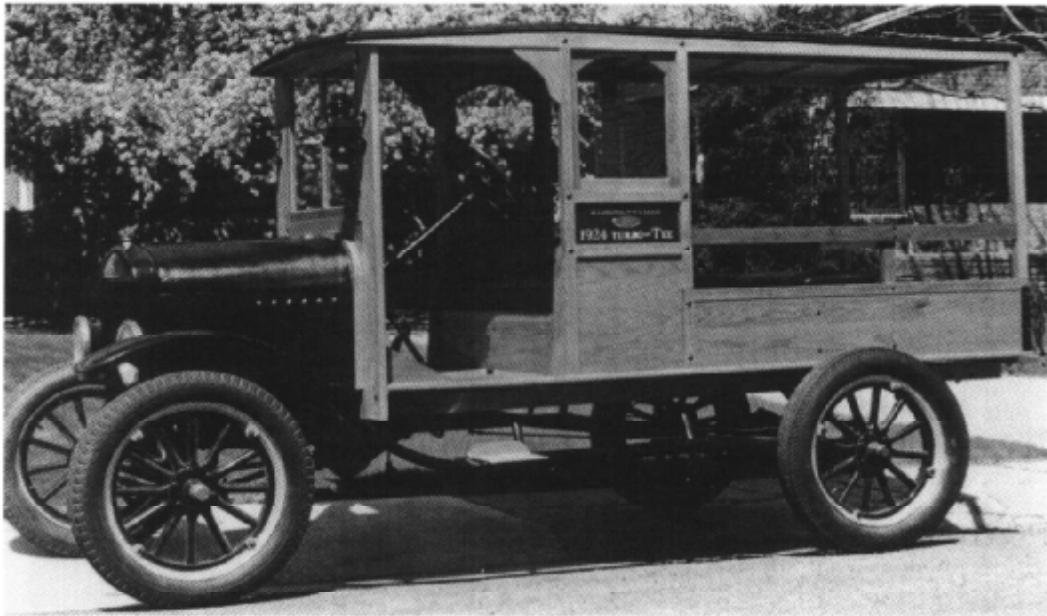


A CLEAN MODEL T *-in more ways than one*



Ben Jordan's 1924 Model T Depot Hack is powered by clean-burning hydrogen and will also run on 10 other fuels.

Ben Jordan, of Denver, Colorado, is the owner of the nicely restored 1924 Depot Hack pictured above. This Model T is stock-but has a few "additions" that make it unique.

Background on the owner

Before we talk about the Model T and its unusual features, a little background on Ben is in order. Ben was born in the southeast and completed his bachelor's degree in mechanical engineering at Clemson University. He received a Master's Degree in Education from Colorado University.

Ben earned his pilot's license at 16 years of age and served as a pilot in the military for 42 years, flying everything from B-29s to jets. He was involved in training the crews of the Enola Gay and Bockscar and was a pilot on General Curtis LeMay's staff.

He became interested in cars at an early age and owns and drives everything from world-record-setting Bonneville racers to his slower-moving Model T.

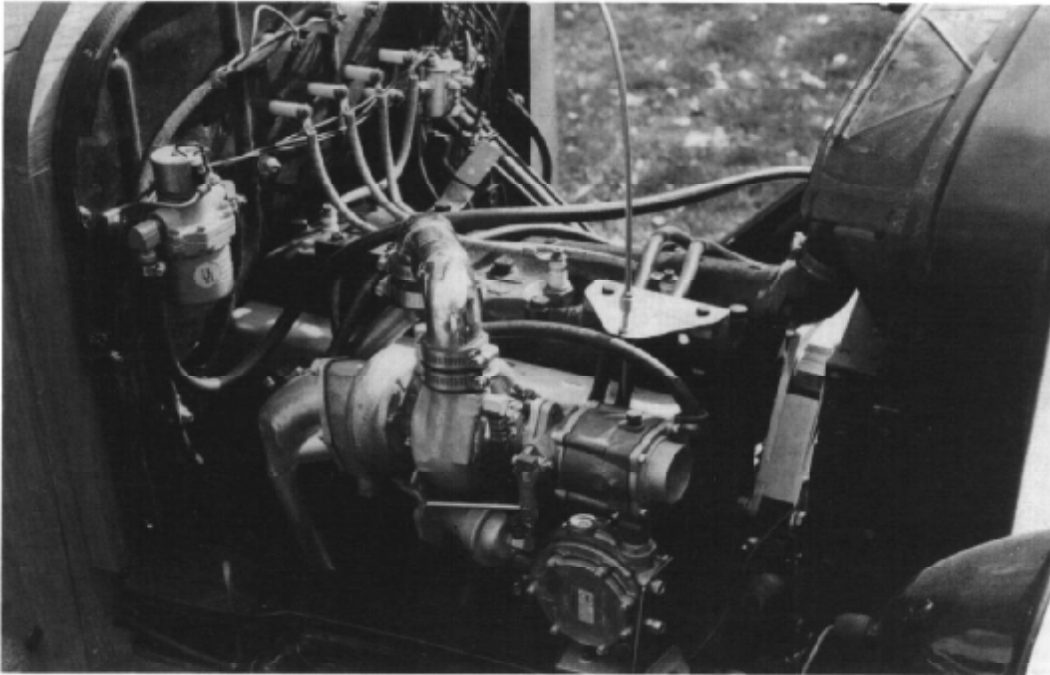
Ben is often described as an environmentalist; not the militant type-but one who is concerned about the future and who quietly goes about trying to demonstrate an alternative to petroleum-based fuels.

Details of the Model T's unique features

Ben Jordan's Model T engine is basically stock; however, certain equipment has been added which allow it to run on 11 different fuels. Currently it is "set-up" to run on natural gas or hydrogen--or any combination of the two. Both fuels are stored at initial tank gauge pressure of 3,000 psi. The hydrogen fuel is reduced to 20 psi at the intake manifold, while the natural gas is reduced to 100 psi. Ben's fuel of preference, however, is hydrogen.

Why hydrogen? According to Ben, hydrogen is the most plentiful element on our planet; it is zero polluting (its exhaust when burned is nothing but water); it is instantly recyclable (H_2 to H_2O to H_2); it is non-toxic; it is the most energy dense (60,000 BTUs per pound); it is safer than any other fuel; and it will be the cheapest fuel in the long run, as other fuel reserves are depleted.

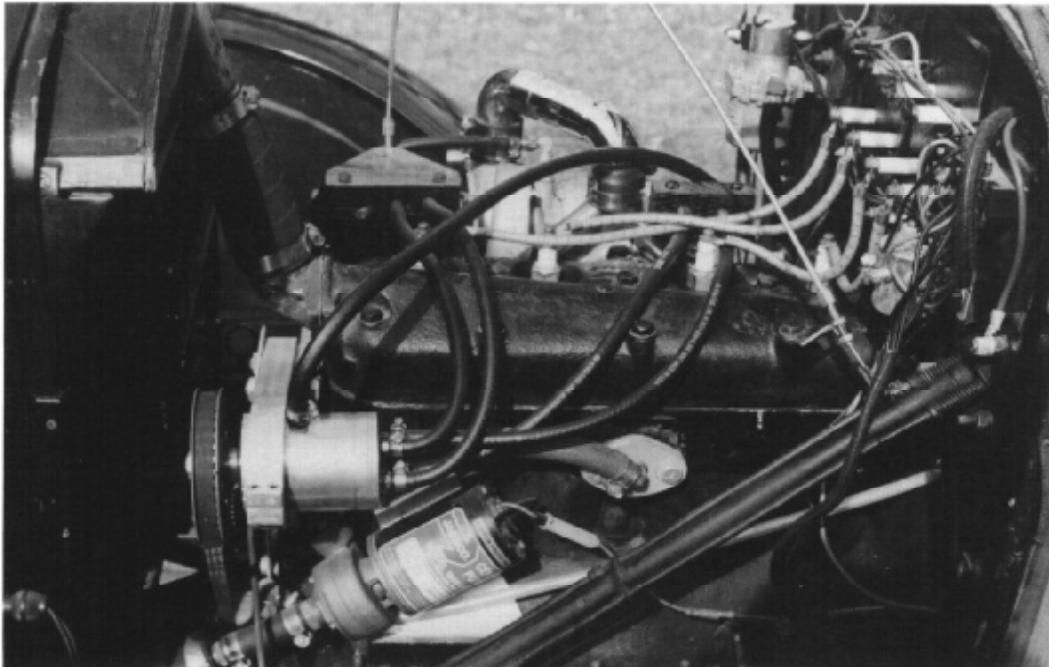
While the turbocharger and high-tech looking equipment may appear to be for power, they merely serve a functional purpose for using the non-conventional fuels. The turbocharger serves primarily as a scavenger to capture any residual gaseous fuels from the intake manifold that might cause a backfire in the intake manifold. It also partially compensates for the high altitude in Denver and



While Ben Jordan's Model T is basically stock, Ben has added a few components that may not be readily recognizable. We'll try to identify some of them and identify their purpose.

Above: An electric solenoid shut-off valve mounted on the right side of the firewall. From the solenoid shut-off valve, hydrogen is fed into a rotary distribution valve mounted on the left side of the engine. The turbocharger is an IHI unit. Its purpose is to scavenge any residual gaseous fuels from the intake manifold. Mounted directly ahead of the turbocharger is an IMPCO mixing valve, used when compressed natural gas is the fuel.

Below: The left side of the engine shows the rotary distribution valve used for metering hydrogen. This valve supplies measured pulses of hydrogen directly to the intake valve opening via four separate hoses. While the thermo-syphon system works fine in normal conditions, the car's use in parades has necessitated a water pump. In this case, a 12-volt JABSCO "Water Puppy" water pump has been added. An accessory oil line can be seen running from the hogshead to the front main bearing.



the inherent loss in power versus gasoline-15% when using natural gas and 20-25% when hydrogen is the fuel source.

The following is a description of the components and their placement and purpose on Bens Depot Hack that permits the use of hydrogen as fuel:

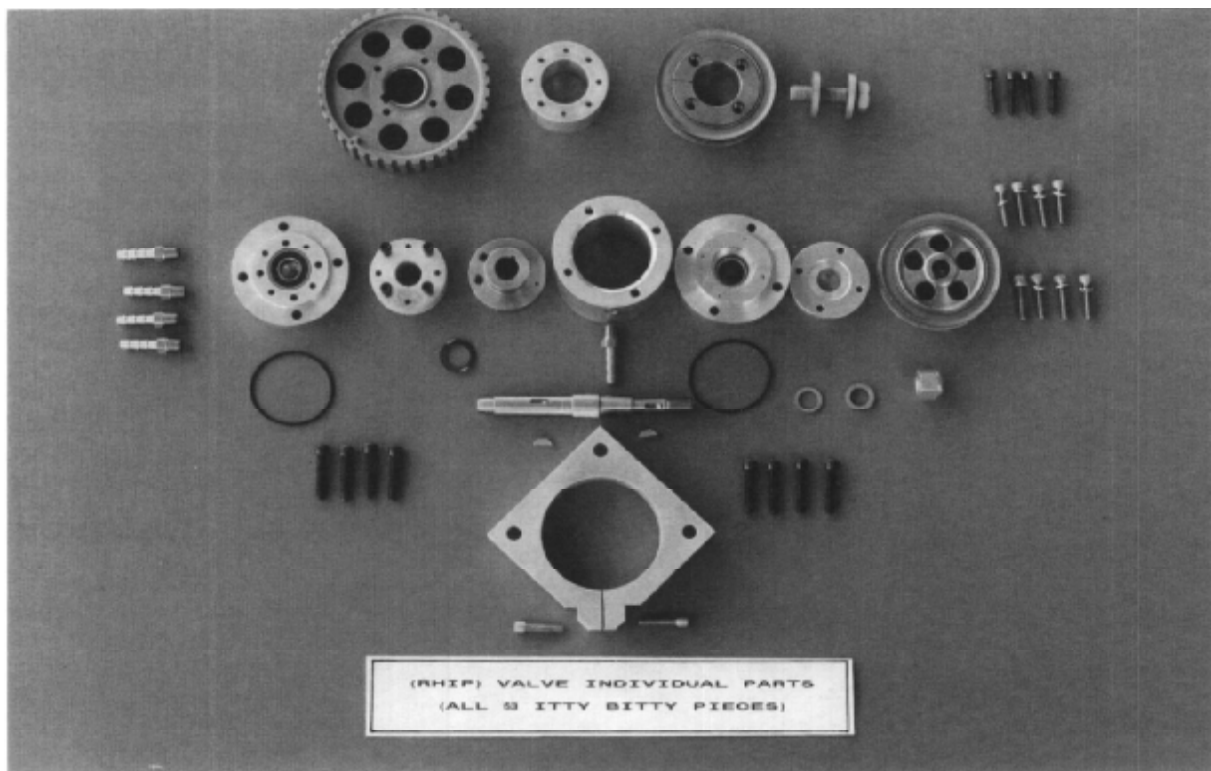
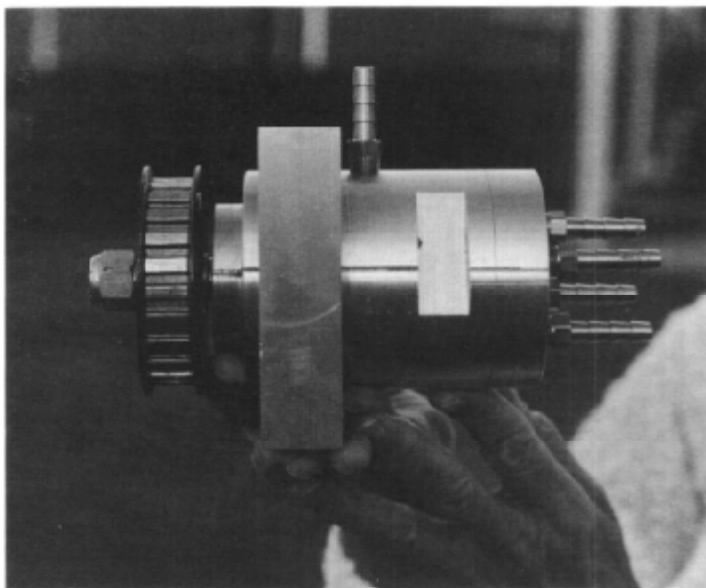
A standard welding gas pressure cylinder is placed vertically between the driver and passenger seats. A standard oxygen pressure regulator with modified threads to fit the hydrogen cylinder is used. (The oxygen regulator allows a greater volume flow than other gas regulators.) The pressure-adjusting regulator and gauges are oriented so that the driver can reach between the seats and adjust the pressure flow to the throttle valve.

A high pressure hose is routed to an electric solenoid shut-off valve mounted on the right side of the firewall, with an on/off switch mounted on the dash.

From the solenoid shut-off valve, hydrogen is fed into a rotary distribution valve

The heart of converting to hydrogen fuel is the Rotary Hydrogen Impulse Pump (RHIP) which is used to distribute a measured amount of hydrogen to each cylinder. The unit is shown assembled in the picture at the right and its detailed components are shown below.

(FWIP) mounted on the left side of the engine. Turning at one-half crankshaft speed, the valve supplies measured pulses of hydrogen directly to the intake valve opening via four separate hoses. Pulse duration is timed to start at about 20° after top dead center (TDC) and cut off fuel at about 20° before bottom dead center (BDC). A double-sided timing belt is used to impart a counter-clockwise rotation to the valve pulley.



The turbocharger is an IHI unit. Its pressure side feeds without throttling directly into the intake manifold. Its purpose is to scavenge any residual hydrogen into the intake valve opening at the end of each timed hydrogen pulse. The wastegate is set to limit manifold boost pressure to only 2-3 psi.

Increased power is principally obtained by increasing the fuel pressure at the regulator.

As mentioned earlier, Ben's Depot Hack is also fitted to run on compressed natural gas (CNG). As with the hydrogen fuel source, the CNG bottle is mounted in the bed, complete with a pressure regulator. It is fed to an electric solenoid shut-off valve, which is mounted under the floorboard on the passenger side. It too is controlled by a dash-mounted on/off switch.

CNG is fed from the shut-off valve to an IMPCO CNG mixing valve, mounted directly ahead of the turbocharger. Fuel flow is controlled via a flexible throttle control connected to the Model T's stock throttle control rod.

Starting and Stopping

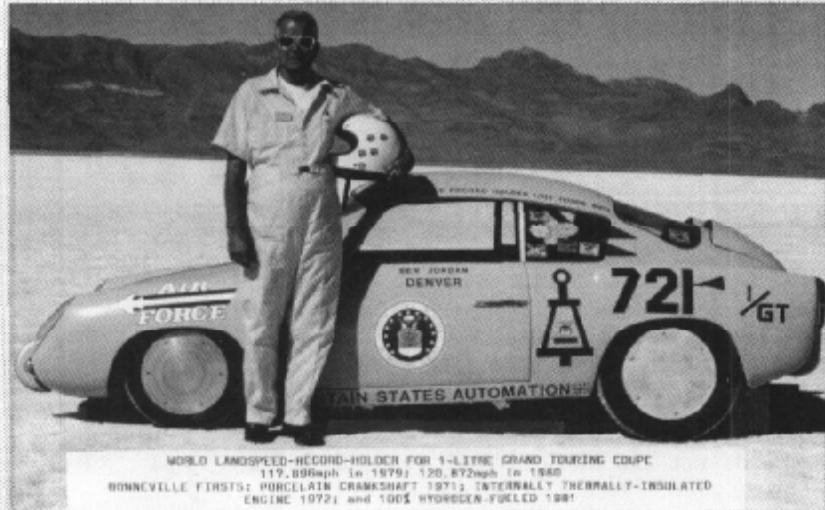
When starting the car, Ben first turns on the ignition. He then engages the starter-and only then does he open the fuel solenoid shut-off valve.

To stop the engine (or if the engine fails to fire) the process is reversed by closing the shut-off valve first. The key is that one never lets the fuel flow if the engine is not turning over or the ignition is not

Interested in Knowing More About Hydrogen?

Ben Jordan, and his wife Barbara, are avid proponents of the use of hydrogen as a fuel source. They use their Model T as a rolling exhibit; speak to individuals and groups; publish articles on the use of hydrogen; lobby politicians; and have even

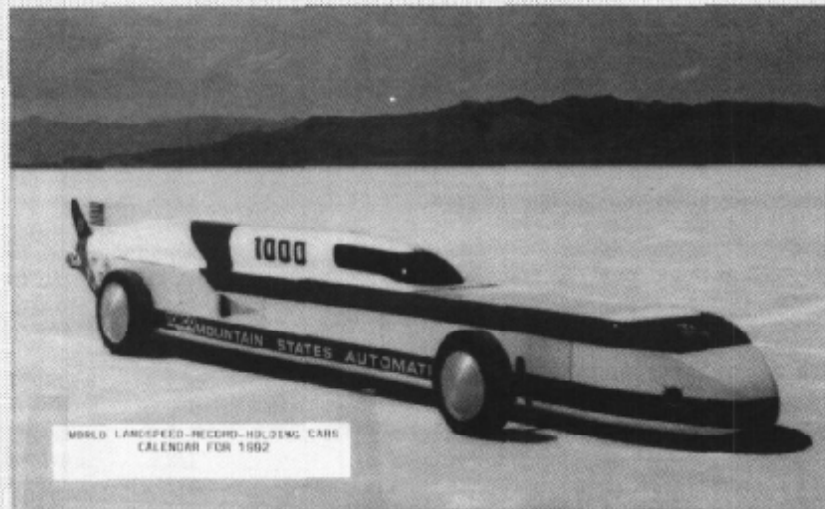
Two of Ben Jordan's Faster Vehicles



WORLD LANDSPEED-RECORD-HOLDER FOR 1-LITER GRAND TOURING COUPE
117.887mph in 1979; 120.872mph in 1980
BONNEVILLE FIRSTS: PORCELAIN CRANKSHAFT 1971; INTERNALLY THERMALLY-INSULATED
ENGINE 1972; and 100% HYDROGEN-FUELED 1981

Above: Ben Jordan and his World Land Speed Record-Holding 1-liter Grand Touring Coupe

Below: The "Bockscar," Ben's World Land Speed Record-Holding Lakester



WORLD LANDSPEED-RECORD-HOLDING CAR
CALENDAR FOR 1992

offered a trophy for the fastest hydrogen fuel powered car at the Bonneville Speed Week.

Ben Jordan will provide more information, advice, and assistance to anyone interested in using hydrogen as a fuel - for cars (Model Ts or modern), airplanes, boats, trucks, motorcycles, kitchen stoves, lawn mowers and more. You can contact him at:

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