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TITLE:

AUTOMOBILES

1

019-AU1 AUTOMOBILES # 1 --- 45 Articles from the 1920s to date reporting major breakthroughs, improvements & innovations in automobile technology, including: H. Caminez's super airplane engine (no crankshaft or gears)..W. Rohn's engine (no spark plug or connecting rods, burns oil or gas - 1927)..Spherical Wheel Drive for Gearless Transmission..One-Wheel Vehicles..C. Vlachos: "Triphibian"..Bosman's extra-simple design: no con rods, twist pins or crank case, gives high mpg (1927)..H. Elmer: 300 mpg oil engine, only 60 parts including bolts! Complete US Patent & article..Purve's "Hoop Car"..Tom Ogle: No-carburator fuel system -- 200 mpg proven, patented! R. Russell's Hydraulic Car (1940s)..Guido Franch: "Mota" fuel catalyst converts water into gasoline-like fuel! E. Cottel: Ultrasonic emulsifier for fuel-water (30% H20, nearly 100% efficient, & available off-the-shelf now!).. Smokey Yunick:"Expander Cycle" fuel system vaporizes fuel, gives 80 mpg ++!.. Ball-Tire for dirt bikes: take curves without reducing speed!.."Fueltron" 1.5 MHz transducer vaporizes fuel, 15% ++ mpg..Lee Williams Air-Car (1926)..Constantinesco's Inertial Wheel Gearless Transmission: simple, automatic, very powerful..How to run your car on half its cylinders: Save $$, increase mpg...Rabinow's Magnetic Particle Clutch..D. Hughe's "Vapipe" Fuel Vaporizer/Carburator..Improved Bourke Scotch Yoke Engine: silent, no problems!..G. Miller: "Perpetual" Air Engine..Unique Wheel Designs..The Webster-Heise Valve: 2-Screen Fuel Vaporizer for increased mpg, reduced pollution, etc... And Much More!...

West German touts invention as engine of future

By JOHN TAGLIABUE
The New York Times

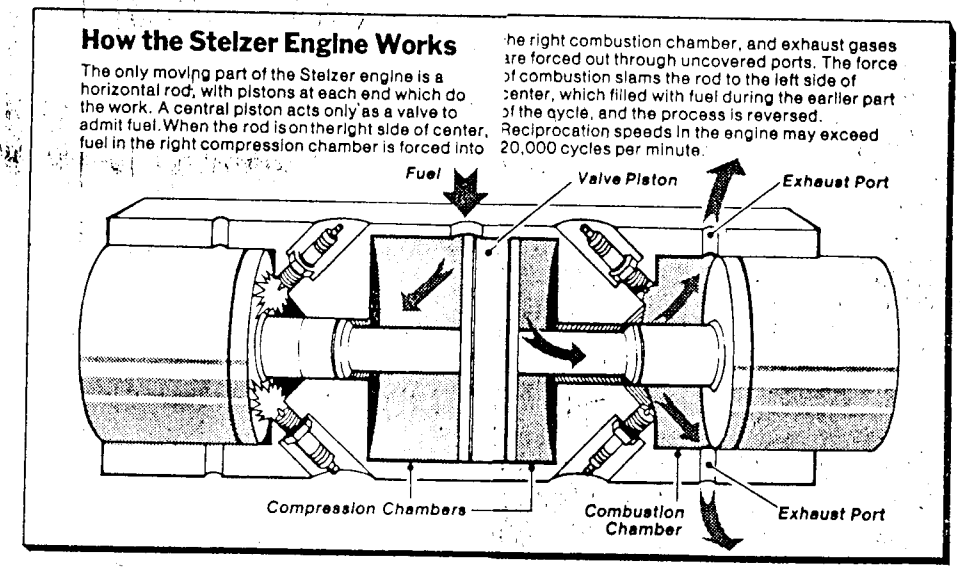
FRANKFURT, West Germany — A West German inventor has developed an internal combustion engine with one moving part that, he says, consumes about 30 percent less gasoline than conventional engines and can be manufactured for a fraction of the cost.

The final verdict is pending, but engineers and industry analysts are unsure whether Frank Stelzer has built the mouse trap to make men beat a path to his door, or has reinvented the wheel.

Automotive engineers call it a free-piston engine, and say the concept has been around since the 1920s. But many acknowledge that Stelzer — a philosophizing blend of Marshall MacLuhan and Gyro Gearloose — has produced an immensely refined version that stands a good chance of revolutionizing the manufacture of pumps, compressors and hydraulic systems, and may even propel the car of the future.

"We're living in the pneumatic age, mechanical solutions are no longer acceptable," Stelzer said, wielding a wrench at a recent demonstration outside the cream-colored garage where he and a helper are making prototypes for interested companies around the world.

Stelzer, 49 years old, who was born in what is today East Germany, says the idea for the engine came to him about 20 years ago. Working days as a cook, baker and film projectionist, he taught himself to run a lathe at night.



New York Times Illustration

The result was a marvelously simple machine, consisting of a cast iron and aluminum piston that shuttles back and forth at furious speeds inside a single cylinder, propelled by the alternate firing of two combustion chambers at either end of the cylinder.

On a recent morning, the engine, about three feet long and outfited with a Harley-Davidson carburetor and a Honda ignition system, hummed along at about 2,500 cycles a minute, mounted on a steel frame with four rubber tires. Though he never accurately clocked it, Stelzer estimates it can reach about 20,000 cycles and generate more than 200 horse power.

Motor industry analysts say European patents were first issued for a free-piston engine in the 1930s. In the 1950s, engineers at the General Motors Research Laboratories in Detroit used a free-piston engine to produce gas to drive an experimental turbine automobile.

Today, two companies, Sigma of France and Alan Muntz and Co. in Britain, produce less sophisticated versions to produce gas for marine turbines or to compress air.

Nevertheless, Stelzer's refinements have led to a fresh burst of interest, and his brash insistence that the Stelzer motor will one day propel cars has sparked lively controversy.

Engineers have long admired the engine's versatility. It can be manufactured of various metals, and can be cooled by water or air. Its reciprocal motion makes it an ideal air compressor.

In 1980 Stelzer convinced a circle of investors to finance the engine, and full-page ads in several West German and British newspapers brought a torrent of inquiries. Last year, the government of Ireland agreed to pay half the cost of a factory at Shannon Airport to manufacture the engines.

Nevertheless, Stelzer's main goal is to convince skeptical auto makers of its value. At Frankfurt's International Auto Show in September he will demonstrate a Citroen station wagon with a Stelzer motor.

United States Patent [19]

Stelzer

[11] **4,385,597**

[45] **May 31, 1983**

[54] **TWO-STROKE INTERNAL COMBUSTION ENGINE**

[76] Inventor: **Frank Stelzer**, Elbestrasse 39, Raunheim, Fed. Rep. of Germany

[21] Appl. No.: **285,495**

[22] Filed: **Jul. 21, 1981**

[30] **Foreign Application Priority Data**

Aug. 1, 1980 [DE] Fed. Rep. of Germany 3029287

[51] **Int. Cl.**³ **F02B 33/06**

[52] **U.S. Cl.** ..... **123/62**; 123/46 A

[58] **Field of Search** ..... 123/62, 61 V, 61 R, 123/56 B, 56 BC, 71 V, 65 W, 65 PE, 46 R, 46 A

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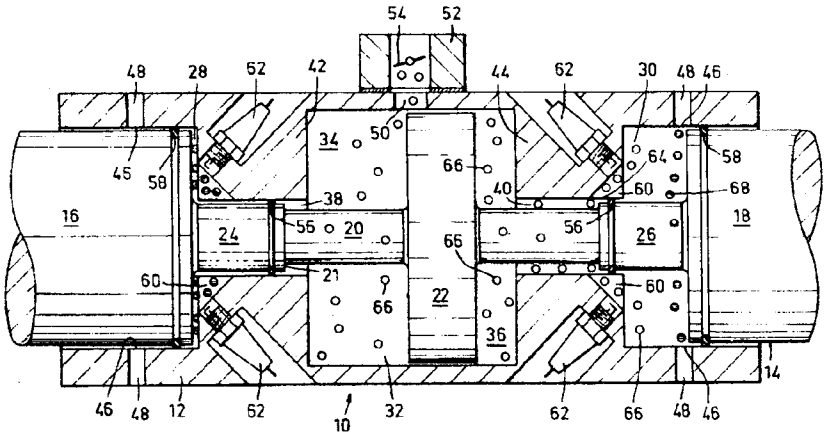
Primary Examiner—Wendell E. Burns

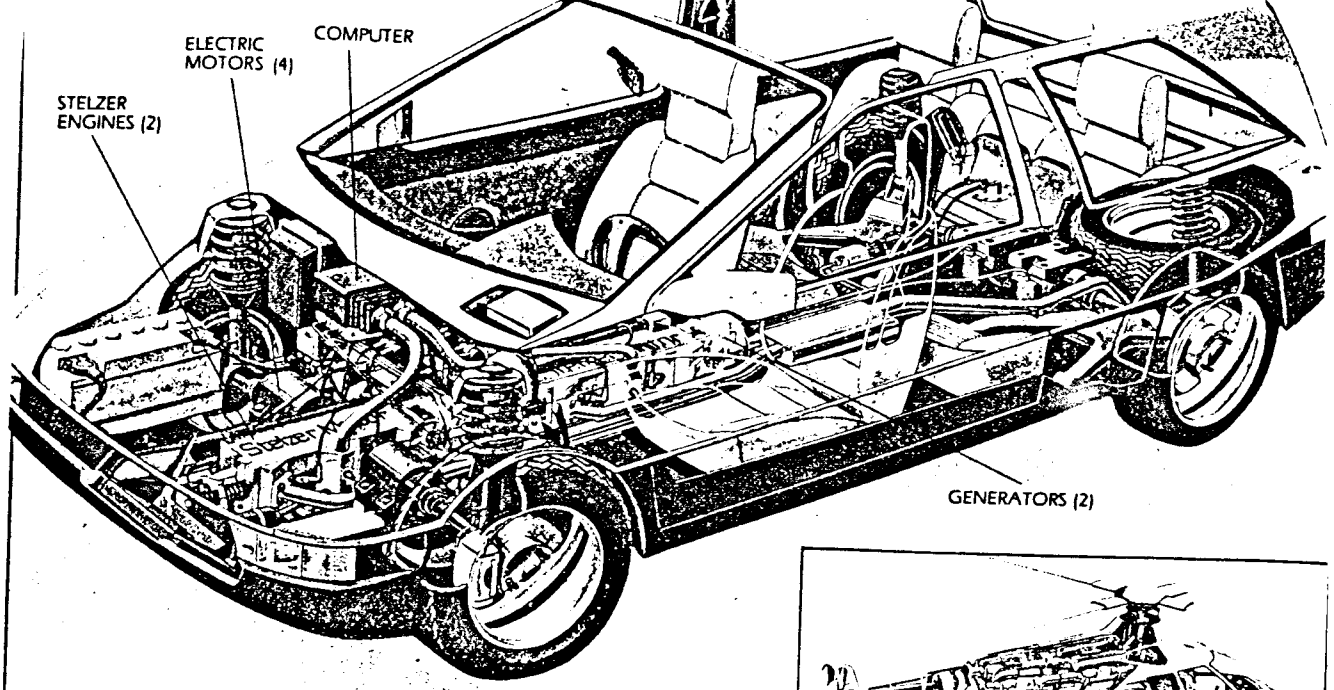
Attorney, Agent, or Firm—Dennison, Meserole, Pollack & Scheiner

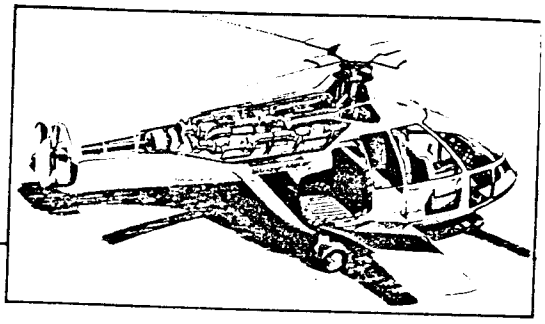
[57] **ABSTRACT**

A two-stroke combustion engine is described which has a symmetrical, floating differential piston (**14**), having at least two main piston portions (**16, 18**), each movable in a combustion chamber (**28, 30**) formed with exhaust ports (**46**), and each connected to a pre-compression chamber (**34, 36**) by means of a respective channel (**38, 40**). The combustion chambers (**28, 30**) are arranged axially inward of the piston portions and between the chambers lies the pre-compression chamber (**32**) in which a central double-acting piston portion (**22**) of the differential piston (**14**) is arranged on a piston rod (**20**). The central piston portion (**22**) divides the pre-compression chamber (**32**) into two separate supercharging chambers (**34, 36**), from which the channels (**38, 40**) leading to the combustion chambers (**28, 30**) terminate at the end walls of the respective combustion chambers. Valve means (**24, 26**) on the piston rod (**20**) serve to open and close the channels so that upon expansion occurring in one combustion chamber material exchange will occur in the other.

5 Claims, 1 Drawing Figure







TRANSPORTATION

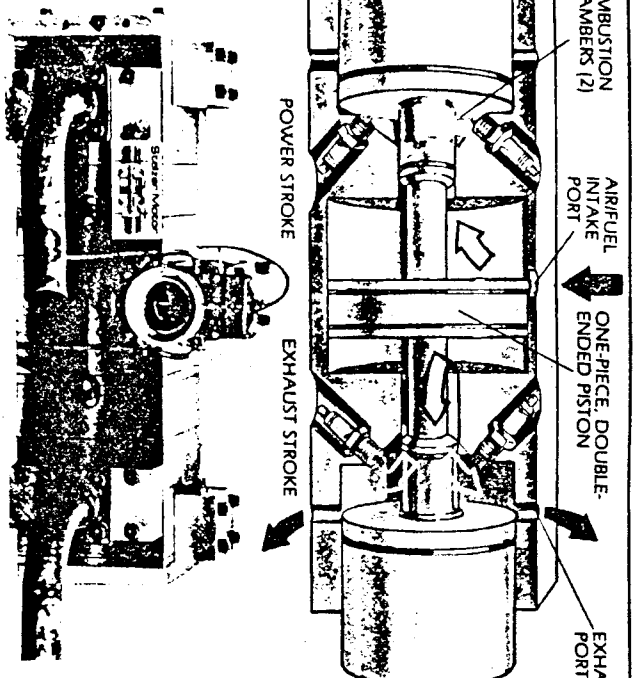
Germany's new engine

When Frank Stelzer introduced his prototype car at a West German auto show last year, he may have opened a new chapter in the ever-evolving book on automotive engines. Under the hood—in fact, under the whole body of the car—purred a strange motor system that can run on any known fuel with little buildup of engine heat and with a purported fuel efficiency at least equal to the best economy cars on the market today. The Stelzer motor is a reciprocating piston system that runs horizontally inside its housing.

Gone are the connecting rods, crankshafts and scores of moving parts associated with a standard auto engine. The Stelzer motor consists of eight parts, and only one—the reciprocating piston—moves. With a displacement of 400 cc, it delivers 75 hp and could be made even more compact. At present, its being sold as a pump, but Stelzer sees uses for it as the driving part of an auto, helicopter or marine system.

The two-stroke piston sits inside a cast-iron block formed by three cylindrical chambers. The middle chamber contains the inlet for the air-fuel mixture from either a carburetor or an injection pump. As the piston oscillates, it alternately compresses the mixture in the left and right combustion chamber. Stelzer claims his engine runs 25 percent cooler than the better auto engines on the market today.

Stelzer's prototype converts power from the push-pull piston to electrical energy. The engine drives two generators that power two motors in the front and two in the rear.



Stelzer car (facing page) would use electric motors and computer for regulated four-wheel drive. The Stelzer engine configuration could also be used in a helicopter. The reciprocating piston (drawing above) has only one moving part. As the piston rocks back and forth, it compresses air-fuel mixture for combustion. A prototype Stelzer motor is shown in the photo above.

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APRIL 1984

This new Free-Flying Piston Engine could replace engines now used

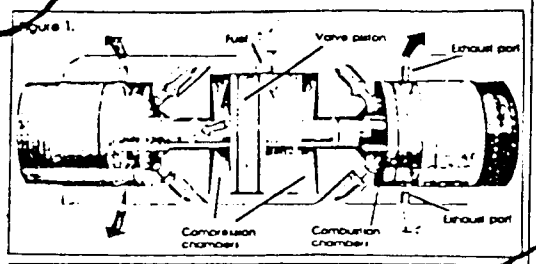
By BRAD DENNIS

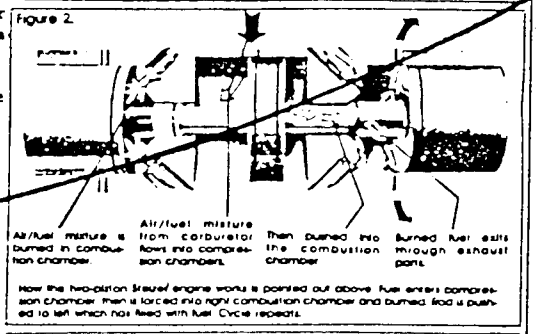
Russell Bourke designed a two-cylinder opposed engine with extremely high rpm capabilities, very fuel-efficient, and inexpensive to build. See pages 49-52 in your GASOLINE CRISIS ANSWERS book for the story.

Today's article describes the Free-Flying Piston Engine, similar in construction to Bourke's, but a little different in its thermal operation.....and has one less moving part. The Bourke Engine had two moving parts. Conventional motors in use everyday have over a hundred moving parts. To me this is a tremendous waste of our technology and fuel.

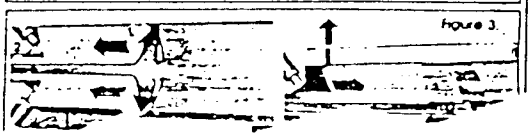
We have the technology to be more efficient!

Let's take a look at what could be todays replacement for the piston engine. The unit is called the Stelzer Free-Flying Piston





How the two-piston fravel engine works is pointed out above. Fuel enters compression chamber, then is forced into right combustion chamber and burned. Rod is pushed to left which now feed with fuel. Cycle repeats.



REMEMBER THIS ARTICLE ?

Special Report and 1986 Renewal Request

Recently I received a telephone call from a NEW ENERGY NEWS subscriber who lives in Boston. He said he had something to show me. Arrangements were made to meet near Seattle-Tacoma International Airport on his return from Hong Kong.

What an enjoyable visit followed! This elderly man was indeed a gentleman. In the past he had been the vice president of two large companies. His background was engineering. Then, after retiring from the second company he started his own small firm manufacturing miniature circuits for one of the federal space programs.

Then he sold that company so he could have time for his own "tinkering and travels."

Last year he read the above-noted article on the new Free-Flying Piston Engine and became intrigued by the concept. From the information in the newsletter article alone, he built a small flying piston engine prototype.

And this is what he wanted to show me in person. What a fine piece of engineering it was. And this "senior citizen's" enthusiasm was contagious. He was eager to fly back to Boston and begin work on a larger model which would demonstrate the units merits and economy. The free-flying piston engine has no negative (wasted) motion. The piston always does work, whether it is coming or going. It is very simple in operation (only one moving part) and is expected to be multi-fuel and highly economical.

Piston-within-a-piston engine

—*fewer parts, less weight*

An innovative fuel-intake system eliminates the conventional valve train.

By STUART F. BROWN

"That's a lot of white knuckles," Charles Ramsey says of the 10 hours of full-throttle bench testing of the latest hand-built prototype of his novel gasoline engine. Ramsey, a Dunkirk, Ind., amateur inventor, holds patents on an internal-combustion engine he thinks could be an attractive alternative to the power plants now widely used to run cars and a host of other machines.

Ramsey has been developing his engine—dubbed the RAM-Z—for about 25 years. The engine has only about a third as many moving parts as a typical four-cylinder, overhead-camshaft automobile engine. Thus it's smaller and lighter, and should be cheaper to manufacture and maintain, the inventor says.

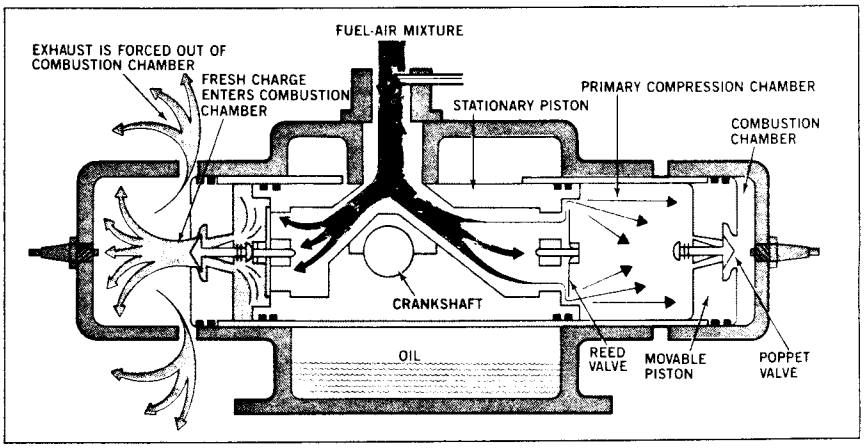
The heart of the engine is a cast-iron stationary piston around which slides a double-ended canister, forming, in effect, a piston within a piston. "The piston is under power 100 percent of the time. It's never at rest," explains Ramsey. The uncomplicated water-cooled cylinder heads contain no valves, an advantage conferred by the RAM-Z's unique fuel-intake system (see diagram).

In some respects, Ramsey's creation resembles the two-stroke engines used in motorcycles and chain saws: It fires every time a piston reaches the top of its stroke, and it expels combustion gases through ports in the cylinder walls. But that's where the similarity ends. The RAM-Z, its inventor points out, admits a fuel-air mixture into the combustion chamber through a spring-loaded poppet valve seated in the center of each piston's crown. Two-stroke engines breathe through transfer ports cast into their thicker cylinder barrels. Another important difference is that two-strokes burn an oil-gas mixture, which has given them a bad reputation as polluters. The RAM-Z burns straight gasoline and is splash-lubricated from an oil sump.

Ramsey is working with faculty and undergraduate engineering students at Rose-Hulman Institute of Technology, Terre Haute, Ind., to develop the engine further. The fourth-generation prototype shown consists of two double-ended pistons running in side-by-side cylinders to form the equivalent of a flat-four engine (photo). Power is transmitted from the pistons to a crankshaft by an arrangement of eccentrics and connecting rods. This 56-cubic-inch prototype develops 10 hp at 1,600 to 2,500 rpm. Peak measured output is 16 hp.

Refinement of the engine's vibration and emissions characteristics is now under way. As funding permits, further prototypes will be built for destructive testing that will show where more developmental work is needed. The first commercial goal, Ramsey says, is to develop a lightweight marine engine. A diesel RAM-Z variant is also in the offing. PS

Inventor Ramsey (at left in photo) works on prototype engine with Rose-Hulman team members. Fuel mixture (below) passes through reed valve into space between stationary and movable pistons, where it is compressed before entering combustion chamber through poppet valve in piston crown. Cylinder at right is prepared to fire. Exhaust gases are expelled from cylinder at left through ports uncovered by piston.



Speedy New Motor-Hoop Amazes Italians

Dec. '24

Policeman's Strange Invention Runs from Milan to Rome

By Giuseppe Gagliardi

SPECTATORS at the speedway before the National Stadium in Rome, Italy, gasped with amazement not long ago when they saw a huge wheel, driven by motorcycle engine, careening at high speed around the track like an overgrown toy hoop. Within the wheel, apparently unconcerned at the possibility of being precipitated in the mad whirl, they saw a driver, his hands gripping an ordinary automobile steering wheel, his feet resting on ordinary motorcycle pedals.

His body kept the wheel in perfect balance. At every turn he would lean to one side or the other. And when the spinning wheel finally slowed down and came to a stop, he simply rested both of his feet on the ground, then let down a standard to keep the wheel from toppling over!

DAVIDE GISLAGHI

Two of the odd new motor-hoops before the National Stadium at Rome, Italy. Notice how the outer rim with its tire moves on rollers about the inner steel hoop, which is held stationary by the weight of driver and engine. At the right is the inventor, Davide Gislaghi, enjoying a ride in his strange vehicle

The driver of this remarkable vehicle was Davide Gislaghi, a motorcycle officer of Milan, Italy. Possessed with the idea that one wheel would be more efficient than two, he had perfected what more than one inventor before him had attempted unsuccessfully—a one-wheel cycle that actually would run!

IN RECENT years there has been a marked tendency to reduce the size and weight of motor vehicles and their parts. The light, speedy cycle-car is one example of this development. But this Italian inventor seems to have arrived at the irreducible minimum. He could hardly hope to travel on less than one wheel, and he has left just enough room in his odd car for the rider to sit and drive, leaving luxury or comfort, of course, out of consideration.

Only one tire to puncture, only one wheel to push out of the mud, a lessening of resistance—the owner of an automobile or motorcycle can think of many advantages possessed by a vehicle that can run on one wheel instead of two, three, or four.

The unicycle, which is called a "velocita" by its designer, and also a "motormota," has two principal running parts—a large pneumatic tire and an inner hoop of steel. The inner circle carries the driving mechanism and the driver, while the tire moves around it. The diameter of the wheel varies according to the height of the driver, but usually it is about five feet. A short man has a smaller wheel than a tall man.

Since economy in size is a primary consideration, the wheel is always made just large enough to prevent the driver's head bumping against the circle.

The air-cooled motor that drives the wheel forward, and its accessories, are fixed rigidly to the inner steel hoop.

The motor, the driver's seat back of it, and the driver himself, are grouped in a small sector of the circle. On the outer circumference of the steel hoop are rollers, and these support the run of the tire. Thus the two concentric pieces, hoop and tire, are independent of each other as the wheel moves forward.

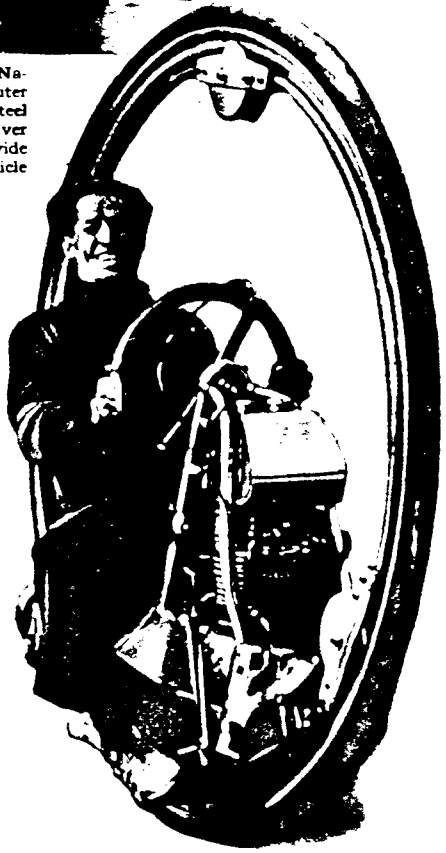
WHEN the machine is moving, the inner hoop is kept stable to a great extent by the weight of the engine and driver. But opposing this, there is a friction roller, driven by the vehicle's motor, which acts against the rim of the tire and revolves it. This force is more powerful than any retarding resistance.

So it is that the driver does not turn with the wheel, but maintains his upright position. He balances the machine much as he would a motorcycle, and he regulates the direction to be taken by the vehicle by inclining his body to the right or left and by a steering-wheel similar to those on automobiles. To keep the wheel from falling when it is not in motion, there is a special stand that fits inside the circle and can be released.

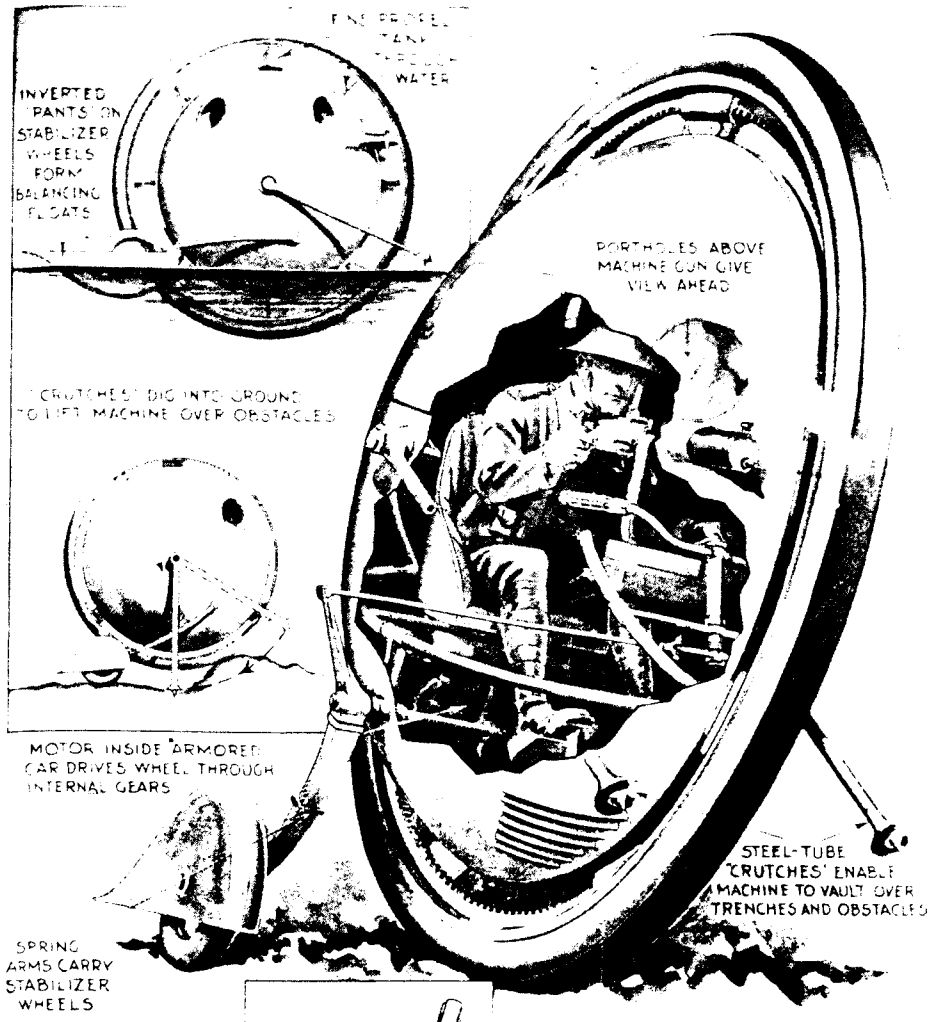
The motor actually travels on an endless circular track furnished by the revolving of the wheel.

When the inventor completed his machine in a small workshop in Milan, the device was not considered seriously by mechanics and engineers. They thought it simply a toy or novelty, incapable of being used as a practical method of conveyance. So Gislaghi made a wager that he could travel in it at high speed from Milan to Rome and race in it before the stadium.

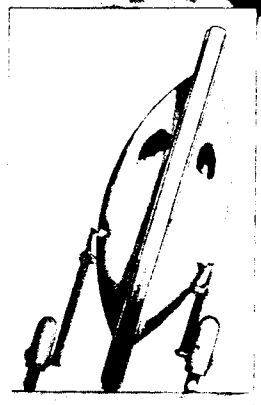
He won his wager and then gave several other satisfactory demonstrations that convinced spectators that what they saw was not a freak toy, but a vehicle that actually could be operated successfully. The inventor now is experimenting to increase the speed of the unicycle, whose possibilities for speed as well as everyday utility he believes are almost limitless.



War Tank ON One Wheel OPERATED BY ONE MAN



This one-man war tank, propelled by a hidden motor, would roll into action as is shown above. The diagrams also give a clear idea of how the machine runs on land or water



SUDDENLY, through the drifting smoke of a hard-fought battle, rush weird, one-man fighting tanks. They have the appearance of disk wheels and roll like hoops across the battlefield. Pouring out machine-gun fire, they leap over trenches, vaulting across on strange steel crutches to pursue the disorganized enemy.

Such is the startling vision foreseen by a New York inventor. He has just obtained a patent upon a unicycle-type tank which he believes will revolutionize battlefield tactics.

Housed inside the armored body, the operator will steer the single main wheel by means of two small auxiliary wheels at the rear. A turn of the handlebar lifts one stabilizing wheel and lowers the other, shifting the balance of the machine and turning it to one side or the other. An internal gear mechanism, operated by a motor inside the body, drives the wheel ahead at remarkable speed.

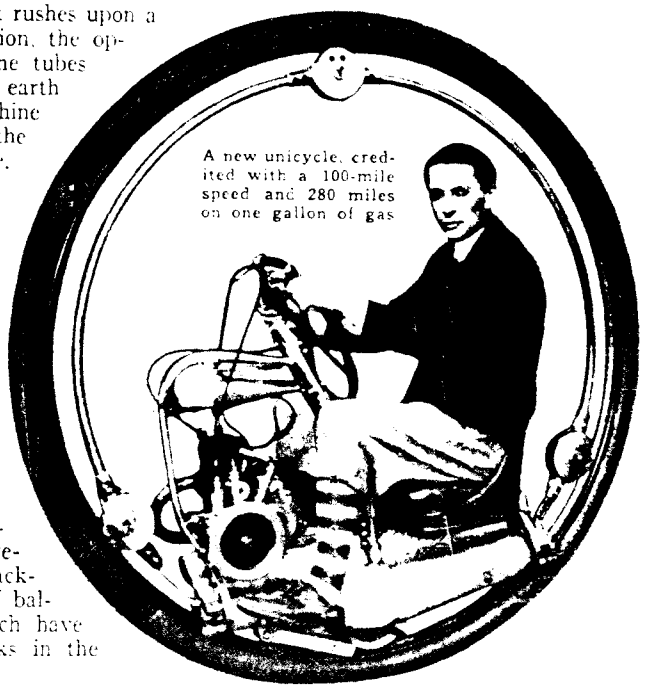
By a simple process of inverting the streamlined pants on the stabilizing wheels, so they form balancing floats, and attaching propelling fins to the main wheel, the tank can be turned into an amphibian capable of plunging into a stream and rolling to the other side.

One of the oddest features of the revolutionary machine is formed by the steel-tube crutches that project ahead on either side like medieval lances. As the tank rushes upon a trench or obstruction, the operator will drop the tubes so they dig into the earth and the whole machine will vault through the air to the other side.

An open-type form of the vehicle, which is shown on our cover, has also been devised by the inventor. Without the armored body or the crutches, it is designed for highway use.

In various parts of the world, recently, engineers have been reviving the idea of the unicycle. Attracted by the economy and compactness of a one-wheeled vehicle, they have been attacking anew the problems of balance and propulsion which have been the stumbling blocks in the path of the inventors.

In England, an Italian inventor has just demonstrated a single-passenger unicycle in which he claims to have reached speeds of 100 miles an hour and to have made 280 miles on a gallon of gasoline. In the near future, he plans to bring the machine to the United States and demonstrate its adaptability to American highways. Perfected after more than ten years of experiment, this odd machine rests solely upon one huge pneumatic tire encircling the driver, and dispenses entirely with exterior steering apparatus. The metal rim within the tire supports the frame and driver's seat and is rotated by a motor of one and three-fourths horsepower. To guide the vehicle to left or right, a steering wheel tilts the central frame with respect to the wheel, shifting the driver's weight and thus steering the hoop. Models of various sizes are contemplated, the diameter of the hoop being suited to the height of the driver, so that a tall man, according to the inventor, would use a larger unicycle than a short man.



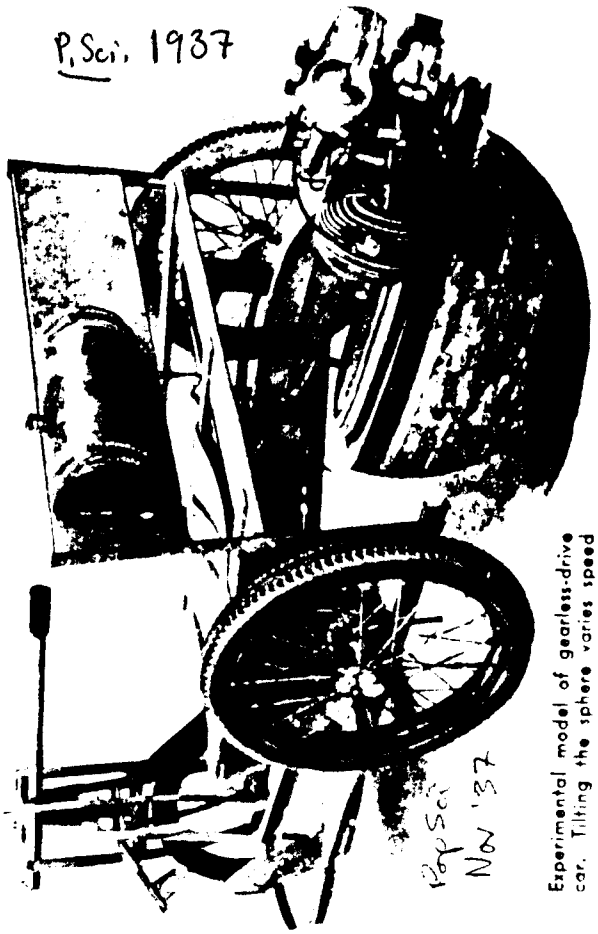
A new unicycle, credited with a 100-mile speed and 280 miles on one gallon of gas

Rex Research

Spherical Drive Wheel Propels Odd Vehicle

PROPELLED by a spinning, motor-driven half globe at its rear, a strange three-wheeled vehicle recently made its appearance on the streets of Paris, France. The fantastic machine serves as an experimental model to test the inventor's idea of a new gearless transmission, the speed of the vehicle being varied by tilting the hemisphere

P. Sci. 1937

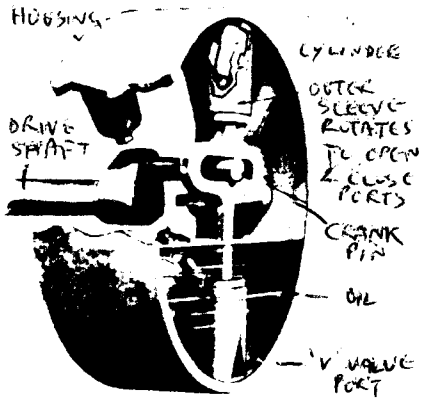


Pop Sci Nov '37

Experimental model of gearless-drive car. Tilting the sphere varies speed

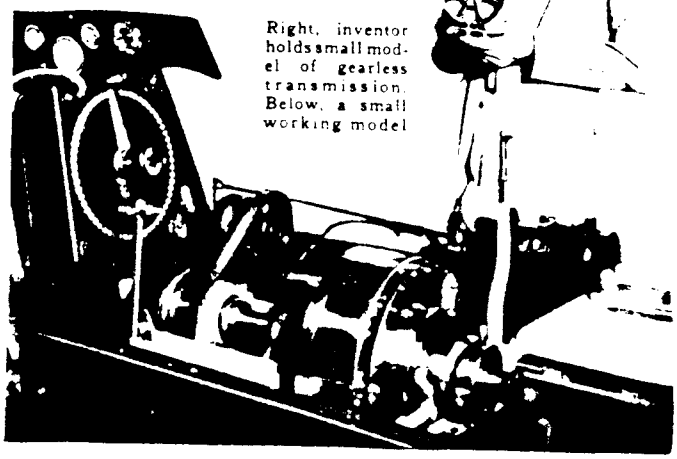
NEW TRANSMISSION HAS NO GEARS

POWER is transmitted at variable speeds by means of a hydraulic unit invented by A. E. Hedlund of Everett, Wash. Replacing gears in automobiles, it employs a steel case containing eight cylinders with eight pistons working in pairs from a crank attached to a drive shaft. When this drive shaft is rotated, a reciprocating motion is set up in each link acting between opposite cylinders, thus causing one cylinder of each set to pump oil, while each opposing cylinder expels it. In the wall of each cylinder is a wedge-shaped port which may be closed or opened. When these ports are open, the unit runs free, but as the port is closed, it takes up the load.



Diagram, left, showing construction and operation of hydraulic transmission in which there are no gears

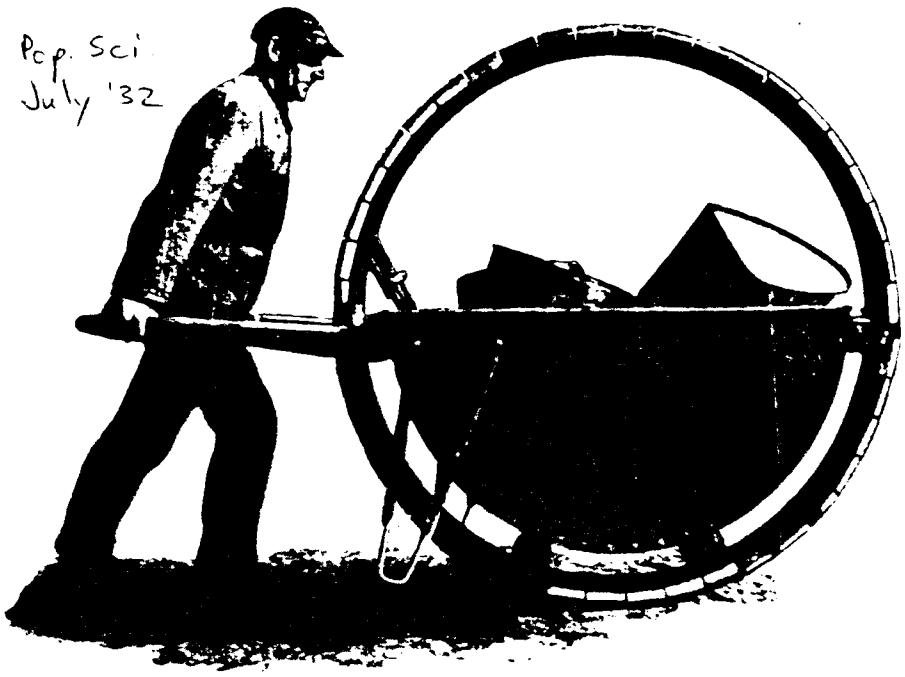
Pop. Sci. April '34



Right, inventor holds small model of gearless transmission. Below, a small working model

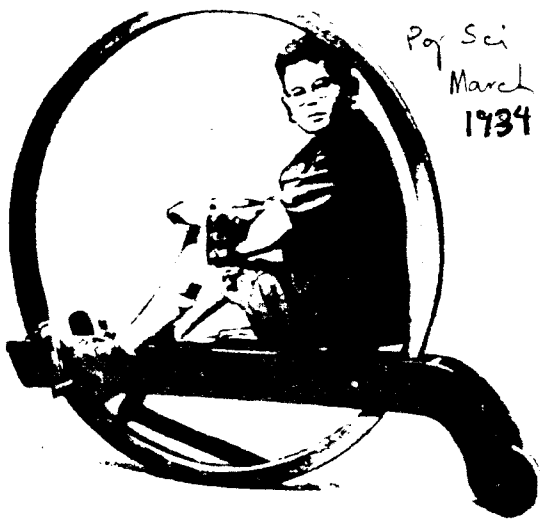
THIS WHEELBARROW JUST ROLLS ALONG

Pop. Sci July '32



AN ADAPTATION of the motor-driven hoop that recently amazed England (P.S.M., May '32, p. 63) has made its appearance in Germany. It is the "hoop-barrow," a wheelbarrow propelled within one huge wheel. The barrow proper, remaining stationary, is attached by means of rollers to the large hoop which is easily pushed by hand. The new device works on the principle of a rolling drum, rather than on that of the lever, and thus much heavier loads can be carried in it.

Pop Sci March 1934



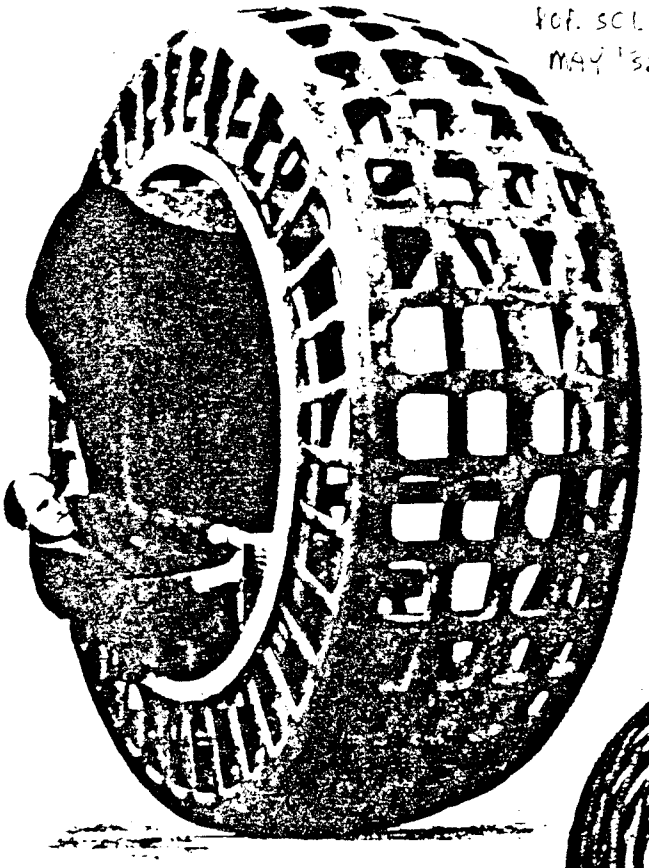
ONE-WHEELED COASTER ROLLS LIKE A HOOP

A boy who likes to roll a hoop may roll along with it since a Vienna, Austria engineer has invented a one-wheel coaster. The youthful passenger sits astride a seat within the odd vehicle. This seat, supported by a roller, is [illegible]

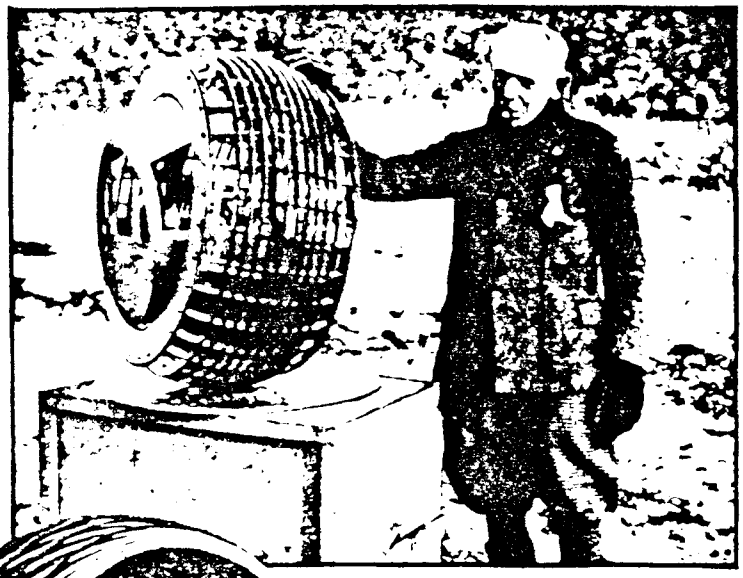
Pop Sci. MAY 1932

Pop. Sci. MAY '32

AMAZING MOTOR-DRIVEN HOOP MAY BE CAR OF THE FUTURE



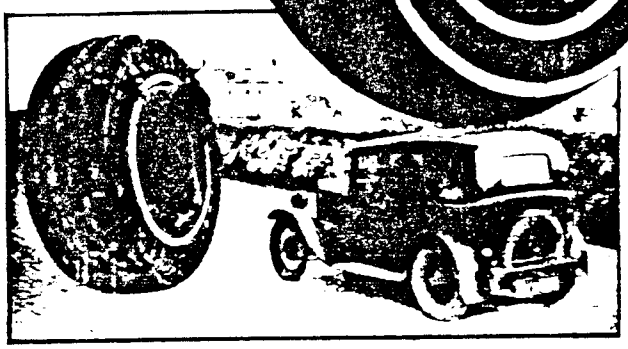
In the unicycle, the operator sits inside the wheel, which revolves around him. He steers by leaning to side. Photo shows inventor's son driving the car



Above, Dr. J. H. Purves, English inventor of the unicycle, with a model of the car. At left, small electrically-driven wheel for one passenger

A TEN-FOOT hoop of iron latticework chug-chugs along an English highway. Passing motorists slow down, and pause to peer at the apparition. The man inside it is driving as unconcernedly as if he were out for a Sunday airing.

Later the same strange hoop is put through its paces on the beach at Brean Sands, near Weston-Super-Mare, England, before a crowd of spectators. With a speed that is astonishing in view of its ungainly appearance, the wheel goes spinning along the sands at a thirty-mile-an-hour clip. When it has come to a stop, the driver and inventor, Dr. J. H. Purves, steps from it and declares he has just demonstrated an experimental model of the high-speed vehicle of the future. By substituting one wheel for the four wheels of the conventional automobile, he maintains that he has reduced locomotion to the simplest possible form, with consequent economy of power. The motor, remaining upright on a roller-mounted carriage with the driver's seat, transmits its power to the inner rim of the hoop.



Present and future? The unicycle meets an auto on the highway

Witnesses of this extraordinary demonstration, which took place recently, saw that a gasoline motor of only two-and-a-half horsepower was sufficient to run the thousand-pound wheel. Another smaller motor hoop was demonstrated, run by electricity. At present the machines are admittedly crude: the driver steers, for example, by leaning to one side and thus tipping the wheel slightly toward the direction in which he wishes to go. But Dr. Purves exhibits a working model to show the one-wheeled vehicle that he visions on future highways.

In this "dynasphere," as he calls it, passengers will sit within an inclosed cabin that remains upright while the tread revolves around it. The tread's curved surface has the shape of a section cut from a sphere. To steer the vehicle, the driver operates gears that shift the cabin to one side or the other, tipping the wheel and thus directing its course.

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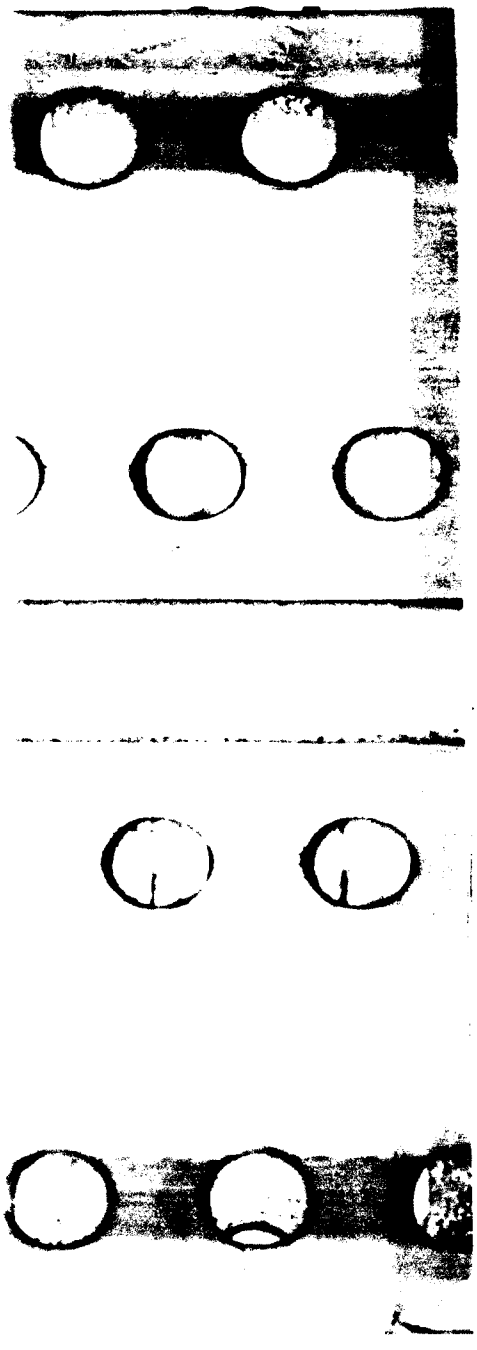
the exhaust port, a confined generator chamber for receiving a liquid fuel, said chamber being located in the exhaust valve between the inner and outer faces of the cylinder whereby the fuel is volatilized in the chamber, such chamber being substantially closed to the inlet of air and having an open unobstructed jet passage into the combustion space of the cylinder, a valve for controlling the flow of fuel into the generator chamber, and means for operating and timing the operation of the exhaust and fuel inlet valves.

In testimony whereof, I have hereunto signed my name, at Syracuse, in the county of Onondaga, and State of New York, this 25th day of March, 1922.

HARRY H. ELMER.

Magnetic Oil Holds New Clutch Tight



This new clutch developed to feed an electronic computer may take the jerks out of driving an automobile.

By John F. Loosbrock

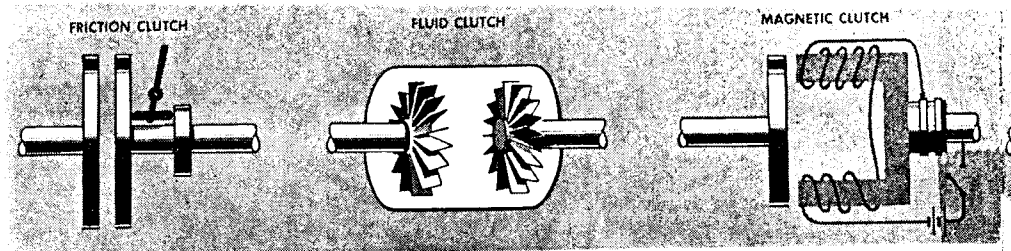
THE problem Jacob Rabinow faced was how to satisfy the appetite of a giant electronic computer that gobbles facts and figures at incredibly high speeds. To solve it, he has produced a versatile device that may also take the jerk out of automobile driving and automatically push the buttons in a push-button war.

Rabinow is chief of the Ordnance Mechanics Section of the National Bureau of Standards in Washington. The Bureau currently is working on a complex electric brain, the Electronic Discrete Variable Automatic Computer. Information is fed into this device on magnetic steel tape pulled along by rollers coupled to electric motors. Since the computer can digest a million magnetic impulses a second, the tape must reach top speed as quickly as possible after the mechanism is turned on—otherwise valuable time is lost.

Rabinow's job was to design a clutch that would couple the motors to the rollers almost instantaneously, without jerking at the start or slipping at high speed.

Research led him to an electrostatic clutch invented by a man named Winslow. Winslow's clutch (shown in a diagram on page 85) utilized tiny particles of ordinary starch suspended in oil between two metal surfaces. It was a good clutch, but

When this small permanent magnet is immersed in a mixture of powdered iron and oil, the "gunk" solidifies and adheres to the magnet. This principle led to the magnetic fluid clutch.



y friction clutch uses plates of unlike ma- ials pressing against each other. It wears idly, overheats, and lacks uniformity. Fluid upling combines centrifugal pump with tur- ne for smooth action, but cannot be locked, hence wastes power. Dry electromagnetic type is fast, easy to control, but tends to overheat and isn't smooth. Winslow electrostatic clutch (far right) is good for fast control but needs high voltages and close spacing of its plates.

required high voltages and close spacing factors Rabinow wanted to avoid.

"What would happen," thought Rabinow, I substituted electromagnetism for elec- ostatic attraction and iron particles for the urch?" He stirred up a "gunk"—his own m—of oil and iron powder. Into it he opped a small electric motor, with a steel linder substituted for the rotor. When he rned on the juice, the gunk gummed up d froze the cylinder so solidly between the les of the motor that he couldn't turn it ith his fingers.

Rabinow hadn't expected quite so much. e was afraid the iron particles had got to the bearings and jammed the motor. t further tests proved his original hypoth- is. The gunk became solid when mag- tized, and the degree of solidification could controlled precisely and quickly (1/30th a second or faster) by regulating the rength of the magnetic field. The mag- netic fluid clutch was the next step to come.

In its simplest form the new clutch consists of a driving shaft with a magnetic plate at its end, and a driven shaft also tipped with a magnetic plate. The iron-oil gunk fills the space between the plates. It is the only connection between the driving and driven elements.

A magnetic field established between the two plates snaps the iron particles together into "chains" that lock the plates. When the mixture is demagnetized, it returns to its original fluid state and the driving plate turns freely. Since an electric current produces the magnetic field, the binding power of the mix can easily be regulated by increasing or decreasing the current.

Many Advantages

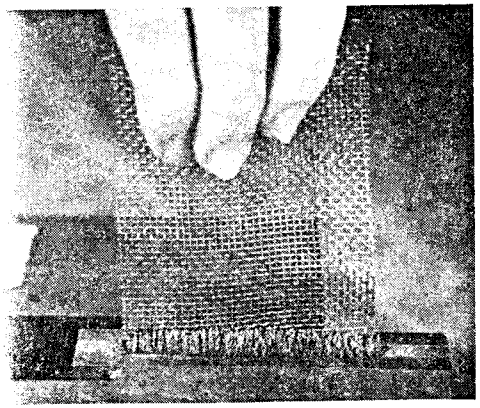
Preliminary tests indicate many advantages over other clutches. Since all surfaces are bathed in oil, action is smooth and wear almost nonexistent. Any abrasion merely adds to the supply of iron particles and may actually increase efficiency. The clutch is easy to control and requires only a small amount of electric power. The type of oil used is unimportant, so silicone liquids may be used for good performance at very low and very high temperatures.

Most obvious application of the clutch, of course, would be in autos, although such a model has not yet been tested. Its characteristics of easy control and low voltages are made to order for automatic transmission systems, where permanently engaged gear trains are clutched in and out according to speed, throttle setting, power load, and so on. Its long life and simple construction also recommend it for autos.

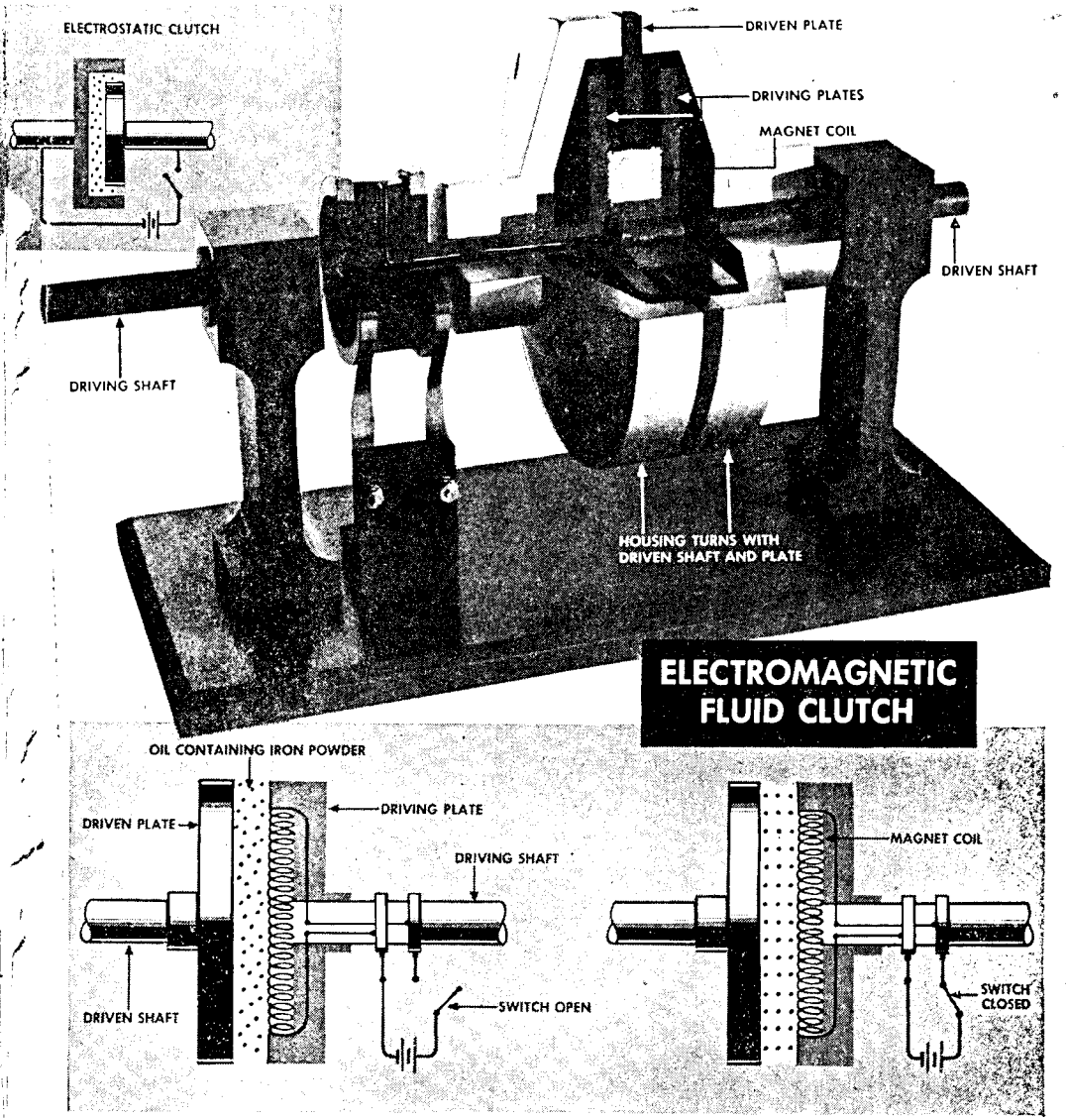
But Rabinow and his associates believe the biggest field for the new clutch is in servo mechanisms—those little electric motors that translate electronic information into reactions of purely mechanical instruments—that do the pushing for the push-buttons.

Even now, servos are steering large trucks, tanks, and aircraft. They operate power brakes in trucks and in some custom autos. They control printing presses and radar antennas, sight and fire big guns, and run electronic calculators.

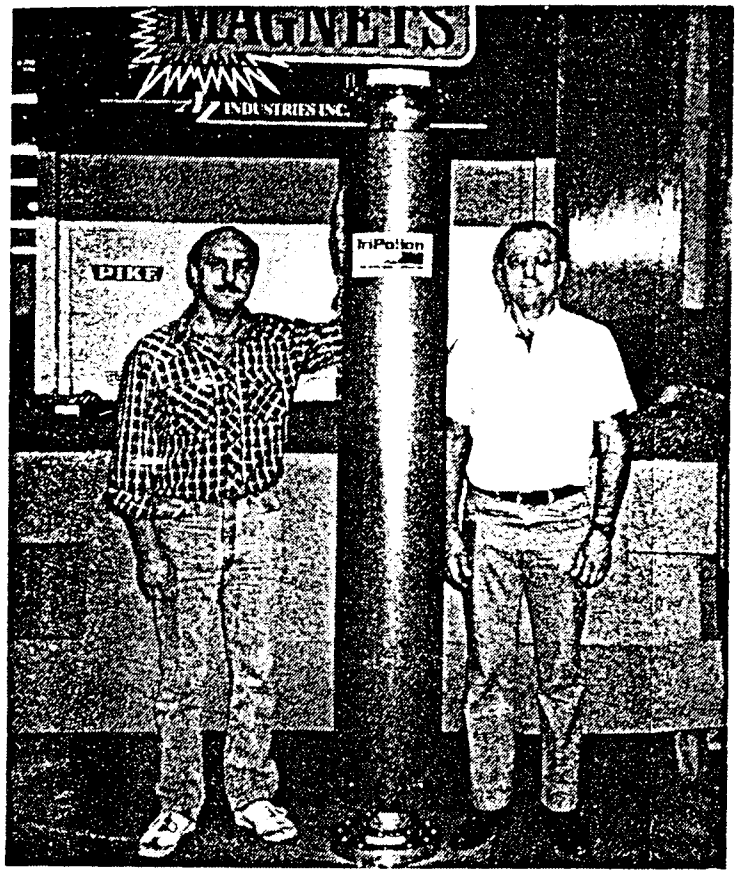
Servos can be operated with variable speed motors, hydraulic transmissions, and other means, but clutch-and-brake systems work the best. Since servos must operate smoothly over a wide range of speeds, they must be easily and almost instantaneously controlled and must resist wear. Here is where the magnetic fluid clutch, which fulfills all these conditions, will probably find its greatest use. END



Screening, dipped into magnetized iron-oil mixture, shows how metallic particles align themselves into "chains" that bind the clutch plates as tightly as would steel clamps.



Cutaway model of a simple magnetic fluid clutch. Varying the strength of the magnetic field controls the "stickiness" of the iron-oil mixture that fills the clutch casing. Any degree of torque from complete disengagement to complete locking can be transmitted from driving shaft to driven shaft smoothly and almost instantaneously. Diagrams show how it works.



Les Adam, right, and his brother Harley pose with a 7-foot Tripolion device for an industrial natural gas line.

New Invention C

EXCLUSIVE TO THE SPOTLIGHT

By Tom Valentine

Gasoline prices should be tumbling down, but the "powers that be" seem able to keep the price at the pump well over a dollar a gallon no matter what calamity hits the OPEC oil cartel.

Saving money by improving combustion and thereby getting better mileage, making the engine perform better, and last longer, as well as reducing the exhaust emissions, comprise a prime goal of energy-conscious Americans.

Now The SPOTLIGHT has learned that a simple magnetic device is available for improving the combustion of any internal combustion engine, and the device is proving to be the most cost effective of all the various inventions. But don't thank the Environmental Protection Agency.

MAGNET IDEA

For years certain old-timers would wire a pair of horseshoe magnets around the fuel lines of their engines on the fishing boats out of Morro Bay, California, this reporter's hometown. Most people thought the idea was crackpot, but the old-timers swore the magnets helped save fuel and made their engines start better and run better.

Additionally, a Scandinavian technical report dated March, 1985 had this to say about magnets and fuel:

"Soviet specialists have developed a device for magnetizing combustion engine fuel-air mixture. It promotes the combustive chemical reaction with full utilization of the source products and is intended for use in gasoline automobile engines with a single- or a double-barrel carburetor.

"The application of the device in car engines reduces the carbon monoxide content of the exhaust two- to three-fold, hydrocarbon content by 30 to 40 percent and fuel consumption by 3 to 5 percent."

Now both the old-timers and the Soviets are supported by a sound scientific basis for why magnetism from a permanent magnet indeed improves the combustion of hydrocarbon fuels such as gasoline, Diesel oil, alcohols and natural gas.

"The hydrogen is the key," explained Les Adam, president of AZ Industries, Temecula, California. Adam is the manufacturer of the Tripolion and Polarion, the latest innovations in fuel line magnetic devices.

"Hydrogen, according to Dr. J.D. Van Der Waals, a renowned fuel researcher with Amocó labs in Illinois, has a cagelike structure and has a tendency to interlock with other elements, not necessarily forming other compounds, but temporarily forming what he called 'pseudo' compounds," Adam told The SPOTLIGHT.

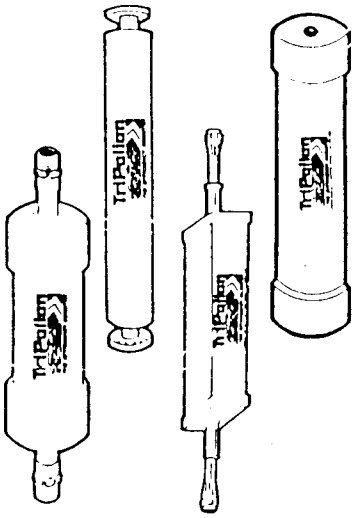
"When these pseudo compounds are influenced by a magnetic field there is a pronounced interlocking with oxygen, which causes better combustion."

Adam, one of the world's leading custom magnetmakers, became interested in the claims of the old-timers who swore magnets improved mileage and reduced exhaust emissions—both being the product of better combustion, in 1980.

'WHY NOT?'

"I'm a magnetmaker," he told The SPOTLIGHT, "and I'm always looking for markets for permanent magnets. Water is treated with magnetic devices to prevent slag buildup in boilers, so why not treat fuel with magnets to improve combustion?"

Adam and Al Kovacs, the inventor of a device called the Polarion,* worked with automotive experts at California State University, Los Angeles. Later, in 1981, the Polarion efficiency booster was checked out by Transportation Testing Inc. of Texas and mileage improvement up to nearly 20 percent with larger cars was certified.



Left to right, Tripolions for various applications from upcoming manufacturer's catalog: fuel oil unit, industrial natural gas unit, propane unit, Diesel oil unit.

...Could Hike Your Gas Mile...

"We were elated by the results. Then the EPA got into the act," Adam said.

Merrill Korth of the Ann Arbor, Michigan EPA facility contacted Adam and requested fuel evaluation tests.

By the end of 1981 a lengthy and thorough series of tests had been completed. Testing with the American Trucking Association and Society of Automotive Engineers also took place and an application was made to the EPA to have the device certified as a valid pollution-reducing gizmo.

But Korth wanted "clarification."

"We had to do all the testing over again at a lab that was certified by the EPA," Adam said.

EXASPERATED

Then the EPA did to Les Adam and the magnetic device what it seems to do to all American inventors outside the established auto industry. "First I was told the EPA does not approve nor disapprove fuel economy/emission retrofit devices, but submittal of a device for evaluation is voluntary," Adam said in exasperation.

"If the EPA does not approve devices even when tests at its own certified labs show the device does what its inventor claims, then why are taxpayers paying for EPA foofaraw?"

The EPA has a rich literature on "evaluation procedure." Adam followed the EPA procedure to the letter and Fairway Environmental Engineering labs in Torrance, California did extensive testing and showed the magnetic field did as the manufacturer claimed. These are EPA-certified labs.

In November, 1982, after two years of expensive involvement with the bureaucrats, Adam was told by the EPA that the government agency was going to issue a report that the Polarion didn't work.

Meanwhile, Adam had come up with his own effective design, expecially for larger engines and heavy-duty trucks, which he called the Tripolion.

"The Tripolion uses more powerful magnet material and is three bar magnets set in a triangle so the fuel flows down the center of the three magnets. The magnets are polarized so that the south pole of the magnet faces into the fuel line and the north polarity field is outside or away from the fuel," Adam explained.

Experimental data indicates that the field effect of only one polarity is more effective than mixing the fields of both poles into the fuel.

RELENT—SOMEWHAT

In mid-1983, following much hassle, the EPA and the California Air Resources Board relented somewhat. EPA approved testing at Fairway Engineering and the ARB rescinded earlier orders that had prevented Adam from advertising and marketing the Polarion and Tripolion devices.

No sooner had the approval to advertise been granted than the California Consumer Protection officials demanded proof of claims. Tests indicated substantial mileage improvement and reduced emissions, but CP officials obtained a "cease and desist" order to stop advertising the device in California.

"By this time, I was furious," Adam told The SPOTLIGHT. "Those tests cost a lot of money and the EPA certified the work of the lab, but none of the bureaucrats want to accept the certified results. The EPA looked at the same tests that we looked at from Fairway Environmental and said they indicated no change took place with the device.

"But the actual tests show substantial changes. I asked the EPA how they could come up with their conclusion. If their lab is wrong, they should decertify it—but the lab isn't wrong. Now I've had to hire lawyers."

Adam has continued to manufacture and develop magnetic devices for fuel lines because ongoing research and testing indicates the effectiveness beyond any doubt.

"We've made a big industrial Tripolion," Adam said, "and it's going onto a natural gas line at a large brick kiln. The brick manufacturer has a natural gas bill of $170,000 a month. If the device saves 5 percent for him, which is our minimum estimate, it will pay for itself in about a month."

MORE REPORTS

A large trucking company, Sunset International Trucks of Los Angeles, recently turned in three reports wherein the Tripolion Diesel unit which retails for about $500, was placed on three over-the-road haulers.

"The truck tests were all over thousands of miles," Adam explained, "and the fuel cost savings were substantial."

A check of the written reports indicated that one truck traveled 41,553 miles, a second traveled 32,645 miles and the third 51,013 miles. Fuel consumption was reduced by 11.5 percent overall, more than paying for the devices.

An unofficial report has come in to Adam recently that a large Tripolion unit was tested on a U.S. Army tank. Fuel consumption was 5.2 gallons per hour without the device and 4.0 gallons per hour with the unit attached.

C.P. Burman is a professional engineer in San Diego and a SPOTLIGHT reader. He agreed to try a Polarion unit on his Chevrolet Suburban van. The heavy vehicle improved from nine miles per gallon to 11 miles per gallon.

The Polarion auto unit never wears out, so it may be removed when a car is sold or traded and used on the new one at no additional cost. The device is simple to install.

"I don't understand the EPA's attitude," Adam said, "but we've never had a complaint. I'm continuing to manufacture them." ●

SOUTH POLE MAGNET TREATMENT OF FUEL

Inventor says he can revolutionize the auto industry with his . .

Engine that runs on air

Inventor George Miller says his incredible new auto engine will cut costly fuel bills, solve pollution problems and stop wars — it's powered by air.

"It would run forever," said the gray-haired retiree.

His amazing engine once whirled under the hood of a 1972 Opel. It is medium-size and has four cylinders.

A retired coal miner who lives on $465-a-month Social Security disability payments, Miller envisions his air engine as a solution to the Middle East wars, pollution and fuel costs.

"Why else are those people fighting for that land over there?" he asked. "Nobody would want it except for the oil and gas."

Though his miracle engine has caught the eye of the U.S. government, politicians, the press and knowledgeable engineers, no one is breaking down his door.

An agency called CENTECH that helps people with new ideas sent its director, Barry Dent, to Johnstown, Pa., to look at Miller's miracle engine.

"We have not made a final judgment as to whether the product has merit," Dent said.

INVENTOR George Miller says his engine will run forever.

"Mr. Miller professes his engine will produce more energy than it consumes.

"But my engineer felt that was not possible." However, he said, in all fairness to Mr. Miller he'd reserve final judgment until he sees the thing in full operation.

"We have been involved in a number of projects that we questioned at first glance but which have become successful and resulted in jobs," Dent said.

Miller has applied for government grants, spoken to private investors and written to Honda Motor Co. in Japan. Honda never replied and the others told him "to come back and talk anytime."

"I think I would have done better with the government if I didn't have all the answers," said the mechanical whiz.

"Engineers say you can't get something for nothing, but I can prove it to them. This thing works, but if I tell them how it works, they won't need me."

Best place to get a drink

Already known for Dixieland jazz, fantastic food and the Mardi Gras, the city of New Orleans has won new fame — best drinking water in America.

The international water taste-test challenge kicked off the annual conference of the American Water Works Association.

Miami, Fla., finished second in the clear water contest and Dallas, Tex., was third.

Battery cost arm and a le

A man convicted of steali batteries escaped a prison se tence, but paid a grueson price for his crime — the chopped off a hand and a foot

Mohamed Edam Mohame became the fourth thief to u dergo a double amputatio since the introduction of I lamic law in Sudan.

A government doctor slice off his right hand and left fo in a Khartoum prison. He ha six prior convictions for theft

3-96 LV RJ

...ould employ a ...eveloped by scientists at Georgia Institute of Technology Atlanta.

Louis ... program dir... ...Plasma ...plications Research ...acility at Georgia Institute of Technology, said applying ...work with tha... ...level radioactive wastes, "but in the long run plasma research will show we can take care of this,"

Samantha ...

Please s...

Water-based motor vehicle fuel soon to flow in Las Vegas

You still can't buy the milky-looking stuff at the gasoline station, but the Renoproducers of a revolutionary water-based motor vehicle fuel figure they're making progress.

A-55 Limited Partnership received certification from the Nevada Bureau of Air Quality in November to market their product in the state as an alternative fuel.

And Dan Klaich, senior vice president, expects soon to announce that a Las Vegas firm will use the fuel in the tanks of their vehicle fleets.

Invented by Rudolf Gunnerman, the fuel consists of a blended mixture of 55 percent water and 45 percent naphtha, a petroleum product sometimes used as lighter fluid.

The fuel is called A-21 and Gunnerman maintains his tests show it emits hardly any pollution. A-21 stands for Advanced Fuel for the 21st Century.

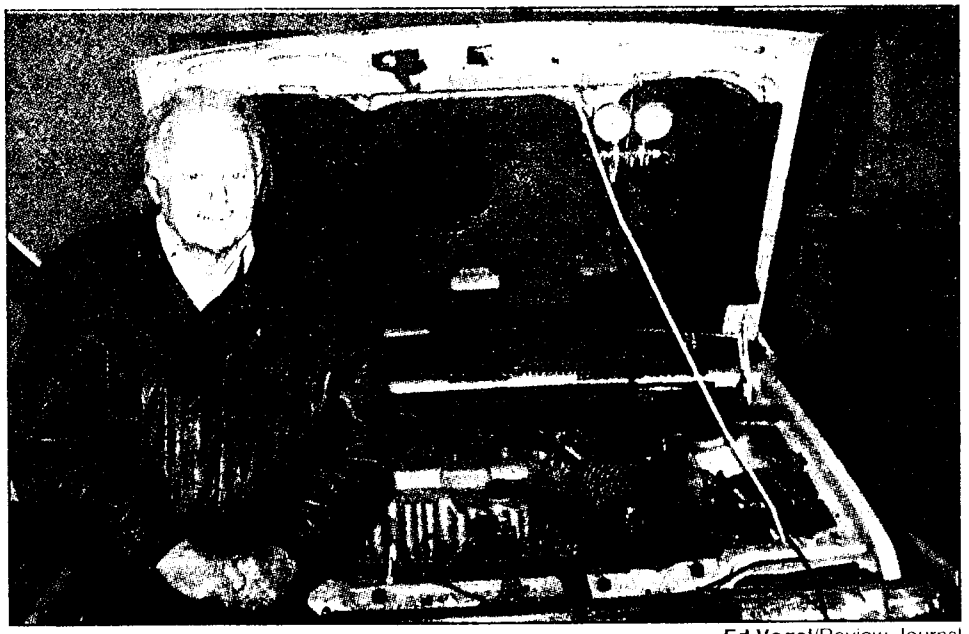
Gunnerman's original product, A-55, consisted of 55 percent water and 45 percent gasoline.

Klaich said tests showed naphtha worked better than gasoline and can be used in both diesel and gasoline engines.

"With A-21, there is absolutely no visible smoke in my estimation from diesel engines," said Tom Porta, supervisor of planning for the Bureau of Air Quality in Carson City.

Porta, a chemist, said he has reviewed tests of the fuel and is amazed.

To win state certification as an alternative fuel, Porta said A-21 had to demonstrate it produced significantly fewer emissions than gasoline.



Ed Vogel/Review-Journal

Inventor Rudolf Gunnerman keeps plugging ahead promoting his fuel of a blended mixture of water and naphtha, a petroleum product.

With the certification, A-21 now can be used by the state and local governments in Nevada as an alternative fuel.

Under a state law, they must use alternative fuels in at least 15 percent of their vehicles. By 2000, 90 percent of their vehicles must be powered by alternative fuels.

"Water-based fuels have been around since World War II," Porta said. "But there was a problem in mixing. Mr. Gunnerman has figured it out with a polymer he adds to the fuel mixture."

Klaich said 1996 will be the year in which A-21 receives widespread fleet demonstrations.

He said the company, which is in a partnership with Caterpillar Inc., has not set a schedule for widespread distribution of the product, which is being studied by the U.S. Department of Energy. Vehicles must be converted to use the fuel.

"In the end, the winners will be consumers," he said.

—Ed Vogel

Update

Violation leads to fine

Walter McCarty, a Kingman, Ariz., man who was the only person cited for violating a closure order at Lake Mead National Recreation Area during last year's federal government shutdown, was found guilty by a U.S. magistrate judge, the judge's acting court clerk said last week.

The acting clerk for U.S. Magistrate Judge Stephen Berkamp said McCarty paid a $25 fine after Berkamp made his ruling during a hearing in Kingman this month.

A National Park Service ranger cited McCarty on Dec. 26 for violating the closure order after he was stopped in a remote part of the recreation area near Pearce Ferry, 45 miles northeast of U.S. Highway 93 on the road to Dolan Springs and Meadview in Arizona.

—Keith Rogers

Wondering how a local story turned out or what happened to someone in the news? Call City Editor Laura Wingard at 383-0264 and we will try to answer your question in this column.

USP 3809025

Stand Back Detroit!

Revolutionary Rotary Engine To Change Automotive Industry

By TOM VALENTINE

M. Deane Harper of Dunbar, West Virginia has invented a rotary engine surpassing anything all the money and engineering brainpower of Detroit could come up with. Good, old-fashioned American ingenuity and inventiveness triumph again!

Harper, a machinist, mechanical engineer and teacher who has a number of inventions to his credit, has developed a rotary engine far superior to the famed Wankel that made Mazda's go hmmmm, but also fizzled due to inherent engineering shortcomings.

One doesn't have to be an expert to realize that an efficient rotary engine is far superior to the present day piston engines. However, it remains to be seen whether the Harper rotary has come along too late in the heyday of gasoline driven motors.

On the other hand, Harper stresses his rotary engine will run well on steam and would be an excellent turbine motor, too.

The Harper design has unlimited potential. The inventor's partner, Robert Weidlich of Charleston, West Virginia said:

"The number of descriptive names for this engine is readily outnumbered by the vast potential of use for this new mechanism that changes expanding gas pressure to rotary motion more efficiently than any other design."

Harper has obtained his patent: Number 3,809,025.

The inventor and his partner drove from West Virginia to Chicago a few weeks ago just to show this reporter the working prototype. "You can't very well write about something you haven't seen," Weidlich emphasized.

The four cylinder, gasoline driven, rotary spins like a flywheel when it runs. The entire engine rotates.

"It's a rough prototype that we run for only a few minutes at a time because we've not designed any cooling system," Harper explained. "I built it from scrap materials found around my machine shop."

While my knowledge of engines is limited, I do know enough to understand that I was viewing an important moment in engine history as the Harper rotary whirred into action.

The future of the gasoline powered engines may be in doubt, but there's no doubt they'll be around at least a decade or two longer and Harper's invention appears to be the highest state of the art.

The working model was built to prove to doubting patent office officials that the design worked. Then it was transported to Denver where scientists from the University of Denver, Denver Research Institute analyzed it.

Dr. Charles E. Lundin and engineer Frank Lynch signed the report which concluded:

"The Harper Rotary engine is difficult to conceptualize at first exposure, but in truth, is very simple in its operating principles. Since all the surfaces in the engine are circles, spheres or cones, it should not be difficult to produce the parts of the engine with standard machine tools.

"The engine is considerably more compact than standard internal combustion engines and aside from a secondary speed oscillation in the pistons, it is vibration free.

"The seals in the combustion chamber at any given radius sweep through circular arcs over a constant radius surface segment at speeds well within the performance limits of conventional piston rings. If the unusual geometry of the piston causes difficulties in using standard piston ring-type seals, then surely the Wankel-type seals would be more than adequate.

"A cursory mechanical analysis disclosed no unmanageable stress problems. The piston pins in the prototype, however, need to be enlarged.

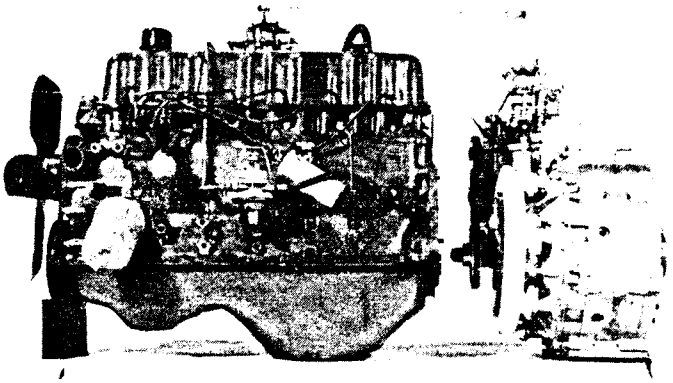
"One of the most significant features of the engine is its variable compression ratio. By maintaining the highest permissible compression ratio under all operating conditions, average operating efficiencies may be significantly improved."

The report was stiffly scientific, but the researchers managed to make suggestions for minor engineering improvements which indicated their enthusiasm for the device.

"The original concept was slow in taking shape because of the unique surfaces," Harper explained. "The conical surfaces are parallel, perpendicular to and at 90 degrees to the center line of the out-put shaft."

But then, after constructing the model, Harper realized he had one of the

Inventor M. Deane Harper gets set to start his rotary engine for onlookers in Chicago. The model proves his principle and he is seeking development capital. His partner, Robert Weidlich, is at the right while the photos at the far right show the engine partially disassembled. The entire motor spins; the pistons are mounted on the shaft which enters the housing obliquely. This unique design accounts for the variable compression feature.



Australian Orbital Engine; Lighter, Smoother, Tighter

(Editor's note: Interested parties may write to: Orbital Engine Co. Pty. Ltd., 22 Rudloc Road, Morley, Western Australia 6062 for complete information.)

INTRODUCTION

The Orbital engine was designed primarily with the objective of providing an extremely compact, light weight, smoothly operating, power device which would provide vehicle stylists and others who seek compactness, extreme latitude and flexibility of design for relevant applications, whilst providing a means of material conservation.

HISTORY OF DEVELOPMENT

The first working Orbital engine, a 6 chamber, having a displacement of 3 litres and 4 cycle operation, was built in 1972.

In the subsequent period a number of engines were built, based upon three Orbital designs:

1. 240 cc displacement, 2 cycle operation and 4 chambers (equivalent to 4 cylinders).

2. 3.5 litre displacement, 4 cycle operation and 7 chambers (equal to 7 cylinders) with poppet valve gas flow control.

3. As an item two, but with disc valve gas flow control.

The disc valve version of the Orbital engine, powered an Australian medium sized family car two years ago. However, most of our engine testing has been confined to dynamometers.

OPERATIONAL PRINCIPLE

The Orbital engine basically consists of an outer, approximately cylindrical housing (1) and two end plates (2 and 3), within which a piston (4) is located and mounted upon a crankshaft (5). The piston's (4) movement is orbital. It is prevented from rotational movement by means of several eccentrics (15) (usually three or four). Multiples of combustion or displacement chambers (19) are formed between the piston (4) and housing (1) and end plates (2 and 3) by utilizing vanes (6, 8) as partitions. Radial motion into the outer housing (1) is caused by the piston (4). Flats (7) on the piston's outer periphery are equal in number to the vanes (6, 8). Running parallel to these flats are slots (10) constructed in the end faces of the piston (4) which receive protrusions from the vanes termed the vane actuating lugs (9). This arrangement is the means by which the radial movement of the vanes (6, 8) is accomplished. Valving may be by either poppet or disc (11) for 4 cycle operation, or by the piston (4) for 2 cycle operation. The combustion cycles are similar to the reciprocating engine.

The orbital has convenient and compact packaging configuration—which allows vehicle stylists or designers extreme latitude in design parameters. This advantage is not confined to automotive applications but to wherever light weight, compactness, style, etc. are highly desirable and advantageous features, e.g. boats, motor cycles, aircraft, mobile water pumps, generating sets and air compressors. The packaging size of the Orbital engine is approximately 1/3rd of that of an equivalent displacement reciprocating engine.

The Orbital engine is expected to be less than 40% of the weight of a conventional reciprocating engine. Further "flow on" vehicle weight savings are anticipated from a lower engine weight therefore lighter vehicle superstructure and from a shorter engine, which enables proportional vehicle shortening and thus a further weight reduction. For an equivalent displacement to a typical 6 cylinder engine, a saving of 40 centimetres is realistic.

The Orbital is a particularly smooth and vibration free engine because it can be perfectly balanced.

Considerable materials savings arise in Orbital engine manufacture, and we estimate that two or three Orbital engines can be manufactured from the materials used to produce one reciprocating engine. In automotive applications further savings arise from the reduced vehicle body weight. These savings will become increasingly important in the future as pressures for materials conservation escalate.

Less engine weight brings the benefit of a reduction in the energy required for handling, melting and machining operations during manufacture.

Unlike rotary engines, the Orbital engine has all seals traveling at low velocities or rubbing speeds (generally 60% lower for comparable displacement engines) and in a permanent angular relationship to mating faces.

It utilizes only one piston for multiples of firings per rotation of the crankshaft and does not require banks of pistons and housings to accomplish this and is not as restricted in respect to combustion chamber configuration.

It may have its outside configuration varied to suit particular applications, i.e., it may have a large diameter by short length or small diameter by long length but it has no exotic material requirements or manufacturing processes.

The Orbital has no exotic machine tool requirements, e.g., the rotary's epitrochoidal profile and piston side seal grooves.

However like the reciprocating engine, it may have multiples of seals. Such multiple seals are impracticable for the rotary engine's apex seal. Where they are constructionally possible, as in the piston side seals, their use is discouraged by the high friction losses associated with high rubbing speeds which may cancel any advantages expected from increased sealing efficiency.

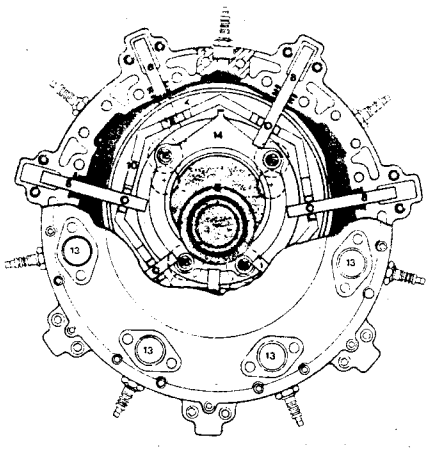
Potentially the Orbital can have close sealing lands, an essential feature in corner sealing, whereas the rotary's apex seal motion is such that this is impractical.

Finally it does not have to allow interchamber blowby whereas the rotary cannot in practice avoid this occurrence, which results in the contamination of the adjacent new charge and the escape of unburnt fuel into the exhaust system and hence high HC emission. It can have its spark plug hole diameter or location relatively unrestricted.

We feel that the Orbital engine has so far, relative to the degree of expenditure, produced extremely encouraging results. Past history, current trends and a little foresight, strongly indicate that light weight and compactness will be highly desirable features in the future world. In this regard, the Orbital engine has outstanding potential unparalleled by other feasible conceptions.

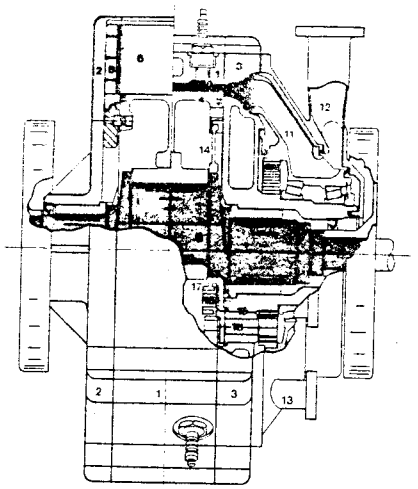
However, the Orbital like any new innovation will not provide bonuses without penalties. In spite of this, we are convinced that with the appropriate investment being made, the current technical difficulties already described in the foregoing text, are surmountable within reasonable limits of expenditure. When considering that problems thought to be virtually insoluble by many engineers, have already been overcome at minimal expenditure, the foregoing claim must be considered realistic.

Improved fuel economy and reduced emissions are of course substantial requisites of current and future engines. We have promising avenues to explore in pursuit of these goals. Should we be able to develop high revving characteristics and provide the weight saving benefits previously nominated, then in terms of miles per gallon and utilization of material, i.e., considering the overall efficiency of the motor vehicle rather than the power plant itself, the Orbital must have considerable promise as a future power plant.

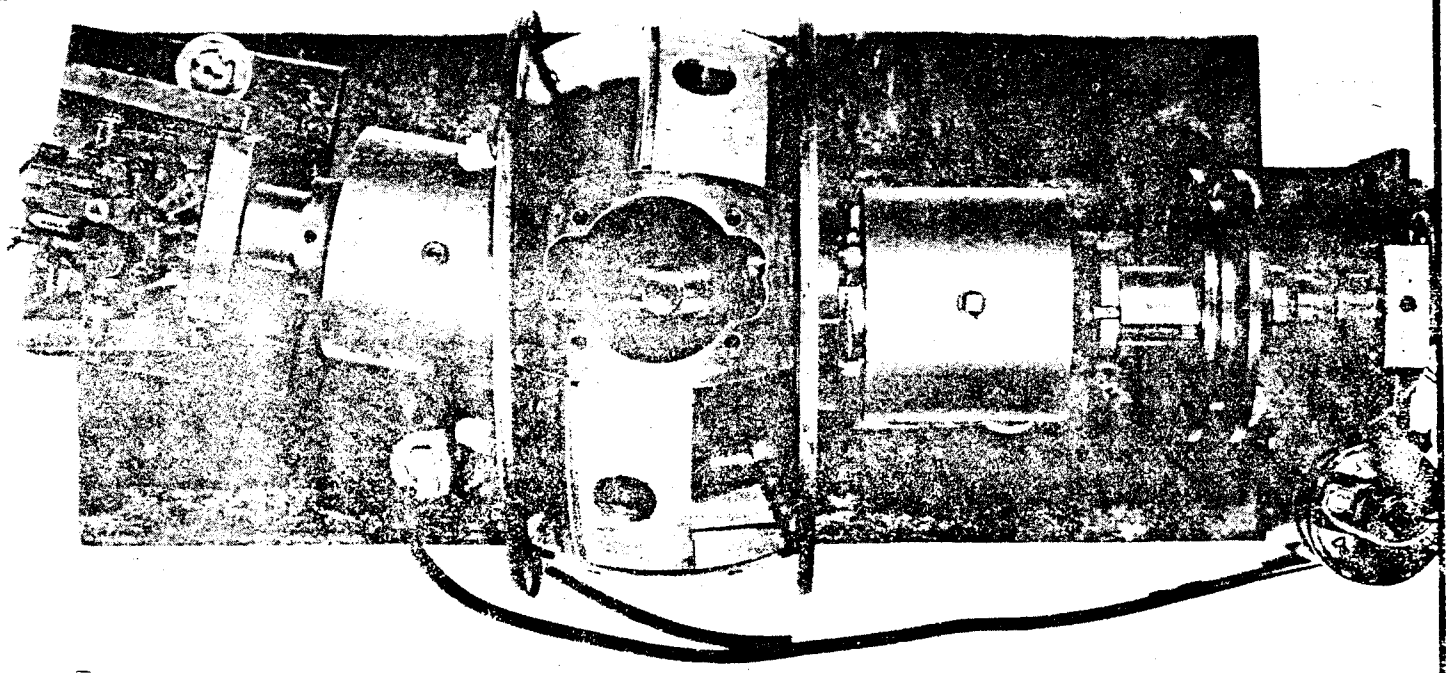


11. Disc Valve
12. Inlet Manifold
13. Exhaust Manifold
14. Stabilizing Plate
15. Eccentric - Stabilizing Plate Journal
16. Eccentric - End Plate Journal
17. Stabilizing Plate - Eccentric Bearing
18. End Plate - Eccentric Bearing
19. Displacement Chambers

3.5 litre disc valve Orbital engine (schematic)



1. Housing
2. End Plates
3. End Plates
4. Piston
5. Crankshaft
6. Vane Body
7. Piston Flat
8. Vane Legs
9. Actuating Lug
10. Actuating Slots



simplest engines ever built.

Weidlich listed the possibilities of this Harper design:

"It can be similar to a 2 cycle, or it can run as a 4 cycle gasoline engine; it can operate as a deisel; a Rankin cycle steam engine; a steam turbine or a Stérling cycle engine."

Harper and Weidlich, who are knowledgeable automotive engineers, are certain that their concept of a "positive displacement turbine" will be the greatest improvement in using steam for motive power since James Watts' engine.

"The positive displacement turbine would have the torque of a steam engine and the low speed of a turbine."

While the technical merits of future production models need to be tested and proved, it is easy to see that as a gasoline powered engine, the Harper Rotary offers a power to weight ratio most appealing to the aircraft industry – especially helicopters.

If there are any drawbacks to getting this invention into production and out into the marketplace to serve our nation, it appears to be in the area of the "automotive after-market."

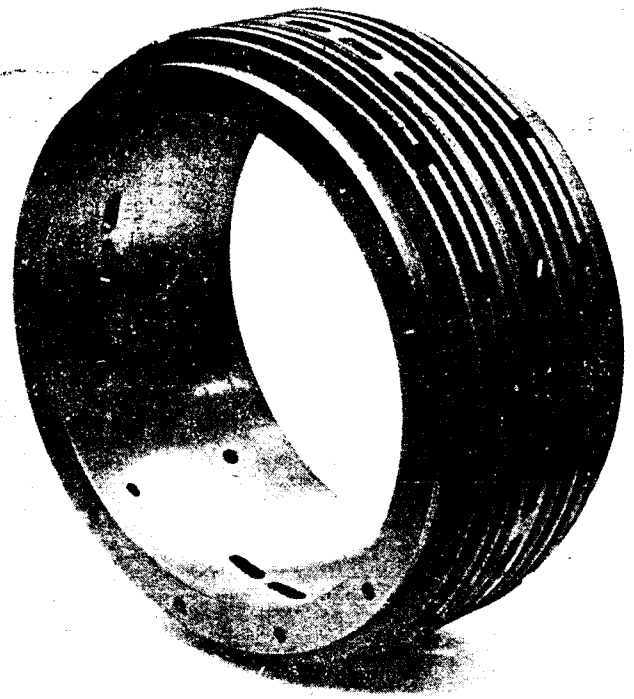
Harper's engine will not wear out like today's cumbersome Otto-cycle, piston-driven creatures. Costly repairs and the need for replacement parts will be virtually eliminated.

The consumer can hail this event with enthusiasm – but not so the national economy.

Since any new invention takes time to move from prototype to production, it seems the industrial complex should be able to adjust to the efficiency – however, a realist will suggest that many jobs and businesses supportive of today's auto after-market will die natural deaths.

To get a partial idea of the impact that could generate if all automobiles suddenly switched to the better engine, consider that Harper's rotary engine has:

- No parts that stop, start or change directions.
- No flywheel
- No camshaft



- No gears
- No distributor
- No valves, valve tappets, valve springs, or push rods.
- No rocker arms
- No counter balances
- No crankcase
- No connecting rods
- No fan
- No radiator
- Perfect balance, variable compression, self-lubricating seals and seals having a surface speed one-tenth of the problematical Wankel seals.

Harper and Weidlich said they ha also contacted Mechanix Illustrated a other publications, but EXCHANGE w the first to respond. It will be intere ing to see how the "experts" handle it.

This is the beginning of a new era automotives and this has been a sto with a moral.

The moral is: "Our nation would well to once again rely upon individu initiative, intuition and ability rather th suppress such qualities with arrogan and waiver forms."

Technical data for experts:

displacement	38 cubic inches
bore	power segment equal to 2 7/8 bore
stroke	Angular running plane of power segments equal to a 1½ inch stroke
firing chambers	4, equal to 4 cylinders.
compression	6½ to 1 and variable.
intake vacuum	15 inches
RPM	tested at 3,200; capable of 20,000.
Physical size	10½ inch diameter; 5¼ inches wide, prototype weight 55 pounds; could be reduced to 35 pounds.
Ignition	6 volt system
balance	perfect
Heat	air-cooled
Main bearings	ball bearings
Power impulses	4 per revolution
Horsepower	no rate at this time, but with a 3 hp per cubic inch rating this model would generate 114 horsepower. If we obtain the same hp as the present day motorcycle engine, we would generate 120 hp.

. RAYMOND RUSSELL

Russell's experimental model has a rather crude plywood body, but may presage sleek cars to come.

OIL PRESSURE DRIVES NEW GEARLESS CAR

By Charles T. Pearson

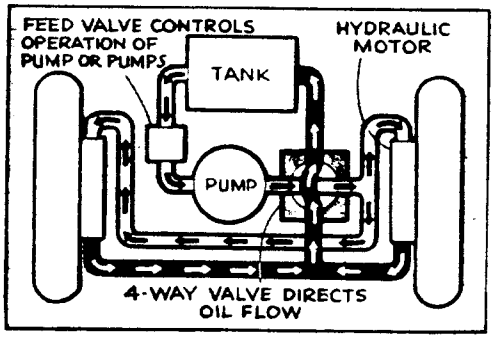
LACKING a transmission, drive shaft, and differential, a revolutionary new car has been undergoing tests in Detroit. Several pumps are directly connected to the engine crankshaft, and oil under high pressure is forced through pipes to "motors" located at the wheels. Among the advantages claimed for this new drive are flexibility of operation, new freedom in body design, and savings of weight ranging up to 800 lb. as compared to conventional cars.

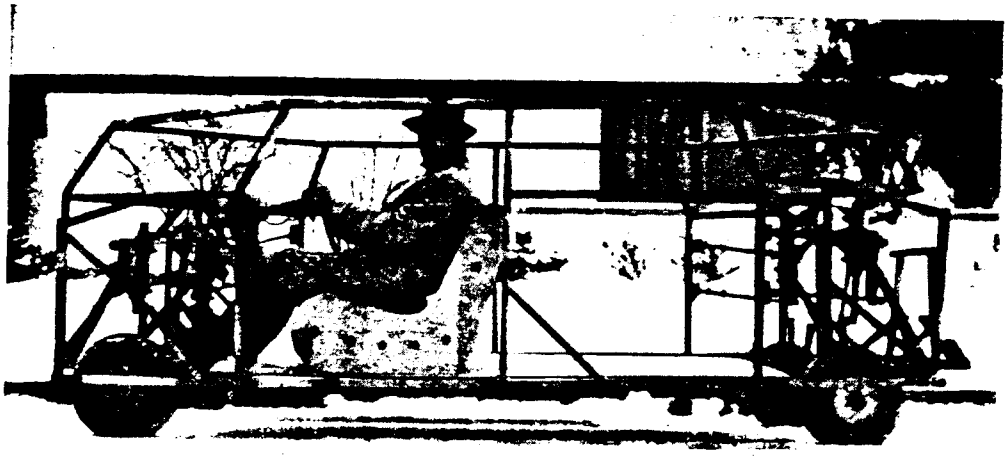
Though the idea of a full hydraulic drive is not new, past endeavors to develop the principle never passed the experimental stage. For the last four years, a Detroit engineer and industrial designer named Ray Russell has been at work on the pump-and-remote-motors idea, and has produced the experimental models shown above and at the right. Lately he has been retained by the Ford Motor Company, reportedly to supervise hydraulic-drive developments.

Full hydraulic drive should not be confused with the hydraulic coupling that has been used on many cars built since the late thirties. In these the fluid coupling is merely a link between the engine and the drive shaft, and still requires a geared transmission, either manual or automatic, a drive shaft, and a rear axle.

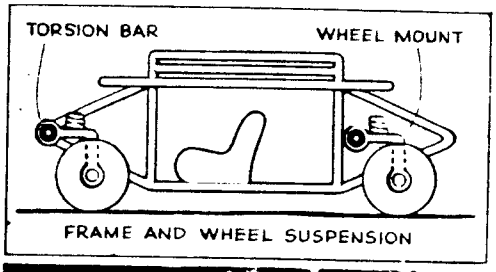
Simplicity of operation is one feature that Russell believes will win public acceptance to full hydraulic drive. The only pedals on the floor board may be the accelerator and brake. A single valve that changes the direction of oil flow takes the place of the conventional reverse-gear system. Other valves, possibly automatically controlled, cut in or out the pumps used and thus change the effective ratio between engine and wheels.

With three pumps of different capacity connected to the engine shaft, seven forward and reverse speeds are possible; with four pumps, 15 different speeds or ratios can be had. As shown schematically in the accompanying drawings, the basic valve action and pipe circuits required to control a hydraulic car are not complicated. All pumps





Above, the steel framing of the experimental model; regular auto wheels were substituted later. Piping system, shown in photo at right below, would be simplified in production by use of steel tubing.

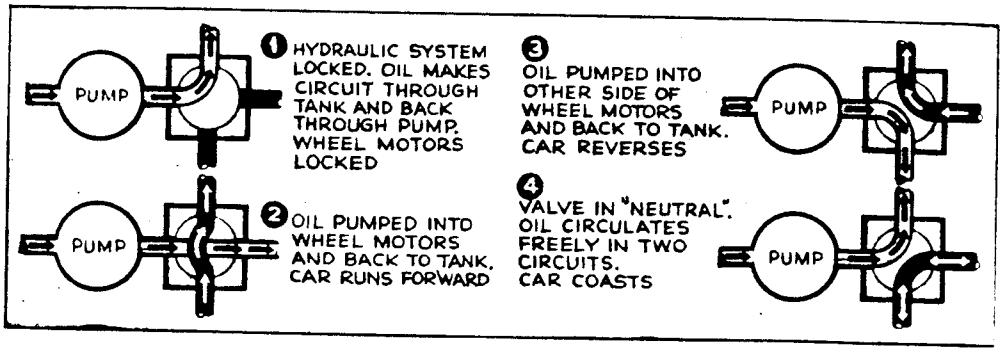


FRAME AND WHEEL SUSPENSION

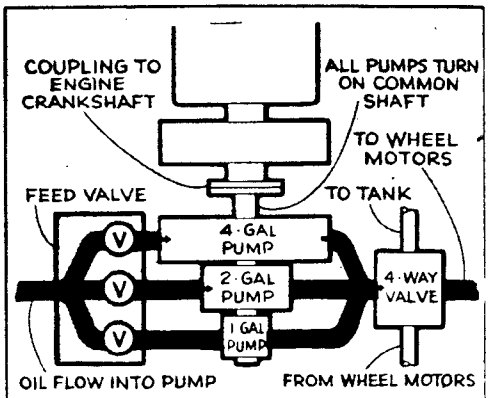
turn with the engine, but only those operate in the hydraulic system that are cut into it by their feed valves. A pump that is temporarily cut out of the system by closure of this intake valve absorbs negligible power.

The directional movement of the car (as contrasted to engine-to-wheels-ratio) is controlled by a four-way valve, which determines the direction of the oil flowing in the wheel-motor circuit, and which disconnects the engine and wheels when desired. By restricting or even reversing the flow of oil through the motors, it is possible to exert a powerful braking action that will greatly supplement that of conventional brakes.

In test runs Russell's model is said to have displayed smooth, silent acceleration, with plenty of power delivered at the wheels and without excessive heat in the hydraulic system. Pressure reached 1,000 lb. per



Ray Russell, a Detroit engineer, believes that his hydraulic drive may be the next big advance in car design. Right, a typical multiple-pump installation shows how hydraulic action does the work of gears.



THREE-PUMP INSTALLATION PROVIDES SEVEN SPEEDS OR RATIOS

ENGINE-TO-WHEELS RATIO			
PUMPS USED			RATIO
1-GAL	.....	.....	1 TO 1
2-GAL	.....	.....	1 TO 2
1-GAL	2-GAL	.....	1 TO 3
4-GAL	.....	.....	1 TO 4
1-GAL	4-GAL	.....	1 TO 5
2-GAL	4-GAL	.....	1 TO 6
1-GAL	2-GAL	4-GAL	1 TO 7

square inch during starting, and dropped to 200 lb. after highway speed was reached. It is reported that temperature of the hydraulic system did not exceed 10 deg. above atmospheric temperature during the tests.

The design of the wheel motors has not yet been finally determined. It seems likely, however, that the most efficient motors will not resemble turbines, but will be similar to positive-displacement pumps. Thus the motor is nothing but a type of pump which, instead of being driven by a rotating power source, is turned by having oil forced through it. Wobble pumps, gear pumps, and internal-rotor pumps are all capable of being adapted for use as motors.

The weight of the entire hydraulic installation is estimated at a quarter of the weight of the equivalent mechanism now used between the engine and the wheels. Russell believes that the total weight of his car need not exceed 2,000 lb. He also feels that the new design will lend itself to simplified servicing, with an engine assembly that can be taken out and replaced in less than an hour. An airplane-type multiple connector will fasten gasoline and electrical lines to the engine. Engines could be made available on a rental basis, as batteries now are, while the original one is rebuilt.

From the viewpoint of the body designer, the hydraulic drive offers new freedom. The engine can be placed almost anywhere in the car, even at right angles to the chassis. There is no need to allow space for the transmission, drive shaft, or differential. As Russell sees it, unprecedented interior comfort will be possible, with full vision for the driver, who will be located somewhat farther forward than now, and with a larger windshield. He says that doors will be "man-sized," and that seats may be wide enough to accommodate four persons side by side. The luggage compartment will be under the shortened hood in front, and the engine will be in the rear, where noise, vibration, and fumes will be minimized.

More recently, Russell has revealed a design for a small personal car for short trips. Known as the "Gadabout," it will have the same hydraulic drive as full-size models, but will be built with a welded-steel framework that completely encircles the car to increase protection in case of crack-ups. Wheels will be individually suspended, using an airplane-type mounting combining a coil spring and torsion bar. Present plans call for the "Gadabout" to be powered by a light air-cooled two-cycle engine.

Another idea in the back of Russell's head is the special adaptability of the hydraulic drive to amphibian design. Since the only power-transmitting connections between the engine and the wheels are the hydraulic lines, it would be simple to run these lines through the hull with waterproof couplings and gaskets. Several amphibians are on Russell's drawing board, adapted both for

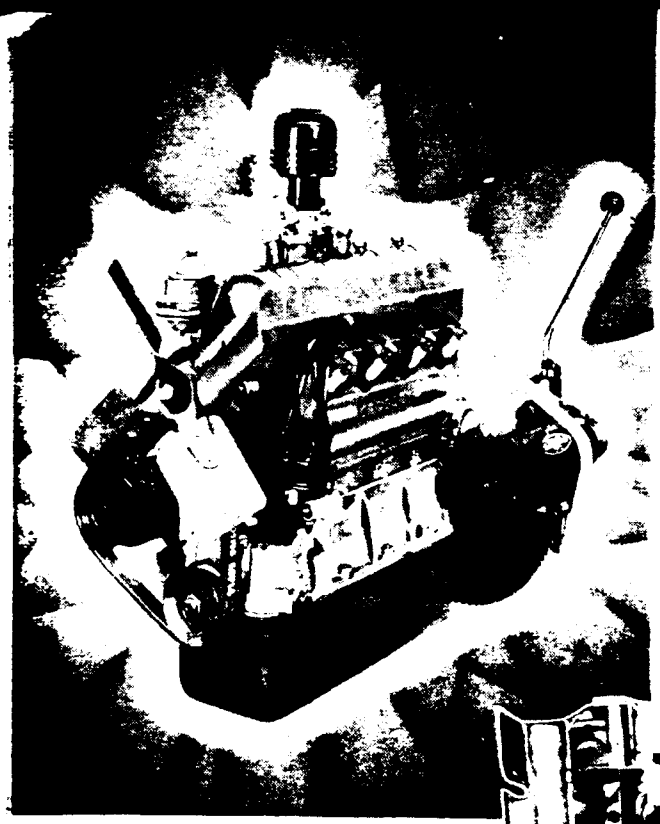
The engine can be located where needed for balance, so hydraulic drive would be good for amphibians.

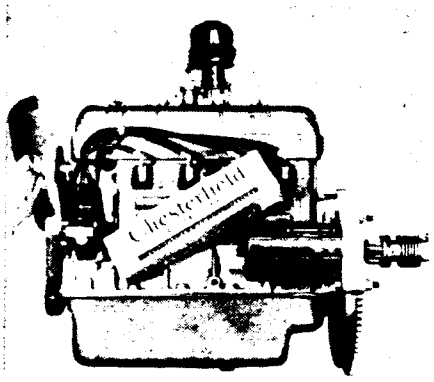
pleasure and for use by farmers and others.

Still another place where the hydraulic drive might have special advantages is in the much-discussed "roadable airplane." Probably the plane best adapted to road use by the addition of hydraulic drive is the Spratt Controllable Wing, which has four wheels like an automobile and has approximately the same tread and wheel base. It would be comparatively simple to add a clutch that would disconnect the propeller for road use and cut in the hydraulic system. A plane installation would probably not require more than two oil pumps, which would give three forward speeds.

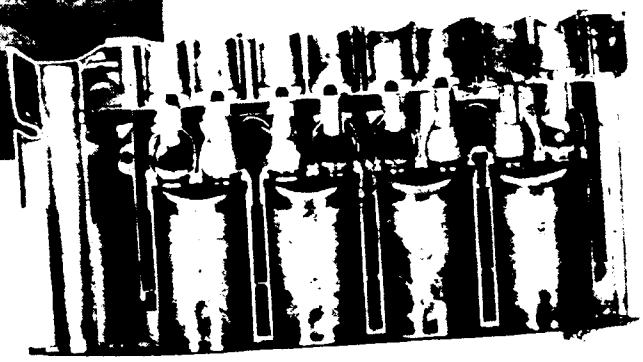
The applications of hydraulic power have increased tremendously during the past few years. Automobile makers already use hydraulic power to raise and lower windows at the touch of a button and to raise and lower the tops of convertibles. They have also already completed designs for hydraulic cylinders that open or shut the hood and rear deck, and that move the driver's seat forward or backward. Whether or not this versatile power-transmitting method is equally adaptable to driving the wheels of a car remains to be seen. Some technical critics retain a skepticism as to the efficiency of Russell's drive, particularly in respect to internal friction. How well founded these doubts are can only be determined by carefully controlled tests, conducted over a period of time.

The Sprott controllable-wing plane might be made a "flyable car" with the addition of a hydraulic drive.





Lay a carton of cigarettes alongside the engine, and you'll get a good idea of the size. Compression rating is 7.5 to 1, and 80-octane gas does not produce a knock at any speed. Engine has 2½-inch bore, 2¼ stroke.



The Crosley-Taylor engine with the accessories shown weighs only 138 pounds. It will drive a 1,000-pound car at 60 m.p.h. Parts are stamped from sheet metal, then crimped to other parts, and brazed. Cylinders are of alloy steel.

59-Pound Motor Drives Car 60 m.p.h.

The body of the pygmy car is made of aluminum. The wheelbase is 80 inches. Its over-all height is 57 inches, and it has accommodations for four persons.

A STAMPED-OUT automobile engine developing 26 hp. and weighing only 59 pounds stripped has been shown in Cincinnati by Crosley Motors, Inc. This low-cost midget can drive the 1946 Crosley car at a top speed of a mile a minute, while at 35 m.p.h. it will do 50 miles on a gallon of gas.

The engine is built on a radically new principle. Thin sheet-metal stampings are used instead of heavy forgings and castings. Cylinder walls are only one sixteenth inch thick, and are crimped to other parts of the engine. Pure copper is then melted into the joints, after which the spot-welded engine spends an hour in a hydrogen furnace for brazing.

A hard coat of plastic inside the water jacket is applied during the baking process. This prevents rust and guards against damage by freezing. The motor operates at 5,000 r.p.m. Wartime uses included the starting of B-29 engines and supplying electric power for gun turrets.

What do people say* about the amazing FUELTRON Gasoline Vaporizer?

***V.H., Ft. Wayne, IN*—Opel GT 1900CC**
"...removes pause when accelerating and going from idle jet to high speed jet—motor now runs very smooth—plan on installing the Fueltron in three more of my autos, I'm so pleased."

***J.D., Santa Maria, CA*—1974 Ford Truck E100**
"We the people should make a law requiring mandatory factory installation of the Fueltron in every car on the road. I get faster starts, smoother running, more power and acceleration, and my oil stays cleaner!"

***G.W., West Warwick, RI*—1977 Dodge Van B200, 319 cc Engine**
"Since installing the Fueltron the van starts easier, runs smoother, has definitely better acceleration and more usable power. My van hasn't run this well since I bought it. Keep up the good work!"

***T.S., Burbank, CA*—1980 Chevrolet Citation**
"Starts easier—don't have to keep the choke closed as long to prevent stalling—better cold engine driveability and throttle response. I wish this had been available years ago. I think the new car makers should look into this."

***J.C., Freehold Twp., NJ*—1977 Pontiac Firebird with Holley 4 bbl (Edelbrock SP29)**
"...improved low end torque, acceleration and power."

***C.H.A., Sheboygan, WI*—1972 Buick Electra modified 455 (Stage 1-V8)**
"Can now run regular gas with 10:1 compression—plugs stay cleaner. Lumpy cold idle is gone."

***B.L., Polson, MT*—1973 Chevrolet ¾ Ton 350, 4 barrel**
"I not only got easier starts and better acceleration, but it also improved gas mileage 2-3 miles per gallon and it stopped run-on that was sometimes a problem. I plan to buy another for my second vehicle."

***C.L.H., Riverside, CA*—1984 Pontiac 6000 STE**
"Better low speed torque—helped performance under 3,000 RPM noticeably."

***D.B., Bloomfield, CT*—1979 Mazda RX7—45 DCOE sidedraft Weber**
"My application was purely performance oriented—all aspects of part throttle operation improved dramatically—the rotary is more eager to accelerate now—runs smoother and is more responsive to light throttle change—exceeds your claims of improved performance."

***H.B.M., Danville, IL*—1984 Ford Tempo**
"Took 1½ hours to install—improved starts—runs smoother—better acceleration—now get about 26 mpg city."

***M.L.F., Phoenix, AZ*—1973 Ford LTD 400cc**
"Better acceleration from idle up to speed—smoother running. As a designer of electronic circuitry, I found the Fueltron to be a very well designed and built device."

***W.F.M., Mechanicsville, VA*—1979 Ford Fairmont, 8 cyl.**
"It will do all you claimed and more. I am a mechanic with forty years of experience, and I believe that with it on our car there would be no need for pollution equipment."

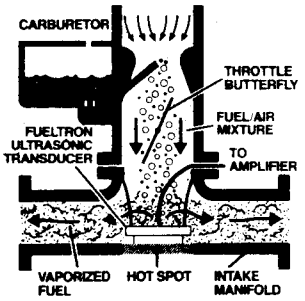
***J.L., Tacoma, WA*—1978 Mercury Z-7, 6 cyl.**
"Eliminated a dangerous flat spot in acceleration—easier starts—used to die 2 or 3 times."

*Full names and copies of letters on file.

OUT-OF-BUSINESS

The Amazing FUELTRON™ Ultrasonic Gasoline Vaporizer

Gives your car more power, more torque, better acceleration, easier starts

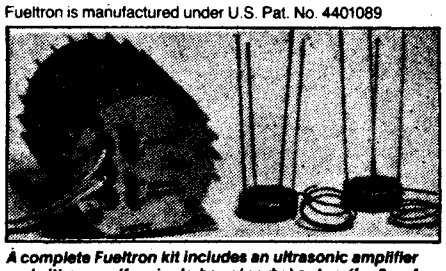


Fueltron's ultrasonic crystal transducer oscillates 1.3 million times a second to instantaneously vaporize gasoline into a high density, cold vapor.

WHAT FUELTRON DOES

To deliver peak performance a gasoline engine needs a completely vaporized fuel-air mixture. But even the best carburetors will not vaporize all the gasoline delivered by the fuel pump. A certain amount of raw fuel is pulled into your engine's cylinders where not even the hottest spark will ignite it. Besides being wasted, that fuel washes vital lubricant off cylinder walls and rings. Fueltron's ultrasonic transducer turns raw fuel into an easy-to-ignite vapor in millionths of a second! This vapor ignites completely and burns with high energy before it can be exhausted.

Fueltron is manufactured under U.S. Pat. No. 4401089



A complete Fueltron kit includes an ultrasonic amplifier and either one (for single-barrel carbs) or two (for 2 or 4 barrel carbs) transducers.

YOU NEED FUELTRON...if you know your car should be capable of faster throttle response, smoother idle and quieter running...if gasoline waste concerns you...if you want to use lower octane fuel with reduced engine knock. Only the easily-installed Fueltron can give you this combination of benefits so economically.

HOW YOUR ENGINE WASTES FUEL

Cold-engine starts waste fuel, because the droplets of gasoline can't vaporize before they're swept into the cylinders, so they don't all burn. Low speed operation can be a problem, because air isn't flowing rapidly enough through the manifold to mix the fuel droplets evenly, resulting in an uneven mixture and ragged running. When you accelerate, the gasoline from the accelerator pump can't be vaporized quickly enough so it floods the nearest cylinders, while those farthest away can suffer from lean-mixture knock.

HOW FUELTRON CUTS FUEL WASTE

Fueltron vaporizes gasoline instantaneously, fooling the engine into thinking it's hot even when it's cold. Those droplets which would normally hit the hot spot at the bottom of the manifold will fall on the Fueltron transducer instead, and burst into a cold vapor instantaneously. The vaporized gasoline mixes more quickly and uniformly with air so your engine starts faster and runs smoother, giving better driveability and increased low end torque. The uniform fuel/air mixture virtually eliminates lean-cylinder knock, hesitation, stalls and flooding. The

Fueltron Ultrasonic Fuel Vaporizer meets the requirements for sale in California[1] works with regular and turbocharged engines, boosting energy while reducing waste and pollution.

THE DETAILS

Fueltron works with any fuel (or fuel mixture), including water injection systems. Installation is simple; if you know how to remove your carburetor, the rest is easy, no modifications to carburetor or manifold required. In the unlikely event that Fueltron fails, normal engine performance will not be affected.

(1) State of California Air Resources Board: Exec. Order No. D-132.

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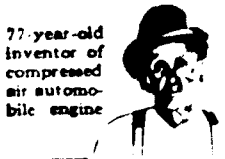
Compressed-Air Engine Built by Aged Inventor

LOUIS C. KISER, a 77-year-old inventor of Decatur, Ill., has been working for years on a system for driving an automobile by means of compressed air. In adapting his



77-year-old inventor of compressed air automobile engine

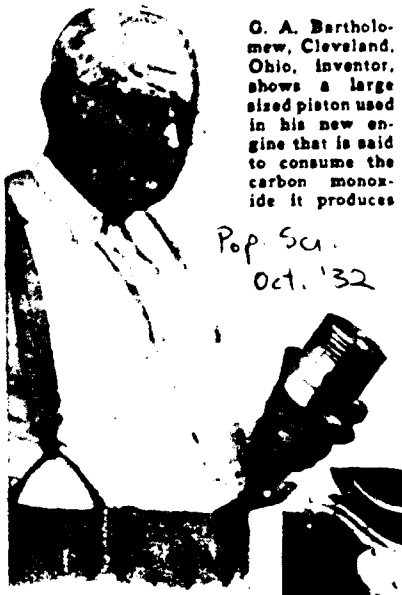
Pop Sci Dec. '25

compressed-air system to an ordinary car, Kiser removes the entire gasoline line, the cylinder head, water-cooling system, and self starter. A special cylinder head is substituted and a compressed-air tank added in place of the gasoline tank.

The inventor claims that the only fuel expense will be the cost of the necessary lubricating oil, but it is not quite clear as to where the compressed air is to come from, since the only way in which compressed air can be obtained is to get power from somewhere to compress it.

Rex Research

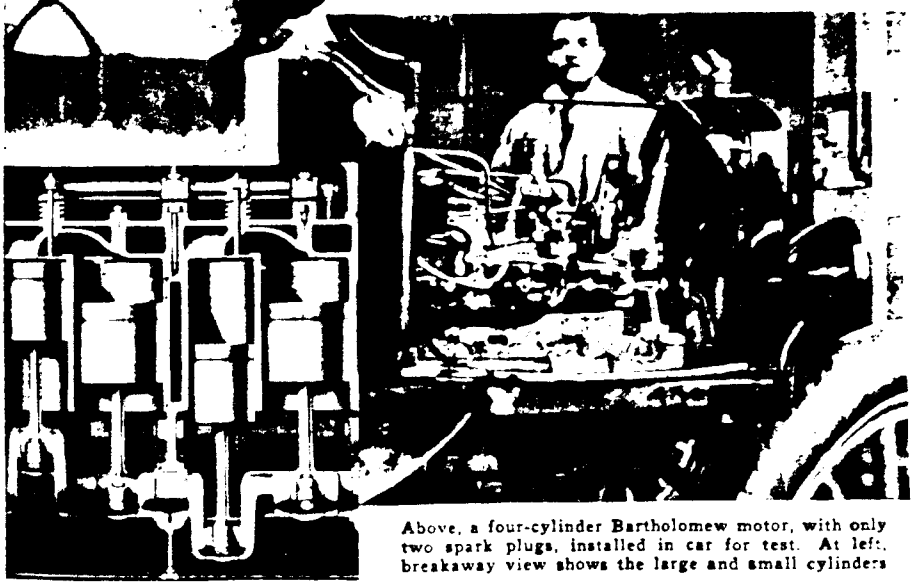
ENGINE BURNS ITS CARBON MONOXIDE



G. A. Bartholomew, Cleveland, Ohio, inventor, shows a large sized piston used in his new engine that is said to consume the carbon monoxide it produces

Pop Sci. Oct. '32

ELIMINATION of deadly carbon monoxide from exhaust gases is claimed for a new gasoline engine of radical design. Half of the cylinders and pistons in the new engine are larger than the other half; and the number of spark plugs, valves, and intake and exhaust manifold openings is half that of an ordinary engine having the same number of cylinders. The inventor, G. A. Bartholomew, of Cleveland, Ohio, uses a principle similar to that of compound steam engines. Only the small cylinders have spark plugs for ignition. When the explosion in a small cylinder is almost over, the hot gases produced pass through a valve into the adjacent large cylinder, and are mixed with fresh air. Here they continue burning, using up all carbon monoxide, and producing additional power with a reduction in fuel consumption.

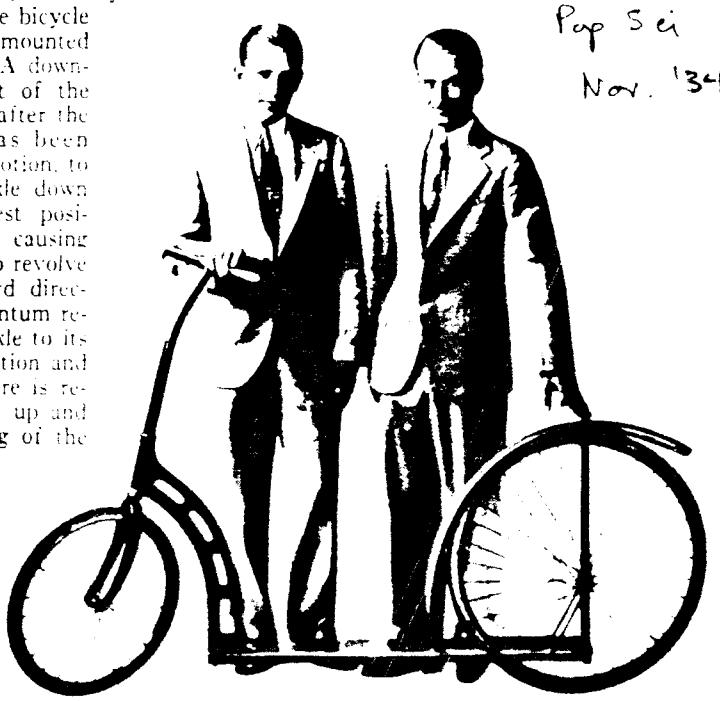


Above, a four-cylinder Bartholomew motor, with only two spark plugs, installed in car for test. At left, breakaway view shows the large and small cylinders

FREAK BIKE RUNS BY MOTION OF BODY

A BICYCLE without pedals, invented by two Chicago men, is designed to operate on body motion alone. Standing on a springy footboard, a rider propels the strange vehicle simply by raising and lowering his body. The rear wheel of the bicycle has its axle mounted off center. A downward thrust of the legs tends, after the bicycle has been placed in motion, to pull this axle down to its lowest position, thus causing the wheel to revolve in a forward direction. Momentum returns the axle to its highest position and the procedure is repeated. The up and down flexing of the footboard, once the rider gets the knack, can be coördinated with the movement of the rear axle to make operation easier. After a little practice, the inventors claim, a rider can make fifteen miles an hour. The exercise is said to be very beneficial to health.

Pop Sci Nov. '34



An eccentric rear wheel on this bicycle furnishes the motive power. Movements of the rider's body produce a speed of 15 miles an hour

TRACTOR CYCLE FOR ROUGH GROUND

WITNESSES of the Fascist militia's recent maneuvers near Rome, Italy, saw a rider on a motorcycle of novel design leave the road, scoot across rough fields and scud up the side of a hill dotted with boulders. The occasion was a test of the latest vehicle for dispatch riders.

Instead of a rear wheel, the queer motorcycle is driven by an endless tread like that of a tractor. Cleats on the tread give firm traction regardless of the character of the ground. The tractor drive is so pivoted that it can tilt forward or to the rear, accommodating itself to uneven terrain. Power reaches it through a chain drive. A heavily-braced, triangular frame supports the tractor at a point far enough back of the seat so that its gyrations will not bump the driver.

While designed primarily for military use, the "tractor motorcycle" may prove to be a useful aid to campers, surveyors and others whose work or recreation takes them off the beaten track and over rough country. In the cover design for this issue our artist depicts it climbing a rocky slope. The box at the rear, mounted upon a rudimentary mudguard, carries supplies or dispatches according to the use to which the vehicle is being put.

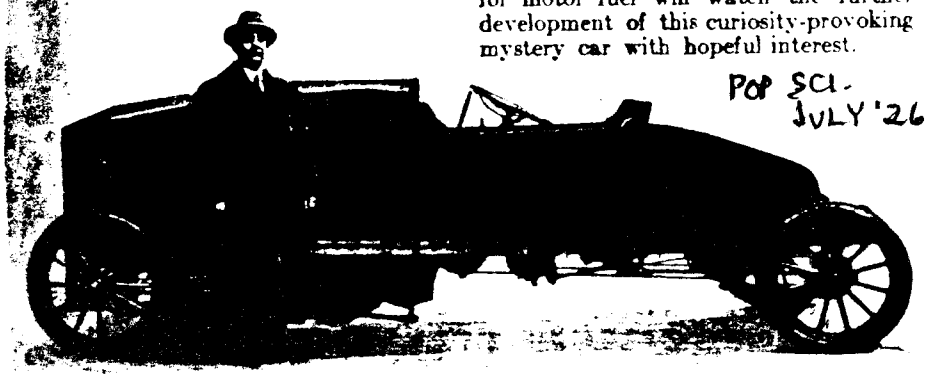
Italian militia are trying out this motorcycle with a "war tank" drive as means of travel over rough ground. They find it superior to horses now generally used.

This Mystery Automobile Runs on Air

THIS inventor has the right idea. Lee Barton Williams, of Pittsburgh, Pa., has invented an automobile which, he claims, runs on air. The motor starts on gasoline, but after it has reached a speed of ten miles an hour the gasoline supply is shut off and the air starts to work.

In its first test, made recently in Pittsburgh, the strange vehicle attained a speed of sixty-two miles an hour. The inventor for the present refuses to explain how air makes the wheels go round. Thousands of automobile owners who are paying out considerable sums every week for motor fuel will watch the further development of this curiosity-provoking mystery car with hopeful interest.

Pop Sci. July '26

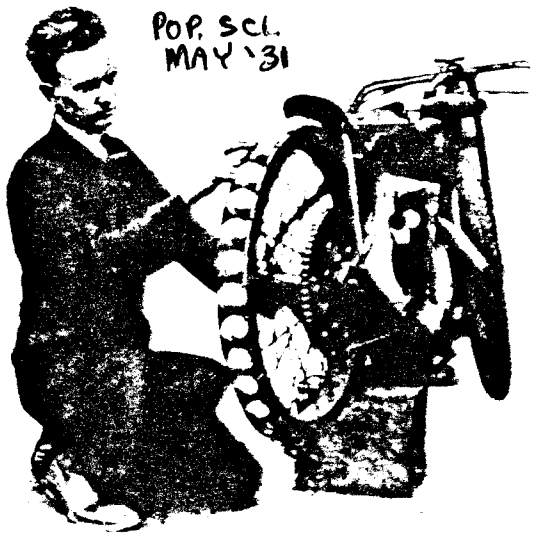


Lee Barton Williams, Pittsburgh inventor, and his automobile that he claims runs on air, after it gets up a speed of ten miles an hour. It recently attained 62 miles an hour

BALL-TIRE MOTOR BIKE WHEEL SKIDS SAFELY

A NOVEL rear wheel enables a British motorcycle race driver to skid his machine around turns on dirt tracks. It has a grooved rim that carries a series of balls free to rotate on small axles. The device is like a large ball bearing except that the balls rotate at an angle to the direction of the wheel moving forward over the ground. An advantage according to its inventor, is that a rider can intentionally skid his machine without reducing its forward speed, making it easier to round sharp curves.

Pop. Sci. MAY '31



Balls used as a rear tire of a motor bike enable a rider to skid around corners in comparative safety

Pop Sci. JUNE '31

SLEEP WHILE YOU RIDE WITH NEW HEAD REST

SO THAT motorists may travel in comfort, sleeping while riding if they desire, M. A. Montenegro, of Tampa, Fla., has devised a head rest for use in autos. Straps suspend the rest from crosspieces in a car's top. The device is equipped with "ear flaps" to prevent the noise of travel disturbing the sleeper.

Shocks and jars of rough roads are eliminated by its elasticity. A head rest for every passenger may be fitted in any car with a top. They are expected to prove a convenience for bus passengers and motor tourists on long runs.

Water-Alcohol Cocktail Peps Up Auto Engines

INJECTION USED IN PLANES ALSO GIVES EXTRA POWER TO CARS

By Merrill Folsom

THERE is an adage that gasoline and alcohol don't mix. When the latter is taken internally by the driver, this may be all too true; but injected into the combustion chamber of the automobile engine—that's a different story.

And it may come as a distinct surprise to motorists, long tormented into sulphurous diction by frozen fuel lines and sputtering engines, to learn that water in the combustion chamber adds materially to the performance of a car and to economy of operation. It will relieve their feelings to know, however, that the water is not mixed with the gasoline in the tank but is piped to the combustion chamber through a separate system.

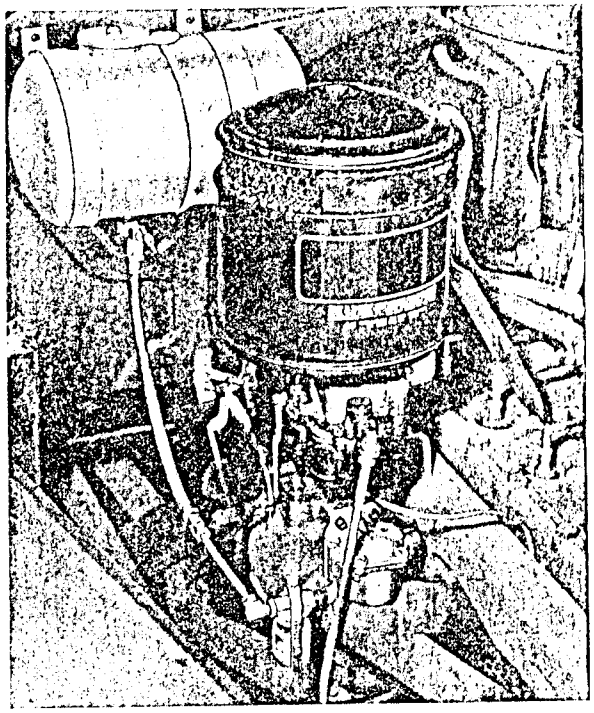
Both alcohol and water are internal coolants in combustion engines. They suppress preignition and detonation and draw higher power output from low-octane gasoline. Water alone is good, straight alcohol is the most effective, a 50-50 mixture of the two costs less and is completely satisfactory.

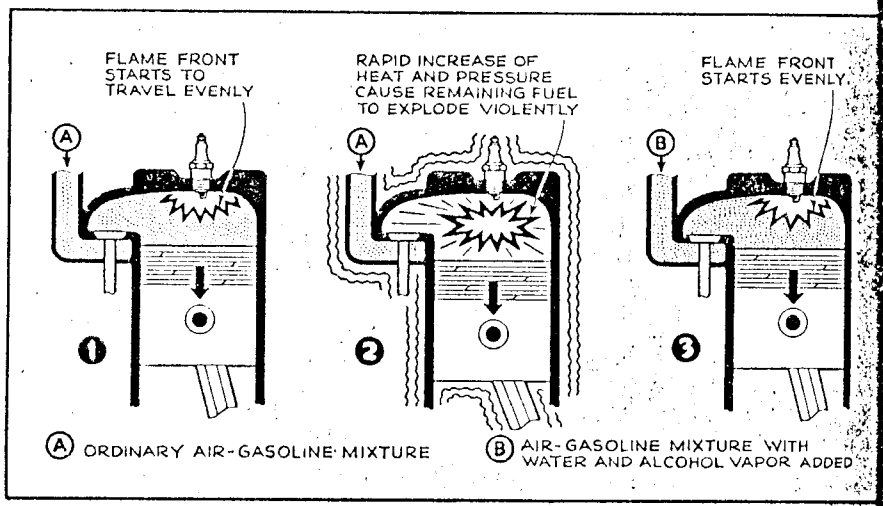
Rainy and foggy weather is usually considered depressing, but it has an opposite effect on the explosive powers of petroleum. On stormy and humid days, and especially nights, you undoubtedly have felt that your car possessed greater power, knocked less, and ran more smoothly than on bright, sunny days. The reason for this increased efficiency was the moisture-freighted atmosphere itself, helping to clean carbon deposits from the engine, smoothing valve operation, and preventing gummy sludge in crankcase oil.

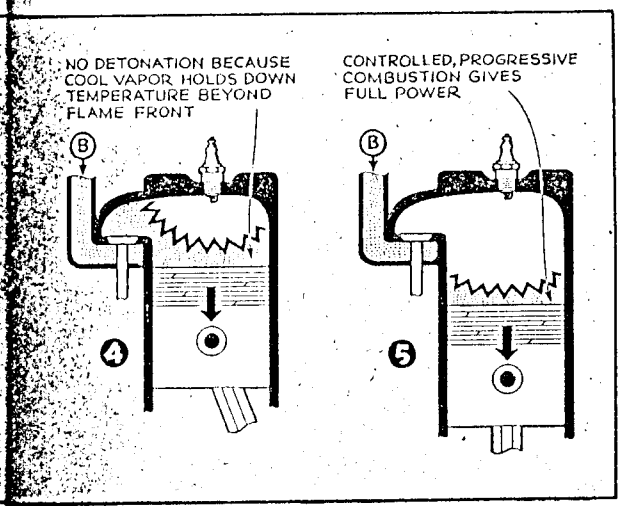
Automotive engineers experimented long ago with devices to inject water into the intake manifold to attain improved performance. Engineers in this country, Hungary, England, and Germany wrestled with the problem even in the days when automobile tops were extra equipment and snappy runabouts boasted a top speed of 40 miles an hour. But the work usually stopped at the experimental stage because of a general demand for engine simplicity and because of an abundance of good-quality gasoline at low cost.

While these experiments were being made, a few mechanically minded car owners got out drills, copper tubing, and petcocks, and rigged their cars with pipe lines that carried moist air from the tank at the top of the radiator head into the intake manifold near the carburetor. They hit on a formula that was scientifically sound, for the moist air did not rise from the radiator core and pass into the combustion chamber of the engine until the engine was thoroughly warm and able to handle properly the extra lift in power that the moisture could give. But the makeshift water feeder was something short of ideal because of its failure to regulate the flow of moist air at various engine speeds.

Recent tests have produced much new information about how fuel composition, combustion-chamber design, air-fuel ratio, ignition timing, and engine temperature affect the combustion process. The injection of water or water and alcohol into the combustion chambers of aircraft engines, especially supercharged engines, permits large gains in power without an increase in cylinder temperature. An extra surge of power has been helpful in getting heavy planes off the ground and in making fighter planes swifter in combat. The injections are equally effective in automobiles, especially if supercharged engines are used. They permit the design of high-compression

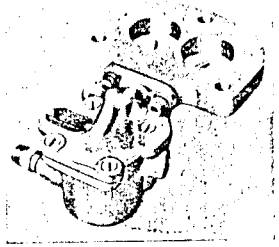






Above and below, a water-alcohol injector unit for adding power to low-octane gas. The coolant, in the tank at top left, flows to the unit over a sediment trap.

There it goes through a vacuum compensator (lower left below), into a mixer to combine with the gasoline-air vapor, and on to the intake manifold of the engine.

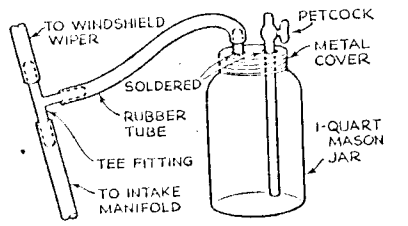


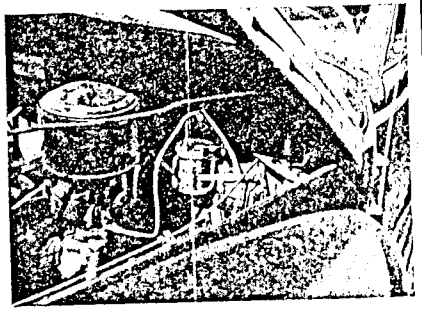
Mason Jar Holds Coolant for Injection into Auto Engine

SOME improvement in auto performance on present-day low-octane fuels can be secured with this homemade water-alcohol injection device. While it will not make a low-octane gasoline behave like a premium gas—due mainly to the fact that intake-manifold vacuum lessens during acceleration, when it's needed most—the device affords an easy way to experiment with injection coolants.

Insert a tee fitting in the windshield-wiper vacuum line and connect it by rubber tube to a 1" length of ¼" copper tubing soldered in a hole punched in the metal cover of a Mason jar. In a second hole in the cover, solder a 6" length of the tubing and solder a petcock to the upper end.

Mount the jar securely on the fire wall and fill it three quarters of the way up with the coolant. Start the motor and adjust the petcock until the bubbles come in a small, steady stream.—STEPHEN J. BENNIS.





engines of minimum weight whether supercharging is used or not. Alex Taub, noted automobile engineer, explains it thus:

"The effect of any cooling agent upon detonation is clarified by taking the process of combustion in stages. In an average passenger-car engine, the first stage is the ignition. At first gas pressure is simply compression pressure, or around 150 lb. per square inch. The second stage comes when the flame has traveled about a third of the distance. Gas pressure in the unburned portion then is about 250 lb. And the third stage comes when the flame front has moved two thirds of the way across the combustion chamber. At that point the gas pressure in the unburned third is 350 lb.

"From there on, what happens depends on the temperature of the last gas to burn. This gas, if it is in the hot area, would be ready to detonate with very little flame movement. If this last gas is in a cool area, or has had the benefit of a cooling medium, or if its temperature is held down by the work done and the work going on in vaporizing a cooling medium, then, obviously, the flame front completes the travel without self-ignition taking place in this last gas. Thus there is no detonation."

After experimenting with a mixture of water and alcohol in equal parts, engineers of Thompson Products, Inc., of Cleveland, reported to the Society of Automotive Engineers that the best gains in economy and operating efficiency are achieved when fuel of approximately 12 octane numbers lower than that normally required by the engine must be used. They said that not only was knocking eliminated but the injections caused a softening and expulsion of carbon from the engines, reduced crankcase sludge, and resulted in no corrosion or alkali deposits in the engine.

The use of a special internal coolant is not intended as a substitute for the anti-knock ingredients already in the gasoline. Ethyl gasoline was perfected after tests on 30,000 compounds that would reduce fuel knocks and improve power. Alcohol contains little more than half as much fuel value as gasoline, and its use in the combustion chamber by injection is as a coolant rather than a direct source of power.

Explaining the engine speed at which water-alcohol injections are most useful, and the need of a device to start and stop the injections at various engine speeds, the Thompson Products engineering triumvirate of A. T. Colwell, R. E. Cummings, and D. E. Anderson reported to the SAE as follows:

"At higher speeds, volumetric efficiency is decreased and turbulence increased, lowering the octane requirement of the engine. However, at the speed of maximum torque and slightly above that speed, maximum detonation and shock take place. This range, therefore, will require the maximum amount of internal-coolant injection. Beyond this range, the quantity can be reduced or entirely cut off."

Utilization of water-alcohol injection has the disadvantage of needing an additional fuel-supply system and the necessity of replenishing the supply. The advantages seem to outweigh the disadvantages, however. Some engineers are trying to simplify the additional fuel system by designing a combination carburetor and injector, while the latest device is a separate injector that can be attached to the intake manifold near the carburetor without interfering with the regular fuel system.

A tank for carrying the water-alcohol mixture should be about a tenth the size of the gasoline tank. It can be mounted above or below carburetor level, but a pump will be needed if it is below. A combination gasoline and water-alcohol pump has been used satisfactorily.

Experience shows that the water used can generally be any that is good for drinking.

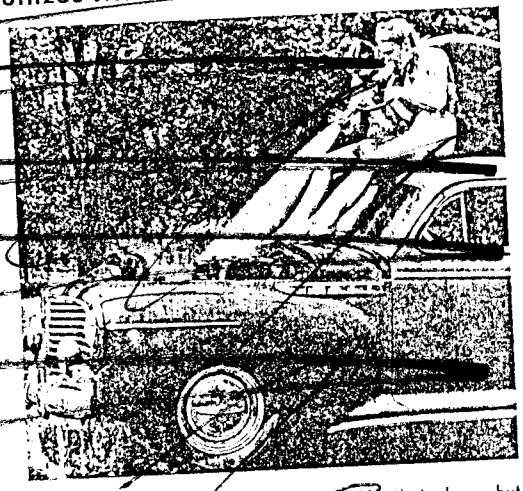
Many variables must be considered in computing the cost of injection. While a cheaper, lower-octane gasoline can be used, the economy to be effected depends largely on how wide open the throttle is kept. Greatest economy is achieved in the middle range of the throttle. Wide-open throttle decreases the economy.

There is another important factor, the Thompson engineers told the SAE. Because there is no need to retard spark to eliminate detonation, a more efficient spark position can be maintained when injection is used.

Waterproofing Liquid Immunizes Motors and Wiring to Dunking

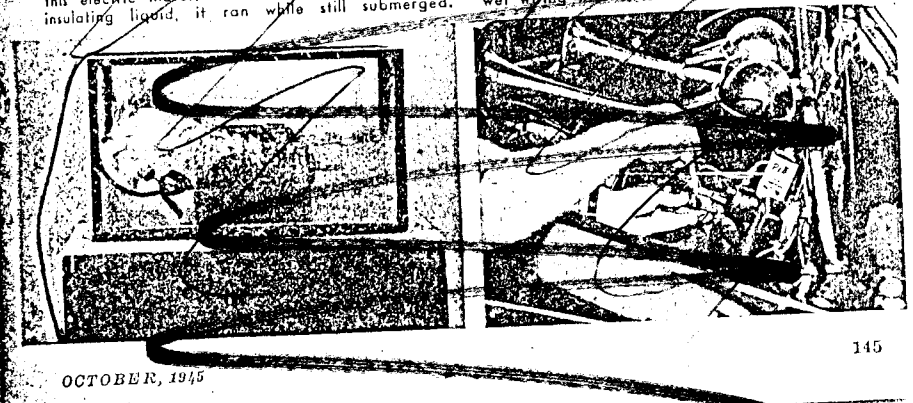
LIQUID insulation, a war development, that waterproofed ignition systems in jeeps and other Army vehicles, is now available for civilian use. Applied to an ignition system, it renders the engine practically immune from water-caused stalling. It can also be painted on an untreated, water-soaked engine to permit quick restarting. An electric motor treated with the liquid and kept under water for two years was run while still under water during a demonstration.

The liquid penetrates other insulating material and forms a tight coating on [illegible]. It is used on auto wiring, spark plugs, and batteries, electric motors, outdoor wiring, flashlight batteries, and the like. U. S. Industrial Chemicals, Inc., of New York, makes it.



Two years under water apparently had no effect on this electric motor. Treated beforehand with an insulating liquid, it ran while still submerged.

Few cars [illegible] that above, but in an emergency liquid insulation applied [illegible] the wet wiring with a brush [illegible] starting.



Queen's man gets the vapours

NEW SCIENTIST 13 FEB 75

A research student at Queen's University, Belfast claims to have developed a better method of achieving fuel economy and reducing pollution by improving the vaporisation of fuel in a car engine than have the joint endeavours of Shell and the National Engineering Laboratory at East Kilbride. Both Shell/NEL and the Queen's man, David Hughes, heat the fuel/air mixture between the carburettor and the induction manifold to improve vaporisation, and therefore allow the car to run on leaner air/fuel mixtures—but their methods differ.

Shell/NEL announced their well-funded Vapipe system nearly two years ago and development continues (New Scientist, vol 58, p 680). Exhaust gases are passed through a heat exchanger to raise the temperature of a working fluid in a heat pipe which in turn is used to improve fuel vaporisation by passing through a further heat exchanger in the induction flow. But there is yet a third heat exchanger to act as an excess heat "dump" and, additionally, a complex gas control system to vary the extent to which heat from the working fluid is "used" or "dumped".

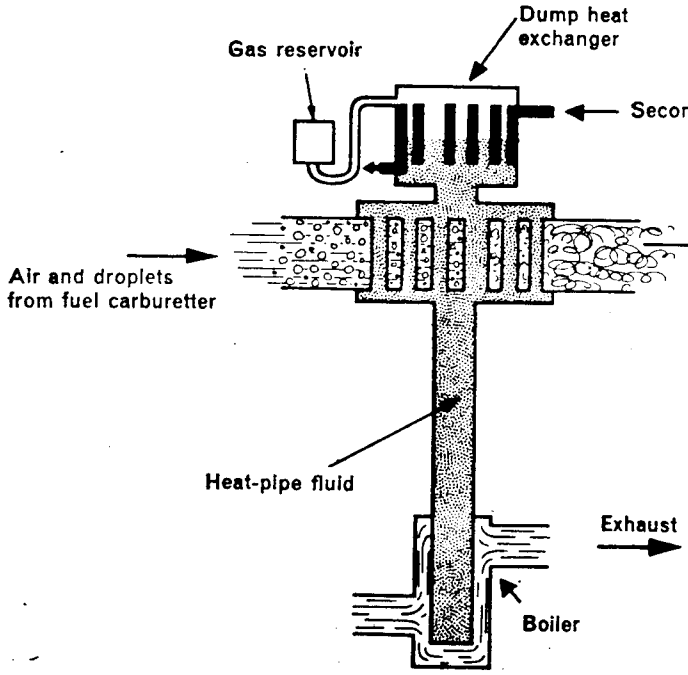
Hughes contends that the same job can be done simply by one small heat exchanger between the carburettor and the manifold, heated directly by the engine cooling water. Plumbed directly into the cooling system it requires nothing more than an extra metre or so of hose. Because of its simplicity, he argues that the system can be easily tailored to suit any car engine, whereas the particular geometry of the Vapipe makes it difficult to install on cross-flow engines, with their exhaust and induction manifolds on different sides. Hughes claims his test results equal those achieved with the much more costly Vapipe.

Both Shell/NEL and Hughes, who is working under Dr John Goldburn in the Queens University Mechanical Engineering Department, began their work with the reduction of exhaust pollutants as their main aim—an objective partially achieved by improving fuel vaporisation (although unburnt hydrocarbon emissions are not reduced sufficiently by the Vapipe system). But with the dramatic rise in the price of petrol since development began, fuel economy is the point now more strongly pushed.

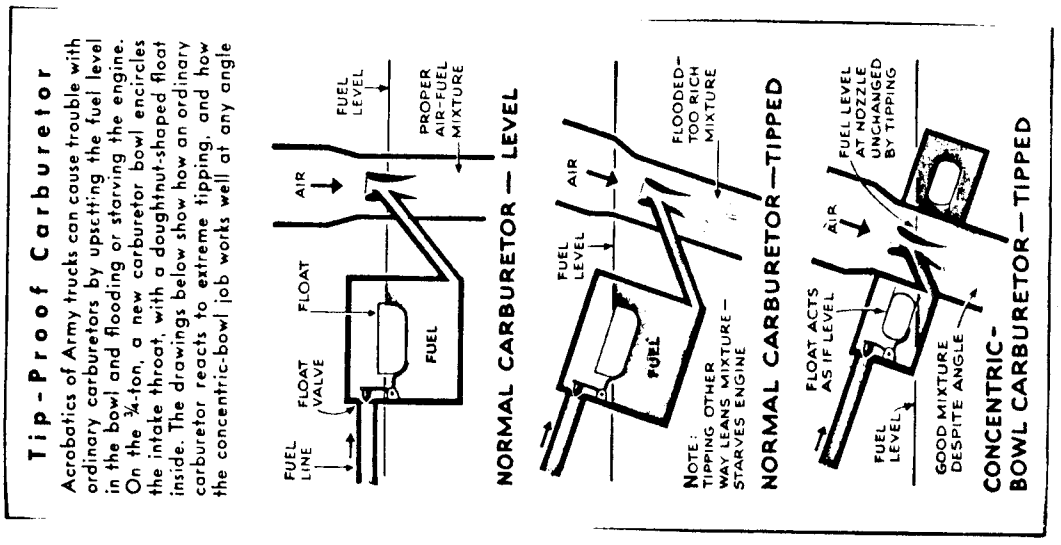
Prototypes of the Queen's unit have been bench tested on a Ford Pinto engine (a low-compression US version of the Ford Cortina powerplant) and several thousand miles of urban road testing have been completed on a Hillman Avenger. The heat exchanger area of the bench unit fitted to the Pinto engine is 2580 cm² (400 in²) and the fuel/air mixture is heated by some 40°-50°C to achieve a reduction in brake specific fuel consumption of 15 per cent.

Results on the Avenger show that emission of hydrocarbon from the experimental engine is less than half the proposed EEC limit, and emission of carbon monoxide is reduced to less than a third of the EEC limit.

In parallel with refining the vaporiser, Hughes is working on improvements in distributing the fuel/air mixture to the cylinder. Talks with a major car manufacturer on exploiting the Queen's research are under way.



The Shell/NEL Vapipe system. Heat is transferred by a heat pipe from the exhaust (bottom) to the output of the carburetter, vaporising the fuel before it reaches the cylinder head. The heat dump takes up excessive heat. But has a Queen's University researcher devised a simpler gadget that does the same job as Vapipe?



HOUSTON, TX CHRONICLE 3/11/87 S PARKER/COUD-I

ADVERTISEMENT

Reprint from Albuquerque Tribune

Device may increase gas mileage by 22%

BOSTON - National Fuelsaver Corp. of Boston has developed a simple automotive accessory that increases gas mileage by 22%.

The Gasaver, which takes only 10 minutes to install, releases microscopic quantities of platinum into the air-fuel mixture entering the engine.

Platinum has the unique ability of making unburnt fuel burn. With platinum in the flame zone, you increase the percentage of fuel burning in the engine from 68% to 90%.

Normally, that 22% of the fuel would only burn if it came in contact with the platinum coated surfaces of a catalytic converter. Unfortunately, this converter process takes place outside of the engine, where the energy produced is lost.

With the Gasaver dispensing platinum into the combustion chambers, 22% more of each gallon burns inside the engine so that 22% fewer gallons are required to drive the same distance.

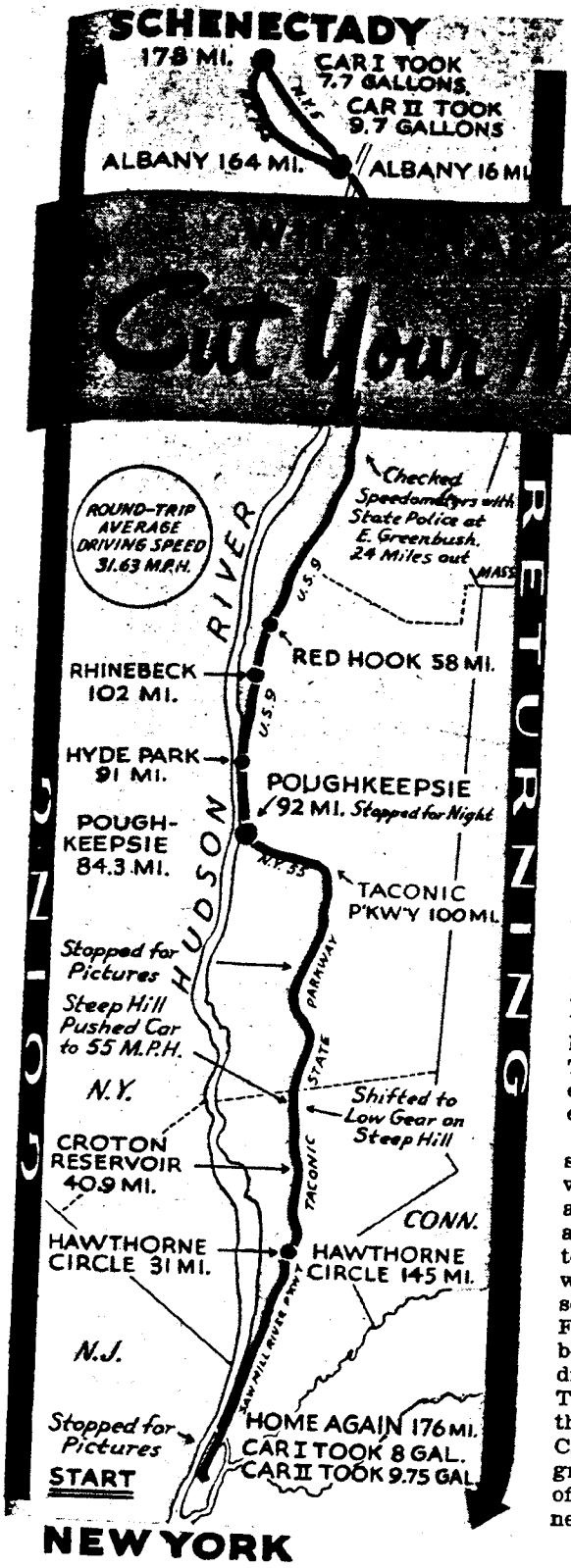
The process works on both leaded and unleaded gasoline, and meets the emission standards of all states.

Federal Judge Walter J. Skinner concluded the five-year administrative procedure studying the Gasaver by stating: "Independent testing shows greater fuel savings with the Gasaver than the 22% claimed by its developer National Fuelsaver Corp."

The government had already confirmed in 1984 that the Gasaver raises the octane of gasoline, eliminating the need for premium fuel.

Joel Robinson, the developer, commented: "We've already sold over 50,000 Gasavers. Ironically, we find more people buy the Gasaver for its third benefit of cleaning out carbon to extend engine life than buy it for its fuel savings or octane boosting."

For further information call 1-800-LESS-GAS or 617-369-6900.



At left, map of the trip made by two identical-model cars, one with half its cylinders inoperative, to test the converted motor's efficiency. Data is from the author's log

Cut Your Motor in Half

HOW AN AGING AUTOMOBILE WITH HALF ITS CYLINDERS DEAD SAVES YOU GASOLINE

By SCHUYLER VAN DUYNE

TO learn what a motorist with an average, or below-average, car gains by using only half of its cylinders, I tried it out. Sticking to the speed limits, I boosted the gasoline mileage of a 1938 Ford V-8 standard four-door sedan nearly 25 per cent on a test round trip between New York City and Schenectady, N. Y.

I probably shifted into second gear more than any 1920 motorist ever did on the same run. Once I even had to drop down to low to get up a hill, and on the ramp of a Poughkeepsie parking garage the car would have stalled in low if I had not slipped the clutch and raced the motor. But—the 359-mile trip, at an average speed of 31.63 miles an hour, saved almost four gallons of gasoline. That was a week's supply with an Easterner's "A" ration book, and enough for 100 extra miles in the car used.

For a fair estimate of the gas saving, a second car of identical make and model, with the same case history, was the standard of comparison. Both cars had gone about 70,000 miles, and neither had nodded to a skilled mechanic in six months. Car 1, which I drove, was "souped down" in the service department of Harold S. Jonas, Inc., Ford dealers in New York City, which lent both the old cars for the test. Car 2 was driven by Robert Smith, staff photographer. The engine of Car 2 was untouched before the trip, except for an oil change which Car 1 also had, and both chassis were newly greased, all tires inflated evenly, and both of the 16-gallon gasoline tanks filled to the necks.

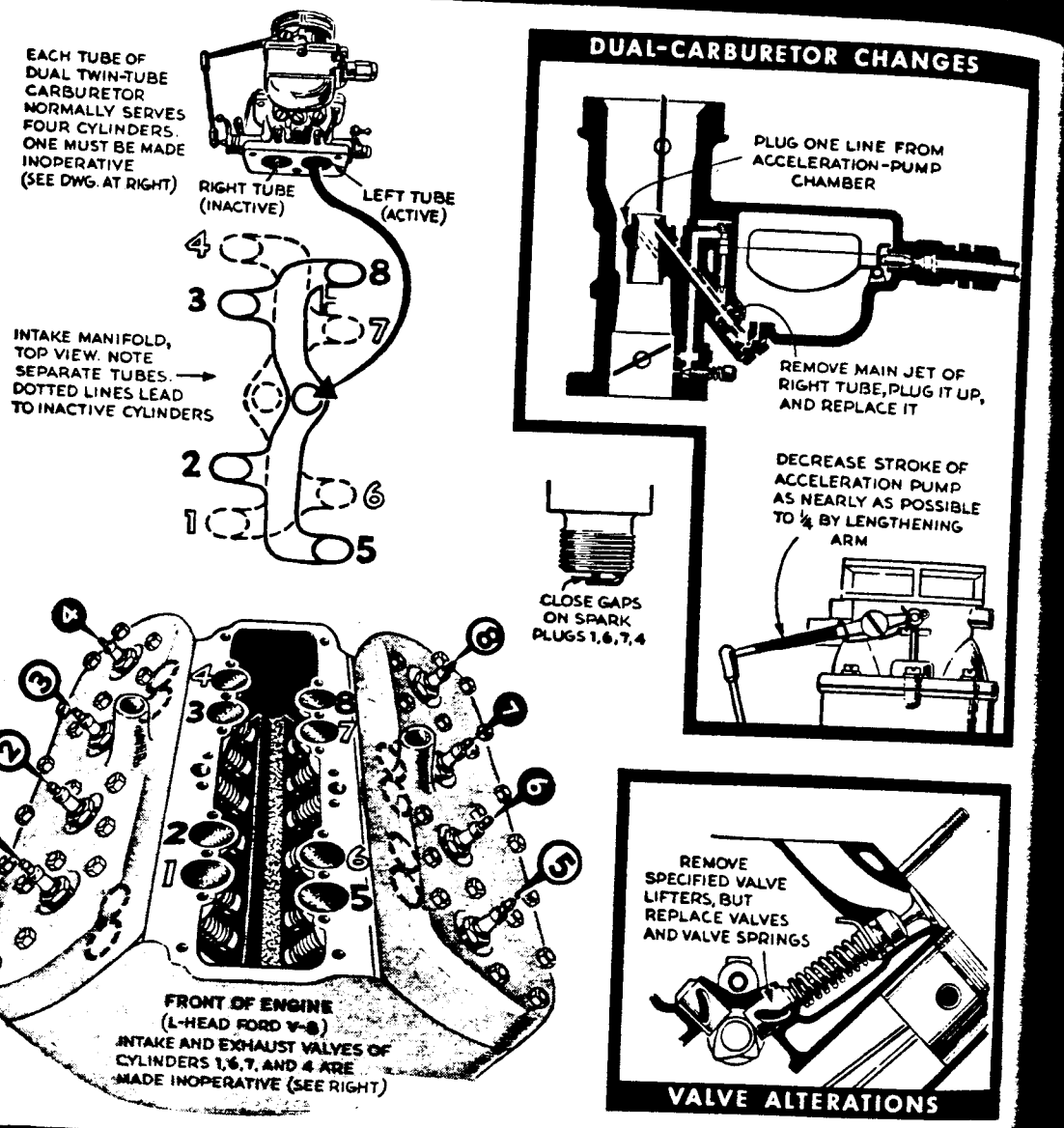
(CONTINUED)

The mechanical changes on Car 1, cutting out half the cylinders, were made according to recent suggestions of the Sun Oil Company of Philadelphia. Lifters were removed from the intake and exhaust valves of the two center cylinders in the left bank of four, and the end pair in the right bank. The valve springs were then relocked so the valves seated firmly, but the valves no longer were opened by the camshaft.

These four cylinders (the other set would have done as well) normally are fed by a manifold tube separate from the tube supplying the other four, and the two manifold tubes attach to separate throats of a dual carburetor. So the main gasoline jet feeding the nozzle in the throat of the dead side of the carburetor was plugged, as was one side of the by-pass between the two manifold tubes into which the windshield wipers, and the vacuum brake of the distributor, exhaust. One branch of the acceleration-pump lines into the two carburetor throats was plugged, and the pump stroke was decreased as closely as possible to one quarter. (This would be half on a single-tube carburetor, and its nozzle would not be plugged.)

(CONTINUED)

How the L-Head V-8 Ford Is Altered To Run on 4 Cylinders



The only other changes were to close the gaps in the dead-cylinder spark plugs and to step up the engine idling speed. The motor was now an even-firing four-cylinder one, with four dead cylinders going along for the ride. Their pistons simply compressed air and let it expand again, and their contribution to performance was a negative one—drag.

Setting out under a summery sun from midtown New York, we headed for the West Side Highway, turned uptown to Henry Hudson Parkway, switched to the Saw Mill River Road. Long before reaching the Hawthorne traffic circle, where we were to cut into Taconic State Parkway for Poughkeepsie, I had rediscovered a variety of old driving sensations. Gone was any semblance of jack-rabbit acceleration for a shift from low to second. If the shift to high came before the speed reached 18 miles an hour, pick-up was laborious, usually broken by some initial bucking. Above 18, high-gear acceleration was smooth, but still lazy.

As we entered Taconic Parkway's first level stretches, I temporarily forgot second gear—until the first moderate hill. Car 2 pulled away easily. I held a conference with myself as I plugged along at 25 in second, lagging farther and farther behind. This, I realized, was less than half a motor. But the hill was not steep for Car 2. More than 300 miles of driving over many hills lay ahead. I knew that the engine was functioning properly, such as it was. What could be done to make the drive less tedious?

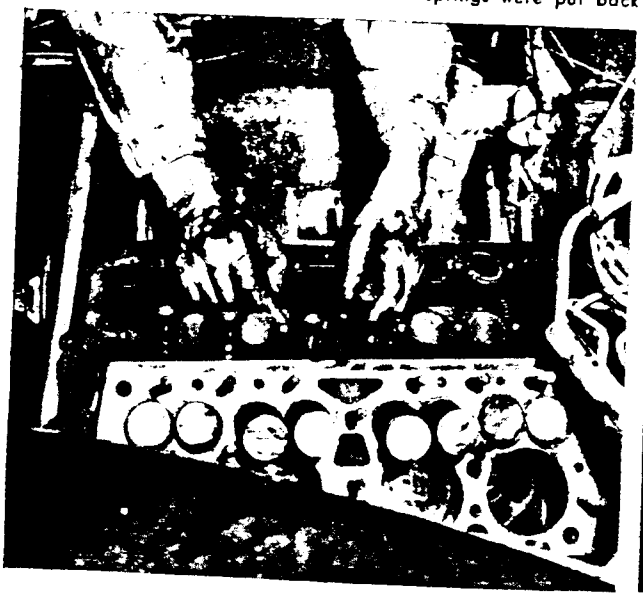
In a few miles I had the answer when it struck me that this was perhaps the least hectic driving I had ever done. No racing away from traffic lights to beat the other fellow. The car wouldn't race. No passing on hills. It couldn't. No dynamiting along straightaways. This race horse was bridled in for keeps. I settled back to my driving, kept an eye on the pace-setter ahead, wrote in my log, and enjoyed the air and scenery as I never had before. Just what had been my rush all these years?

On the whole trip, only two minor events marred the real driving pleasure that I had discovered, both on the same hill near the Dutchess-Putnam County line. There, on the trip out, the car seemed momentarily to be floating on air with unaccustomed motions. I snapped out of it to find that the long steep grade had boosted my speed up to 55, with the throttle closed. At the same hill, on the return trip, I shifted to second as usual before the hand dropped to 20 miles an hour, but instead of holding the speed or increasing it, the shift failed in its purpose completely. With a sheepish, silly feeling, I dropped down to low and chugged over the hilltop a few minutes later. Smith was waiting for me beside his car, yawning.

At Schenectady the first proof of improved gasoline economy was shown. Splitting the slight difference between the indicated mileage on the two speedometers, we had covered 183 miles. Refilling both gasoline tanks, these facts came to light:

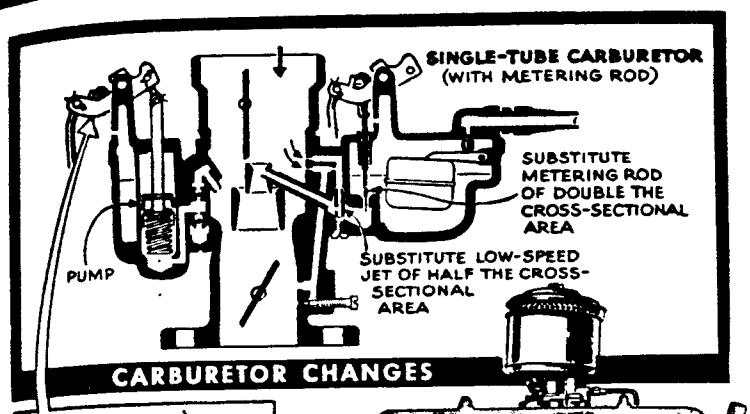
Car 1 used 7.7 gallons.
Car 2 used 9.7 gallons.
Car 1 averaged 23.76 miles per gallon.
Car 2 averaged 18.86 miles per gallon.
Mileage improvement: 25.97 percent.

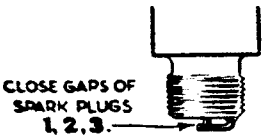
Removing valve lifters from the Ford V-8 engine that powered Test Car 1 on the economy run. Note the raised valves in the foreground. Later these valves and their springs were put back

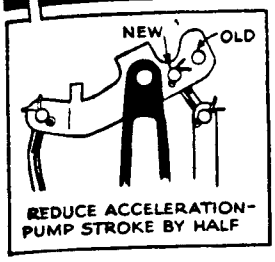


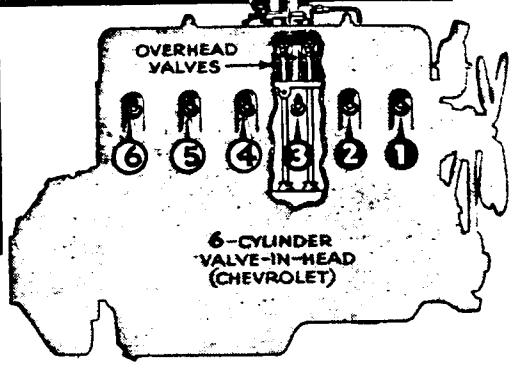
Important detail in altering Fords: Plug one side of by-pass between the two separate intake-manifold systems

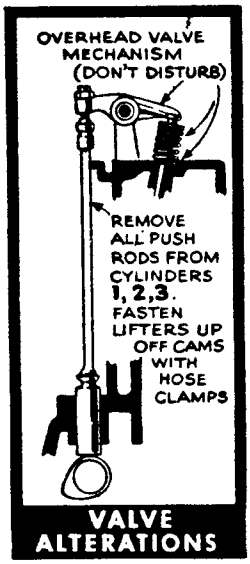
Changes for the Overhead-Valve-Type 6-Cylinder Chevrolet



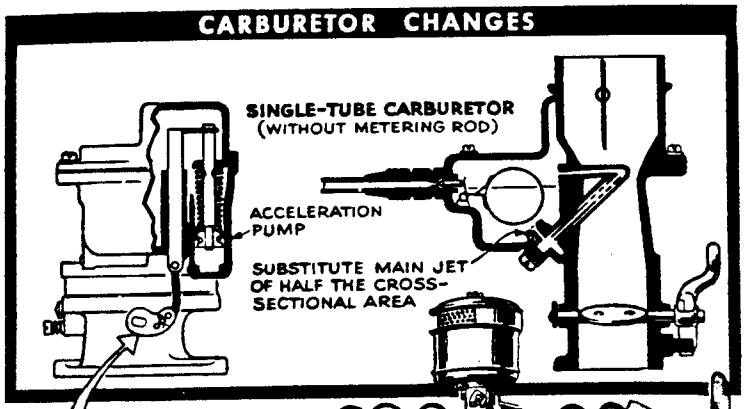


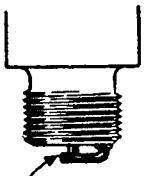


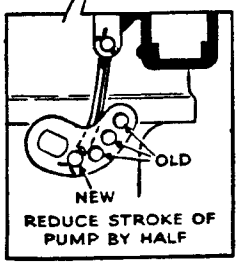


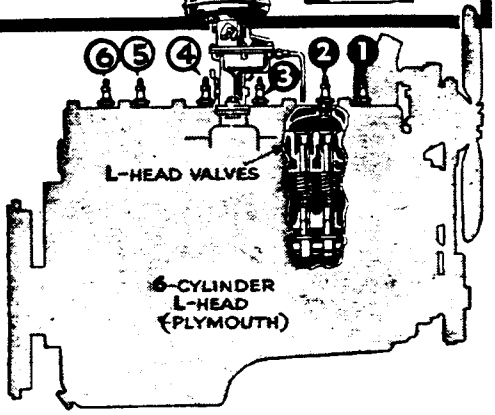


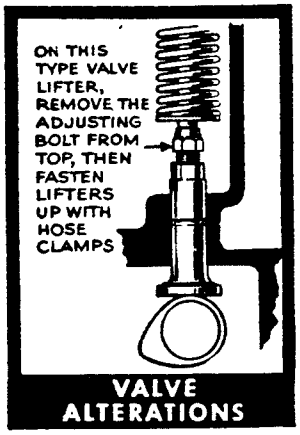
L-Head 6-Cylinder Motors Like Plymouth's Follow This Plan











DRAWINGS BY STEWART ROUSE

What Happens When You Cut Your Motor in Half!

(Continued from page 77)

starting at the front, so you eliminate either 1-3-2 or 5-6-4, but preferably the forward group. For V-8's, firing order usually is 1R-1L-4R-4L-2L-3R-3L-2R. Use either set of alternates. For 8-in-lines, the firing order is 1-6-2-5-8-3-7-4. Again use either set of alternates. On V-12 Zephyrs, either bank of cylinders is dropped. Some V-8's vary from the Ford in firing order. In any case, the rule is to cut out alternate cylinders in their firing order.

On double-tube (dual) carburetors, you simply plug the main jet and the acceleration-pump nozzle feeding the tube leading to the proper cylinders. On single-tube carburetors, you must reduce the flow of gas through the main jet by half, substituting a jet of half the orifice area, and cut the stroke of the acceleration pump by half. In effect, you have made the engine more efficient for moderate-speed driving because the throttle valve must open wider. A possible exception is on recent Buicks where the unconventional intake manifolds already give particularly good moderate-speed fuel economy.

Sun Oil tests indicate that the best ignition procedure is simply to close the gap of the plugs in the killed cylinders. Do not remove the plugs' lead wires, or the high-tension coil will be damaged.

The final chore is to step up the engine idling speed to about 550 or 600 r.p.m. on sixes, 450 to 500 on eights, to make idling smoother.

Compared with the Sun Oil test on a V-8 Ford, on which a 40-percent mileage improvement was gained at 30 miles an hour, the writer's test was obviously less fruitful. Unconverted, the Sun Oil car made 24.7 miles to the gallon; converted it made 34.6. But that test was made under special conditions with a 1941 car in A-1 condition. On actual traffic tests, the Sun Company points out, at a speed of around 24 miles an hour (six less than ours), their car's mileage improvement was 24 percent, or no better than ours.

That may also be compared with a test of our altered car using a gasoline-metering gauge in New York City traffic, which showed mileage, at the necessarily restricted speeds of a busy city, ranging from a low of 14.5 miles to the gallon under worst conditions, up to a high of 25 miles under the best. For a four-year-old, down-at-the-heels car, that's good!

FLOWER MOUND, Tex. (UPI) — In 1972 Richard Clem announced the invention of a way to operate automobile engines on cooking oil.

He's still making that claim today, even though his first prototype motor fell apart and he had been "strung along" by at least 15 companies before he found financial backing.

Clem, 48, a heavy equipment operator for the city of Dallas and part-time inventor, says if the automobile industry adopts his invention, motorists could change the eight gallons of vegetable oil only every 150,000 miles and never buy any gas.

Clem said he uses vegetable oil because his motor runs at 300 degrees — a temperature where water has boiled away and conventional motor oil breaks down. Though he won't divulge many details of the engine, a 12-volt battery apparently is the only other source of power.

When Clem finished his first vegetable oil engine in 1972, he mapped a 600-mile test trip to El Paso for the first engine model he had financed through his earnings. But he only made it as far as Abilene before the "shafts and everything bent in it."

He blamed the failure on poor construction, too small a shaft and the use of chains instead of gears. Undaunted, he decided to try again, but said, "I needed money to build this thing better."

Neither the automobile industry nor the 15 other companies he wrote — some as far away as Taiwan — were interested in financing a prototype and then manufacturing it.

Then last year, he said, a large coal company offered to back him. Clem refused to disclose the name of his benefactor, but did say the coal company had signed contracts to sell the engines to power companies for use in pulling turbines.

Clem said he expects to finish work on the motor by the end of this year and estimates the final cost at $25,000. But, he said, if the engine goes into mass production, "It won't cost any more than a regular engine."

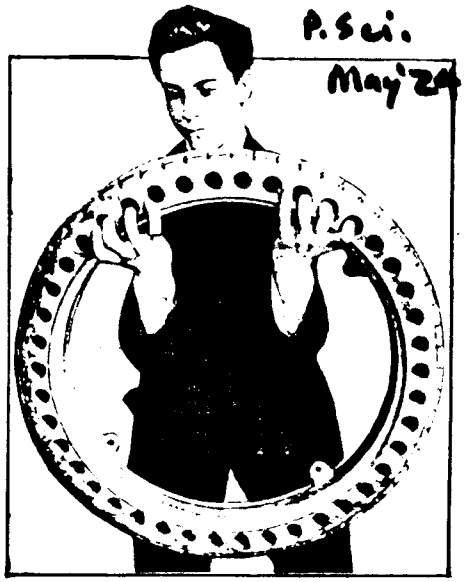
'SACRAMENTO BEE' CALIF. 8-23-77

Unusual resiliency, shock-absorption, and increased tire mileage are claimed for this new type of spring wheel. The hubs are flexibly suspended, giving a sort of floating wheel action

Solid Tires Cushioned by Perforations

RESILIENCY in the solid type of tire required by trucks and other heavy motor vehicles is said to have been achieved by the perforated tire shown below.

A series of holes, closely spaced and more than an inch in diameter, circles the tire near the bead. Besides giving resiliency with little internal stress upon the rubber, the new tire is said to cool the center by the constant current of air that is admitted through the holes.



The new solid tire, showing perforations

Feed System Cuts Auto Costs by Vaporizing Fuel Oil

DRIVING AN AUTOMOBILE 200 miles on 25 cents worth of fuel oil would be a cinch, according to Joseph E. Blanding, of New London, Conn., if its engine were fitted with a fuel feed system he has invented. This device, which converts low-compression, spark-ignition engines into compression-ignition engines, causes the fuel oil to be completely vaporized as it is sucked into the cylinders, Blanding states. This complete vaporization makes possible efficient combustion without the use of the injectors and high compression ratios found in conventional Diesel engines which operate on similar, or an even more refined, fuel. Blanding has designed a special engine for use with this device, but has used it on ordinary marine and automobile engines.