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TITLE:

AUTOMOBILES # 3

GAS-SAVER DEVICES

021-AU3 AUTOMOBILES # 3 (GAS-SAVER DEVICES) --- 20 Articles, product reviews, etc., 2 complete US Patents,& 6 USP Abstracts of retrofit devices to increase mpg: Water & Steam Injection..Emulsions..Atomizers & Vaporizers..Teflon Additives..."Moleculator" Fuel Energizers (20% more mpg quaranteed!)."Fueltron" Ultrasonic Fuel Atomizer (15% ++ mpg guaranteed)..McGuire's "Narrow- & Air-Fuel Ratio Control"..J Davis: "Clean Power" Additive (40% ++ mpg)..B. Polo: Computerized Ignition Timer..R. Linger: "Pelco Fuel Saver" (35% ++ mpg, 60% less pollution)..R. Kennedy: "Tadpole" Air Filter insert (10% ++ mpg)..Lindberg's Combustion Control System (Steam-injection, 20% ++ mpg, FAA-approved for aircraft)..D. Hughes:"Vapipe" Fuel Preheater/Vaporizer/Carburator (70% less pollution)... C. Brown's "Power-Pak" Humidifier (28% ++ mpg).. Meierbachtol's Atomizer..Berger's Vapor Injection.. Do-It-Yourself MPG Test...Kits (Beware & Read the reviews here before buying anything!).. USP Abstracts: Magnetic & Electrostatic Fuel Treatments..Ozonizers..Refractionators..More!

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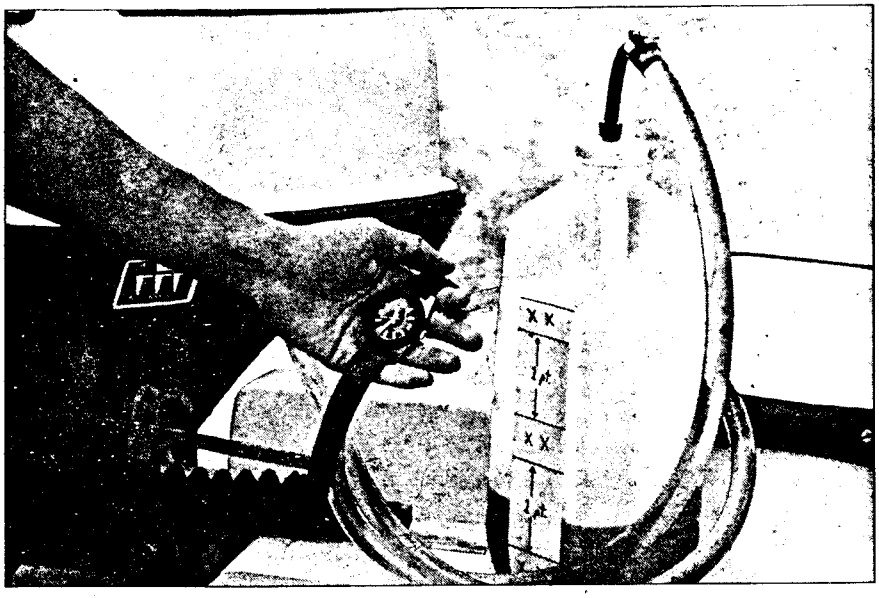
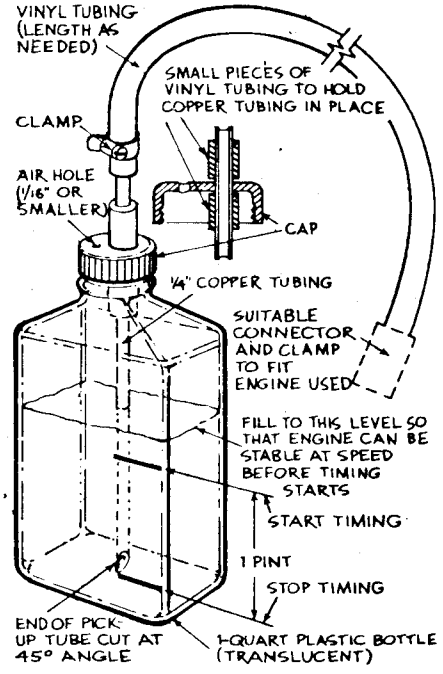
77

A DO-IT-YOURSELF FUEL GAUGE FOR BOATING ECONOMY

By Bob Stearns BOATING EDITOR





Measured amount of fuel, *a measured course over which to run your boat and a carefully measured elapsed time—these are the elements you need in order to compute your boat's most efficient speeds.*

ALTHOUGH gasoline prices have been edging downward recently, don't hold your breath until they hit the lows we enjoyed during the early 1970s. Even in the face of a somewhat-improved fuel situation, you can still save a lot of bucks at the fuel dock if you know how to operate your boat as efficiently as possible. One way to determine easily those speeds that offer the best fuel economy is to use the simple do-it-yourself fuel gauge described here.

You can build it in an hour or so with less than $5 in actual cash outlay. Please note, however, that this gauge is designed only for carbureted engines and will not work with any fuel-injected engine, either gasoline or diesel. Also note that using the gauge is a two-person operation . . . one to manipulate the gauge, another to operate the boat.

First, let's assume that your boat's bottom is free of marine growth, the engine is in good shape (doesn't need a tune-up) and the propeller is not badly worn. Each of these items by itself can rob 10 to 25 percent of your potential fuel economy. If all three are seriously in need of attention, you might be getting only about half the miles per gallon you should, and adding a fuel gauge won't help much.

To build the gauge you'll need these basic items: a quart milk jug or similar plastic container translucent enough to see the liquid level inside, approximately 14 inches of ¼-inch copper tubing, 4 feet of ¼-inch (I.D.) clear vinyl tubing, two small hose clamps and the necessary fitting to connect the vinyl tubing to the gasoline intake on your engine. If your boat is outboard-powered, this means the fitting that connects your remote tank to the engine. For inboards and stern-drives it's usually a hose nipple, one end of which has ½-inch thread. The nearest marine dealer who sells your make of engine can sell you one. So can most hardware stores if you know exactly what you're looking for.

Cut off one end of the copper tubing at a 45° angle and insert that end down into the jug through a hole of appropriate size drilled in the cap. A second very small hole should also be drilled in the cap to admit air as the level of gasoline goes down. Two ½-inch-long pieces of vinyl tubing slipped down over the copper tubing—one on each side of the cap—ensure that the copper tubing stays firmly in place during the fuel-consumption tests.

One end of the vinyl tubing is inserted over the projecting end of the copper tubing and held there firmly with a hose clamp. The other end is attached to the fuel fitting identical to the one that connects the fuel system to your engine and also secured in place with a hose

ART BY FRED NEINAST

and narrow water tank. A 40- to 50-gallon tank, approximately 5 feet long and 14 inches in diameter is a good size. Glass-lined steel tanks are most commonly available from new or used gas or electric water heaters. These tanks last about 10 years. Stainless-steel tanks with specially designed inlet and outlet pipes that decrease the mixing of the water in the horizontal batch tank have recently become available. These tanks should last a long time, but are expensive. A 40-gallon stainless-steel tank which can withstand typical house water pressure costs about $400. Don't use stone-lined tanks in this collector because the lining may collapse when the tank is placed horizontally.

For maximum heat retention I recommend covering the tank with a selective-surface foil. A selective surface absorbs about the same amount of solar energy as black paint, but the selective surface radiates much less energy back out through the glazing. The selective-surface foil costs about $40 to cover one 40-gallon tank, and tests have shown it increases performance by 15 to 25 percent. The foil is available through local solar-energy stores or can be ordered from the Solar Components Corp., Box 237, Manchester, NH 03105.

Now, place the prepared tank on a 2×6 frame inside the collector. Connect the plumbing between the batch tank and auxiliary water heater. Allow the solar water heater to operate for at least 24 hours, then test the plumbing for leaks.

Either double or triple layers of glazing can be used effectively with this collector. Glass provides an attractive outer glazing. Teflon can be used for inner glazings. Teflon has high solar transmittance and is long lasting, lightweight and moderate in cost. Since Teflon is a thin film, you will have to build a frame to support it with ¾×⅞-inch wood strips.

After installing the glazing, you can complete the collector by adding the glazing caps, trim, siding, flashing and caulk. Bevel the lower glazing cap to shed water running down the glazing. Now, complete the trim and siding. If you are using wood shakes, work from the 45°-angle side toward the house. Slide flashing under the house siding and over the upper glazing cap. Use silicone or urethane caulk to seal the ⅛-in. seam between the glass and the glazing caps, and where the collector adjoins the house.

clamp. It's a temporary setup.

The jug serves as the gauge and must be accurately calibrated in order to provide you with reliable numbers. This is quite simple, however, because all you need is a standard kitchen measuring cup and a ruler.

First, measure off approximately an inch above the bottom of the jug, and draw a line with some sort of permanent marking pen (i.e., a laundry marker). The exact distance between this line and the bottom of the jug is not critical. Add water to the jug very carefully until you exactly reach the line you have just drawn. Now fill the measuring cup very carefully to the one-pint line (16 ounces), and add that water to the jug. (You'll have to do this twice if your measuring cup is only 8 ounces.) Draw a second line to correspond precisely with the new liquid level, then empty the jug. The distance between the two lines now represents exactly one pint (⅛ gallon).

At this point, a word of caution is in order. In the interest of safety, *do not* transport gasoline in this jug. Carry it in an approved gas can and use a funnel to pour those amounts you need into the gauge. Do so carefully, only when you're ready to commence testing.

To do the actual testing, you'll need either a water speedometer or a tachometer and a measured course on the water to determine speed. The ideal combination would be a tachometer and a reasonably accurate water speedometer to eliminate the necessity of having to calculate speeds from time/distance information.

If no measured course is available you can make one by using a tape or a piece of low-stretch line of measured length. Choose a stretch of shoreline where the water is reasonably calm and drive a stake into the ground at water's edge. Select a distance that suits you from the table of speed constants below and drive a second stake into the ground that much further along the shoreline.

Distance (in feet)	Speed Constant (in mph)
660 (⅛ mile)	450
1,000	682
1,320 (¼ mile)	900
2,640 (½ mile)	1,800

Using the speed constant for any given distance is simple. Just divide the constant for that distance by the time in seconds required to run the distance. The answer is in mph. For example: If it took you 28 seconds to cover 1,000 feet, the answer is 1,000/28 = 35.7 mph. The formula, by the way, for determining the speed constant for a course of any length is: distance (feet)/5,280×3,600 = SC.

Fuel consumption (gph) is determined by using the gauge. It's best not to do both speed and fuel consumption at the same time. And it makes no difference which you do first. Once you know both, you can determine mpg for your boat at selected intervals over the speed range (i.e., at intervals of 500 rpm or 5 mph).

To determine gph at any given speed or rpm, you fill the jug to an inch or more above the top line, and hook the vinyl tubing up to

your engine via the fitting. The extra fuel above the top line (that begins the one-pint measured amount) is to allow time for you to get the boat on plane and the engine stabilized at the desired rpm or speed. Start timing when the level in the gauge just passes the top line; stop timing when it just passes the bottom line. Then record the time in seconds.

There's a fuel constant you can use that makes calculating gph just as simple as figuring mph. Simply divide 450 by the time in seconds, and the result is gph. For example, if it took 40 seconds to consume that 16 ounces of gas, you would be burning 5.6 gallons per hour. (If you're using a small engine, i.e., 50 hp or less, you can mark the jug for ½ pint and use 225 as the fuel-constant figure.)

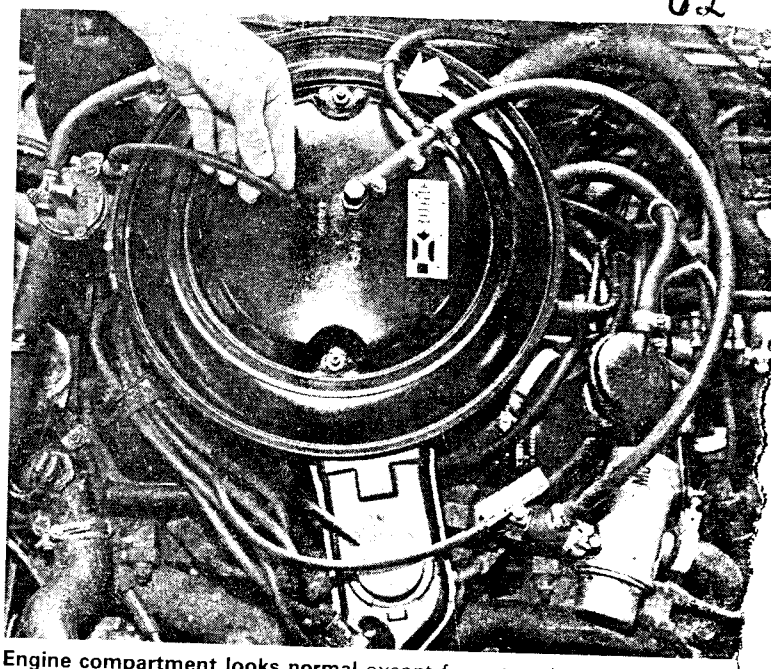
Determining mpg is just a matter of dividing mph by gph. Once you've completed a table showing speeds, fuel consumption and miles per gallon, choosing the most economical cruising speed for your particular boat is just a matter of looking for the speed or rpm that yields the greatest mpg, just like in your automobile.

As a rule of thumb, assuming the boat is fitted with the correct propeller size and develops the maximum-rated rpm at full throttle, your most fuel-efficient cruising speed will fall between 2,500 and 4,000 rpm for four-cycle engines—and 3,500 to 5,000 rpm for two-cycle outboards. If you run enough tests to determine your mpg for everything from 1,000 or 1,500 rpm to full throttle, you'll note that there are several speeds where economy really goes out the window. Most noticeable are while the boat is trying to climb on plane as well as near the top of your speed range.

Even if you tend to be a fuel-conscious and conservative skipper by nature, you might find to your surprise that backing off too much on the throttle can waste almost as much gas as sticking your foot in the carburetor! This is especially true of outboards, by the way. MCI

Pop. Sci. Jan. '80

Water injection improves small car's performance and mpg



Engine compartment looks normal except for extra plumbing. Hose held by hand is water hose to nozzle. Hose (arrow) goes to pressure gauge on the dash. Other hose is from AIR pump.

By RAY HILL

With rapidly rising gas costs, fuel shortages, and inflation nibbling at our heels, fuel-efficient engines are becoming increasingly important. Not only are the auto makers saddled with the task of making their cars get better mileage, they must also meet increasingly demanding emissions requirements.

As a result, many engines today knock, performance is a shadow of what it was a few years ago, and, if you've got an older car with a high-compression engine, you may not be able to run it because you can't find gas with a high enough octane rating.

Water injection is a solution for these problems. It lets you run a high-compression engine with lower-octane fuel, resulting in improved performance and mileage. So claims Pat Goodman, president of Goodman Engines in Winchester, Va.

Goodman backs his claim with a Ford Fiesta he has modified. It has a 13:1 compression ratio; water injection to prevent detonation; a reworked head and different pistons to induce more turbulence of the fuel-air mix, for more efficient burning; and a slightly different camshaft (changed partly to prevent the valves from hitting the pistons at TDC, and also for a slight performance gain). Body, drive train, and wheels are stock.

The Fiesta was tested at Transportation Research Center (TRC) in East Liberty, Ohio. TRC is the largest independent vehicle-testing facility in the U.S. Owned by the state of Ohio, the huge 8100-acre test center does everything from crash-simulation testing to fuel-economy testing for the transportation industry.

Goodman's Fiesta was first tested in stock form at TRC. Then the engine was modified and TRC tested it again. Mileage improved, performance increased, and emissions tests were passed with a comfortable margin.

When I first heard all this, I was naturally curious to learn more. So I arranged to drive the car, and to take the engine apart and photograph it.

The drive was intriguing. We topped off the gas tank at a local gas station in Winchester, and then I drove the car 81 miles and topped it off again. The tank took an even two gallons. That averages to 40.5 mpg. Much of the drive was over crooked mountain roads. And I made no attempt at fuel economy, letting my heavy foot have its way.

Performance is snappy. I jabbed the accelerator several times in low and second gears and the tires spun immediately. TRC testing bears this out. Pat Goodman showed me the test data sheets. With the car stock and a 430-pound payload (including the driver), zero–60 mph was 17.3 seconds. With the modified engine, zero–60 time was a livelier 15 seconds (again with a 430-pound payload).

Mileage also improved between testing sessions at TRC. Mileage was measured in two ways: on a chassis dyno and on the track. Dyno procedure was identical to the EPA city-driving schedule, which also measures emissions. In stock condition, the Fiesta got 30.17 mpg. Modified, it got 34.05 mpg. Both times it passed emissions requirements easily.

Track testing, which is closer to real-world use, but is not used by the EPA, was the SAE J-1082 fuel-economy test procedure. This consists of three modes of driving, supposedly simulating urban, suburban, and interstate driving conditions. Basically, the urban cycle consists of a lot of stop-and-go driving with speeds up to 30 mph. The suburban cycle has fewer stops with speeds up to 60 mph. And the interstate cycle has no stops, and an average speed of 55 mph.

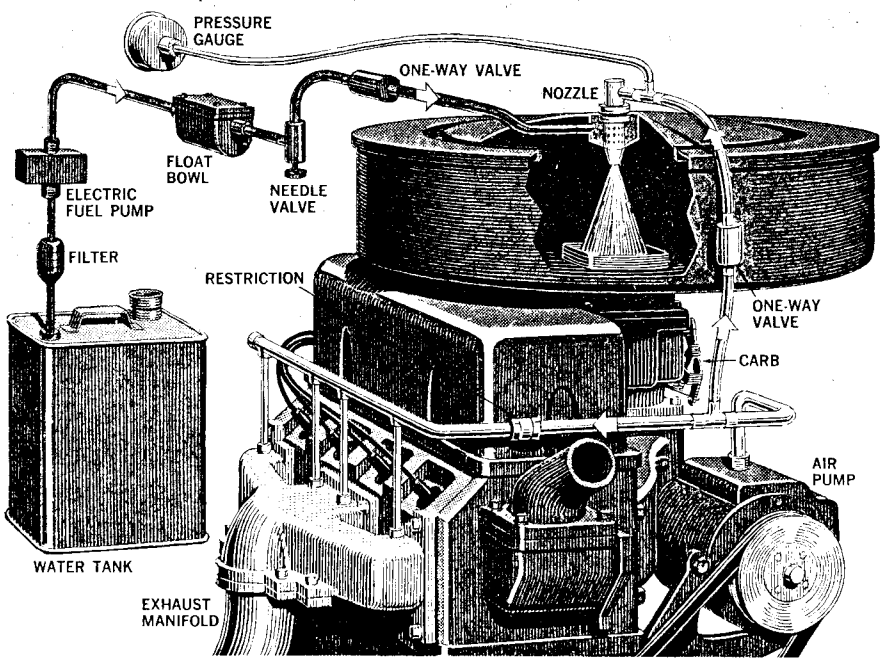
Before modification, the Fiesta got 21.97 mpg, urban; 36.80, suburban; and 37.04, interstate. After modification the figures were 25.27, 36.66, and 39.70. The reason for the lack of improvement in the suburban cycle, says Goodman, was that water vapor going over the brass throttle shaft in the carb cooled the shaft, which in turn cooled the electric choke, causing it to close partially—and at those speeds there was not enough engine heat to overcome the cooling effect of the water on the shaft.

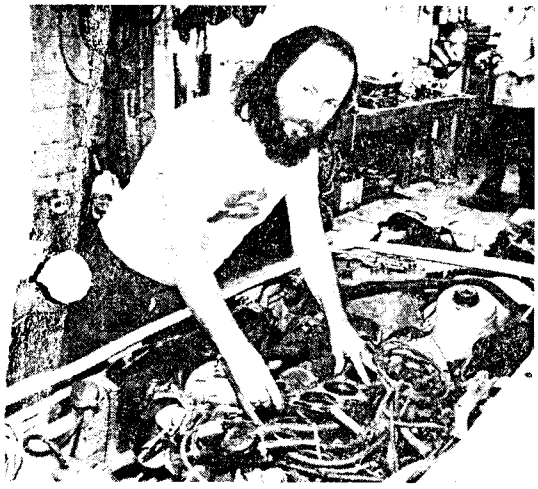
"This happens only between 20 and 50 mph under mild acceleration," Goodman says. "We had not encountered this particular combination of temperature and driving conditions before, so we didn't realize it could happen. It could easily be cured, though, with the addition of a hot-water line running to the choke element."

How the system works

Basically what happens in the engine is that an ultra-fine water mist is sprayed through a special nozzle mounted above the carburetor throat, where it is sucked down into the rejetted carb and into the combustion chambers, along with the fuel-air mixture. As the water-mist turns to steam in the combustion chamber, it lowers the peak combustion pressure and extends the pressure time toward the bottom of the stroke, which also keeps the nitrogen oxides down (see drawing).

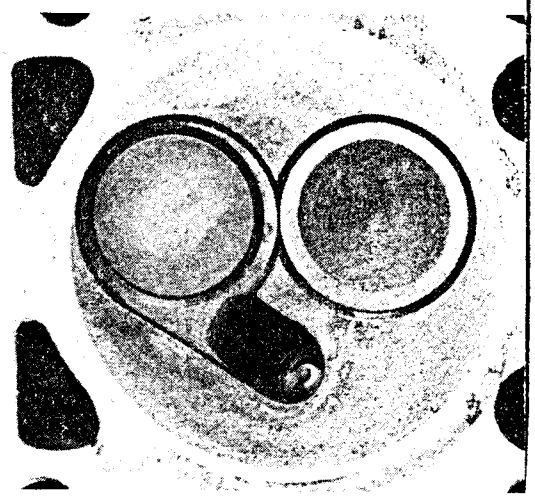
How the water-injection system works: Electric fuel pump pushes water into float bowl, then through adjustable needle valve (from a model-airplane engine) and a one-way valve (which keeps line to nozzle full at all times). Air Injection Reaction (AIR) pump still pumps air into exhaust manifold, but a restriction has been added to reduce the amount of air to the exhaust manifold. The lower volume of air needed is due to the lower temperature of the gases entering the manifold. AIR pump also pumps air into the atomizing nozzle through a one-way valve. Without a valve, at trailing throttle and high rpm, vacuum in the exhaust manifold could suck in water. One-way valve here is from oxyacetylene welder. Air pumped through nozzle draws water through nozzle's many tiny orifices. The amount of water spray increases in proportion to the rate of air flow through nozzle. Manifold vacuum draws the spray through the carb and into the cylinders.





Modified Fiesta engine's head gasket is removed by Pat Goodman. His shop, Goodman Engines, builds racing engines and does automotive machine work.

With top off air cleaner and a shop air hose connected to the special nozzle, a fine mist is produced by nozzle. In car, nozzle pressure ranges from 2½–10 psi.



Top half of combustion chamber is in cylinder head (recessed area around exhaust valve and spark plug). Top of flat piston has matching recession.

An air-injection pump (standard on the Fiesta and many other cars) is used to control the amount of water spray leaving the nozzle above the carb. Because the pump normally supplies more air pressure as engine load increases (also the condition in which more water is needed to prevent detonation), it's an ideal device for controlling the volume of water spray.

The combustion chamber has been designed to increase turbulence and therefore provide better fuel-air mixing. The chamber is comprised of matching depressions in the piston and cylinder almost entirely under the exhaust valve (see photo).

Goodman says the car can be provoked to detonate, if you run it at full throttle for a long while and get the pistons really hot. "But that's a developmental problem," he says. "If I had oil spray on the piston, as Mercedes does in its turbocharged diesel, or a spark sensor like the one on the Buick Regal, I wouldn't have it."

Advantages of the system

Increased performance, better mileage, and the ability to burn low-octane fuels without knocking are the benefits of this system, Goodman claims. "What you're doing," he says, "is using water as a replacement for lead. Lead will give you the power, because it will let you run a higher compression ratio, thereby increasing the engine's efficiency. But lead is a harmful pollutant, and the higher temperatures produce nitrogen oxides, another no-no. Water not only takes the place of lead; it also serves the function of EGR (exhaust gas recirculation), which is disconnected on Goodman's Fiesta. The result is more fuel economy: Running at a higher compression ratio, the engine uses less gas to do the same amount of work."

"Thermal efficiency in modern engines is almost nothing," he continues. "If car makers raised compression and used water injection, they could use a smaller engine, increase engine efficiency, and at the same time enjoy the benefits of a smaller, lighter car. Less weight not only translates into more mileage; it means that producing the cars would use less energy."

Why has water injection, which has been tried many times before, not been widely adopted?

The main problem, Goodman believes, has been finding a way to meter the water properly. "At 60 mph," he says, "this engine burns five or six quarts of gas and six ounces of water in one hour. It's hard enough to make the carburetor meter five quarts of gas in an hour, without trying to make it meter five or six ounces of water."

His two key solutions: the special

[*Continued on page 159*]

Water injection

[Continued from page 113]

nozzle, and using the air-injection system to draw the water through the nozzle. "The nozzle does a super-fine job of atomizing. In a test by AiResearch a few years ago, a similar nozzle was used to atomize unfiltered crude oil to run a turbojet engine on a test stand. The nozzle will atomize practically anything," he says.

The beauty of the system, Goodman claims, is that not only could car makers easily incorporate it into original engine designs, but that someone with a high-compression engine could also adapt the system to use the lower-octane fuels available today, without engine knock.

He says that modifying the combustion chambers for more turbulence isn't necessary for retrofit purposes. All that's needed is the nozzle, an air-injection pump (many cars have one as standard equipment), and the plumbing to hook up the system.

All the necessary items are readily available (at auto-parts stores, junkyards, hardware stores, etc.). And the average do-it-yourselfer can make the hookup, he says. The only item not readily available is the patented nozzle.

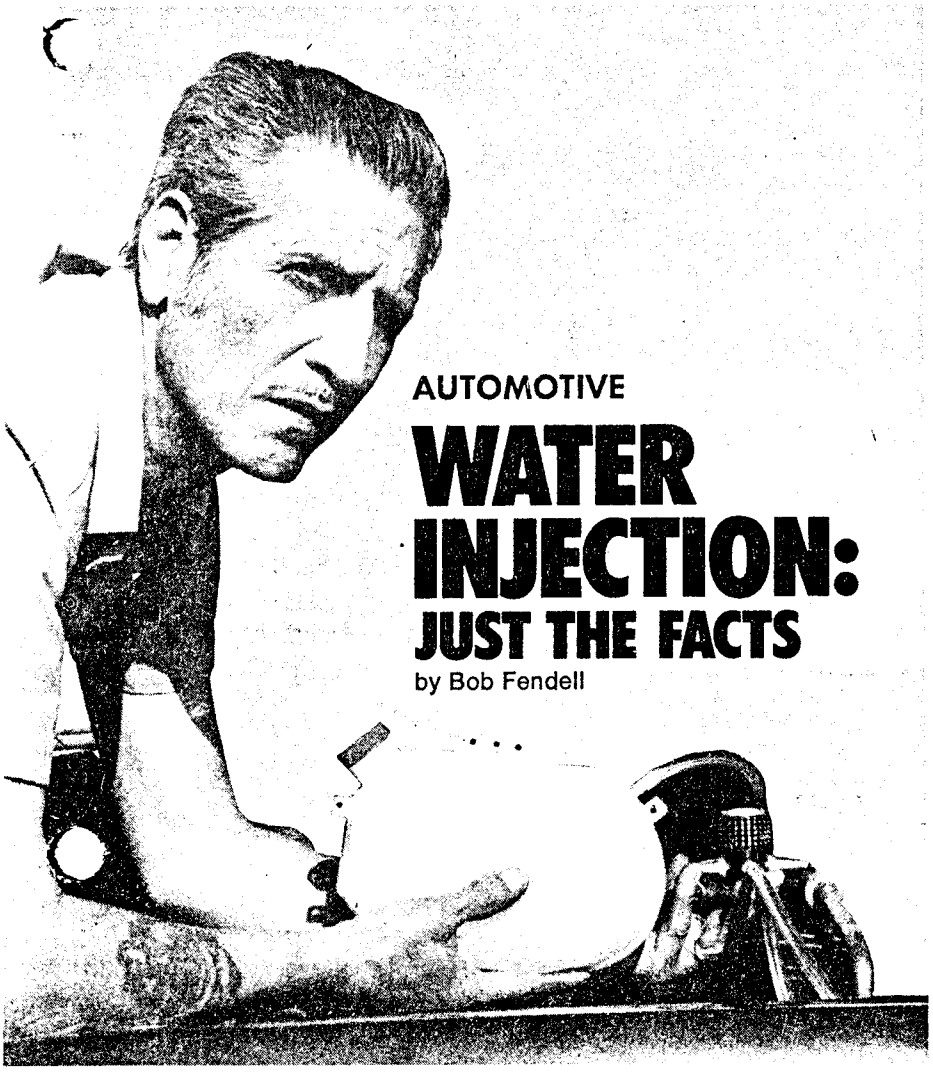
If you want to try this system on your own older high-compression engine, Goodman will sell you the nozzle for $25. At press time he was preparing detailed plans that outline the parts you need, where to get them, and how to hook them up. He intends to sell the plans for $8.50. Also, by the time this issue is printed, he may have available a kit with all the parts needed to make the installation. For information, write Goodman Engines, 685 N. Loudoun St., Winchester, Va.

What does the future hold for this method of water injection?

At this point it's impossible to say. Perhaps its most likely use is to enable older higher-compression cars that have a knocking problem to run on today's lower-octane gas. While in theory it should do this, at press time no retrofit on an older high-compression engine had been made. And, though it does seem to work satisfactorily on the Fiesta, that engine also has modified pistons, head, and a different cam.

Still, the system does seem worth investigating at the OEM level for small cars. Whether it can compete favorably with developments like the Texaco engine and others on the combustion horizon remains to be seen.

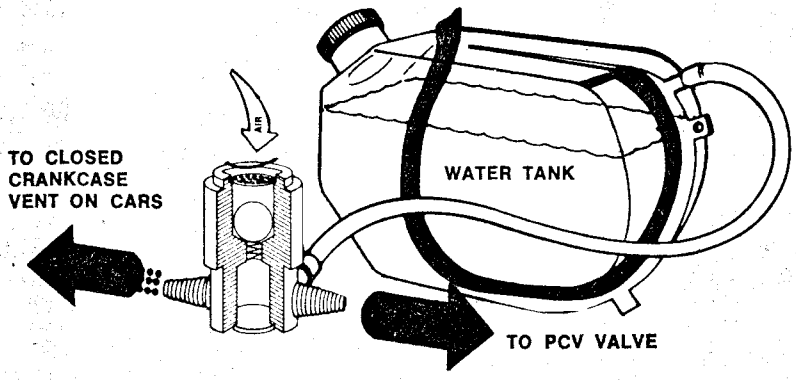
It certainly is an interesting technical exercise. Will it become more than an exercise? At this point, that's anybody's guess. PS



AUTOMOTIVE

WATER INJECTION: JUST THE FACTS

by Bob Fendell



Water injection has been used in racing cars for years to boost power. Now, when everybody's trying to squeeze the most out of a gallon of gas, they're catching on with the common motorist. The device shown in the above drawing is manufactured by Hydro-Air Corp. It's operated by a car's vacuum lines (in this case, the PCV valve); the engine creates a vacuum which sucks water from the storage tank and injects it into the intake manifold below the carburetor throttle plates. The water tank holds 38 oz., will last about 400 mi.

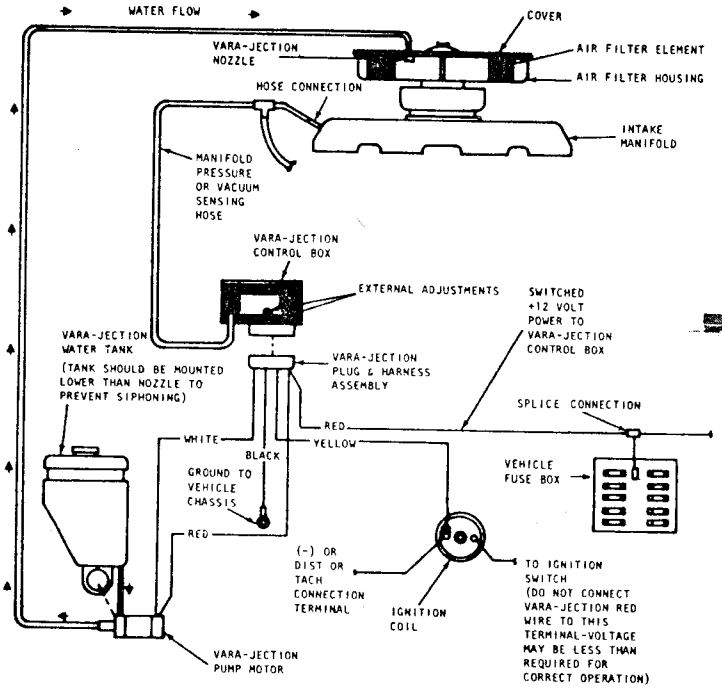
☐ Is water injection an automotive myth or another revived gimmick? Or is it something that will help most cars on the road get better fuel economy, better power, longer more maintenance-free engine life or a combination thereof? Government scientists reporting on tests of various water and water/alcohol injection devices have reached varying conclusions when rating their effectiveness. And no car company, U.S. or foreign, in the past 20 years has seen fit to offer a liquid injection system as even an option—not even on a turbodiesel where the injection of water or water/alcohol would seem to be highly beneficial.

When seen from Detroit's point of view, that is understandable. According to Bruce Everling, who before joining The Goodman Co. (an injection system manufacturer) was a government engineer with EPA, no car company is going to add a device which carries an implied performance claim for fear of its recall potential or complaints about performance. Such an item is better left to independent companies, they feel, until the benefits of the device are taken for granted, thus making lawsuits on the question highly improbable.

But perhaps we are getting ahead of ourselves. We should examine what the reasoning behind liquid injection is and what it's supposed to do to produce beneficial results.

Have you ever noticed that your car seems to run better on a damp day? That is because the moisture in the air is just enough to forestall detonation and pinging, allowing the engine to run smoother. Early prototype water injection systems attempted to duplicate this phenomenon without really understanding it. (Water injection was first patented in 1904.)

Over the years, however, at least partial knowledge of what occurs inside an engine has been achieved and the injection devices on the market now are better thought out. Most are controlled in some manner to become activated under load instead of only when the engine is idling. The question becomes not whether the devices themselves work—they obviously do inject either droplets or vapor—but whether they: 1) are worth the bother; 2) create other problems; 3) are useful for some kind of powerplants but not others. Some researchers seem to indicate that the game is not worth the candle and emphasize that the effect of this injection on a



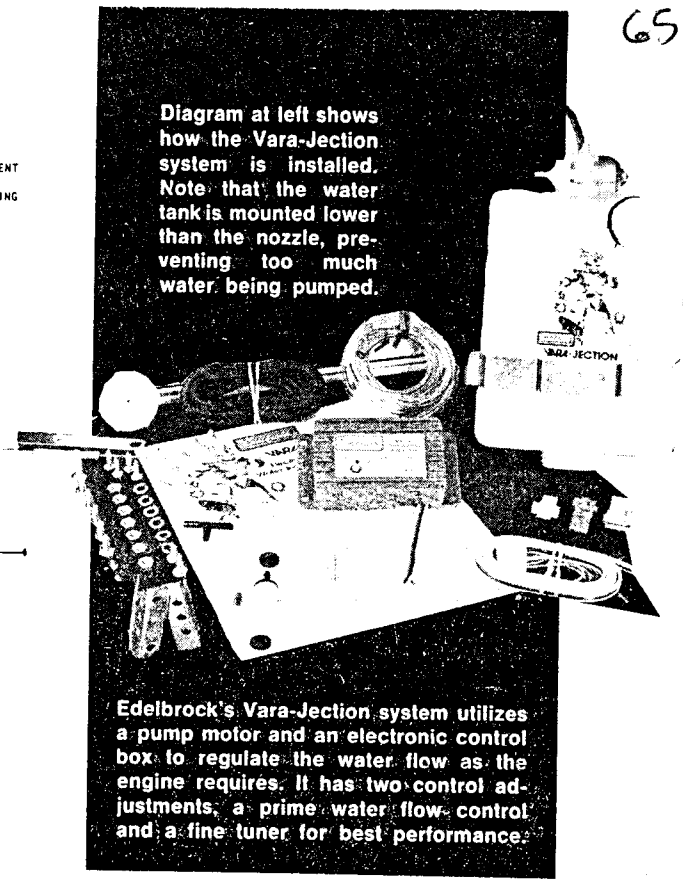


Diagram at left shows how the Vara-Jection system is installed. Note that the water tank is mounted lower than the nozzle, preventing too much water being pumped.

Edelbrock's Vara-Jection system utilizes a pump motor and an electronic control box to regulate the water flow as the engine requires. It has two control adjustments, a prime water flow control and a fine tuner for best performance.

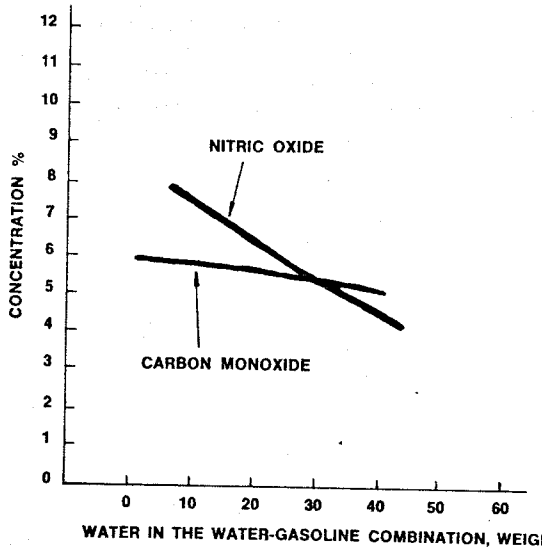
carbureted engine is not a simple one. While the people selling the liquid injectors obviously disagree with the first part of that statement, they totally agree with the second part.

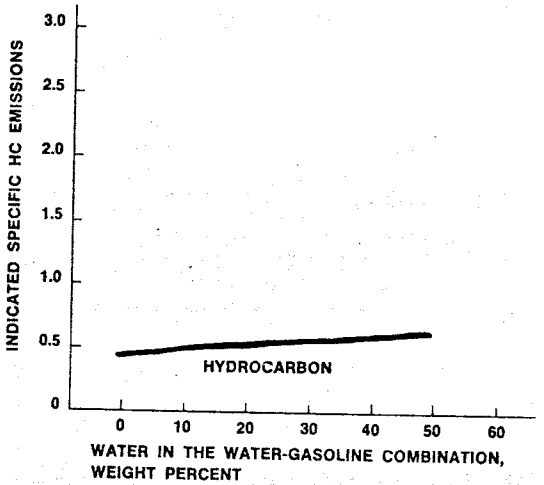
How the Water Helps. The water injector works not because the engine is burning water, but because the injection process apparently cools the flame front in the cylinder. Adding any one of several alcohols mixed with the water assists in this effect and is believed to give further benefits specified later.

The injection of the liquids does several things. First, there is a greater potential for expansion of the fuel charge since cooling makes it denser. The result is believed to be a pressure boost: the injection of water is, in effect, raising the octane of the fuel (a certainty if alcohol is used) by raising the flash point (the instant when explosion occurs). The water's cooling effect creates the conditions for a more thorough combustion at lower peak temperature. That's why it eliminates ping in many models with modern engines. Some injection makers even claim the water turns to steam and you're getting added "steam engine" power. Cooling of the charge seems to retard formation of nitric oxide and its dilution seems to inhibit hydrocarbons, although the EPA has not yet confirmed this.

The second benefit, claimed by some systems, is that it cleans the engine, the exhaust and the carburetor

All graphs: B. Peters and R. Stebar, SAE

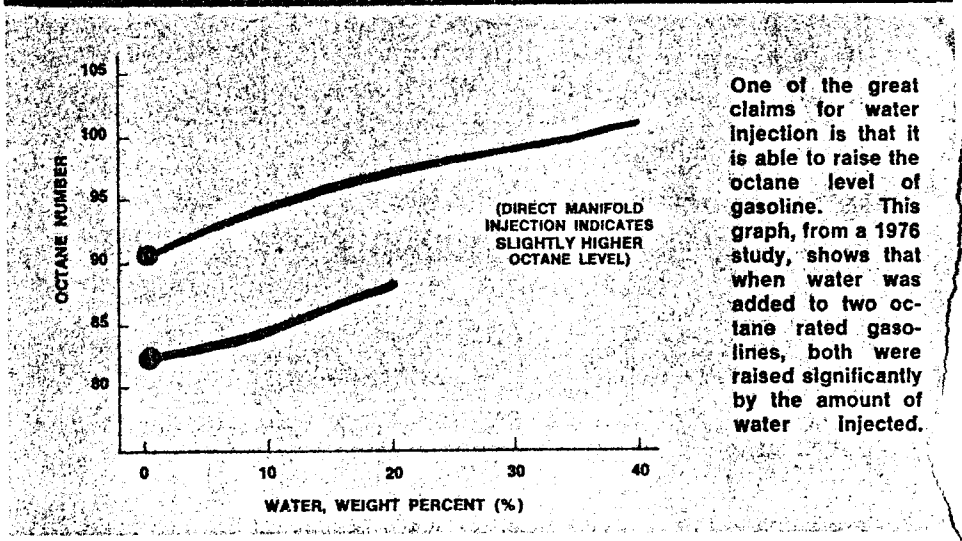




These two graphs show the effects of water injection on pollutants. In the top graph, nitric oxide was significantly reduced and carbon monoxide also lessened, but more slightly. The effect was only noticeable where carbon monoxide levels were relatively high. In the lower graph, the level of hydrocarbons actually increased when water is added.

WATER INJECTION

All graphs: B. Peters and R. Stebar, SAE



One of the great claims for water injection is that it is able to raise the octane level of gasoline. This graph, from a 1976 study, shows that when water was added to two octane rated gasolines, both were raised significantly by the amount of water injected.

arbon deposits, thus permitting the car to run cleaner and more efficiently. A third benefit is that it permits use of the lowest octane gas available with no loss of performance. That would be 70 octane in some parts of the country.

It's also claimed that water injection permits you to advance the spark to lean out the mixture and thus increase fuel economy without injurious effects. This may be true for many recent model domestics which were set rich for best performance, so you must investigate carefully whether or not your car or truck falls into that category.

After much research into what the firms that are reviving interest in liquid injection are saying, the fact remains that neither they nor the car companies completely understand the effects of injection on the combustion cycle or on the engine. But water injection still seems to have beneficial effects on many vehicles under many conditions. Addition of alcohol to the mix—ethanol, methanol or even just plain isopropynol rubbing alcohol—certainly has the effect of raising octane and cleaning out carbon deposits even faster.

Yet it is not even clear, according to Everling of Goodman, whether the liquid injection changes the rate of burn, for instance. The Goodman expert believes that water injection proves beneficial because it increases the differential between the highest temperature the engine can reach and the exhaust temperature. If there is an increased differential, it means that less work/heat is escaping through the exhaust, he says.

Thus, if we know that *in theory* that water injection can provide benefits—power, elimination of knock or ping and/or fuel economy by various means—perhaps it's not really relevant to know exactly *why* these benefits occur. So we can proceed to the question of which hardware works.

The Manufacturers. There are any number of systems on the market. They all have different hardware and they all disagree about how to get the water or water mixture into the combustion cycle and in what form that should be. The difficulty of the problem comes from the admission by virtually all that too much water kills fuel economy (their main selling point), but that not enough really doesn't have much effect on it one way or the other.

They differ on whether the liquid can be sucked into the engine or whether it must be injected. And they differ on whether it should be injected continuously or whether the injection should vary with the loading (that is, when you press your foot on the accelerator or when you maintain pressure as the vehicle climbs a hill). And they differ further on the degree of atomization necessary to insure good distribution to all cylinders.

A number of studies on water injection have been done, some comparing the mechanisms utilized and the claims made. One of these was at the University of Nevada Reno by Barry S. Hunter who makes the point that it "is not applicable to direct power or economy; water injection allows the engine to develop more power and thereby become more thermodynamically efficient."

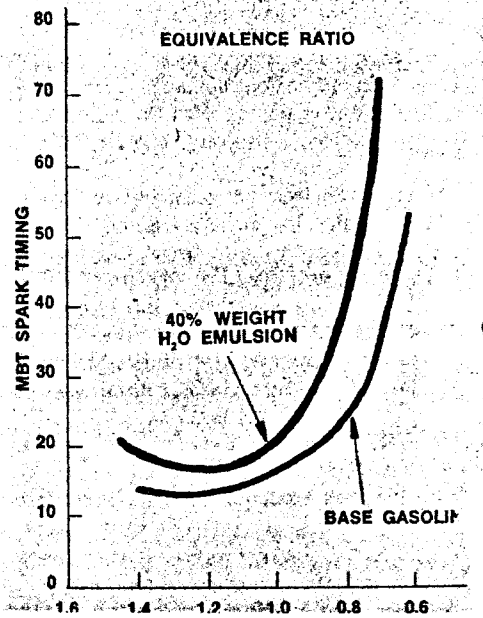
Mr. Hunter, who is not convinced that water injection is worth the cost for the amount of benefits, nevertheless differentiates between those systems permitting water to be sucked into the system and those which use pressure to push the liquid in. The former are called vapor injectors and they are the least expensive kind. In this type, a carburetor vacuum line is tapped and when high vacuum occurs the water is drawn in. As Hunter points out, high vacuum occurs during idle and deceleration, and one problem to be solved—detonation—occurs only under rapid increase in acceleration (load). So for this problem, such vapor devices seem useless.

Moreover, the vapor injector automatically leans out the mixture. This can result in a fuel economy benefit as long as the mixture does not become too lean, which can cause internal damage.

It is interesting to note that Hunter became interested in water injection for cars because of the longtime use of water injection on supercharged airplanes. He notes that auto companies in fact did offer water injection for a short period to counter the low octane of the gasoline of the day.

But can it be successfully transferable from airplane to auto? The California Air Resources Board has advised against at least one system for rotary and diesel engines and those which are fuel injected. Yet systems have been marketed specifically for diesel engines (on farm tractors). Turbocharging and supercharging are making a bit of a comeback as a way of making smaller, more economic en-

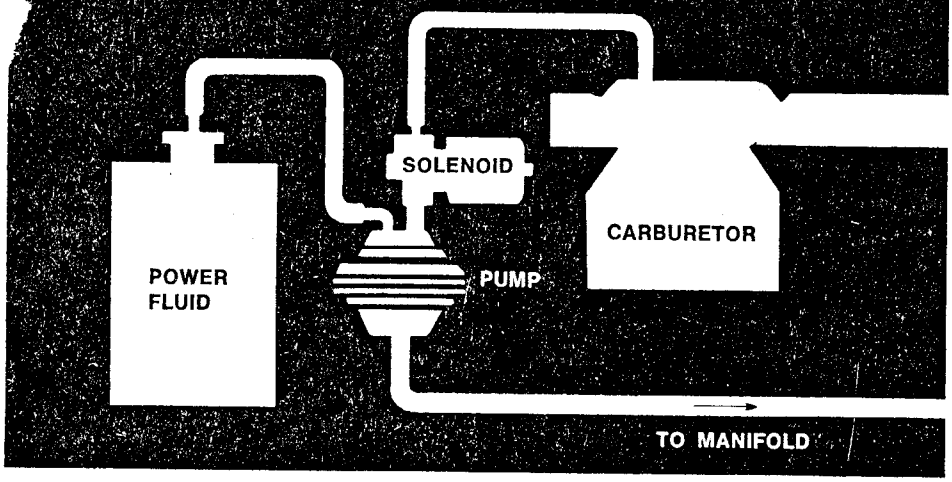
As this chart indicates, water injection slows the combustion process in spark ignition engines, thus the engine timing must be advanced if it's to show a mileage improvement.



COMPOSITE SUMMARY OF EMISSION TESTS RESULTS

TEST DESCRIPTION	HC	CO	NOx	MPG
Baseline FTP	2.34	35.54	2.33	16.20
Baseline HFET	0.53	6.40	2.25	22.42
Waag Injection FTP	2.79	15.01	2.31	20.29
Waag Injection HFET	1.36	3.34	2.16	26.55

The Waag system was developed during World War II to produce greater power for airplane engines. When under load the system injects equal amounts of water and alcohol directly into the engine combustion chamber. The above chart shows the results of two sets of tests—Federal Test Procedure (FTP) and Highway Federal Emissions Test (HFET)—with and without the Waag injection. Hydrocarbons were up slightly, but so were mpgs; CO, NOx decreased.



gines provide enough power during acceleration to retain performance; perhaps there is where there will be a transferable experience from airplanes.

So we have determined that each car may derive more or less benefit from liquid injection and may derive different levels of benefit from the competing systems. To help you decide which of the many systems you might like to try, we have compiled information on a number of them. Unless you are mechanically inclined, we would suggest you have them installed by an experienced mechanic. Order of listing does not imply any recommendation.

The Wagg System injects a water-alcohol mixture directly into the carburetor. The maker recommends resetting the ignition timing and rejetting the carburetor. The patented device has an integrated, electrically operated regulator pump which senses engine vacuum, thus determining need for the injection operation. Operation with water-alcohol mixture plus a rust inhibitor or straight alcohol is recommended.

Wagg makes the following claims: mileage increase; decarbonization of engine; reduction of engine wear; cure of detonation, dieseling, and rough idle; and a reduction of emissions. An EPA interim report now being challenged reported an increase in nitric oxide and reduction in carbon monoxide with a fuel economy benefit.

The Waag system is sold through a distributor network. Lorne Cameron, president of the company, says the alcohol used costs less than one cent a mile. Methanol is recommended. Injection occurs only under load. Address: Waag Products, Engine Fuel Systems Inc., 6451 N. Federal Hwy., Suite 1220, Fort Lauderdale, FL 33308.

Shelby-Spearco's system injects a water/alcohol mixture directly into the carburetor. Ignition timing must be reset. A black box electronic coordinator senses intake manifold vacuum and ignition rpm to determine when to have water pump build pressure and inject water into the carburetor intake. They recommend operation on water-alcohol mixture.

Claims: fuel economy increase; power increase; volumetric efficiency increase by cooling intake air; decarbonization of engine; and use of lower octane fuel.

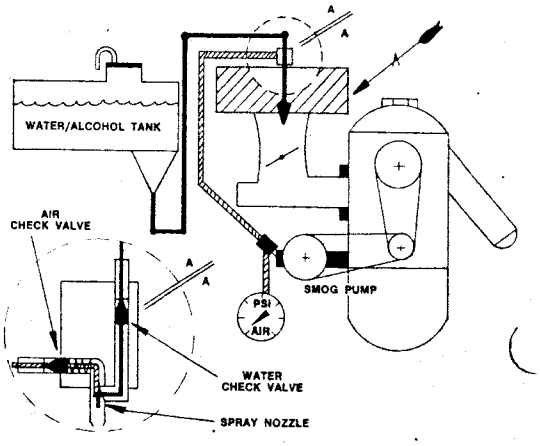
This unit is sold direct or through selected stores and shops and is probably the most expensive of the liquid injection systems. Address: Sperco Performance Products, 10936 South La Cienega, Inglewood, CA 90304.

Goodman Systems' injector is powered either by an existing smog pump on the engine or a vacuum pump provided and injects atomized droplets directly into carburetor. Air from the smog pump or equivalent is routed to atomizer nozzle which mixes this air with water or water/alcohol and squirts it into the carburetor venturi.

Claims: increased mpgs; elimination of detonation; some decrease in emissions; decarbonization of engine and carburetor; and greater engine durability. Early literature claims you can detach exhaust gas recirculation valve and can advance timing for economy reasons without failing to meet emissions requirements. This is

(Continued on page 106)

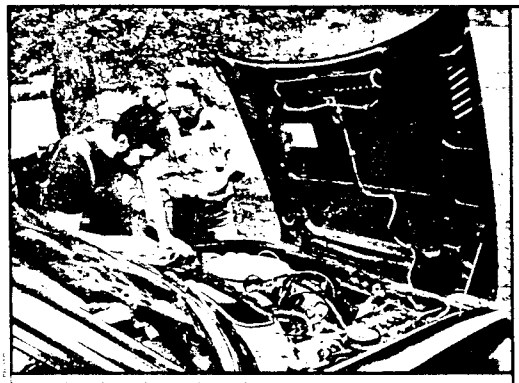
A configuration of the Goodman System is given at right. This one is unique in that it is powered by the car's smog pump. Air from the smog pump is routed to the spray nozzle which mixes the air and water like an atomizer does prior to entering the carburetor. Goodman claims that the device will increase mpgs, eliminate detonation, decrease emissions, and reduce carbons.



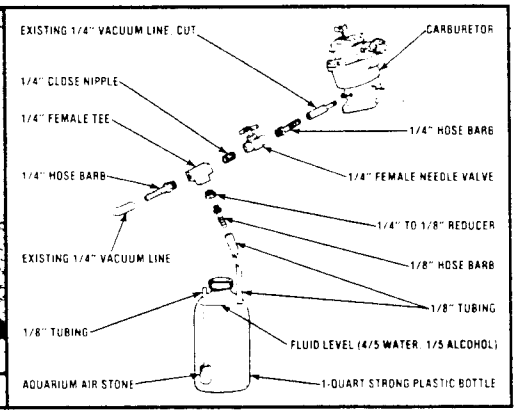
Rex

One of MOTHER's seminar students gave a few lessons of his own!

RON NOVAK'S DO-IT-YOURSELF WATER INJECTION SYSTEM



Ron Novak (right) explains the subtleties of the mileage saver.



You can improve your car engine's starting ability, pickup, *and* fuel economy by constructing a homemade water injection system . . . for a total cost of *under five dollars*! And you'll spend that small amount of money (heck, it takes more cash than that to buy one tank of gas nowadays!) entirely on parts . . . because all the information you'll need to "inject" your own auto is right here in this article!

MOTHER's staffers have installed and tested one of the "engine aids" (and, by jeepers, the thing works!), but we can't take the credit for *inventing* the build-it-yourself device. Nope, all the know-how for this half-hour (or less) shop project comes from a very generous—and clever—visitor to this magazine's seminars . . . Mr. Ron Novak.

Ron openly shared his under-the-hood "secret"—during the July Mother Earth Week—with everyone who was interested. (And once the word of his brainstorm got out, the inventive fellow spent as much of his visit *teaching* as he did studying!)

Actually, Mr. Novak made *two* improvements to his 1978 Honda CVCC station wagon before he started the long trek from his upstate New York home to MOM's western North Carolina land. The traveling seminarian's major modification was to install a homemade water injection system that feeds a 4:1 H_2O/alcohol mist into his vehicle's carburetor . . . but he also added a drag-reducing "air dam", under the Honda's front bumper, to further improve his car's gas mileage. *[EDITOR'S NOTE: MOTHER's ever-busy researchers are hoping to report—in an upcoming issue—on this second (the "fender extender") idea.]*

Ron got the notion for his water injector from some automotive magazine advertisements that offered a $50 fuel-saving device. The canny Nor'easterner carefully read the literature about the expensive accessory and realized that the mileage-extender consisted of little more than a bottle (partly filled with some "miracle" solution) that was rigged with [1] an underwater air intake line that bubbled air through the liquid and [2] a mist-grabbing outflow tube to feed the "foamed-up" vapor directly into the engine's carburetor. The wet air was reputed to help produce more efficient fuel-burning (by "atomizing" the gasoline droplets and lowering the fuel's temperature) and to improve the power plant's overall performance and life span (by cleaning out the engine's carbon buildup).

Novak figured that he could make a similar fuel-saver himself . . . if he could solve one problem: What "gadget" could he put on his underwater air tube to produce those myriad tiny air bubbles? Well, the tinkerer tried just about every device he could think of (including the pinched end of a cigarette holder), but—in spite of his efforts—the bubbler had him stumped. For lack of one simple piece, Ron couldn't get the whole dang system to work!

Then one day, while the New Yorker was running an errand in a pet shop, he noticed a small aquarium "air stone" that was (what else?) busily breaking an incoming oxygen supply into tiny little bubbles . . . to mix air into the fish tank's water. Ron bought one of the low-cost objects, attached it to his homemade injector's underwater tubing, and—eureka!—he was in business!

The entire installation procedure was easy, inexpensive, and legal (Ron didn't fiddle with his car's EPA emissions devices). And Novak's "new" water-injected Honda ran better—and further on one tank of gas—than it ever had in its life!

Since that first attempt, Ron has installed his "bubbling bottles" on all sorts of vehicles . . . from a BMW R60/2 motorcycle . . . to a 1973 Opel GT . . . to a 1968 Cadillac. In each case, gas mileage improved dramatically! So, folks, there "ain't no reason" why you can't get better performance and gas mileage by building your own water injector . . . no matter what form of gasoline-engined transportation you're driving! All you have to do is read this article's sidebar, head off to the nearest pet store for your "auto parts", and then get to work!

WATER INJECTION: 6% GAS SAVINGS—AND MORE POWER—FOR AS LITTLE AS $3.72

Installing a hydro-atomization system on your car—a modification which adds damp air to the engine's intake mixture and produces a variety of benefits—involves little more than the purchase of a three-inlet valve (such as a fish tank's air regulator), an aquarium air stone, five feet of 1/8" clear tubing, and a strong plastic bottle . . . plus about 15 minutes of under-the-hood tinkering.

When MOTHER's mechanics tackled the job, they were able to pick up all of the necessary pieces—with the exception of the $1.98 brass valve—at a local pet shop for only $1.74. The boys then simply drove around the corner and recycled a photochemical bottle from a trash bin behind a photo shop, stopped by a nearby plumbing supply store to pick up the three-way valve, and returned to the research center to actually install the parts . . . which took just a shade over ten minutes.

You can begin your installation by splicing the valve into one of the vacuum lines which comes from the base of the carburetor. (In many cars the distributor advance hose would be the best choice for valve-insertion. However, the Honda Civic CVCC that MOTHER operated on has a very convenient 1/4" vacuum line running to a fresh air valve, so MOTHER's crew tapped into that hose with their makeshift control.)

Next, securely suspend the liquid-containing bottle in the engine compartment. (In this case our research team fabricated a holder from an old coat hanger and bolted the assembly to an existing fastener on the left wheel well of the Honda.) Once your tank is in position, drill two 1/8" holes in the top of the container . . . one on each side of the cap. Then run a suitable length of the 1/8" hose from the remaining outlet on the three-way valve to one of the 1/8" openings . . . and allow 1/2" of the tubing to enter the reservoir.

Now take the rest of your 1/8" hose, insert it through the unoccupied 1/8" hole, attach the air stone to the inside end of this line, and slide the aerator and tube into the bottle until it just touches bottom. The leftover 1/8" line—which protrudes from the container—should be snipped off to about three inches in length.

Finally, fill the reservoir—to about an inch from the top—with a solution of four parts water to one part alcohol (the latter keeps the water from freezing in winter), start your motor, let it warm up, and then adjust the valve until a gentle bubbling comes from the air stone. Once that's done, it's time for a test drive!

MOTHER's researchers noted an immediate improvement in low-RPM power—which helped the Honda to accelerate up hills that had previously required a downshift—and a significant reduction in vibration. Better yet—after we ran three tanks of gas (and a quart of fluid) through the engine—the Civic's gas mileage jumped from 32 to 34 MPG. Plus, much to the auto owner's surprise, water injection cured a longstanding cold weather starting problem. In fact, the driver claims that the modification "paid for itself" with that starting improvement alone . . . and that, in his opinion, the power gain and gas savings are icing on the cake!

EDITOR'S NOTE: People who read about Pat Goodman's water injection system (see "Water Injection Wizardry" in MOTHER NO. 59, page 46) may wonder about the differences between Ron's homemade "carburetor squirter" and Pat's more sophisticated—and, of course, more expensive—device.

The most important functional distinction between the two is that Novak's injector "bubbles" most rapidly when the car is idling and least intensely when the vehicle's under full throttle. Goodman's smog-pump-controlled instrument, on the other hand, increases its vaporizing activity with higher engine output. Pat's "mistifier" will therefore produce a much greater overall boost in gas mileage than the do-it-yourself device does . . . but can only be added to a car that already has a smog pump. Ron's homemade system can be installed on just about any vehicle on the road today.

A 20 to 50% gas mileage improvement can be yours with . . .

WATER INJECTION WIZARDRY

During the second World War, fighter pilots could push a button and inject a stream of water into the turbochargers of their monstrous powerplants . . . to get extra thrust on takeoff. Some time later, Chrysler (among other auto manufacturers) installed water injection on a number of its large displacement engines . . . again for a performance increase. Indeed, water injection—used to produce power increases—is nothing new.

But using "Adam's ale" to save gasoline sure *is* a change of pace! You see, until recently there just hasn't been any way to effectively control the volume and atomization of the tiny amount of fluid needed to adapt H_2O injection to a small, economical engine. And typically enough, while big technology has failed to figure out how such regulation could be handled, a small back-lot entrepreneur (with a wealth of experience and ingenuity, but a paucity of dollars and degrees) has succeeded.

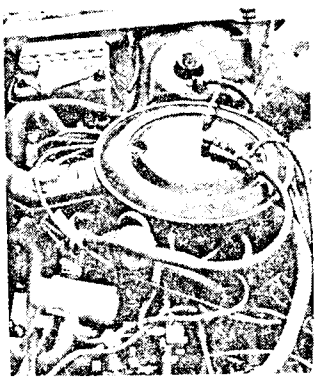
Pat Goodman installed his first water injection system (on a Porsche racing car) in 1964, and the racing organization responded by banning his device . . . it made the vehicle *too fast!* Undaunted, Pat decided that—even if the racing establishment *wasn't* interested in "improving the breed", *he* was.

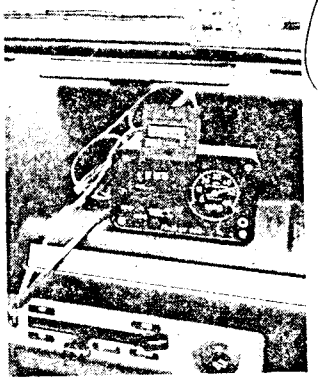
Today, several near-bankruptcies later, the innovative mechanic owns a vehicle that only the government could argue with: a 1978 Ford Fiesta . . . that gets *50 MPG in normal around-town driving.* (This impressive figure has been verified by a MOTHER staffer, who accompanied Goodman on a 48-mile jaunt around Winchester, Virginia. During the drive—which Pat accomplished with, if anything, *more* speed than normal—the small four-cylinder sipped only .95 gallon of unleaded gas.)

BACK TO BASICS

Like most good ideas, the Goodman water injection design is an amazingly simple approach to a frighteningly complex problem. In fact, the production system is much less complicated than the prototype model pictured in the accompanying photos. It consists only of an atomization nozzle, plus two one-way valves from squirt guns, some hose (to supply water to the "sprayer" and draw pressure from the emission system), and a one-gallon water tank.

STAFF PHOTOS





At left is the water injection "brain" . . . at right the results.

The nozzle is screwed into the top of the air cleaner housing and sprays minute droplets of water into the carburetor throat . . . in response to orders from the engine's stock smog-control devices.

Despite his occasional criticisms of the government's regulatory bureaucracies, Pat is graciously thankful for all the time and money they've spent developing his system's volume-control device: the smog pump. This air injection mechanism carefully monitors engine speed and load . . . and provides the pressure to activate the Goodman unit's water nozzle!

By restricting air pressure from the pump (either with a valve or by crimping the hose) to about 2-1/2 PSI at around 3,000 RPM (measured with a fuel-pressure gauge), the proper ratio of 5% water to 95% gasoline is assured. And at 5%—if the motor burns a gallon of gas every 15 miles, for example—the gallon of water will last about 900 miles.

HOW?

So—you may be wondering—just how does water improve gasoline mileage? After all, plain old H_2O won't burn. However, because water *doesn't* burn . . . the fluid *does* (in effect) raise the octane of the fuel!

This higher "flash point" produces three specific benefits (as well as some offshoots). First, because the water cools the gas-air mixture, there is greater potential for expansion (since pressure is directly proportional to temperature). Second, combustion turns the water droplets to vapor . . . which also helps create a pressure bonus (much as the same substance drives a steam engine).

Finally—and most significantly—the conversion of water to steam consumes heat (at a rate of about 1,100 calories per gram of the liquid) at a very critical instant. This absorption of heat prevents the temperature of combustion from rushing to a sharp peak (as it does in a standard engine) and then dropping rapidly off. Instead, the car's heat increases more slowly, reaches a lower peak, and descends much more gradually. (In addition, the longer overall combustion duration creates more pressure than does a standard engine's cycle.)

Thus water injection alone can make your engine more efficient (and gas-thrifty), but a good mechanic can easily *improve* upon such benefits! Goodman, for instance, runs his Fiesta at a 12.7:1 compression ratio. He can do this because the reduced temperature of combustion prevents the normal problems of pre-ignition and nitrous oxide emissions (which are produced in a *high* heat environment). In fact, Pat's little Ford recently loped through the EPA's rigorous (and—at $3,000—expensive) nitrous oxide test with only *half* the maximum legal emissions.

A high compression ratio can have many benefits . . . but for the most part such "pluses" involve increased power. Most folks assume—or have been led to believe—that more power means more gasoline consumption. Not so! A compression-ratio hike does *not* change either displacement or fuel flow, but only makes *better* use of the fuel that's available. In the Goodman Fiesta, more power means that *less* throttle can be used to travel at the same speed. That efficient gasoline use translates to better mileage . . . as well as a boost in performance. (By the way, the pistons Pat used to raise the compression in his little Ford are obtainable from his auto parts store. You'll find the address at the end of this article.)

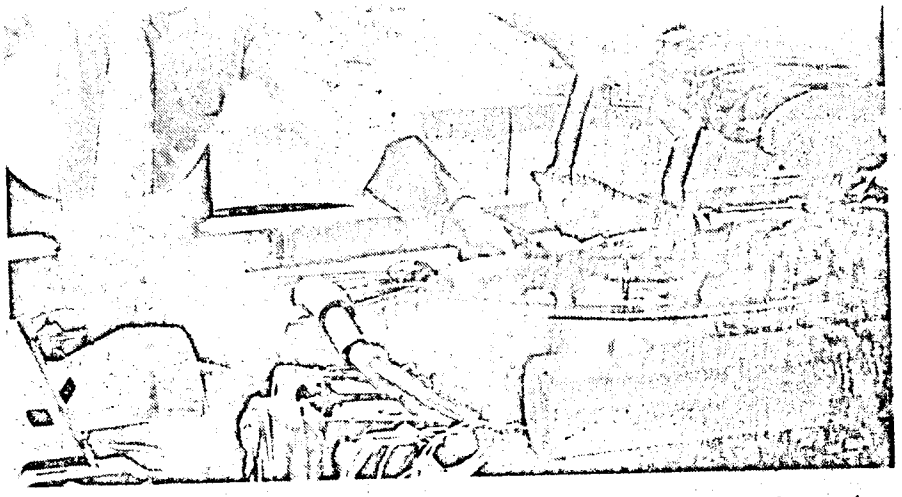
If you're reluctant to tackle piston replacement, you can still enjoy an approximately 20% MPG improvement by installing a water injection system on your stock engine. Since Pat plans to sell an installation kit—including nozzle, one-way valves, water tank, related hardware, and detailed instruction book—which will be available (by the time you read this) for under $50, a water injection system should pay for itself (at the rate of about a penny per mile) just 5,000 miles down the road.

In addition, the system is so simple to install that it can be ready to run in less than two hours, and the only recommended maintenance is a nozzle-cleaning (with vinegar) every 20,000 miles.

However, the future of the Pat Goodman water injection system is still undecided. Amidst negotiations for distribution with a large New York firm, Pat received word about the possibility of pending EPA action against people who manufacture automobile engine accessories.

While MOTHER can fully understand why devices that make noise, spit out smog, or gulp gasoline should be controlled, allowances *must* be made for small manufacturers who can genuinely help us all. Today Pat is not allowed to install his nozzles (nor is any *professional* mechanic, without that $3,000 nitrous oxide test) despite their seeming benefits. Tomorrow he might not be allowed to make them at all.

EDITORS NOTE: You can obtain the nozzles, instruction books, Aries Pistons, and a variety of other import parts from Atlas Import Parts, Inc., Dept. TMEN, 685 North London Street, Winchester, Virginia 22601. ■



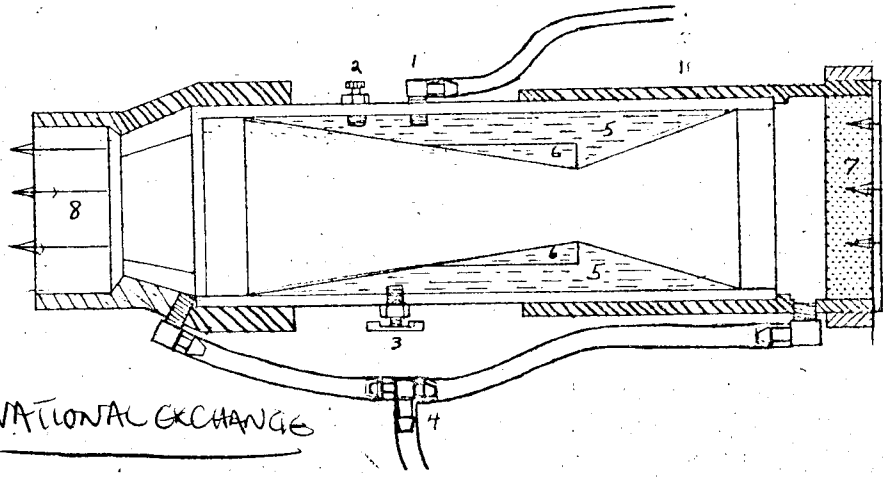
More good reports on Charlie Brown's Power Pak humidifier for saving gasoline and getting better performance from your auto: New accolades pouring in make this device the most consistant of all the gas-saving, clean-air promising gadgets so far investigated.

There are a lot of gadgets and gimmicks advertised that promise to give you X-percent better mileage and to keep your clunker's exhaust from polluting the atmosphere...claims are one thing, performance is another! So far the simple humidifier designed by a Florida group headed by retired Air Force colonel Charlie Brown (mailing address: 8801 S. W. 116th St., Miami, Florida, 33176) is the only device I can happily report has not had a single detractor. The Power-Pak is so simple it must be embarrasing to Detroit's braintrust. It is nothing more than a ceramic circle or venturi shape and a water drip system. The water drips onto the ceramic, the porous ceramic naturally shapes the water into molecular-sized droplets which mix with the incoming air and humidify it before it mixes with the fuel in the carburetor. Everybody knows cars run better in fog or light rain!

Anyway, Bob Beaver of the magazine 1001 Truck & Van Ideas has tested the Power Pak in his gas-guzzling van. Here's what Beaver wrote at the end of his article in the November 78 issue:

"After 600 miles of continuous use (with the van's air-conditioning

1. Water supply hose
2. Air Vent
3. Water drain
4. Weep drain
5. Water
6. Venturi-area of maximum humidification
7. Air Filter
8. Humidified air to carburetor



NATIONAL EXCHANGE

operating) the Power Pak has resulted in an increase of 1.9 miles per gallon, increased performance and lower emission levels. It should deserve serious consideration by any Van or RV owner because it will greatly lower your fuel costs..."

And then there is this letter from Exchanger Dale Scott of Seattle, Washington:

"Dear Tom Valentine, Last year I wrote to Charlie Brown and ordered a Power Pak. Well it took me to August of this year to install it on my car. I feel that my car has some added power, but at the time I was having problems keeping water in the Power Pak. I wrote to Mr. Brown and he immediately sent me an additional clamp and a bottle container, that I broke. I installed them and took a trip. My mileage went from 22 miles per gallon to 26 miles per gallon! Mr. Brown has been more than prompt in replying to all my letters and questions. A very pleasant, helpful person."

The original Power Pak was a ceramic ring that fits into the air cleaner com-

guarantee a customer that caustics and water for a minimum of fi made clear but can be made in any co years or more even under the worst of

The only thing that removes it, and t aromatic solvents. There are so many us Industries, Inc. will be a major, major

Some of the more exotic situations years of testing and perfecting include of any boat or ship and get a few knc — did you hear that Ted Turner?

Automobile rust proofing is big bu resort to thick greasy coatings appli they last only 36 months generally sp not bullet proof, however) and goes o part of total use picture. For instance that can be applied to paintings, one to Ultra violet radiation, the part yellow...

And of course the new product mak solves one of the major problems for water proofing. Anakar sticks to any resists water acids, caustics and rust nothing to it, but don't try electrostati

One other thing, dirt has a hard ti and perhaps even "non-polar." Being it would beat barnacles — which are not yet, but I'm working on that," w

★ ★ ★ ★ ★

Money, money, money makes the The lyrics from the song out of "Ca people money is important. However all should know, especially our Cong book, "The Great Cookie Jar," by D section) and I want to share a tidbit o

Dr. Popp uses words very carefl definition of all the terms for econon the following brief synopsis on the mc today I found very interesting:

"The current Federal Reserve notes

"They have a number of undesireal tion (as opposed to sold into circulat to bring them into circulation. They a not bona fide notes. (Dr. Popp has written evidence of a promise to pay. such evidence.

"The Federal Reserve banks obtai cost of the paper and printing. At th per note.

"If a local bank should wish to Federal Reserve bank an interest bear value of the notes it receives. The Fe on that bond. In effect it receives int of the paper and printing.

"We said the Federal Reserve note are certificates of legal tender signed treasury of the United States. They a Reserve bank.

"There is no need for the United Federal Reserve banks. If the gover tender, it could issue them as such terest-bearing bond would be needed

Now let's contrast his latter statem bodied gold and silver coins:"

"Their desirable qualities were th terest-bearing debt was incurred. anything because they had full excha

"The one undesirable quality the that Congress placed a fixed exchan at the time they were minted. That i

"The coins would have stayed declared the legal tender value to be tent of the coins at the times the c payment (in taxes) or paid out by th the writers of the Constitution mc

converters and the auto moguls feigned frustration at being told to install them, when all along it added to profitability and a great deal of free advertising via media news stories.

One might ask, why not take the thing down to your local auto dealer and get him to test it?

"The manufacturers have a policy that forbids dealers from testing new devices or concepts," Brown pointed out.

Meanwhile, millions of Americans are subjected to televised propaganda about EPA mileage estimates designed to sell cars and major oil companies advertise how hard they are striving to provide the "energy needed to keep America rolling."

Brown admits that his earlier device, the "Ring of Power" caused rust problems and was expensive because it was made of ceramic tile. But the Power Pak solves both problems and fits easily on all vehicles.

"One of our problems certainly must be the rash of gas-saving gimmicks that popped up across the country over the last few years. These useless gimmicks have given all such devices a bad name."

Carburetion devices have come and gone throughout the history of automotive engines, and the auto makers steadfastly deny that anything more efficient than what they manufacture has ever come forth.

Some of the "better ideas" did turn out to have major drawbacks. The famed Fish carburetor invented by John Robert Fish was indeed more efficient for racing cars and hotrods, but for around town driving it left much to be desired.

The equally noted Pogue carburetor invented by Canadian Nelson Pogue could indeed obtain fantastic mileage -- but it did not give the car the necessary performance standards American drivers demand.

However, Brown's Power Pak and Ben Polo's Equalizer are in a class by themselves. Neither are mere gimmicks; both work and have impressive test credentials -- and both can be inexpensively installed on present vehicles.

Rather than attempting to force new carburetion systems down industry's throat -- as several inventors have tried to do and failed -- these inventors have found a way to make today's fuel systems, in both gasoline and deisel engines in the case of the Power Pak, work cleaner and more efficiently.

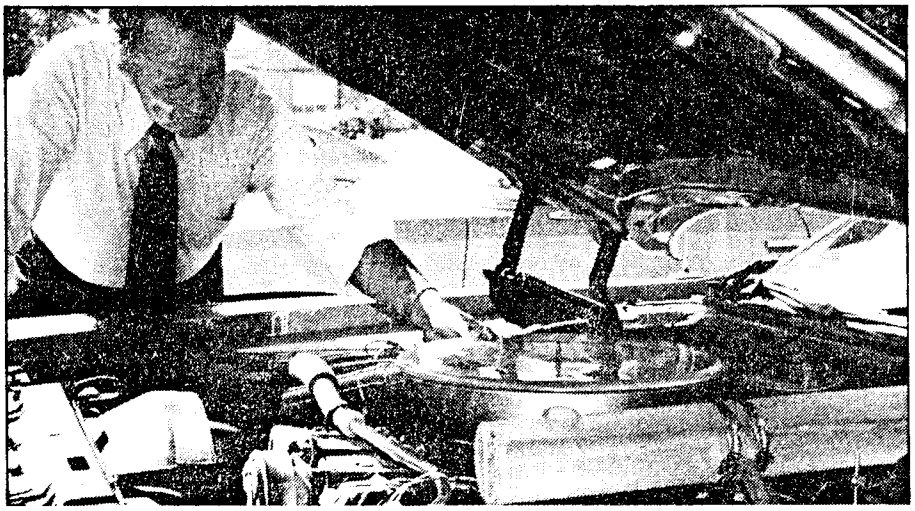
California has at least acknowledged Polo's Equalizer; Brown has been totally ignored. His Power Pak deserves a fair hearing and trial.

Brown repeated his statement, still incredulous that the powers that be do not act:

"Here is something that can be inexpensively installed on existing cars: giving them longer life and better performance for the investment.

"In addition we help clean up the air and save fuel."

The automakers certainly cannot say that! NR



Charlie Brown demonstrates how simple it is to install the Power Pack humidifying system in today's autos. The air filter housing on all modern vehicles is ideal for the unit.

Detailed Testing Indicates Brown's System Works Well

Dynamometer tests of the Power Pak were made by several outside firms. One series of tests were conducted by Autohaus Mart, a Mercedes-Benz dealer in Pompano Beach, Florida.

The two vehicles used for testing were a 1973 Mercury Marquis with a 429 cubic inch displacement (CID) engine at 5,217 miles on the odometer and a 1973 Pontiac Grand Prix with a 400 CID engine at 7,452 miles.

Another dynamometer test was conducted by the Engineering department of the University of Miami on a 1973 Chevrolet with a 350 CID engine at 25,744 miles.

All the dynamometer tests showed a clearcut maximum increase in effective road horsepower of 20 per cent in the 50 - 70 miles per hour speed range.

All the tests took place in South Florida where the humidity is already high -- the results should be even more impressive in the southwestern part of the U.S. or in the mountain states.

There were also impressive results in mileage tests of the Power Pak on rotary engine equipped cars.

Additional testing with a 1977 Buick Electra 225, four door passenger sedan equipped with a standard General Motors 350 CID engine were made last December.

The vehicle was tuned to factory recommendations then a run was made using a Space Kom model 6100 digit-flow-digital miles per gallon meter and totalizer combination which was factory calibrated to within 2 per cent of accuracy.

All road tests consisted of four runs of between 2 and 2.2 miles in both west and easterly directions to negate wind factors. The test series commenced only after the vehicle had attained 55 miles per hour under cruise control.

The four test runs with the standard vehicle indicated an average of 16 miles per gallon fuel consumption at 55 miles per hour.

The four test runs with the Power Pak indicated an average of 20.56 miles per gallon.

A third series of test runs were made and this time a product called "Moly Mach-7" an engine lubricant developed by a Dallas, Texas firm, was added along with the Power Pak and the mileage average was 21.48 miles per gallon.

Charlie Brown's Mercury Marquis is as finely tuned and equipped as any standard vehicle can be. He obtained an average fuel consumption rate of 7.7 miles per gallon around town and a top of 11 miles per gallon cruising at 55 miles per hour.

After 22,000 miles of testing his various humidifier devices during the development stage he shows an average around town miles per gallon consumption of between 12 and 14.5 and a highway speed mpg figure of 20.1.

Overall the tests indicate that the Power Pak humidifier increases miles per gallon by 28 per cent. NR

GAS-SAVERS

At last—EPA tests reveal the truth about those gas-saving devices

POP. SCI. MARCH '80

Miracle mileage boosters? Or a multimillion-dollar swindle of U.S. motorists?

By JIM DUNNE

Would you buy a device that lets you drive 140 miles farther on a tank of gas? Of course you would.

But do you believe there is such a device? Apparently, a lot of Americans do; they spend millions of dollars each year for devices advertised to do just that—teased by the notion that a miracle mileage booster exists somewhere.

Recently, I visited the Environmental Protection Agency laboratories in Ann Arbor, Mich., where government engineers examine alleged fuel-stretching devices to verify claims of extended mileage. A special testing program was set up, and over 60 devices were run through the lab. "So far, all we've found is zero," reports Peter Hutchins, project manager at the lab. "They're selling miracles, and we've found none."

Gas-saving products fall into several categories—ignition devices, fuel additives, air-bleed systems, vapor air bleeds and water injectors, and air filters. The EPA sampled them all and here's what it found:

Ignition devices

These promise better fuel economy and cleaner emissions. One such device made by the Special Formula Company of Minneapolis consists of centrifugal advance springs that replace stock parts on 1974 GM cars. The EPA test results, however, show that the springs, which provide less tension than stock GM parts, produce no statistically significant improvement in fuel economy, while exhaust emissions of NO_x, CO, and HC jumped 33–38 percent.

EPA project manager Peter Hutchins cradles some of the gas-saving devices tested by his agency at government labs in Ann Arbor, Mich., shown in background.

A second device is the Paser Magnum Electronic Anti-Pollution Engine Economizer. The device fits between the distributor and the spark plugs, and is supposed to transfer energy by a metal connection between the plug wires. EPA's conclusion: "Paser Magnum shows no measurable effect on exhaust emissions and no effect on fuel economy."

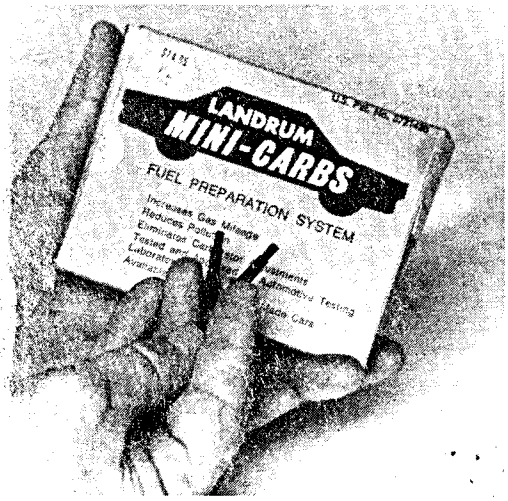
Note that by simply advancing or retarding the timing of your engine, fuel economy will change significant-

Continued

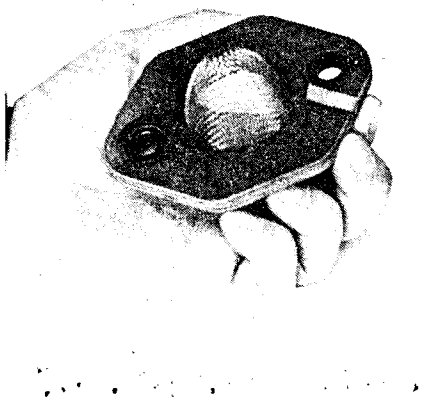
How the EPA tests the devices

Here's how the EPA tested the devices described in this article: A test car is run through the EPA city and highway emissions tests without the gas-saving devices. Then a second run-through is made with any adjustments recommended by the manufacturer of the device, but without the device attached (timing or carburetor changes are made at this time). Finally, the car is tested with the gas-saving device. The results—which include emissions levels for hydrocarbons, oxides of nitrogen, and carbon monoxide, as well as fuel economy—are compared. In some cases, the cars are "run in" for hundreds of miles by operators who follow the manufacturers' instructions so that the device has a fair chance to "modify" the engine.

A close-up look at devices tested by the EPA

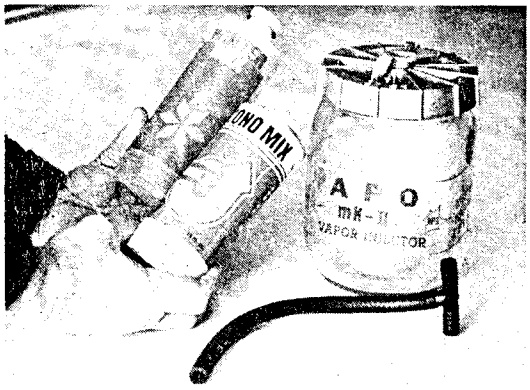


Tiny holes drilled through Mini Carbs are designed to admit additional air to the carburetor. EPA tests found no provable fuel-economy increase with them.



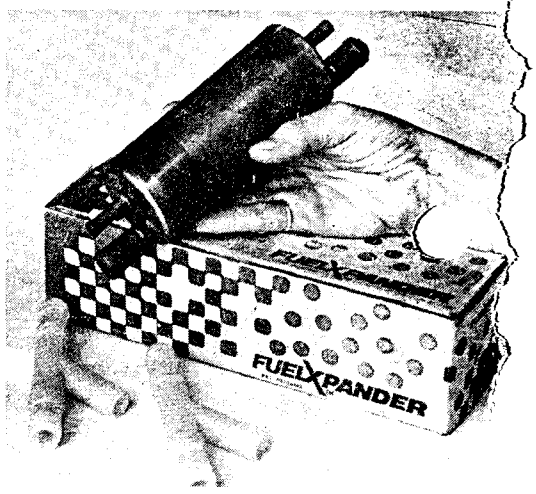
Better atomization and vaporization of air/fuel mix is supposed to occur with the Hydro Catalyst installed between carb and engine. EPA found no gain in mpg.

Paser Magnum is said to direct electrostatic energy from firing spark plug to nonfiring cylinders so it bombards fuel molecules with radiation.



Test engine suffered burned-out valve when the Mark II vapor injector was installed. The air-vapor bleed device offered no fuel-economy improvement.

Up to 50 extra miles per tank of gas is manufacturer's promise for Tephguard. EPA tested it and found no mpg gain or lowering of exhaust emissions.



Finer droplets of air/fuel mixture are said to be produced after installation of Fuel-Xpander. EPA says it performed no better than other tested gas savers.

Synthetic/super-slippery oils:

Included in this group are all the new oils that promise extended life and improvements in fuel economy that result from their "slippery" nature. In one test, of Analube, a synthetic engine lubricant made by Environmental Lubricants Company of New Britain, Conn., some improvement in fuel economy over the base 10W40 petroleum oil was found. It amounted to 3.6 percent, or less than half a mile per gallon of gasoline. The accuracy of this test, however, is not dependable.

It is important to note, though, that the EPA team feels that synthetic oils do offer fuel-economy advantages—probably two percent—and is devising tighter tests to find out exactly what the advantage is. Right now a baseline oil (a 10W40 type) is being formulated to measure against, and within a year the results should be in. If the preliminary EPA results are proven right, synthetics may eventually replace petroleum oil in new cars. Economy improvements then can benefit both the consumer and the car manufacturers, who must meet tighter mpg standards.

"The oil companies are shooting for a clear one percent improvement, perhaps two percent," says Peter Hutchins, project manager at the EPA labs in Ann Arbor, Mich. "If we can prove two percent, the consumer can probably get three or four percent in the field."

Hutchins points out that the oil companies are realistic when they make their claims so low. After all, there is only so much friction inside an engine that oil can overcome, and it does not approach the 20 percent or more than some miracle-additive marketers claim.

ly in most cases. EPA tests of spark timing shows that highway fuel economy can drop as much as 11 percent when the timing is retarded five percent from its recommended setting. But, by advancing the timing five percent, highway economy can improve by as much as six percent. These tests were conducted by simply comparing different spark settings. No "miracle" devices were added to the car. The phenomenon is important to remember, since many device manufacturers recommend a change in timing as a necessary part of their installation instructions. That means that if an increase in economy does occur, it's probably caused by the timing advance.

Most cars on the road today need a tuneup. Device installation in-

structions often include a tuneup. Manufacturers credit improvements to the device, yet they may come from the new spark plugs or change in timing that go into a tuneup. The EPA claims that an mpg penalty as great as 14 percent can be associated with ignition timing being retarded as much as 10 degrees. The EPA, however, does not encourage advancing the ignition timing beyond the point specified by the manufacturer.

Fuel additives

Buy the fuel additives NRG #1, QEI 400, Rolfite Upgrade, Johnson gasoline additive, or EI-5, and you will go farther on each gallon of gasoline, or clean up your car's emissions, or both. Those are the claims. But EPA tests fail to support them. In no test of these fuel additives did fuel economy improve significantly nor did exhaust emissions show a significant reduction. In some cases emissions levels rose. But even so, fuel economy remained constant—within statistical limits, the EPA says.

Typically, additives are combined with gasoline in quantities of about one ounce per gallon. While some combinations of ingredients are "trade secrets" held closely by the manufacturer, they seem to be mostly petroleum products or detergents, and appear to contain no "miracle" element that would change the laws of combustion physics.

Air-bleed systems

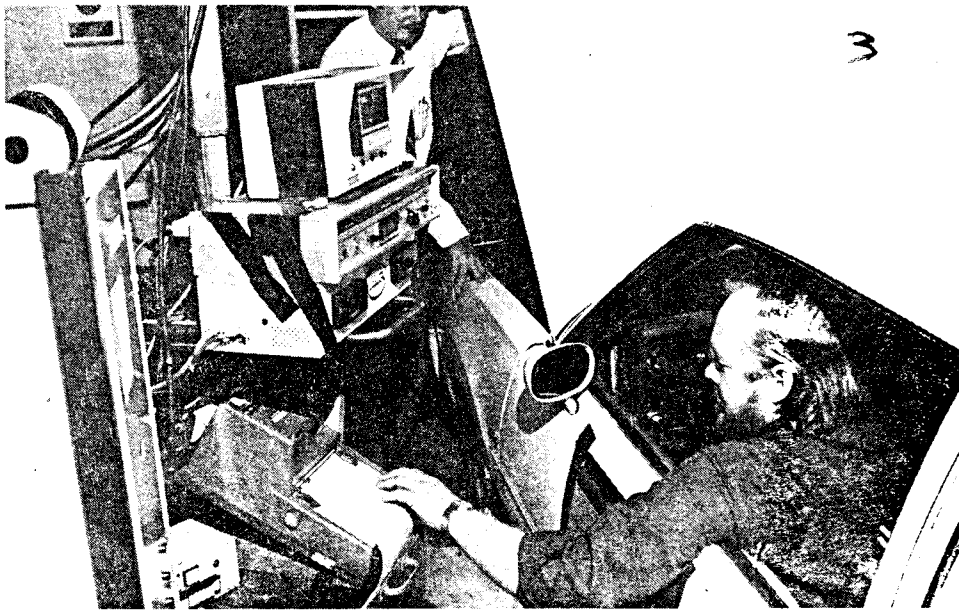
The idea behind air bleeds is that when more air enters the carburetor at a critical location, a better air/gasoline mix occurs. This leads to better burning of the gasoline. Also, the additional jet of air helps homogenize the air/fuel mixture through additional swirl in the fuel stream, and that means more complete ignition.

The Econo-Jets Air Bleed Idle Screws are an example of those tested by the EPA. These were marketed by the Econo Corp. of Detroit, though they may be available under other names in other parts of the country.

Econo-Jets are idle mixture screws that replace the factory-built screws in the carburetor. They are drilled so that a tiny hole allows additional air to pass directly into the carburetor throat through the idle fuel port. The vacuum of the carburetor passage furnishes the pull that's needed to draw outside air through the screw.

After testing Econo-Jets, the EPA am concluded that there is "neither a general increase in fuel economy nor a decrease in emissions associated with the replacement of standard mixture screws with Econo-Jets."

Other air-bleed devices tested by the EPA include the Mini Turbocharger Air Bleed, a Ball-Matic device, and the Landrum Mini-Carbs. EPA conclusions: No significant improvement in fuel economy and emissions levels.



EPA's Peter Hutchins (rear) watches as technician runs car fitted with gas-saving device through standard EPA fuel-economy and emissions cycle on dynomometer.

Quick installation is one lure of gas-saving devices. Ball-Matic fits easily into carburetor feed tube, but doesn't contribute to fuel economy, EPA says.

Vapor air bleeds, water injection

Here you find some fuel-economy contribution, but the price is higher than the saving. Among the air-vapor injectors the EPA tested is the Mark II Vapor Injector, marketed by APO of America, Inc., Dallas. This system uses an injector mounted in the carburetor-throat body to add moisture to the air/fuel mixture. The vapor material is drawn from a mixture of two-thirds water and one-third Mark II Econo Mix fluid that is stored

[*Continued on page 182*]

Gas-saving devices tested by the EPA

Air bleeds—devices that bleed air into the air/fuel mixture: ADAKS Vacuum Breaker; Air Jet; Aquablast Wyman Valve; Ball-Matic; Berg; Econo-Jet Idle Screws; Econo Needle; Landrum Mini-Carb; Landrum Retrofit; Mini Turbocharger; Monocar HC Control; Peterman; Pollution Master; Turbo-Dyne GR Valve.

Fuel additives—materials that are added to the gas tank: EI-5; Johnson; NGR #1; QEI 400; Rolfite Upgrade; Sta-Power; Stargas; Technol G; Val-Do Combustion Cleaner and Power Lube; Verb 10.

Carburetor–intake manifold devices—devices that are claimed to improve the atomization and vaporization of the air/fuel mixture: Environmental Fuel Saver; Hydro-Catalyst Precombustion Catalyst System.

Lubricants—usually materials that are poured into the crankcase: Analube; Tephguard.

Ignition controls—devices that are attached to the ignition system: BIAP; Magna Flash; Paser Magnum; Special Formula Advance Springs.

EGR—add-on EGR system: Lee Exhaust and Fuel Gasification EGR.

Vapor air bleeds—similar to air bleeds but air is bubbled through a water/antifreeze solution: Econo-Mist; Frantz; Mark II; SCATPAC; Turbo.

Intake-system devices—modifications to intake system: Electro-Dyn Superchoke; Filtron Urethane Foam Air Filter; Lamkin Fuel Metering Device; Smith Power and Deceleration Governor.

Fuel-pressure regulator—device for controlling pressure of the fuel delivered to carburetor: Malpassi Filter King.

Gas-saving devices

[Continued from page 119]

in a reservoir mounted under the hood. Outside air is drawn into the reservoir by engine vacuum and directed to a point below the level of the mixture. The resulting bubbling action creates a moisture-laden air mixture at the top of the reservoir that is drawn off to be injected into the carburetor. The composition of Econo Mix by volume is 65 percent methanol, 34 percent acetone, and one percent propylene glycol.

Benefits claimed for the Mark II are a decrease in required octane, increased fuel economy, increased power, elimination of carbon deposits, extension of engine life, and reduction of emissions. It was also claimed that the benefits would occur after the system had been "broken in," so the EPA tested the device after 2000 miles of operation on the engine.

EPA tests showed that there was no difference in fuel economy. Nor was any improvement in performance noted, according to the agency.

Tests on other vapor-injector systems showed these results: With Turbo Vapor Injector, "no reduction in fuel consumption was observed"; SCATPAC resulted in "no statistically significant change in fuel economy"; Frantz Vapor Injector and Econo-Mist "did not yield any improvements." The claims of water-injection-device marketers center on the fact that addition of water to the combustion chamber reduces knock, and thereby improves the burning process in the engine. At the same time, it may allow the engine to run at a slightly advanced spark setting. (The farther the spark is advanced, within limits, the better the fuel economy.)

"But in the real world, I don't think you're going to find it," says the EPA's Hutchins. "When water injection was used in aircraft during WW II, you were dealing with supercharged engines, trying to get extra power during takeoff under battle conditions."

Hutchins sees little similarity in modern car driving. To duplicate the airplane experience you would have to drive constantly under extreme conditions, with full throttle.

"You don't run an automobile engine like that," Hutchins concludes. "You run it at five to 10 percent of its rated power most of its life."

Air filters

In one test of an air-filter device, the EPA team found that a urethane-foam filter element made by Filtron Products Co., Van Nuys, Calif., "did not cause either a significant reduction in exhaust emissions or a marked improvement in fuel economy." The urethane element is designed to replace the paper filter used in most engine air-induction systems. Its apparent cost is about twice that of the paper element.

It's impossible to pinpoint just how many consumer dollars are wasted on mileage boosters each year. But the Federal Trade Commission does have one example, that of the "GR Valve," whose sellers it successfully prosecuted last year. In one 90-day period, a mail-order firm sold 36,000 of these devices at $16 apiece. The take was $576,000. Its costs? "The cost of making the device is miniscule," reports William Haynes, a lawyer with the FTC's Bureau of Consumer Protection. "They operate on a shoestring by putting inexpensive ads in papers or on television."

Why are fuel-saving devices promoted in publications and on television despite the fact that EPA tests show they don't perform as claimed?

The FTC's Bureau of Consumer Protection is taking an agressive attitude toward fuel-saving devices, but it's unable to stop manufacturer's from advertising. Currently the FTC has a number of investigations under way that should result in convictions. But that probably will not stop the stream of gimmicks.

"There are over 100 different devices, systems, or additives being sold under different names," says Haynes. "Because we have no censorship laws, the advertisements for these products will continue. It will happen again and again. The government will put people out of business. But more will take their place."

The Better Business Bureau has also joined the fight against false claims. It has set up a media alert that asks newspapers and TV stations to request substantiation from advertisers, proving the claims of fuel savings. The media are asked to request EPA results from the advertisers. PS

Wanted: real gas-savers

The EPA told PS that it wants to encourage the development of gas-saving devices and is willing to test any offered for evaluation—after developers have first submitted their devices to an independent lab for testing. On the basis of those test results, the EPA will decide whether to test the devices itself. It costs about $3000 per car to fully test the gas-saving devices in a private lab, the EPA claims. Developers can get more information by writing to Director, Emission Control Technology Division, U.S. Environmental Protection Agency, 2565 Plymouth Rd., Ann Arbor, Mich. 48105.

A major oil company knew Kennedy's invention worked: they offered him a contract for $500,000. He turned it down. Why? Read why he's offering his invention, "Tadpoles"® to you for $7.95. Here is the amazing story behind this invention.

In a tape-recorded interview, reporter David Bessmer put inventor Kennedy on the spot with pointed questions about the "Tadpole's" legitimacy. The following are direct quotations from that interview.

Reporter: "Tadpoles, Mr. Kennedy? Some kind of fairy tale you've got here?"

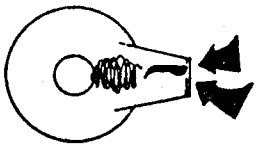
Kennedy: "A simple name for a simple product, based on a natural phenomenon."

Reporter: "Like what?"

Kennedy: "Like the spiraling air turbulence from the wingtips of the big jet planes . . . you know, jet contrails."

Reporter: "Exactly what does air turbulence have to do with cars and improving gas mileage?"

Kennedy: "My 'Tadpoles' make air in the air cleaner spin like a tornado on its side. That turbulence sucks up to 40% more air to the carburetor. And that makes gas burn more efficiently . . . at city speeds . . . at turnpike speeds. About 10% more efficiently. That means you do get $11 worth of mileage for $10 worth of gas. It also means you get more power and a cleaner exhaust.



Reporter: "Why don't you have prominent people or authorities in the field endorse your 'Tadpoles'? Or, run testimonials by regular users?"

Kennedy: "Because people who give testimonials, my friend, would have a financial interest in this ad. You know it, and I know it. Naturally, I wouldn't put in a statement by someone who knocks the 'Tadpoles.' That's why I asked you to pick someone you trust to buy 'Tadpoles' and when they work . . . you can take their word for it . . . and believe it."

Reporter: "How much testing have you done on your 'Tadpoles'?"

Kennedy: "I've spent in the neighborhood of $200,000 in the past 5 years on road tests and other research and development. I've got a file a foot thick of favorable reports from users."

Reporter: "Wouldn't it be easier for everyone if you sold your 'Tadpoles' right at filling stations?"

Kennedy: "Are you kidding? The oil companies would never allow a gas-saving invention like mine to be sold at a filling station. My 'Tadpoles' stand to cost them plenty in lost sales . . . at least a 10% cut . . . and they don't want that!"

Reporter: "Why don't you sell your invention for $10 million bucks and retire . . . down in Florida?"

Kennedy: "Because the people who have offered me money for my invention really wanted to keep 'Tadpoles' off the market! No royalties for me . . . darn little money after taxes . . . and no 'Tadpoles' for you."

Reporter: "You're kidding. I've heard stories like that . . . never did believe them."

Kennedy: "You'd better believe them! I decided I wanted all Americans to share in my simple invention . . . and this is the only way I can be sure they will."

Reporter: "And of course . . . make you a lot of money in the process."

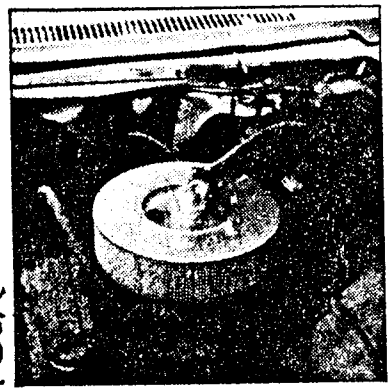
Kennedy: "You bet. I've been working on 'Tadpoles' for about 5 years. Advertising, research and development—it all costs money. So I'm not about to get my investment back for some time. But sure . . . I want to make money, like anybody else."

TO: Jam-Air Company
208 North Prospect Street
Sturgis, MI 49091

I am enclosing $7.95 for a set of "Tadpoles," the instruction sheet, and the Mileage Guide.

Man's Fight Against Auto Industry

'TATTLER'

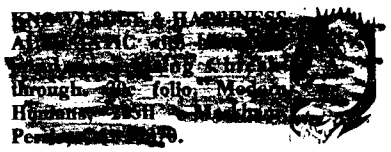


BROWN'S carburetor on his car.

In that series, you'll recall, our Tom Valentine and Tom Ayres uncovered the story of how big business has kept some miraculous inventions off the market.

AND IN ANOTHER report, we covered the work of inventor George Arlington Moore, who solved gas mileage and pollution problems for autos half a century ago. He had obtained more patents than any one individual, only to see his best efforts smothered by powerful special interest groups.

Not one to waste time, Brown plunged into the musty files of the U.S. Patent Office for the complete details, drawings



and specifications. He then built working models for installation on his own Chevy.

Encouraged by his success, Brown next contacted Moore's widow for further information and permission for his next project, a book, "Suppressed Inventions," which shows everything.

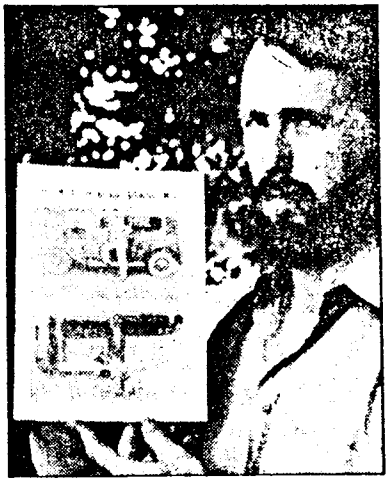
Brown claims his book makes adapting the old improvements to modern cars a simple task, where such modifications are legal.

But his major goal is to spur the efforts of more highly trained inventors and engineers as TATTLER's reports inspired him.

BX. 206, BEREA, KY

"I THINK TATTLER has done the U.S. one of its greatest services by pointing out the way big business suppresses new ideas in order to protect its monopoly," he said.

"If some smart guy digs into carburetion, he might come up with another miracle carburetor that the big boys can't suppress. I've developed a couple of my own and we'll soon be putting out installation kits.



BROWN studied work of late George Arlington Moore to aid his campaign.

"If we get enough heads together in this thing, the people can come up with gas-saving devices and better engine systems and beat the big boys at their own game," Brown enthused.

His book is available from Mike Brown, [illegible]. Reprints of our series on Suppressed Inventions will be sent for 50¢ per copy directly from TATTLER.

MIKE BROWN: P.O. BOX 206 BEREA KY

AVAILABILITY UNKNOWN

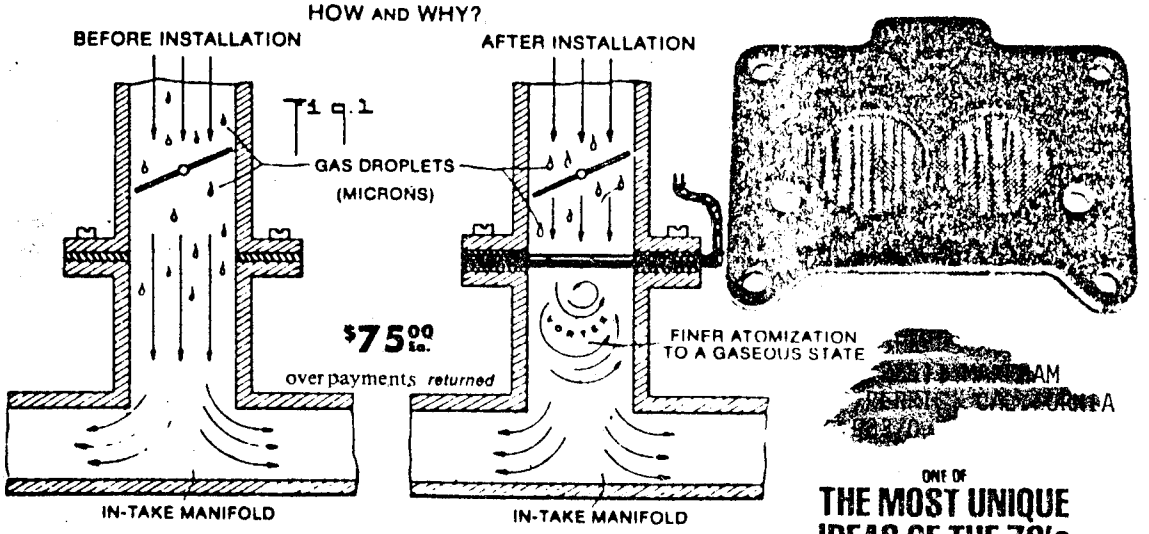
ECONOMY Breakthrough

The PELCO FUEL SAVER provides better gas mileage and lowered pollutant emissions through improved vaporization and distribution of the gas by electrically heating it under controlled conditions at the critical area where it counts most. . . the throat of the manifold prior to entry into the combustion chamber. When gasoline is cold, it is often poorly atomized by the carburetor. Before gasoline can be burned, it must be vaporized.

Vaporization changes the liquid to a gas state and this only occurs when the liquid absorbs enough heat to boil. The PELCO FUEL SAVER operates at a controlled temperature, thereby assuring almost perfect distribution of the fuel in a gaseous state at any time.

This newly patented FUEL SAVER is guaranteed against defects in material and workmenship for a period of 24 MONTHS.

HOW AND WHY?



ONE OF
THE MOST UNIQUE IDEAS OF THE 70's

Economy Ecology

YORK RESEARCH CORP STAMFORD, CONNECTICUT

[up to 35% better mileage], [up to 65% less pollutant emissions], no possibility of adverse reactions;

FUEL MILEAGE TEST WITHOUT UNIT		WITH UNIT
1970 MERCURY 390 C.I. ENGINE	13.3	20.8
1972 PLYMOUTH 225 C.I. ENGINE	16.9	26.7
1974 PLYMOUTH 225 C.I. ENGINE	20.5	27.8
1971 PONTIAC GRAND PRIX	12.5	18.9
1974 FORD 351 C.I. ENGINE	11.8	18.8
1971 BUICK 225	14.4	19.1
73 THUNDERBIRD	12.2	18.8
1967 OLDSMOBILE SUPREME	13.1	19.2

ALL TESTS WERE MADE AT 60 M.P.H.

IMPORTANT—HELP US FILL YOUR ORDER CORRECTLY: Give full information about car, truck or motorcycle for which merchandise is ordered.

MAKE OF CAR: (Chevrolet, Volkswagen, Ford, etc.)	MODEL (Impala, Monte Carlo, TR3, CR 750, etc.)
YEAR (1975, 1976, 1977)	BODY STYLE: (Sedan, Conv. Hdtp., Sta. Wgn., Etc.)

CARBURETOR NO. OF BBL

1 bbl = one barrel carb., 2 bbl = two barrel carb., 4 bbl = four barrel carb., C = Carter, F = Ford, H = Holley, R = rochester, S = Stromberg

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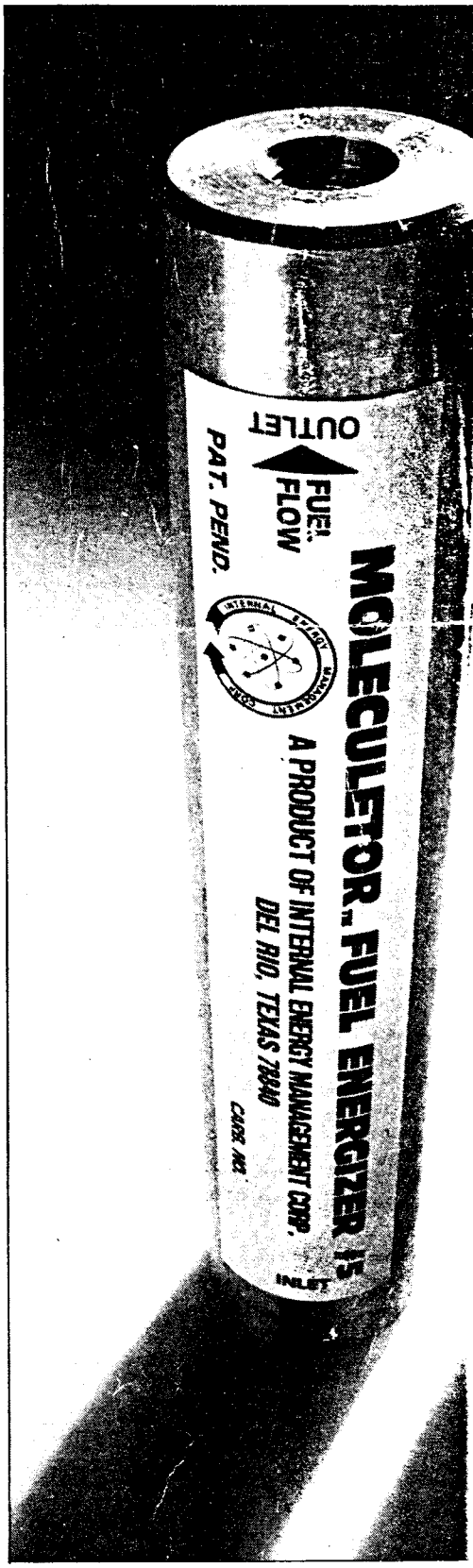
Mirade Mi

We still don't believe it

by Chuck Nerpel and Peter Frey

PHOTOS BY JIM BROWN



When we were approached by representatives of the Internal Energy Management Corporation with a device they called the Moleculator Fuel Energizer Unit, we were openly skeptical.

The device appears to be a solid piece of aluminum rod an inch-and-a-half in diameter and 6 inches long, with a hole drilled down the center. (The device comes in three lengths—longer for larger engines—and has a 45-day money-back warranty, with one year free replacement. Prices range from $139.95 for the smallest unit to $395 for a diesel truck unit. However, at the outset of our talks with I.E.M., the devices sold for only $97.45, $137.50 and $302.50, respectively.) It is installed in the main fuel supply line, as close to the tank as possible, so that fuel runs through it on its way to the engine. A *secret* "energy field," supposedly stored in the aluminum, reportedly rearranges the normal "clumped" structure of the molecules in the fuel into a more "linear" form. This is supposed to turn them into "smaller, more burnable units," and raise the BTU (British Thermal Unit) content.

The manufacturer's claim is that the Moleculator will improve the efficiency of an internal combustion engine, whether gasoline or diesel. According to the claims, after a break-in period of 500-1200 miles, large trucks should show a fuel-economy improvement of up to 40%, and a passenger car should improve up to 23%.

This all sounded very unlikely, but I.E.M. sparked our interest when they produced a folderful of the results of tests run by the California Air Resources Board and Olson Engineering (a government-approved testing laboratory), and what appeared to be testimonial letters from a state director of The Good Sam Club (a recreational vehicle organization), several large trucking firms, a diesel engine manufacturer, a law-enforcement organization, and an international company that services oil drilling rigs.

We agreed to run our own tests. A program involving five cars was set up, and while they were being run over a period of several weeks, we began digesting the information the Moleculator people supplied us.

The section of the Olson Engineering report that contained the hard data from the laboratory-controlled tests they ran seemed to indicate a fuel economy increase in every case. Tests on four cars were included, but three of them showed only the highway-cycle results, and the fourth only the city-cycle test. All the tests were run on a chassis dynamometer that reproduces typical urban and highway driving speeds and loads under completely controlled atmospheric conditions, according to the approved Federal Test Procedure.

When we showed a copy of the report to a representative of Olson Engineering, he confirmed that the data indicating a highway-cycle fuel mileage increase from 16.08 to 17.82 mpg for a 1978 Chevrolet Caprice with a 305cid V-8 and automatic transmission was correct, but that it was only one of many tests they had run. When we pressed him for a conclusion, he answered with an engineer's typical caution: "The number of tests we ran was not sufficient to produce a statistically defensible conclusion. The data they present here, which is not complete, is representative of the test vehicles only, and may not necessarily be applicable to all cars."

The California Air Resources Board came to a more pointed conclusion. Portions of the Olson Engineering report, selected by the I.E.M. people, were presented to the ARB as part of the process of getting an exemption from the provisions of Section 27156 of the California Vehicle Code, which prohibits the sale of any automotive aftermarket device that alters vehicle emissions for use on 1979 or later cars. Their comments on the evidence presented indicated seven cars had been tested, not just the four on which we had seen data. They state that of the seven cars, only three had been tested according to the full ARB-specified

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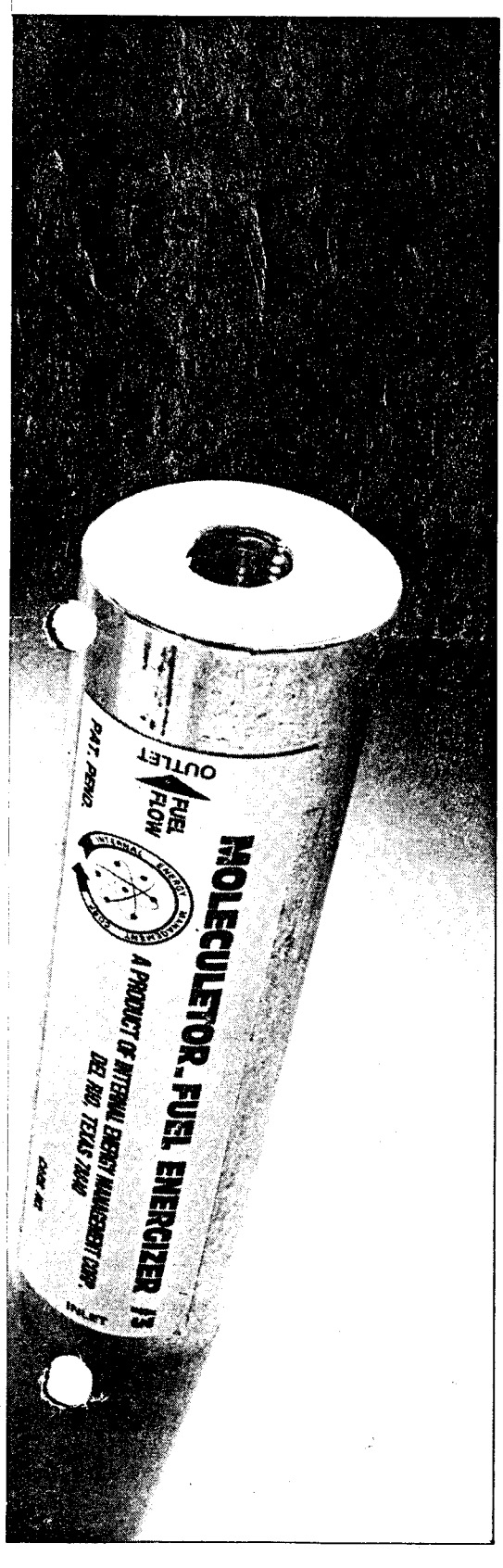


procedure. These cars showed average gains of 5-7% in urban-cycle fuel economy, and 1-2% in highway-cycle economy, both of which are considered to be within the bounds of test variability. The remaining four cars showed 8-23% increases, but the tests did not comply with ARB specifications and, therefore, could not be considered valid.

The ARB then ran its own tests on two other cars, measuring the fuel economy with both the carbon-balance analysis of exhaust gases, and with a flowmeter placed in the fuel supply line. These tests showed no increase in mileage with the Moleculator, and their report ended with that conclusion.

Suddenly, we were faced with a problem. The first two items of evidence we examined, both from laboratories where the tests are completely controlled and results are calculated down to the *n*th degree, seem to have torn the credibility of the Moleculator completely to shreds. We probably would have dropped the project right then except for two things: these tests are the same kind that produce the EPA new-car mileage figures, and we know how they vary according to real-world driving; and we got back the results from our first field test, showing a significant improvement in fuel economy.

The test vehicle was a 1979 Ford Econoline van with a 351cid V-8 and automatic transmission. It has dual fuel tanks, so we installed a Moleculator in the line from the main tank only, which would allow us to switch back and forth between the "energized" and "un-energized" fuel. Tests were run over our 73-mile loop and on an all-highway cruise at 55 mph.

Test No. 1: 1979 Ford Econoline Van
(351cid V-8, automatic)
Test course—MT 73-mile fuel loop

	Baseline	*Moleculator*
Distance	73 miles	73 miles
Time	2 hours	2 hours
Fuel used	4.9 gallons	4.2 gallons
Mileage	14.89 mpg	17.38 mpg

Increase: 16.7%

Test course—highway (constant 55 mph)

Distance	100 miles	100 miles
Time	1.8 hours	1.8 hours
Fuel used	7.0 gallons	6.0 gallons
Mileage	14.29 mpg	16.66 mpg

Increase: 10.4%

We also put the van through instrumented acceleration testing, with fuel supplied first from one tank, then the other, and noted no difference. We used a chassis dynamometer to measure the rear-wheel horsepower, and an exhaust-gas analyzer to check the emissions. The "energized" and "un-energized" fuel produced exactly the same readings.

We couldn't see how *only* the fuel economy could be affected, so we contacted the diesel engine manufacturer that had tested the device on an engine dynamometer, which produces much more accurate horsepower readings. Their test engine was also equipped

Miracle Mileage

with sensors to measure manifold pressure and exhaust-gas temperature. The man who supervised the tests said there had been no difference in any of the readings they had taken. They did, however, notice a 14.2% decrease in fuel consumption.

The deeper we dug into this thing, the more tangled the information was getting. We decided it would be a good idea to talk to someone who knew more about the chemistry of gasoline, so we contacted a scientist at the research division of a major oil company. We explained what the device was supposed to do and what information we'd gathered so far, including the positive test results on the van. His responses did nothing to reassure us.

He said the process of changing the molecular structure of the fuel in the way the manufacturer of the device describes is called "isomerization," and that with the best technology currently available, the process requires a considerable amount of energy and a catalytic agent, neither of which aluminum has. If the device actually did raise the BTU content of the fuel, it would show up as an increase in horsepower and in exhaust-gas temperature. And, in response to our own testing, he simply said, "There are so many variables in a field test that it is exceedingly difficult to get accurate results."

Once again we wavered on the edge of killing the project, but two more of our tests had been completed, and both showed improved fuel economy with the Moleculator.

Test No. 2: 1979 Honda Accord
Test course—MT 73-mile fuel loop
(Note: Moleculator was installed in engine compartment, contrary to installation instructions)

	Baseline	*Moleculator*
Distance	73 miles	73 miles
Time	1.6 hours	1.6 hours
Fuel used	2.1 gallons	2.0 gallons
Mileage	34.76 mpg	36.5 mpg
Increase: 5%		

Test No. 3: 1980 Honda Civic
(1500cc 4-cylinder, 5-speed manual)
Test course—MT 73-mile fuel loop

	Baseline	*Moleculator*
Distance	73 miles	73 miles
Time	2 hours	2 hours
Fuel used	1.7 gallons	1.5 gallons
Mileage	42.8 mpg	48.6 mpg
Increase: 13.28%		

Certainly there were variables, but we went to considerable lengths to make sure the tests were as accurate as possible. In each test, the baseline and with-device tests were done by the same driver, over the same route, at the same time of day, and under as nearly identical conditions of humidity and temperature as possible. We were satisfied that our test results were accurate.

Our next contact was the law-enforcement organization whose captain had written a letter to the I.E.M. people, stating that in tests his organization had run on two patrol cars, they recorded a 15.4% and 17.1% increase in fuel economy. We spoke to an officer who himself had been involved in the testing, and he told us the letter referred to a relatively casual initial test. Later tests, run out of headquarters, involved 20 vehicles, six months, and several hundred thousand miles. The conclusion was that the Moleculator "... was found to have no appreciable effect on fuel economy."

Next, we got in touch with the state director of a branch of The Good Sam Club, whose letter stated that, in tests on a motorhome with a Dodge 440cid engine, mpg had gone from 6.9 to 7.5 when members installed a Moleculator. She confirmed the results and said that several other club members had gotten similar results from their own tests. She also said that The Good Sam Club viewed the Moleculator as a possible salvation of the RV concept.

When we contacted the club's official technical representative at their national headquarters, he said he was aware of the tests run by the state chapter, but that they were purely uncontrolled, individual tests and should not be considered as the official position taken by The Good Sam Club. He admitted that his club was officially testing the device, but had not yet been able to draw any conclusions.

We were beginning to feel that the people from I.E.M. had presented us with information that was, to put it charitably, open to question. Predictably, just as we had gotten good and suspicious, everyone else we contacted confirmed a fuel economy improvement in their tests of the Moleculator. A large trucking company reported an average increase in fuel economy on the order of 19% for a test involving 10 diesel trucks over a year-and-a-half period. A company that services oil well drilling rigs tested the Moleculator on two diesel-engined generators and confirmed a 19.23% and a 21.18% decrease in fuel consumption. The chief mechanic of a fleet of mortuary vehicles told us of a 25% fuel economy improvement on a 1979 Cadillac limousine.

All of these results agreed with the results of our own final series of tests.

A Moleculator was installed in the main tank fuel line of a 1979 Ford van equipped with two tanks. This allowed us to run back-to-back mileage tests, first on the un-Moleculated fuel from the auxiliary tank, then again with fuel from the main tank that passed through the device.

Test No. 4: 1972 Toyota Land Cruiser
(236cid inline six, 3-speed manual)
Test course—highway (constant 55 mph)

	Baseline	*Moleculator*
Distance	250 miles	250 miles
Time	4.5 hours	4.5 hours
Fuel used	15.0 gallons	12.5 gallons
Mileage	16.6 mpg	20.0 mpg
Increase: 20.4%		

(Note: This test was run four times, each time under the same conditions, with the same driver. The tests showed a gradual increase. Results above are from the final test.)

Test No. 5: 1970 Datsun 240Z
(2.4-liter inline six, 4-speed manual)
Test course—highway (constant 55 mph)

	Baseline	*Moleculator*
Distance	200 miles	200 miles
Time	3.6 hours	3.6 hours
Fuel used	7.2 gallons	6.7 gallons
Mileage	27.7 mpg	29.8 mpg
Increase: 7.58%		

At this point, since the story of the Moleculator has so many conflicting elements, let's summarize the major points:

1) The I.E.M. Corporation has offered no acceptable explanation of exactly how the Moleculator operates, or exactly what it does.

2) Within the bounds of currently recognized technology, we can find no proven way to induce a permanent energy field in aluminum that will alter the molecular structure of fluids passing through it.

3) Tests conducted by the California ARB indicate that the Moleculator does not significantly affect emissions or fuel economy.

4) Tests conducted by Olson Engineering according to ARB specifications and submitted to the ARB by the I.E.M. Corporation show no improvement in fuel economy. Other tests, also conducted by Olson but not according to ARB specifications, show an increase but are not considered valid by the ARB.

Gas Saver Patented and Tested

DENVER — The Los Angeles Herald Examiner reported that United States Patents have now been issued to Wm. Trevaskis, California veteran electrical engineer, for his Vapor-Jet[r] brand water vapor injector.

Trevaskis has developed what amounts to a 20 cents per gallon "rebate" on gasoline, by designing a low-cost injector for automobiles, light trucks, and recreational vehicles.

The Vapor-Jet system has survived stringent testing by a certified independent automotive testing laboratory. Test results showed miles per gallon improvement of 17.3 per cent on Trevaskis' 1972 Ford Galaxy and 13.3 per cent on his 1973 Old Starfire.

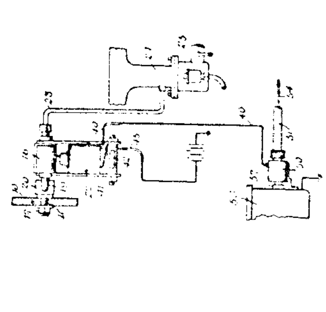
Water injectors were developed to a highly refined state during World War II, to give combat planes increased speed and extended range. However, up to now, the low price of gas and the high cost and extremely difficult installation required for earlier injectors combined to make them unattractive for automobiles and light trucks.

The design of Trevaskis' new Vapor-Jet[r] is, on the other hand, very inexpensive ($27.95) and can be easily installed in ten minutes. More than this, the unit has no moving parts and is so compact it can fit every make of car.

The Vapor-Jet has an unconditional 30 day guarantee.

Further details on the Vapor-Jet[r] brand water-vapor injector, for which patents have just been issued, may be obtained from Vapor Jet, 15160 Hwy. 144, No. 7, Ft. Morgan, CO 80701 or contact by phone (303) 867-9320. For purchase send $27.95 and $3.00 postage and handling to the above address. All orders are filled promptly.

2,437,992
CARBURETOR ATTACHMENT FOR CONSERVING FUEL
Barney Bennett, New York, N. Y.
Application August 14, 1945, Serial No. 610,718
2 Claims. (Cl. 180—82.1)



1. In combination with a motor vehicle having a conventional intake manifold through which air is normally supplied, means for supplying additional air to said motor, said means including a valve, an air intake for said valve, means for adjusting the opening of said valve, means for yieldingly holding said valve in closed position, a magnet for opening said valve, a circuit, a centrifugal switch for closing said circuit when said vehicle reaches a predetermined speed and a mercury switch adapted to break said circuit when the front of said vehicle is on a higher plane than the rear thereof.

Miracle Mileage

5) Field tests conducted by companies and organizations on various kinds of engines in various applications produced conflicting results.

6) Field tests conducted by the *Motor Trend* staff consistently indicated improved fuel economy.

All of these considerations make any absolute conclusion about the Moleculator impossible. The important point to us, however, is the final one. We ran our tests *most* carefully, and in a field experiment with many variables, we would expect results on a fuel-saving device that didn't work to fall on both sides of the baseline data. In each of our tests, the results came up positive by a significant degree. We even fabricated our own "Moleculator," compared it to the baseline test and the tests run with the I.E.M. version, and we got a substantial *decrease* in mileage (baseline mpg, 43.5; with I.E.M. Moleculator, 48.6; with our "Moleculator," 36.6). Although we don't know why, the vehicles in which we installed an I.E.M. Moleculator went farther on every gallon of fuel that passed through it. MT

Adding to the data . . .

We have tried to present as balanced a view of the information concerning the Moleculator as possible. If you have decided to purchase one (Internal Energy Management Corporation, P.O. Box 1429, Del Rio, TX 78840) and try it out, we would appreciate if you would keep a record of the results and drop us a line after you've reached your own conclusions. If we get enough responses, we'll do a follow-up story a couple of months from now, based on your results.

Test Procedure

I. Baseline:

- Note temperature, barometric pressure, and humidity.
- Note the beginning and end time of test, and the miles traveled, so that you can calculate average speed.
- Top off fuel tank (shake car to eliminate air pockets in tank).
- Drive car 80-100 miles.
- Refill tank.
- Divide miles-traveled by gallons-of-fuel-used to obtain mpg.

II. Install Moleculator as per instructions. Follow specified break-in procedure.

III. Re-test car as in section I. Try to duplicate conditions as accurately as possible.

Factors that affect fuel mileage

1) Air temperature
2) Headwinds
3) Wet roads
4) Engine's state of tune
5) Tire inflation
6) Hilly terrain
7) Driving technique

They've Seen It For Themselves!

The Del Rio Police Department in August, 1981, performed extensive testing with the FUEL DOMINATOR™ under various driving conditions, these being typical of police vehicles. The results were excellent! The average fuel saving was 20½% (twenty and a half percent). As a result of their comprehensive investigation and cost efficient fuel savings, the Del Rio Police vehicle force has been equipped with FUEL DOMINATORS™. These vehicles continue to show the same savings increase.

JAMES E. RIGGS, CHIEF
Del Rio Police Department
Del Rio, Texas 78840

I can honestly say that I'm a real believer in the FUEL DOMINATOR™. It not only showed me increased fuel mileage (14.3%), but gave me better performance.

RON CIVILLE
Van Nuys, California

Dillard's Department Stores (San Antonio, Texas, Division) conducted rigorous testing with the FUEL DOMINATOR™. All results attained showed that costly fuel was indeed saved. In fact, the total average fuel SAVINGS WAS: 14½% (fourteen and a half percent). These apparent and observable savings led to the installation on May 5, 1982, of the FUEL DOMINATOR™ in the store's fleet of delivery trucks. The FUEL DOMINATOR™ CONTINUES TO SAVE FUEL DAILY.

DILLARD'S OF SAN ANTONIO
San Antonio, Texas

Independent Truck Industry Tests Confirm: The "FUEL DOMINATOR™" Really Works!

In a recent test held under the auspices of *Motor Truck Magazine* and conducted by Labatt's Brewery Company of Canada—using test procedures developed by the Society of Automotive Engineers and the Regular Common Carrier Conference—the FUEL DOMINATOR™ demonstrated that it works as well on heavy-duty trucks as it does on autos and RVs.

In the test, three Western Star truck trailers with Cummins diesel engines were first given a baseline test over a 77-mile route to determine the average MPG for each rig.

Two of the trucks were then fitted with FUEL DOMINATOR™ units (the third truck acted as the control) and the test route was rerun under the same weather, road and traffic conditions.

At the conclusion of the test, Test Truck 1 showed an 8.62% increase in fuel efficiency and Test Truck 2 registered a 14.33% increase—positive proof that the FUEL DOMINATOR™ really works.

The **FUEL DOMINATOR™** is available in two sizes:

Model 100—for cars, pickups and trucks —(up to one ton).

Model 200—for heavy-duty trucks and —recreational vehicles.

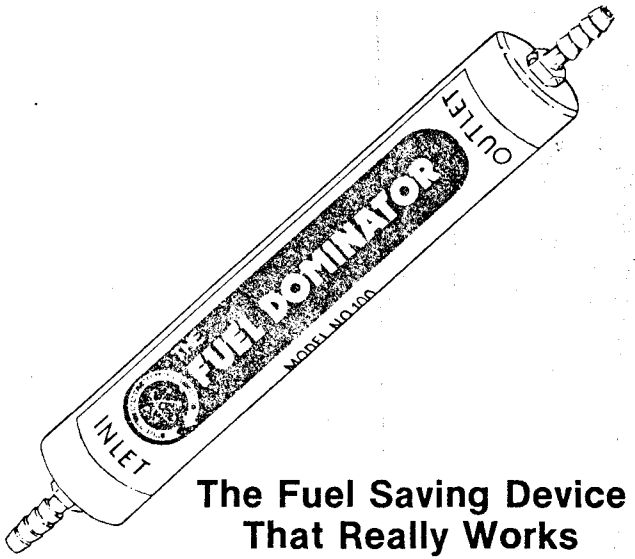
Your Local FUEL DOMINATOR™ Source Is:

The FUEL DOMINATOR™ is a product of
Internal Energy Management Corporation
Del Rio, Texas 78840 • Henderson, Nevada 89015

Scientific Breakthrough!

This remarkable new product can save you up to 23% on your car, truck and RV fuel bills.

Introducing THE FUEL DOMINATOR™



The Fuel Saving Device That Really Works

(We Guarantee It!!!)

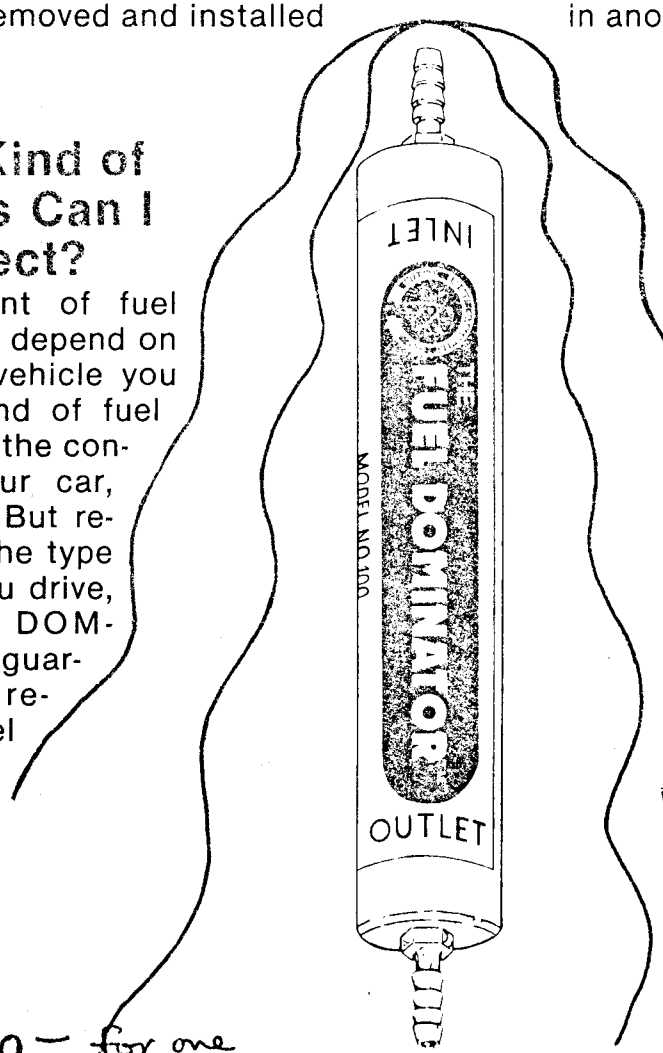
The "FUEL DOMINATOR™" (A Technical Description)

The FUEL DOMINATOR™ is a unique cylindrical design constructed of fuel- and oil-resistible plastic. The cylinder is engineered for maximum surface contact during fuel passage and treated by a special proprietary process and application. Once treated, the fuel that flows through the unit will be affected in the same manner as a surfactant (wetting agent) by reducing the interface tension. A reduction in interface tension in the fuel will allow more complete vaporization per unit time and will diminish the droplet size of any non-vaporized fuel. Both of these factors will produce a more complete burn and therefore, contribute to improved fuel economy.

The FUEL DOMINATOR™ works on any type of fuel—gas or diesel—and on any make or model car, truck or RV. It has no moving parts, requires no maintenance and can be removed and installed in another vehicle with the same results.

What Kind of Savings Can I Expect?

The amount of fuel you save will depend on the type of vehicle you drive, the kind of fuel you use, and the condition of your car, truck or RV. But regardless of the type of vehicle you drive, the FUEL DOMINATOR™ is guaranteed to reduce your fuel consumption by up to **23%** — and at no risk to your engine or its performance.



What About Installation?

Installation of the FUEL DOMINATOR™ is quick and easy and takes only ten to fifteen minutes. You can install it yourself, using a few simple tools and easy - to - follow instructions. Or your dealer will do it for you for a nominal charge.

45-DAY MONEY-BACK GUARANTEE

There's no risk involved when you purchase the FUEL DOMINATOR™ because each unit comes with a **no-strings 45-Day Money-Back Guarantee.**

But that's not all. If, within one year of the date of purchase, you should become dissatisfied with your FUEL DOMINATOR™, simply return it to the seller and he will replace it for you free. The only qualification is that the original unit was installed and operated according to the unit's printed instructions, and that the unit was not subjected to accident, negligence, alteration, abuse or misuse.*

Internal Energy Management Corporation
Del Rio, Texas 78840
Henderson, Nevada 89015

*See unit package for complete Limited Warranty statement.

INTERNAL ENERGY MANAGEMENT
PO Box 1429
Del Rio TX 78840
512 - 774 - 3388 / 383-6965

370 E. Kimberley Dr.
Henderson Nevada 89105
702 - 565-7450

PRICE — $140 — for one
Model #100
$85 ea for two $80 ea 3 or more

CARLOS R. SOTELO, Pres

Australian inventor develops a low cost fuel injector for automobile engines

Ralph Sarich, Australian inventor of an orbital internal combustion engine, has now developed a simple, low cost direct petrol injector for automobile engines.

Called the Orbital injector, the new device does not require high precision manufacture—which is the main reason for the high production cost of conventional fuel injectors. "The orbital injection metering prototypes are being built on simple machine tools—for example, 100 times less stringent in manufacturing accuracy and 30 times less demanding in relation to surface finish than currently available commercial systems", Mr. Sarich said. "This means that the proportional manufacturing time of current fuel injector systems is at least 56 times higher than the Orbital's and, therefore, significantly more expensive."

Mr Sarich claims that the Orbital injector atomizes fuel more effectively than systems used in existing motor cars. Atomization of fuel is an extremely critical factor in engine performance.

Mr Sarich came up with the direct fuel injector while looking for a solution to problems in the orbital engine which he is still developing. He had been seeking a method to reduce fuel wastage due to quenching and distribution, which increased the carbon emissions.

The new fuel injector is not yet in commercial production. Discussions were to be held with major manufacturers of fuel injection systems to weigh up the commercial potential of the Orbital injector system.

It is expected that two-stroke as well as four-stroke engines will gain substantial benefits from the Oribital system because of its capability of injecting suitably atomized fuel into the cylinder after the exhaust port is closed. Normally, a considerable loss of fuel into the exhaust occurs during the fuel/air induction cycle of operation.

Mr. Ralph Sarich bench-tests the prototype of his direct (Orbital) fuel injector system.

Prof. Robert Brown, head of Mechanical Engineering at the University of Western Australia, has acclaimed Mr Sarich's direct petrol injector. He says Mr. Sarich's system has overcome the problems of precision engineering until now associated with fuel injection systems. "As with many good innovations, this new development is essentially very simple and one is left asking the question: Why was it not developed previously?", Prof. Brown said.

Mr Sarich is aware that he has developed his direct petrol injector at an opportune time. An estimated 3,000,000 petrol injector systems are expected to be sold in the United States alone in 1983.

But he is chiefly pleased because his innovation represents another step towards developing his orbital engine to the point where it could be commercially exploited. □

INVENTION INTELLIGENCE

— NO LONGER AVAILABLE

'Gas Savers'

By FRANK SALZARULO
Auto Editor

While U.S. officials and motorists fret over the loss of oil from Iran and tight supplies at home, two Hoosiers believe they've got devices that will stretch gasoline supplies.

As gasoline prices push up and as fuel supplies dwindle, more people will come up with more ideas and devices which they claim will give more miles per gallon.

In Kokomo, Danny Jewell, says he has a device, a 10-inch long cylinder about four inches in diameter, that operates on thermal energy and powers all vehicle accessories, freeing the crankshaft of gasoline consuming chores. He's seeking financial support for his invention, not yet patented.

In Indianapolis, R. N. Linger, already is manufacturing a patented device called a "Pelco Fuel Saver" for cars equipped with one-, two- and four-barrel carburetors. Someday, someone in the oil or the auto industry will listen to inventors and check out their devices to determine if they will do what inventors claim they will do.

Following a telephone call to Linger, sales manager for Pelco Industries Inc., he sent material detailing claims for the fuel saver. The material says, "The fuel saver provides better gas mileage and lowered pollutant emissions through improved vaporization and distribution of the gas by electrically heating it under controlled conditions at the critical area where it counts most . . . the throat of the manifold prior to entry into the combustion chamber. When gasoline is cold, it is often poorly atomized by the carburetor. Before gasoline can be burned, it must be vaporized.

Linger with fuel saver.

"Vaporization changes the liquid to a gas and this only occurs when the liquid absorbs enough heat to boil. The Pelco Fuel Saver operates at a controlled temperature, thereby assuring almost perfect distribution of the fuel in a gaseous state at any time."

Linger says the fuel saver has had three years of testing and makes these claims:

Up to 35 percent better mileage
Up to 65 percent less pollutant emission
Saves fuel
Easy start in cold weather

Linger sent these test results from the York Research Corp., Stamford, Conn., which showed fuel mileage tests (miles per gallon) without the unit and with it for these test vehicles traveling at 60 miles per hour:

1970 Mercury 390 cubic inch engine — 13.3 and 20.8
1972 Plymouth 225 cubic inch engine — 16.9 and 26.7
1974 Plymouth 225 cubic inch engine — 20.5 and 27.8
1971 Pontiac Grand Prix — 12.5 and 18.9
1974 Ford 351 cubic inch engine — 11.8 and 18.8
1971 Buick 225 - 14.4 and 19.1
1973 Thunderbird — 12.2 and 18.8
1967 Oldsmobile Supreme — 13.1 and 19.2

Sales primarily so far have been made to companies with fleets of cars for test purposes, but the item is available to others at prices ranging fron $68.18 to $76.42, depending on the number of carburetors. For those mechanically inclined, instructions detail how the device can be installed. Otherwise, the work can be done by mechanics at a cost of $15 to $20.

cars for test purposes, results are not yet available.

In Kokomo, Jewell is trying to gather support for his invention and says no one in the auto industry will listen to him partly because he will not reveal all details. He has applied for a patent.

Linger's fuel saver is in production, and he makes startling claims for the gas saving device and offers money-back guarantees.

While he says it will save fuel, he says, too, it will reduce pollutants coming out of the tail pipe, something which the Environmental Protection Agency and the auto industry should be interested in. He sent The News a copy of a letter from the Air Resources Board, El Monte, Calif. That state has the most stringent controls among the states and even more stringent than EPA pollution ol regulations for motor vehicles.

The letter says, "Our evaluation indicates that the installation of the 'environmental fuel saver' device would not cause any adverse effects on emissions."

By JOHN DOYLE
Associated Press Writer

While U.S. leaders worry about the rise of Mideast oil prices — and drivers worry about the subsequent jump in gasoline prices — backyard inventors by the thousands are tinkering with ideas to give America's roaming masses more miles for their money.

The work is being done in basements, garages and sheds by such everyday Americans as a pizza parlor worker in Kokomo, Ind., a farmer in Minnesota and an auto mechanic in Indianapolis.

The hope of anyone able to sell his invention to a skeptical auto industry is sudden riches and fame.

Some of the nascent Edisons' claims of fuel savings have been disputed and their work is hard to verify because they are secretive about their inventions, fearing their ideas will be stolen.

But each year the nation's automakers get thousands of unsolicited inventions. Ford Motor Co., the country's second-largest automaker, gets 3,000 to 4,000 inventions or ideas a year, and Ford spokesman Robert Harnar said the number has roughly doubled in recent years.

So far, Harnar said, Ford hasn't bought any substantial idea from a layman, but that hasn't stopped R.N. Linger of Indianapolis.

Linger is manufacturing and selling his patented "Pelco Fuel Saver" himself. Linger says the device heats gasoline vapors inside a car's engine for more even distribution and fuel economy.

After three years of testing, he contends the device gives up to 35 percent better mileage and up to 65 percent less pollutant emission. Sales of the device have been primarily to companies with fleets of cars, but it is available to individuals for about $75, not including installation. Linger says test results from the companies using his fuel saver are not yet available.

Other inventors have met with less success.

Federal agents seized the still that Lance Crombie used on his Webster, Minn., farm for fermenting corn to make alcohol for fuel. Cromble then obtained an experimental permit to operate the still legally. But the publicity from his run-in with the law stirred the public's interest, and Crombie said he now gets hundreds of telephone calls asking how to make the alcohol fuel.

Ford Motor Co. said the trouble with most inventions is they already have been tried.

In fact, Danny Jewell of Kokomo, Ind., a 25-year-old pizza parlor worker and part-time mechanic, said all his ideas came from the public library. The result: A thermal-powered engine attachment that runs all automobile accessories, freeing the crankshaft of those gasoline-guzzling chores and, says Jewell, increasing mileage 15 to 30 miles per gallon.

When both auto engineers and government officials — including the White House — ignored his telephone calls and letters, Jewell picketed the Howard County courthouse for a week to attract investors.

Part of the reason for his recognition problems, Jewell admitted, is that he refused to give a detailed description of the 10-inch-long cylindrical device for fear someone will steal the idea. He has applied for a patent, he said.

"I tried to approach the auto companies, but unless you tell them everything and let them make decisions on it, they won't talk to you," he said.

Robert LaForce of Providence, R.I., took his invention to the public, too, demonstrating a new engine type in front of the Rhode Island statehouse — which did him little good.

Wednesday, March 28, 1979
THE INDIANAPOLIS NEWS

[redacted] your catalog and complete details on [redacted]

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CITY STATE ZIP

deterrent capacity. er.

Gas-saving device could have more far-reaching consequences

Gannett News Service Oakland Trib. '82

Two Arizona mechanics, using scientific principles neither understood, may have stumbled onto one of the biggest technological advances in 40 years.

It's a simple valve designed to eliminate the need for high octane gasoline and improve mileage as much as 20 percent.

Furthermore, it could remove salt from sea water inexpensively, said David Lindahl, an energy expert who studied the device for two years for the Congressional Research Service, the research arm of the Library of Congress. As a result, farmers might grow crops in deserts and nationwide water shortages could disappear.

"This could even affect where people live," he said.

Some observers rank the device invented by Sherwood Webster and Richard Heise right up there with the transistor and the laser beam — two of the most significant inventions since World War II.

Since they first demonstrated the valve two years ago, the inventors allege the oil industry has tried to cover it up. But several powerful Republicans, including two congressmen and Vice President George Bush's office, have gotten behind it.

Basically, the device forces particles of air and fuel to mix, somewhat like stirring sugar into coffee. Installed beneath the carburetor, it uses a double screen to vaporize the air-fuel mixture, allowing more complete burning, which gives off less pollutants.

MILEAGE CALCULATOR

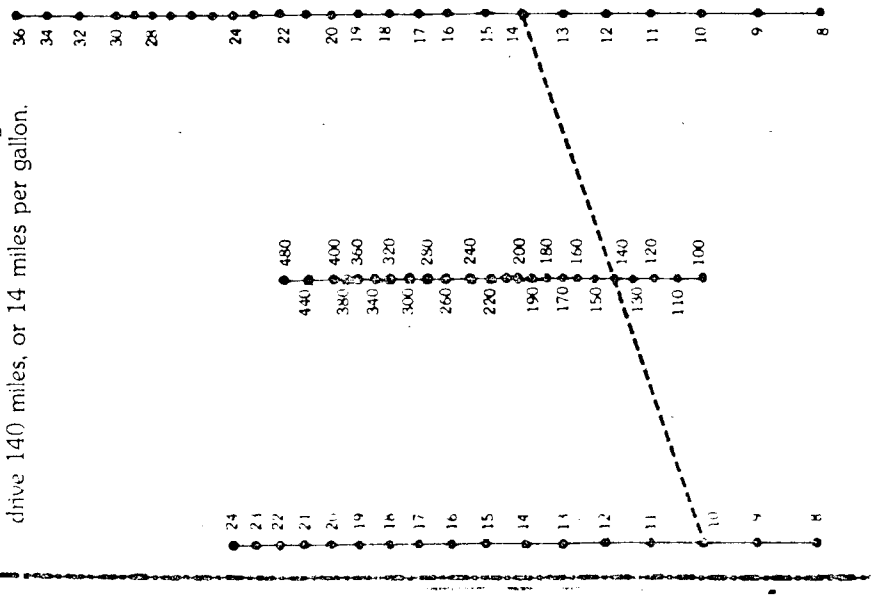
TO USE

Calculate miles per gallon only between fillups when the car is level and the tank is filled nearly to overflowing.

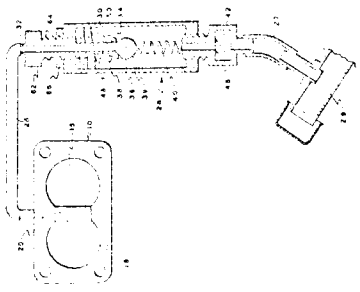
Record the gallons and miles traveled since the previous fillup.

Using any straight edge (card, paper, envelope, map) line up the gallons used (left scale), with the miles driven (center scale) and read the miles per gallon (right scale).

Example (dotted line) shows 10 gallons to drive 140 miles, or 14 miles per gallon.



3,118,435
CRANK CASE BREATHER
Edgar W. Almquist, Milford, Pa.
Filed Oct. 12, 1961, Ser. No. 144,615
9 Claims. (Cl. 123—119)



1. A breather for use in connection with an internal combustion engine of the type which includes a carburetor and a crank case,

said breather including a hollow casing located between said crank case and said carburetor,

a first tube connecting one end of said casing to said carburetor,

a second tube connecting the other end of said casing to said crank case,

and a heat responsive element intermediate said carburetor and said crank case movable, when subjected to a temperature of a first, relatively low, predetermined value, to a first position in which it obstructs the flow of gases from said crank case to said carburetor,

said heat responsive element being calibrated to move, when subjected to a second, relatively higher, predetermined value, to a second position in which gases can flow from crank to the carburetor.