be a fifth-order equation:

$$(W = 1227 + 163.6\ h + 1.80\ h^5) \qquad O \leq h < 3.66 \tag{3}$$

For the unloading portion of the curve the equation is:

$$(W = 1227 - 163.6\ h - 2.4\ h^5) \qquad O \leq h < 4.91 \tag{4}$$

With the values fed into an IBM No. 704, the profiles necessary for the piston and retainer can be established in 10 min. Before the programming was established it required two mathematicians two days to complete one calculation series.

We feel that with the diaphragm type of air spring we have met the conditions we laid down at the beginning of our development work regarding cost, size, life, adaptability, and ease of "tailoring" rate characteristics.

Part II

by F. H. Cowin and S. L. Milliken

THE advantages of air springing had been interesting to us for some time and when the Eldorado Brougham was proposed, the air spring seemed to be particularly attractive. The preliminary studies and experimental testing with Cadillac modifications of the engineering staff designs increased our liking for the springs.

1. The car was to be only 55½ in. high (Fig. 6) which was 3½ in. lower than our standard sedan for 1957 and 6½ in. lower than the sedan of 1956. All of these are measured at the standard five-passenger load conditions, of course.

Air suspension offered a constant-height feature, with the car at the same height whether at curb weight or under full-load conditions. Between these extremes of loading, the car would stand at the same height as in the design studio or on the showroom floor. Even with the trunk filled with luggage, the styled appearance would be retained.

2. The height available for ride clearance between the axle and the frame could be used more efficiently.

Air-spring suspension would insure a constant ride clearance under all load conditions and permit a ride rate and balance that would not change from minimum to maximum load.

3. The air suspension would permit lower ride frequencies, thus giving us greater latitude in choosing the best characteristics for both ride and handling. The constant height gives constant-ride travel so the ride rate could be lower without excessive bottoming. It would give the ideal boulevard ride without compromising the handling characteristics.

With these promising advantages of the air spring, supported by our experimental testing on modified production cars, the following design parameters were established for the new Eldorado Brougham springing:

1. The ride frequencies would be approximately 55 cycles per min, or about 15% lower than those with our steel springs. This was a good compromise, we felt, for handling and ride. Ride rates lower than this might introduce problems in handling, and we did not want to impair those important characteristics for the sake of basic ride.

2. The diaphragm type of air spring would be used. The amount of development work and the experience up to that time with experimental installations favored the diaphragm type, rather than the type that is used on large passenger-bus suspensions.

3. The pressure in the air domes at normal passenger load would be approximately 75 psi. This pressure would permit a piston of reasonable size that would not necessitate a larger air dome than we could conveniently accommodate in the chassis. This air pressure would not be too demanding on the rubber diaphragms.

4. The front suspension would be a modification of our basic parallel-link design, with air springs replacing the usual coil springs. This would permit considerable interchangeability of frame and suspension parts with the standard line of cars, which would continue with coil-spring front suspension.

5. The rear suspension would be of the so-called 4-link type with a rigid axle. This would be entirely new and different from the leaf-spring and Hotchkiss-drive design used on the standard line of cars. The 4-link design would permit independent control of roll center, lateral stiffness, and acceleration squat.

The roll center could be raised and established definitely to assure proper car handling with the proposed lower spring rates.

Lateral stiffness could be increased to reduce rear-end sway and steer. Understeer could be set and depended on as the suspension height would not change with the load.

The swing arm for the rear axle could easily be set for the best performance between rear-end rising or lowering on acceleration; a latitude that was not possible with the leaf-spring design.

This type of suspension would give better control of rear-axle pinion windup under both braking and acceleration torque.

6. The air system would be of the "Open-type," with inlet air for the compressor being drawn from the atmosphere. Air vented from the air springs would be discharged to the atmosphere.

The engineering staff installations had used a "closed" system, with the used air returned to a low-pressure tank from which it was drawn by the air compressor for re-use in the air spring. The proposed "open" system, in conjunction with our leveling-system controls, would use only small amounts of air which could be supplied by a small, electrically-driven compressor requiring little current. The "open" system would not require a low-pressure tank or the associated plumbing.

With these major parameters established, serious design work was started to adapt the basic design to the chassis requirements of the Brougham body. The design work was done concurrently with that for the 1957 standard cars.

Front Suspension

The adaptation of the engineering staff's basic design to our Eldorado Brougham naturally brought many changes in detail. Mounting the air spring in the frame-front cross member is a good example.

It was desirable that the frame-front cross member be common to both the air-spring and the coil-spring suspensions.

With the spring rate established at approximately 85% of our 1956 rate, and the air-spring position determined, the volume required in the air dome was fixed at 450 cu in. The normal working pressure was to be 75 psi. But the original design of piston, diaphragm, and air dome (Fig. 7) resulted in an air dome that was too large for the space available in our frame-front cross member.

This led to a basic redesign of the piston. It was made with a hollow shape and a 3-in. diameter hole at the top. The 126-cu-in. volume in the piston reduced the volume required in the dome by 36%. The smaller-sized air dome would then fit into the space available in the front cross member. The piston and diaphragm are shown in the normal-height position (Fig. 8).

The first design of the piston (Fig. 7) relied upon air pressure in the dome to hold the inner bead of the diaphragm against the piston. And the bottom of the piston was held into a spherical depression in the lower control arm by the same pressure.

But experience showed the desirability of having the piston mechanically retained, so it could not jump out of position if the pressure was lost during car repairs or improper jacking. Mechanical retention to the diaphragm was obtained by adding a narrow strap, or clip, (Fig. 8) that twists into the top opening of the piston and extends over the inner bead of the diaphragm.

At the bottom of the piston, a stud was added, which bolts into the lower control arm tray. The head of this stud is encased in a phenolic resin cover that has a spherical shape to match the seat in the bottom of the piston.

In the first designs of the air dome, (Fig. 7) the dome was welded to the piston skirt. This made it necessary to install the diaphragm through the smaller opening in the skirt and then spring the outer diameter to its proper seat in the air dome. Experience showed that a separate skirt, bolted to the dome after the diaphragm was in position, would be better (Fig. 8). This permits a stiffer wire in the diaphragm's outer bead and a slight interference between the bead and the dome for better sealing.

The separate dome and piston skirt design also permitted an improvement in the skirt, for it could now be tailored to its particular task. The first skirts were made of fairly light steel, but laboratory tests revealed deflections in the skirt, and the two-piece design made it possible to: increase the gage of the steel used, add reinforcing sections, and add additional flanges.

This change to separate dome and skirt was also an aid to the production department in that the assembly of the dome, piston, and diaphragm was simplified. Also, the bead seat in the dome was exposed and could be better controlled for size and finish.

Diaphragms—The all-importance of the diaphragm in this suspension is apparent. The early diaphragms, made by the U. S. Rubber Co., showed promising durability, both on the cycling tests and in experimental installations. Fig. 9A shows the front diaphragm.

It is of two-ply nylon construction and has solid

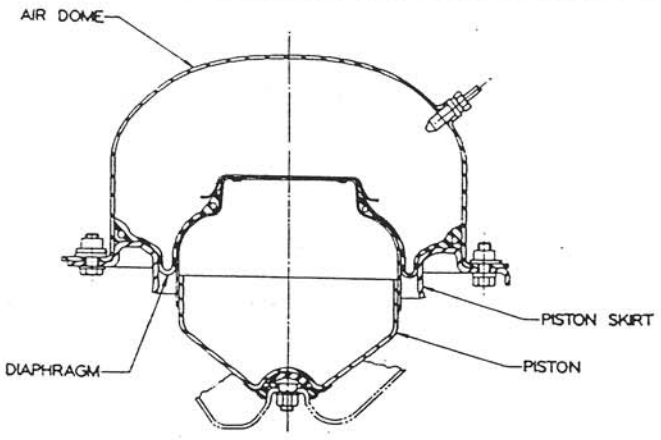


Fig. 8—Final design of front air spring

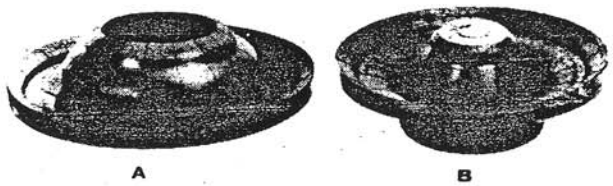


Fig. 9—(A) Front diaphragm (B) Rear diaphragm

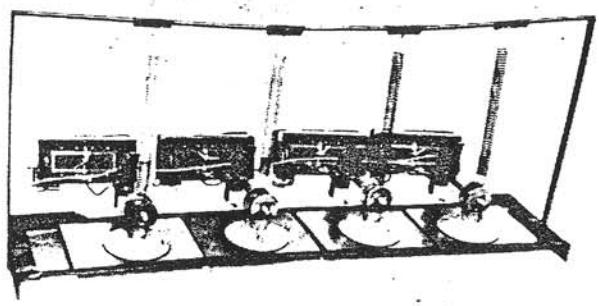


Fig. 10—Test apparatus used to evaluate sealing qualities

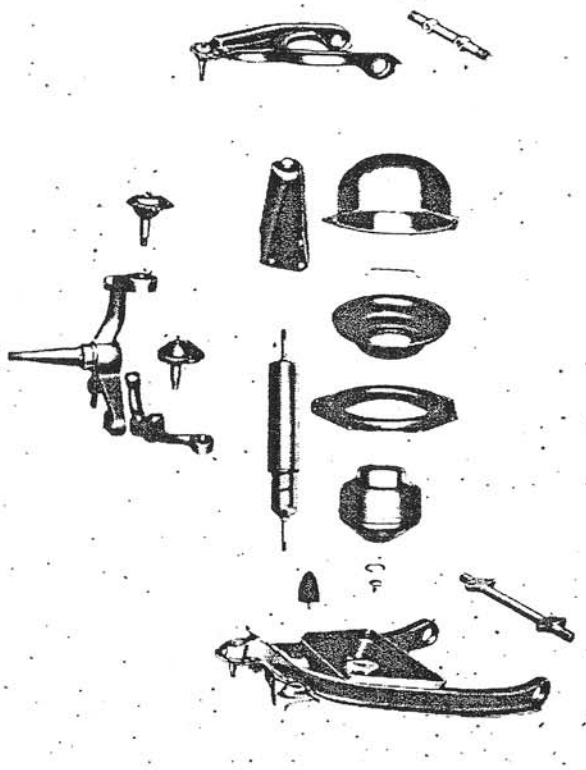


Fig. 11—Exploded view of front suspension parts

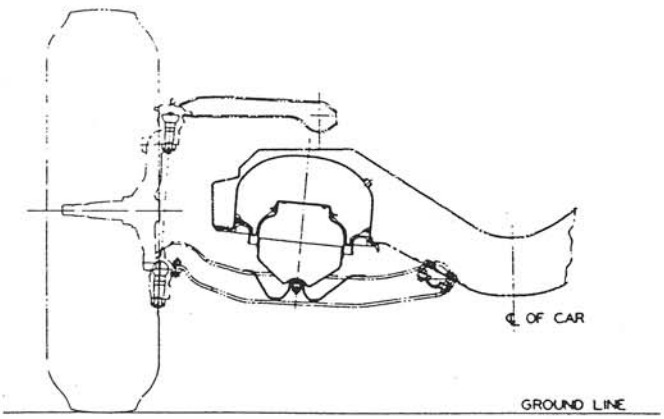


Fig. 12—Front suspension

wire beads. Early diaphragms had braided bead-wires, but tests proved that solid bead-wires are stiffer and assure a better seal. The solid bead-wire was possible after the air dome and piston skirt were changed from one-piece to bolted construction. Natural rubber is used for the covering because of its good flex life. It is compounded for ozone resistance.

As the Cadillac designs developed, changes were required in the size of the diaphragms, and this introduced some new problems. The cord pattern, and resultant strength of the diaphragm, is satisfactory if the diameter of the inner bead is at least 30% of that of the outer bead. This influenced the proportions of the spring. The cords must be well-secured around both beads, and the beads must be precisely located to prevent any movement of the bead on the seat. Movement would result in bead chafing and possible leaks.

The early diaphragms were built under laboratory conditions and it was possible to have thin wall sections, with each cord covered with rubber. Because it was realized that it would not be practicable to hold these close tolerances on the production diaphragms, much laboratory and road testing was done.

This resulted in a section that allows enough rubber to insure good coverage of the cords, even if they float toward one side of the membrane during the moulding cycle. Wall thickness is still thin enough to insure low strain in the outer skin of the membrane during the stroke cycle. The wall is approximately ⅛ in. thick for all of the area between the beads.

At first, radial grooves were moulded into the diaphragm for venting during the moulding operations, but this sometimes exposed the cords and caused air leaks. Development work resulted in a change to radial lands that provide mold venting but do not expose the cords.

Careful laboratory work, followed by extensive testing under extreme conditions, has resulted in diaphragms with a life of 1,000,000 cycles on the test rig.

Diaphragm Sealing—Early tests, both on the road and in the laboratory, showed the need and the difficulty of maintaining a good air seal between the diaphragm bead and the dome and piston.

The original diaphragms had tapered bead seats that necessitated a reverse draft in the air-dome bead-seat area. This was changed to a vertical bead seat that allowed a normally drawn sealing diameter in the air dome. This, along with the separate-piston-skirt construction and the stiffer bead-wire mentioned earlier, allows a slightly oversize diameter on the diaphragm and a light interference at the seal.

The surface finish of the air dome at the bead-seat area is most important. We thought, at first, that this would be comparable to the sealing of a tire bead to the rim, but development work in the laboratory showed a marked difference. While a tire rim is formed by rolling, the air dome and piston are drawn in a die and the resultant surface is not as good for sealing.

The apparatus shown in Fig. 10 was devised to evaluate the sealing qualities of different surfaces. Rubber suction cups, 3 in. in diameter, were attached to each specimen. Springs, loaded to a 4-lb

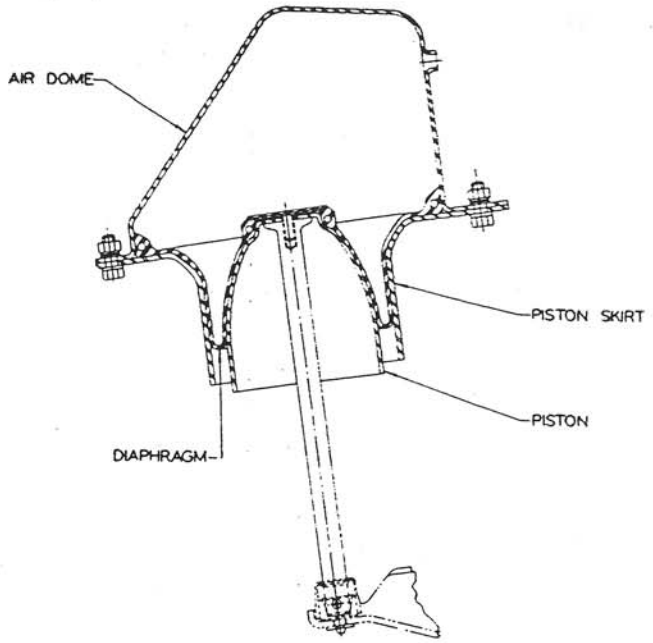


Fig. 13—Rear air spring

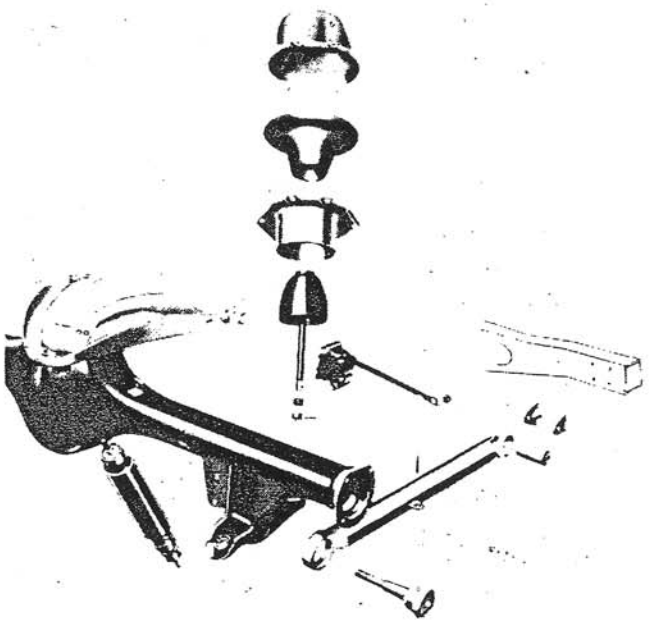


Fig. 14—Exploded view of rear suspension parts

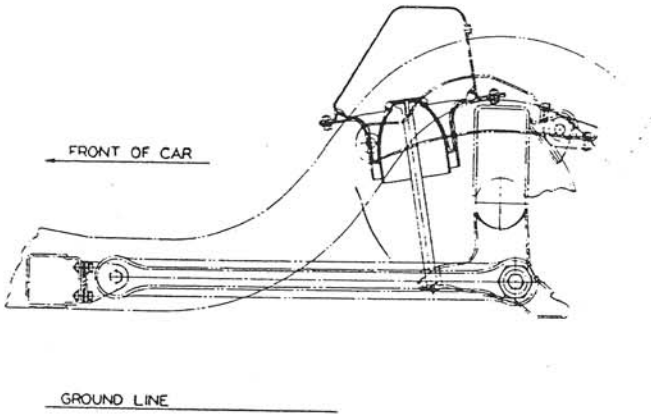


Fig. 15—Rear suspension

pull, attempted to pull the suction cup from the steel surface. The time required to do this was a measure of the airtightness of the seal between the rubber and the steel surface.

Many methods of finishing, plating, and sealing the steel surface were investigated. This resulted in the following specification for the air domes and pistons:

1. Use mill-run 1008 cold-rolled satin-finish steel with surface of 45-micro-in. maximum.
2. After forming, buff the sealing areas to remove die marks.
3. Apply a rust-preventive phosphate coat.
4. Apply black primer paint to the same area.
5. Cover sealing areas with Silicone grease #4.

The relation of the air dome, diaphragm, and piston to each other and to the suspension parts is shown on this exploded view (Fig. 11). The shock absorber works between a bracket on the lower control arm and a bracket which is bolted to the frame side bar.

Fig. 12 shows the relation of the air-spring assembly to the lower arms of our parallel-link front suspension. The air dome is bolted to the underside of the frame cross member. The locating and retaining stud at the bottom of the hollow piston bolts into the lower control-arm tray.

Rear Suspension

The parts for the rear air springs are not interchangeable with those at the front (Fig. 13). The piston is of smaller diameter, as dictated by the air pressure, spring position, and geometry for the 4-link suspension. The top is closed and has a bullet-nosed shape. A rod is anchored in the piston and connects it to a bracket on the rear-axle housing.

The lower end of the rod is domed and bears in a steel cup that is attached to the axle bracket. The rod is loosely pinned to the cup to prevents its jumping out of position at any time.

A rubber seal around the cup and the rod retains the grease and insures long-life lubrication for the bearing.

The shape of the dome was determined by the volume required (300 cu in.) and the space available. The attachment to the piston skirt is the same as at the front spring.

The rear diaphragm (Fig. 9B) is of the same type as the one used at the front spring, but is not interchangeable. The center of the diaphragm is solid and has a steel washer vulcanized in place. A stud on the underside of this washer screws into the tapped head of the piston to give a mechanical tie between the diaphragm and the piston.

Fig. 14 shows the relation of the components to each other, along with the lower arms and the upper yoke that form the 4-link suspension.

Fig. 15 shows the relation of the air spring to the complete rear suspension. The lower control arms are parallel to the centerline of car. The front end of the arms anchor to the same frame outriggers

that are used for body mounting bolts. Rubber bushings are used at this point.

Ball joints attach the rear ends of the arms to the same bracket on the axle housing as carries the lower end of the air-spring piston rod.

The upper control arm of the so-called 4-link suspension is in the form of a yoke, as this gives a better mounting to our "Tubular Center-X" frame. Rubber bushings are used between the front end of the yoke and the frame cross member. At the rear of the yoke a ball joint is used for the mounting to the axle housing. The length of the upper yoke and of the lower links, along with the height of their attachments to the frame and to the axle, gives the desired geometry for the proper swing-arm length, rear-end steering, roll center, and rear-end lowering on acceleration.

The combination of bushings and ball joints in the arms and the yokes gives freedom in roll, desired noise isolation, and good durability.

Considerable design and development work was required on the upper yoke to insure sufficient strength to handle the lateral, fore-and-aft, and tramp forces exerted by the axle.

Testing at our proving grounds disclosed fatigue failures in the ball-joint mounting bracket on the axle housing. Strain gages were mounted on the bracket and the axle housing to determine the transverse and fore-and-aft loads during Belgian Block and other road driving. The loads were found to be high (3400-lb maximum) and about equal in magnitude. A laboratory set-up was then evolved to permit controlled testing of the mounting and to determine the necessary strength.

Fig. 16 is a picture of the Eldorado Brougham chassis showing the suspension components mounted in the frame. The lower arms and the upper yoke that form the so-called 4-link suspension at the rear axle are shown. The air-spring installation, plus the control arms and new frame parts that were required in our design, added about 45 lb to the weight of the car.

Leveling System

As mentioned previously, the leveling system used on the Cadillac Brougham is of the "open" type, in which the air is compressed from atmosphere and is exhausted to atmosphere after being used.

Many systems of valve control were studied and tested in the search to find the best control for the wide range of conditions that affect car height. The system found best for all the conditions of loading and operation combines simplicity and dependability. Four solenoid-controlled valves in one package meter the flow of high-pressure air to the leveling valves at the wheels.

The first pair of valves allow pasage of air only when a car door is open or the ignition is on. Of this pair, one valve controls the inlet air to the leveling valves, with the other valve controlling the outlet air. When the car doors are closed and the ignition is off, there is no passage of air and the leveling system is locked out. This provides for all conditions of jacking, shipping, and parking.

The second pair of solenoids control the flow of air under operating conditions. When any door is opened, there is an unrestricted flow of air to the leveling valves and any change in car height, due to entrance or egress of passengers is corrected quickly. This occurs with the ignition on or off.

During all driving, there is a restricted flow of air through a coined orifice in the solenoid valve. This permits constant adjustment of car height during running to compensate for loss of weight (as with the consumption of fuel) or for added weight (with an accumulation of mud or ice). And it allows a correction in height when the car is driven away after having been parked on a side hill, or with one wheel on a curb or in a deep hole. This leveling can be done without excessive use of air.

Severe drops in temperature during overnight parking will, of course, reduce the pressure in the air dome and, consequently, lower the car height. This is corrected as soon as a car door is opened.

Briefly, the car height is quickly adjusted to a new load condition when a door is opened and is constantly adjusted when the car is in motion, but at a much slower rate. During jacking, parking, and shipping, the levelizing system is locked out.

Leveling Valves—The leveling valves control the pressure in the air spring at each wheel to keep the horizontal plane of the car parallel to, and a fixed distance above, the ground. The valve is mounted on the frame, and connected to the wheel control arm with a mechanical linkage. Any change in height of the frame actuates the valve, and high-pressure air is admitted to or exhausted from the air spring to restore the normal height of the car.

There are two leveling valves at the rear suspension, one at each air spring. At the front, one leveling valve serves both of the front springs. This arrangement of the three valves establishes the plane for the car and avoids the fight effect that would accur with a leveling valve at each of the four wheels.

Our leveling valves are made by Delco Products Div. and are the result of much experimental testing and development with that division. The only valves available at the start of the program were too large, too heavy, and too complicated for our needs. (Leveling valves of the electrically controlled type were tested during the development program, but did not have the durability of the mechanically actuated valves.)

Each leveling valve has two tire-type valves (one for intake, one for exhaust). They are operated directly by the linkage from the lower control arms. The composition of the rubber seal of the core has been changed to assure long life in this use.

Each leveling valve has a delay mechanism to prevent leveling action during wheel-hop frequency.

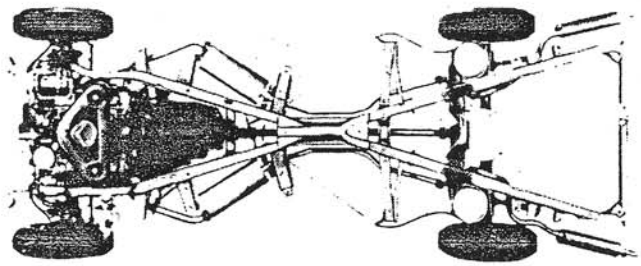


Fig. 16—Chassis of 1956 Eldorado Brougham

This prevents a pumping-up or a bleeding-down of the air spring due to small differences in the inlet and outlet restrictions. Levelizing action takes place at all frequencies below approximately 10 cps. Fig. 17 shows a typical leveling valve. This one is mounted on the front cross member and, as mentioned before, it controls the two front springs.

The tee fitting in the air-line connection between the two springs also incorporates a special check valve that permits fast flow of air during leveling, but a restrained flow through a 0.012-in. orifice during roll. This prevents the mushy handling that would result during cornering if there was an unrestricted flow of air between the two front springs.

The threaded portion at the lower end of the valve linkage allows manual adjustments for height of body in relation to the suspension. This provides for precise trimming of car height if there is any variation in production parts.

The enlarged view shows the details of the special joint used for all the air-line fittings. A shoulder is upset near the end of the air line. At assembly, the threaded nut forces this shoulder down against the bottom of the tapped recess in the body. This assures a fixed compression of the special rubber "O" ring and insures a leak-free joint. This joint allows minor misalignment of parts at assembly without leaks.

Compressor—The compressor is of the piston type, with 0.276-cu-in. displacement and a capacity of 600 cu in. per min against a 100-psi head. It is electrically driven and is mounted atop the generator in the engine compartment. This mounting and location was found best for noise isolation, oil supply, and plumbing. An integral thermal switch protects the motor from overheating.

The inlet side of the compressor is piped to the engine air cleaner to insure a clean supply of air.

The compressor is lubricated from the engine's oil system. The high-pressure oil line from the engine is restricted at the compressor to meter the oil flow to slow drops onto the crankshaft bearing. A standpipe in the crankcase returns the overflow to the engine oil pan by gravity.

The compressor normally runs only about 30% of the car operating time. However, at high altitudes the compressor runs about 80% of the time.

A pressure switch, integral with the compressor, starts and stops it to maintain pressure in the air reservoir at 120 to 130 psi. A blow-off valve on the outlet side of the compressor is set at 160 psi to protect the compressor and the air system from excessive pressure.

The compressor can run only when the engine is running. This insures that there will always be adequate lubrication for the compressor.

Air Reservoir—A cylindrical tank, of 500-cu-in. capacity, is mounted just forward of the radiator top tank. This provides a reservoir of high-pressure air more than sufficient to level the car from curb to five-passenger load without additional air from the compressor. It also serves as a trap for any oil or water, and has a manual valve to allow periodic draining of any fluids.

If for any reason the pressure in the air reservoir drops below the 75 psi required for car leveling, a light on the instrument panel (similar to the oil-pressure warning light) notifies the driver that the pressure level should be restored. This can be done by starting the engine, which permit the air compressor to start. There is a tee fitting in the air-reservoir line that can be used with an air hose during any service work on the car or to check air pressure in the system.

The general arrangement of the chassis components is shown in Fig. 18.

All of the air lines are 3/16-in. OD copper tubing. This diameter of pipe was found to be the smallest that would allow the fast leveling we wanted when a car door was opened. Further experience and testing may allow us to use less expensive steel or plastic lines.

Assembly—The design and location of the components was developed with constant consideration of the making and the ultimate assembly of the parts into the chassis. As a result, the air-spring suspension has caused no unusual problems on the production line.

The vital importance of a leak-free system was realized from the first consideration of the idea of air suspension so the design, the manufacture, and the assembly of the components has been tailored to that result.

After the complete assembly of springs, pipes, and controls into the chassis, there is a snifter test for leaks and a final check with soapy water on the tubing connections. Experience gained with air-conditioner installations has helped with the air sus-

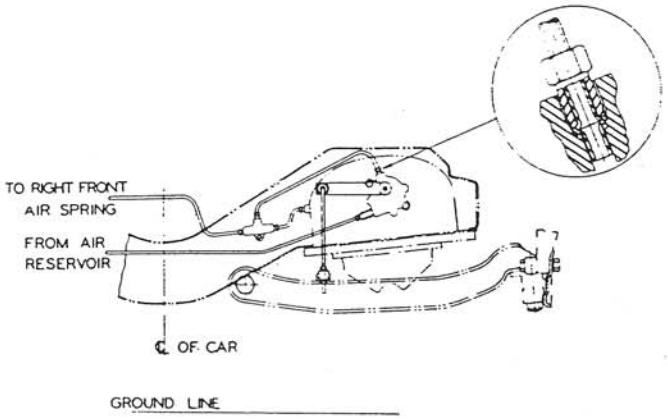


Fig. 17—Leveling valve

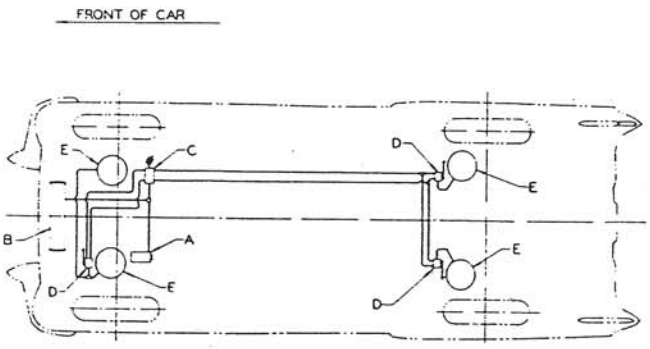


Fig. 18—Air-spring suspension: A—compressor, B—air reservoir, C—control solenoid package, positioned between air reservoir and leveling valves, D—three-wheel leveling valves, E—air springs

pension, as the leak problems are similar.

The manufacturing and assembly divisions have done an excellent job in devising new methods and procedures to insure a trouble-free car that will give the better ride that is inherent to this design. The men in those departments deserve much credit.

The suspension system was subjected to an extensive testing program after the final design was determined. Tests at Pikes Peak and other high-altitude areas showed that the compressor had adequate capacity for the suspension at any operating altitude.

Many thousands of miles on the Belgian Block roads at our proving grounds and on road tests have shown satisfactory life for all of the components.

John Hoban, Cass Cislo, and Dick Nietert of our department carried along the design and development work and surmounted the many new problems that cropped up so frequently.

Summary

In summary, Cadillac's air suspension on the Eldorado Brougham gives a new and a better ride.

1. The ride is of slower frequency, with slower body motions that are pleasing to the passengers.
2. The ride characteristics are constant. With the driver alone in the car or with a full passenger load plus baggage, there is no change from the designed ride.
3. The air suspension gives a damping quality that cannot be obtained with conventional springs or with shock absorbers.
4. The combination of a low center of gravity and the high roll center, that is obtained with the 4-link rear suspension, results in an exceptionally good-handling car.
5. The constant-height feature improves the appearance of the car, as it is always at show-room height regardless of the load.

We feel that the air-suspension principle has even greater potential and that, as we gain more experience with it, we will be able to design and build further advantages into the car for the benefit of our customers. Acceptance of the air ride has been gratifying, and we suspect that in the future many more people will be "riding on air."

Bob Hope's 1958 Eldorado Brougham

By Stephen Nadon

I recently saw a 1958 Eldorado Brougham in my hometown of London, Ontario. This Brougham once belonged to Bob Hope and was purchased from Kansas City by Steven Plunkett, a local Cadillac enthusiast.

This Brougham is Body #571 and has a black body with white/black leather interior. Furthermore, the car is in mint condition inside and out with only 89, 487 miles. It is on coil springs, and appears to ride high above the ground. To sum it up, as London is mainly a '55-57 Chevy, Ford and muscle car town, it is great to find a Brougham here.

London, ON N6A 1M2
Canada

August 22, 2002

Hello Allan:

I hope that you are keeping well and enjoying the summer. Guess what, I went to the Cadillac LaSalle Club's Grand National in Dearborn, Michigan. The show was fantastic and I saw many cherished models, including the 1957-58 Eldorado Broughams. It was also great to see many fellow Cadillac club members.

I wrote about the event, as well as a brief paragraph on Bob Hope's 1958 Eldorado Brougham. Enclosed are copies of both articles and I hope that you will feature them in the September Brougham Owners Association newsletter.

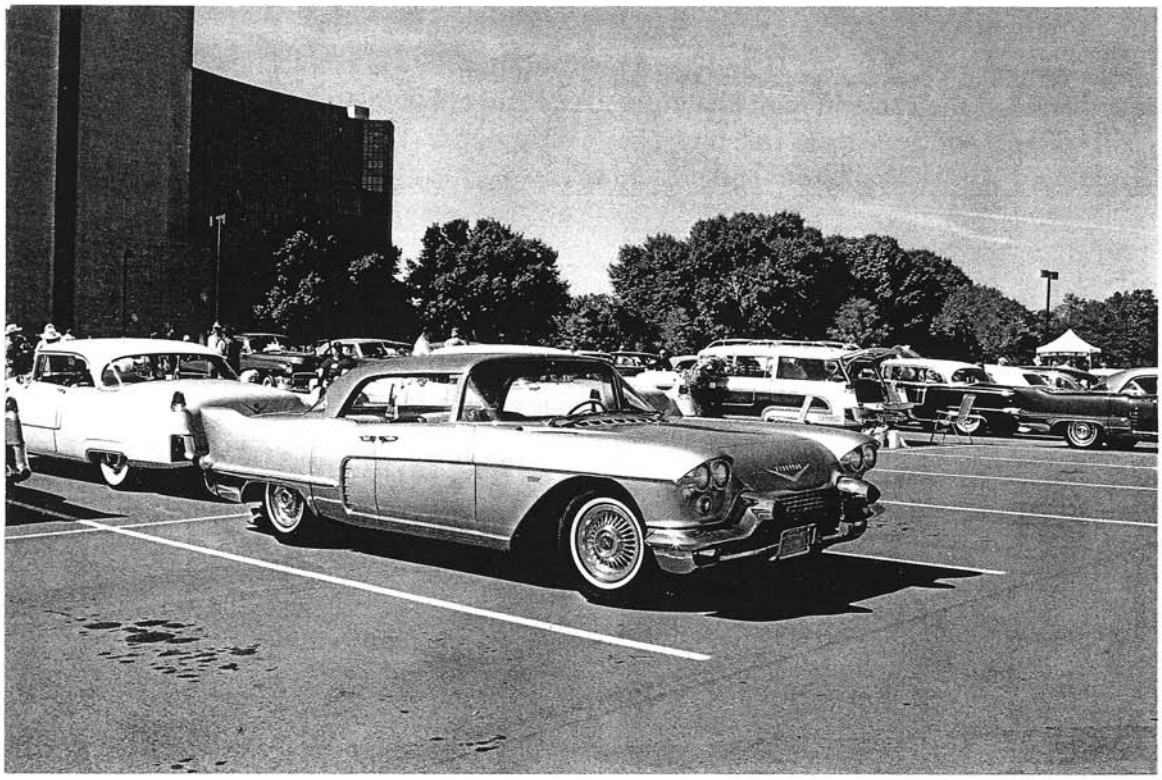
I have also enclosed two photos. One is a silver 1957 Eldorado Brougham taken at the Grand National, the other is Bob Hope's car.

With warm personal regards,

Stephen Nadon

Stephen Nadon

Glen Durmisevich's silver 1957 Eldorado Brougham.



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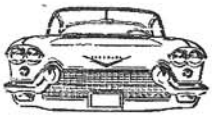
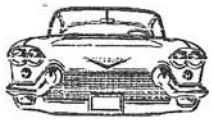


IMPORTANT NOTE

All articles, ads, etc., will pertain to the 1957-1960 brougham unless designated otherwise.



CARS FOR SALE

1957 Brougham - #195 Black #2 car without vanities on springs located in Kansas. For complete details contact: Matt Massoth (913) 651-2866. Asking $20,000.00

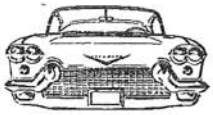
1958 Brougham - # 651. Chamonix white, solid black leather interior (all original). Black mouton carpet. 34,000 Miles. Perfect glass and roof. Converted to coil springs. John Foster Dulles car. $30,000.00. Contact: Ken Ward for further details. (513) 521-2029.

1957 Brougham - #351. Blue, Stainless steel roof. Original Car with 45,000 miles. Show condition. AACA winner. Car has all vanity items. Converted to springs. Looking for best offer. Contact Keith Geisow (908) 233-2339.

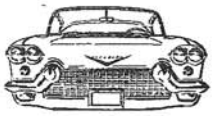
BROUGHAM FOR SALE? YOUR AD BELONGS HERE!
NO CHARGE TO B.O.A. MEMBERS!

PARTS FOR SALE

(1) NOS windshield washer unit with decal $150.00. Jar $50.00. (2) Hubcaps in original boxes $225.00 each. (1) Oil pressure gauge Stewart Warner $80.00. (1) Delco distributor cap$17.50. (5) T-3 headlamp bulbs $12.50 each. (2) AC-PF 122 Oil filter cartridges $15.00 each. (3) Delco Remy coils (used) $12.50 each. (3) Blue cap points $10.00 each. (2) Vanity mirrors (original) white and light gray $125.00 each. (2) Vanity compacts complete with mirror, comb, lipstick, Evan's powder puff, etc. $950.00 each. Window switches 2 & 4 poles with escutcheon trim. (1) Outside driver's door remote mirror in show condition with mint handle $150.00. (1) Complete radio $90.00. (2) Clocks. Glove box opener $35.00. (1) Right side vent window motor and trans. $75.00. (1) Seat motor and trans. (left side) $75.00. (2) WCFB carb kits $45.00 each. (1) Trunk hinge motor and clutch unit $125.00. (1) Master brake cylinder. (needs kit) $35.00. (1) 13/4 Gas fillpipe neoprene hose 11/2' long $10.00. (1) Air conditioning condenser (original and very good) $60.00. (1) Original wheel completely restored (mint Chrome $950.00. (1) decent original wheel with slight pitting of Chrome $150.00. (5) Restorable Kelsey Hayes wheels $50.00 each. Jack instruction card #12.50. I.D. Card for under hood $10.00. Starter $50.00. Transmission and torque converter $175.00. Voltage regulator $75.00. Various relays and motors. Right and left rear bumpers (mint) new Chrome. Front bumper license plate bracket with back up plate (mint chrome). Original new anodized license plate frame (mint). Buckets of cadmium plated bolts, clips, & brackets. Doors and trunk lids (very reasonable). Power steering pumps. A.C. Compressor & misc. parts. Exhaust manifolds. Cigarette lighters. Arpege perfume (2) in original (sealed) box (1) 1 oz. bottle with gold label. Call: Jerry Schantz evenings only (386) 677-4373 (Fla.) till June 15th then (828 387-4860 North Carolina.



PARTS FOR SALE



PARTS FOR SALE- 57/58 Brougham: (20) year collection of parts. What do you need? Contact: Dr. Zeiger (310) 275-8156 with your needs.

PARTS FOR SALE- 57/58 Brougham: A trailer load good used Brougham parts. Inquire with your needs. Trades for your spares considered. Please send list of parts you need Contact: Mike Rizzuto (909) 674- 0509.

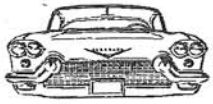
PARTS FOR SALE - 57/58 Brougham: Left (driver's side) lower stainless rocker panel cover. Very good condition $200.00. Heater blower motor (main unit) $40.00. N.O.S. window regulator motor $75.00. Original shop manual (near mint) $95.00, Original shop manual (some wear) $75.00, "57" shop manual (good) $45.00, "58" supplement (fair) $35.00, Original powder puff $50.00. Valve cover hold down bolt kit $15.00. Front end stabilizer rebuild kit $60.00. Contact: Allan Dowling at (440) 238-8474

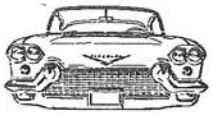
PARTS FOR SALE - 57/58 Brougham: (1) good chrome fender louver , (1) set of front bumpers (1) driver's side rear door lower shield (die cast) Good chrome) (1) set front door lower stainless, (1) set center pillar lower finish stainless , (1) cowl grill (chrome) , (1) heater core assembly , (1) original glove box with lens and trunk control , (1) passenger side vent window (good chrome), cigarette lighters , (1) driver's side center wheel well , (1) driver's side wheel well above fiber glass , (1) driver's side fiber glass splash guard (like new) , (1) driver's side back body piece (skirt mount & exhaust) , (1) white rear vanity mirror (original) , (1) door striker plate , (1) box of door and window tracks, etc. (best offer). (1) passenger window switch , (1) trunk light socket , (4) door lock knobs , (1) headlight knob, (1) rear ash tray , (4) door handles , (1) exterior mirror, Exterior windshield trim, (1) left rear upper door panel . Contact: Marion Falat (847) 381-4295

PARTS FOR SALE - For Pininfarina bodied Broughams. A lot of Miscellaneous parts such as window motors, trunk motor, valence trim, windshield chrome frame, rear bumper, taillight, trunk panels, ashtrays, relay clusters, side mirror, various chrome and trim pieces. Inquire about the lot or individual pieces. Call Lars at: (718) 797-5201. Or E-mail: Wassard@att.net

NEW BROUGHAM SERVICE FACILITY

Are you having trouble finding a competent, experienced, reliable and reasonable technician to work on your Brougham? I am a recently retired auto mechanic and race car crew chief with 40 years of automotive repair experience. I am thoroughly familiar with all aspects of the '57 and '58 Brougham, including all mechanical, electrical, air ride, air conditioning, brakes, tune-up, and cooling system problems. I am also familiar with the procedures for chrome plating aluminum parts, ie. wheels and bumpers. I have done complete frame-off restorations of these cars and am currently just finishing a modernization of my own '58, utilizing a Northstar engine, 700R transmission and modern patterned leather interior. I am a BOA member and located in Southern California. Call or e-mail me for further info. Dale Armstrong, 909-303-1540, e-mail darmstron747@earthlink.net





PARTS FOR SALE

PARTS FOR SALE - 57/58 Brougham: (1)Right front bumper tip $350.00, (18) Lower rear door spears (10) per car $450.00, (2) rear fender crown moldings $250.00, (1) Temp. gage $100.00, (2) tail light in fin (1) rechromed w/lens$125.00, (1) taillight & back up lens in bumper $50.00, (1) outside rear view mirror (new) $100.00, (2) air cleaner hold down nuts $40.00, (2) drum clocks $75.00 each $150.00 both, (2) Arpege perfume bottles (1) empty) (1) 3/4 full $225.00, (1) powder puff $50.00, (1) lipstick holder (needs silver plated) $45.00, (1) generator rebuild kit includes both end plates, field coils, cooling fan, and band for brushes, (1) set of brushes, (2) long bolts $135.00, (1) owner's manual (fair condition) $150.00, (1) set of lighters $40.00, (2) NOS ignition switches $50.00, (1) air compressor oil filter $10.00, (1) auto headlight relay box (trunk) $50.00, (1) trunk motor & relays (in trunk lid) $50.00, (1) seat motor w/screw shaft $40.00, (1) inside door handle $10.00, (2) NOS rear wheel bearings $100.00, (1) hold down latch cowl & (2) hood pcs. $20.00, (2) Carter carb rebuild kits $50.00, (1) stop light switch $10.00, Brougham brochure 18"x 6" $125.00, (2) Brougham ads from Fortune magazine (laminated) $90.00, (1) Brougham ad never released 14"x21" $100.00, (2) Franklin Mint models $450.00, (1) Revell Brougham kit $50.00, (1) Brougham model kit $20.00 Contact: Larry Muckey (231) 777- 1849.

$AVE *BACK ISSUE SPECIAL* $AVE

With the growing numbers of new members we have, we have decided to continue offering our back issues at a considerable savings over individual pricing. The first thirteen years of the B.O.A. can be your for $250.00 plus $5.00 shipping and handling. We have made a lot of progress over the years. **New members** - take advantage of this offer. You will find just about every topic covered that concerns the history of the Brougham and restoration of your Brougham. Order from the Timberline address.

As you can see from the number of ads we have this issue, the cars and parts situation is getting very tight as could have been predicted some time ago. Restorations and general upgrading of the Broughams in operation are making good cars and parts harder to find than ever. Take a look around and see if you have any parts left over from a restoration, or perhaps some literature, or maybe you are thinking of selling that car that has just got the best of you. You ads are always published free in the newsletter. Take a few minutes to jot down what you may have and send it in. Someone is waiting for that special part or car. AWD

CARS WANTED

1957/58 Brougham #2, #3 car either in original condition or properly restored. Car does not have to be concours. Contact Mitchell Terk of Jacksonville, FL @ (904) 306-9854. E-mail: mterk@bellsouth.net

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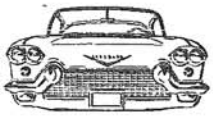
1957 - 1960 Eldorado Broughams in any condition, even parts cars. Contact: Peter Krell at (972) 458-2004. Dallas Texas.



FREE LITERATURE

1. 57/58 Photofacts radio diagrams. **Free** to B.O.A. members. Send letter size S.A.S.E.to: 16784 Timberline Drive, Strongsville, Ohio 44136

2. 57/58 exhaust louver template. **Free** to B.O.A. members. Send letter size S.A.S.E. to: 16784 Timberline Drive, Strongsville, Ohio 44136

3. 57/58 Brougham Pre-delivery inspection sheet. **Free** to B.O.A. members. Send letter size S.A.S.E. to: 16784 Timberline Drive, Strongsville, Ohio 44136

LITERATURE

4. Eldorado Brougham electrical system and compressor lubrication improvements. October 1957 to all dealers (6) pages. Not in manual. $10.00 to B.O.A. members.

5. Eldorado Brougham electrical circuit diagrams. (18) pages. Not in manual. $20.00 to B.O.A. members.

6. Eldorado Brougham service supplement 1959. (15) pages. $20.00 to B.O.A. members.

7. Eldorado Brougham sevice supplement 1960 (5) pages. $10.00 to B.O.A. members.

8. Full color Xerox copy of FORTUNE ad. 10x13 suitable for framing. This was the only ad ever published. $15.00 to B.O.A. members.

9. Set of (6) 8x10 glossy photos from the originals at G.M. Tech Center. (3) of the Towncar. $55.00/set to B.O.A. members.

10. Color copy of U.S.Steel advertising material featuring the "56" prototype Brougham $10.00 to B.O.A. members.

11. Rare 10x12 factory rendering of "56" Towncar. Includes desscriptive material on features ect.. B/W Xerox copy. $10.00 to B.O.A. members.

12. Complete set of news releases from Cadillac on the "57" Eldorado Brougham. $20.00 to B.O.A. members.

13. Set of (5) 8x10 photos from "HERE IT IS THE ELDORADO BROUGHAM" sales brochure 1957. $55.00/set to B.O.A. members.

NEW MEMBERS

Jim Burchett
Nashville, TN

Frank Marter
Huntington Beach, CA

Allan Stern
Winnipeg, Canada
#401

Silvio Santana
Miami, FL