Holley 94s

The Other Vintage Carburetor

By Ron Ceridono
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http://www.streetrodderweb.com/tech/0510sr_holley_94_vintage_carburetor/index.html

It's more than a little ironic that in this day and age of trick, aftermarket carburetors and programmable electronic fuel injection that anyone would want to run a vintage mixer, like the Stromberg 97, that was designed over 70 years ago. But then no one ever said everything in street rodding had to make sense.

Over the years, a variety of Stromberg carburetors have been produced. The Type 40 was introduced on Ford V-8s for 1934; model 48s were found on the 1935 Flathead; 97s were used on 1936, '37, and early '38 Ford 85hp engines (81s were used on the '37 60hp engines) and the LZs were used on the Lincoln V-12s. In addition to the carburetors manufactured by Stromberg, the Bendix Corporation built replacement 97 carburetors under license. The Type I was made in South Bend, Indiana, (most carry the 97 logo). Type II carburetors were made in Elmyra, New York, and while some had the 97 logo, most were labeled 1-1.Before the advent of truly efficient four-barrel carburetors, multiple Stromberg 97 carburetors were the hot rodder's induction system of choice. Reasons were many; 97s were readily available, they were simple and easy to modify for fuel, and jet changes could be made quickly. About the only thing that doesn't hold true today is availability.

When my good buddy, Paul Willis, decided to build a Flathead for his highboy '29 roadster, he went on the prowl for a pair of Strombergs. After looking at lots and lots of overpriced 97s, most of which looked like they had been used for anvils thanks to the time-honored practice of hammering on the float chambers to correct a malfunctioning needle and seat, he opted for a pair of alternative mixers--Holley 94s.

Often mistaken for Strombergs, Holley 94s were used by Ford from 1938-57, which means there were a bunch of them made, and many more were sold by parts stores as replacements. The net result is that they are far more plentiful--and much less expensive--than 97s.

As Jere Jobe explains it, the Holley 94 was created when Henry Ford went looking for a more efficient carburetor for his soon-to-be-released 24-stud engine. Ford contracted with the Chandler-Groves Company to develop an entirely new carburetor. Ford gave Chandler-Groves a one-year contract to supply all the carburetors for the 1938 production run. In exchange for that agreement, Ford was given the patent rights on the new design. When the year was up, Ford took the blueprints and went looking for a better price on carburetors. With some minor changes to the design, Holley cut the price by less than 10 cents a piece and became the sole supplier for the 94s until production came to a halt in 1957.

While the 1938 carburetors are labeled Chandler-Groves, Holley made many with the Ford script on the float bowl. Jobe points out that some later-model carburetors have a 94 cast into the bowl and that there are usually Holley R-713 or 2100 models that were sold by Holley as replacement carburetors.Although the 94s and 97s share the same three-bolt mounting pattern and look similar, there are a number of significant differences between the two designs. The fuel inlet is in the float bowl top of the 94s, rather than the side of the bowl as on the 97s. The 94s use a center-hung float, which is less likely to cause flooding or starvation in corners as the side-hung design of the 97s. Finally, the 94s used spray bars for discharging fuel in the main system, while the 97s used emulsion tubes. While there is some debate over which design is better, we've never been able to prove there is an advantage to one design over the other (see Jere Jobe's comments on this).

At this point the obvious question is, "What's the big deal with using 94s?" The main issue is the vacuum-controlled power valve. Every carburetor has some sort of enrichment system to supply more fuel when the engine requires it. Typically that's when the engine is under a heavy load, such as full throttle acceleration, passing, pulling a steep hill, and the like. In all these situations, the throttle is open and as a result the manifold vacuum drops. Holley 94s used a power valve (also called an economizer valve) that opened to supply extra fuel to the engine when the vacuum dropped to a certain point, usually 7.5 inches Hg or less (the opening point is indicated by a number stamped in the housing). The problem is that when two or more carburetors are used, the vacuum signal drops earlier and more aggressively than with a single carburetor. As a result, the power valves open prematurely, making the mixture much richer than necessary. A common mistake in this situation is to re-jet the carburetors--that results in even worse driveabilty problems. Another mistake often made is to plug the power valves, something that we don't recommend. The best approach to this problem is to stick with stock jet sizes (or very close) and use power valves that open at a lower value. In the past with dual 94s, we've used 3.5-, 4.5-, and 5.5-inch Hg valves, depending on the cam used, with excellent results.

Selecting the proper power valve can be done a number of ways. The best method is to use a portable exhaust gas analyzer to check the air/fuel ratios under real-world conditions and try different power valves until the right combination is found. Another means is to use a vacuum gauge. Drive the car and note the vacuum readings at idle, then install power valves with opening points that are in between the vacuum level at cruise and wide open. Then there's the seat-of-the-pants method. If the car stumbles and puffs black smoke when you jump on it, the power valves are opening too soon, so go to a lower-number valve. If it pings, do the opposite and try a higher number. Finally, there's the "best guess" method. Two carbs, so lets go about half of the stock value of 7.5 inches of vacuum Hg, and that puts us in the 3.5- to 4.5-inch Hg range. While swapping power valves is a simple cure to an overly rich mixture, we should point out that while contemporary Holley power valves will fit in a '94, they don't seal properly. The early carbs have a smaller sealing surface than subsequent designs, and the later power valves have a radius at the bottom of the threads that prevents a good seal. However, Charlie Price at Vintage Speed stocks a wide selection of modified power valves that fit and seal like they should. (He also has virtually every other part you might need for 94s.) After making the decision to use 94s, Willis dug through his stash of Y-block parts and called in a few favors from buddies; and soon he had a box full of 94s for next to nothing. As there were at least 17 versions of the Holley 94 produced, the first challenge was to find a matched pair. The second was to find base casting that didn't have worn-out throttle bores. He lucked out on both counts.

With a matched pair of rebuildable 94s on hand, Willis contacted Speedway Motors and ordered two rebuild kits and two extended throttle shafts. In addition, he took a guess and had Charlie Price of Vintage Speed send a couple pairs of power valves, 3.5- and 4.5-inch Hg. Once the parts were on hand, Paul went about freshening up a pair of Holley 94s. Here's how you can do it, too.

WHICH IS BETTER?
By Jere Jobe
When it comes to vintage carburetors, one of the foremost authorities around is Jere Jobe. He has been rebuilding and modifying carburetors for more years than he cares to admit. Recently we asked him a loaded question; "Which is better, a Holley 94 or a Stromberg 97?" Here's what he had to say:

"Which is better? It all depends on the application in which the carburetor will be used. Aside from the cost and availability issues, the two carburetors have some minor but noteworthy physical differences. The Holley AA-1 line of carburetors (94s) is slightly larger in their front-to-back dimension, making it difficult to get three of them on some manifolds without grinding off one of the screws. Also, the fuel inlets on the two carburetors are in somewhat different locations, which can complicate the layout of the fuel lines in some cases. Vic Edelbrock Sr. did not believe that it was a good idea to use three Type 94 carburetors on a single engine, so he designed his intake manifolds so they would accommodate three 97s nicely, but not three 94s. I agree with Vic Sr.

Older carburetors were never made with the same accuracy that the modern ones are, and it is therefore possible to get two carburetors of exactly the same l, and that look identical that have noticeably different flow rates. The Holley 94 has two 15/16-inch venture while the Stromberg 97 has two 31/32-inch venture. Since the Stromberg has larger venture, it only seems logical that they should flow more cfm. However, that is not necessarily true. If you were to carefully measure the flow characteristics of 100 of each of these types of carburetors, and average all of the data for each type together, you would find that the two designs are, for all practical purposes, equal to each other in their flow capacity.

Dyno testing demonstrates that a single Stromberg is slightly more efficient, (horsepower developed per unit of fuel consumed), between 1,000 and 2,500 rpm than are the Holley AA-1 line of carburetors. The Holley carburetors yield slightly better efficiency above 2,500 rpm. I believe this to be due to somewhat better atomization of the fuel by the spray bars verses the older Stromberg emulsion tube design at higher airflow rates. The difference only equates to +/- 1.0 to horsepower and is really insignificant in the overall picture. Change the ignition timing by a degree or two, and those differences become mute.

While there are exceptions to all rules, in general, the Stromberg 97 and the Holley 94 carburetors are just about equal on an individual-to-individual basis. However, when these carburetors are used in a multi-carburetor configuration, it's a whole different story. In order to get any multi-carb setup to perform reasonably well, all of the individual component parts within that system must be working properly. Even when all of the components are functioning properly, the entire system must be tuned to the specific combination of factors in which it will be used."

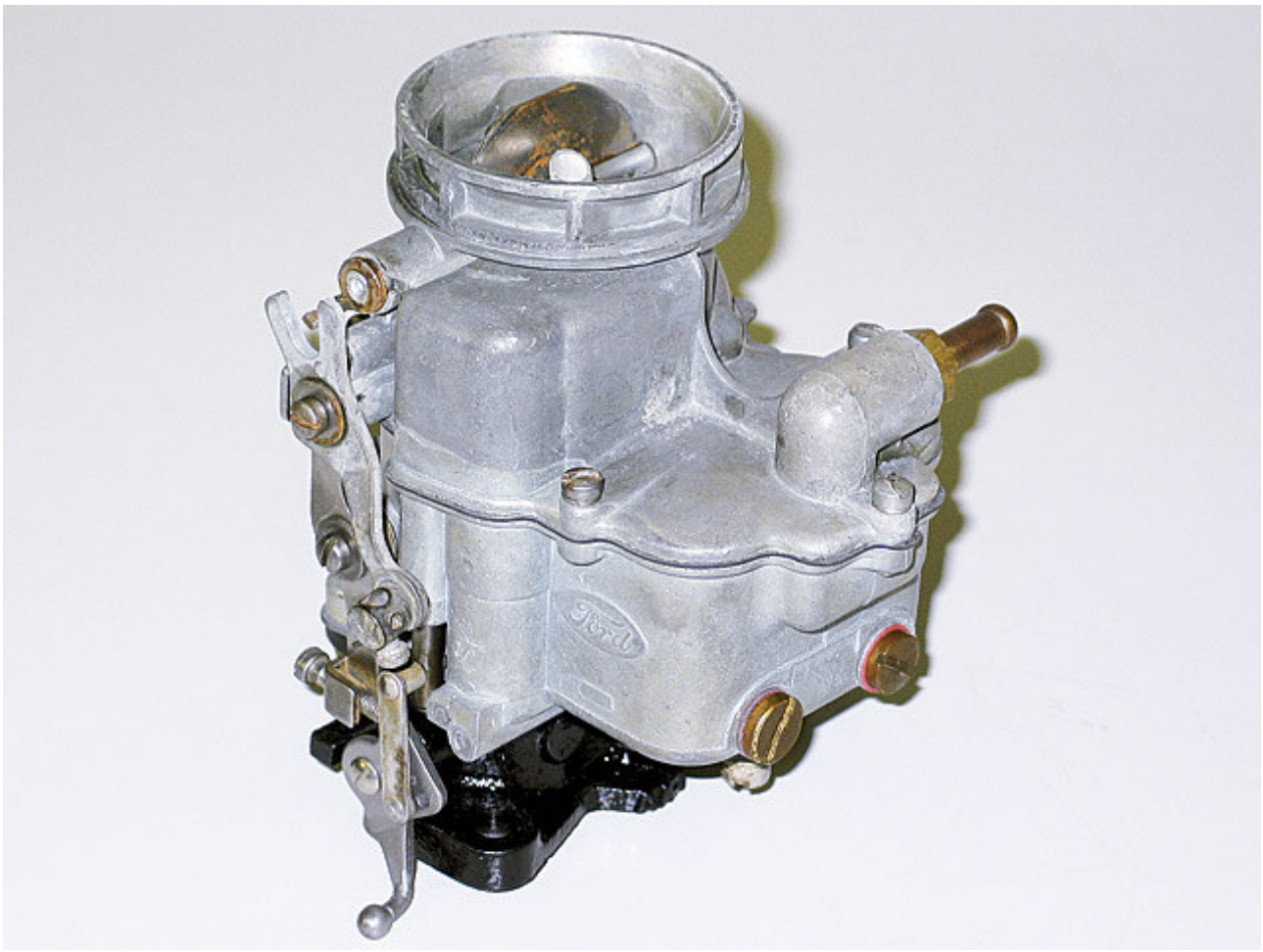
For a comprehensive, in-depth look at Stromberg and Holley carburetors, order a copy of the "Complete Flathead Ford Engine Manual" from the Hot Rod Library: (800) 513-8133. It includes a chapter on 94s and 97s by Jere Jobe, ed.

TOO MUCH?using a pair of 94s on '49-53 ford flatheads.
By Ron Ceridono
Ford used a unique distributor on the '49-53 Flatheads that relied on a vacuum diaphragm as the sole method of

advancing the ignition timing. The vacuum signal for the advance unit came from the carburetor, but that signal was unique. Rather than ported or manifold vacuum, the source used to alter the timing was venturi vacuum.

When two or more carburetors are used, the airflow is divided and as a result, airflow and vacuum are reduced. The end result is less spark advance. One of the most common mistakes in this situation is to connect the distributor to manifold vacuum. Unfortunately, that makes things worse, as now there is full advance at idle and, as soon as the throttle is opened, the timing retards.

Although some say it's possible to alter or adjust the springs in the distributor's advance mechanism to compensate for the low vacuum signal, we disagree. While the stock distributor can be made to work with the modifications mentioned, we've found performance to be marginal. If you want multiple carbs on a '49-53 Flathead, plan on changing to an aftermarket distributor while you're at it.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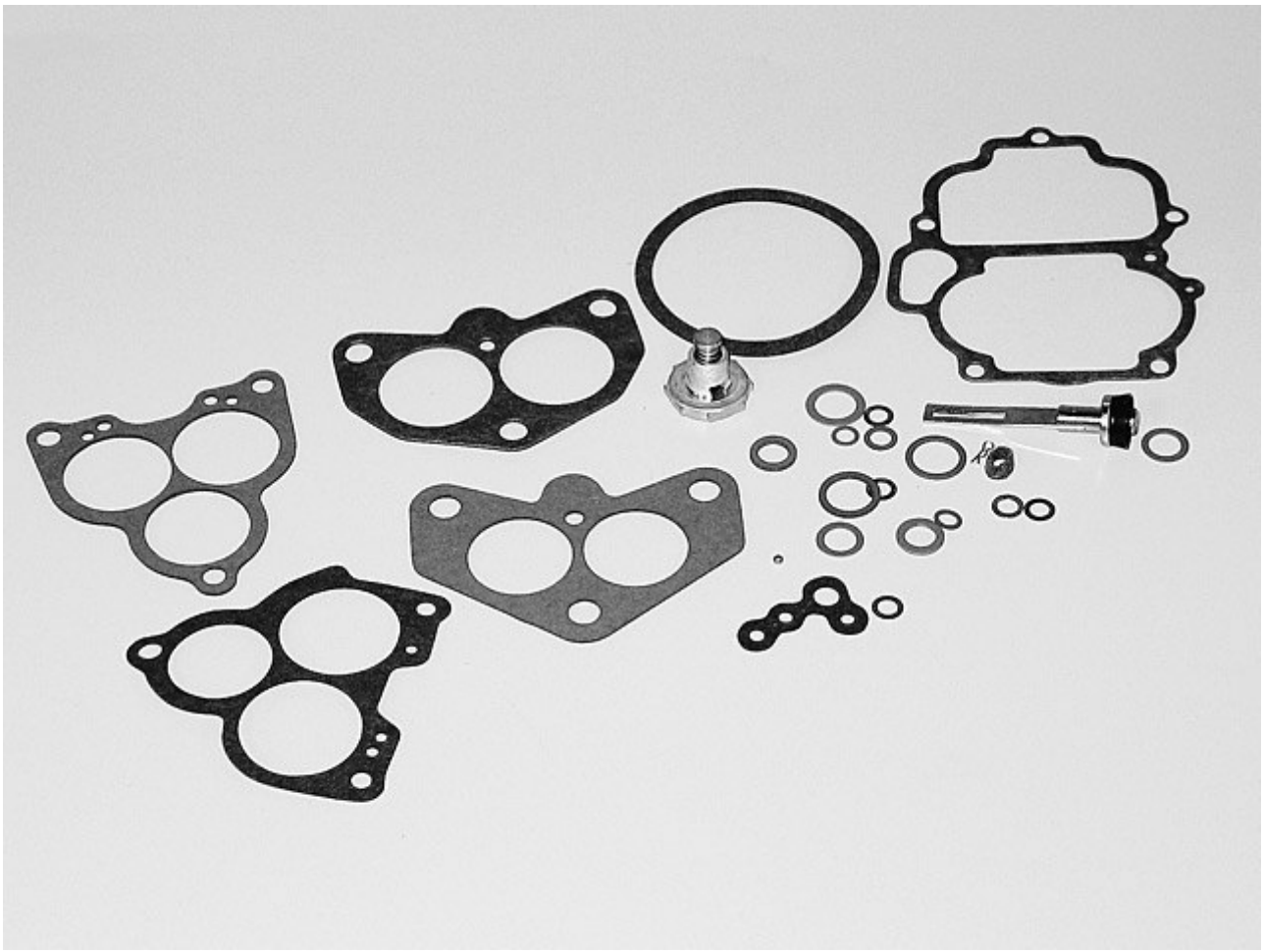

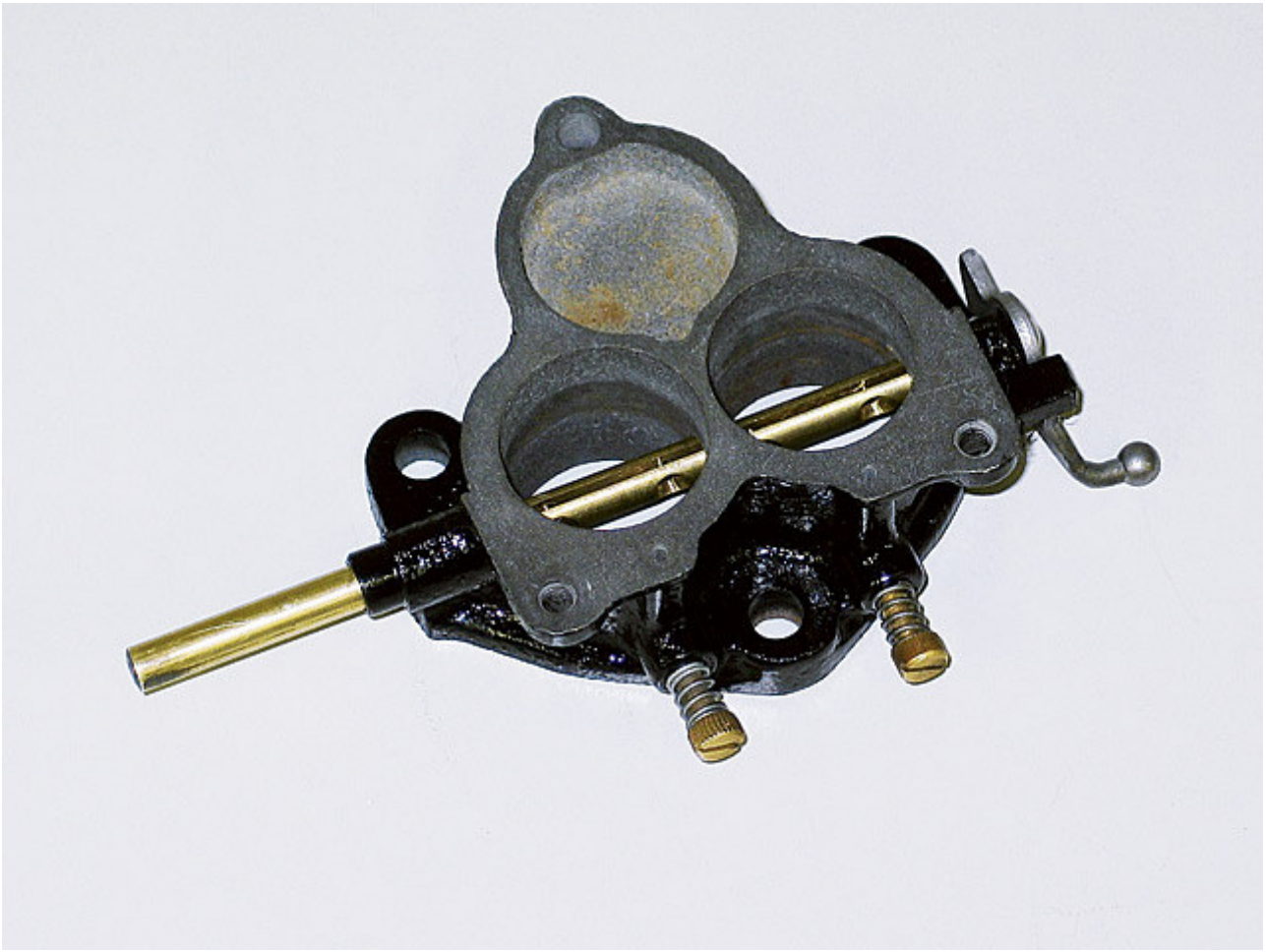

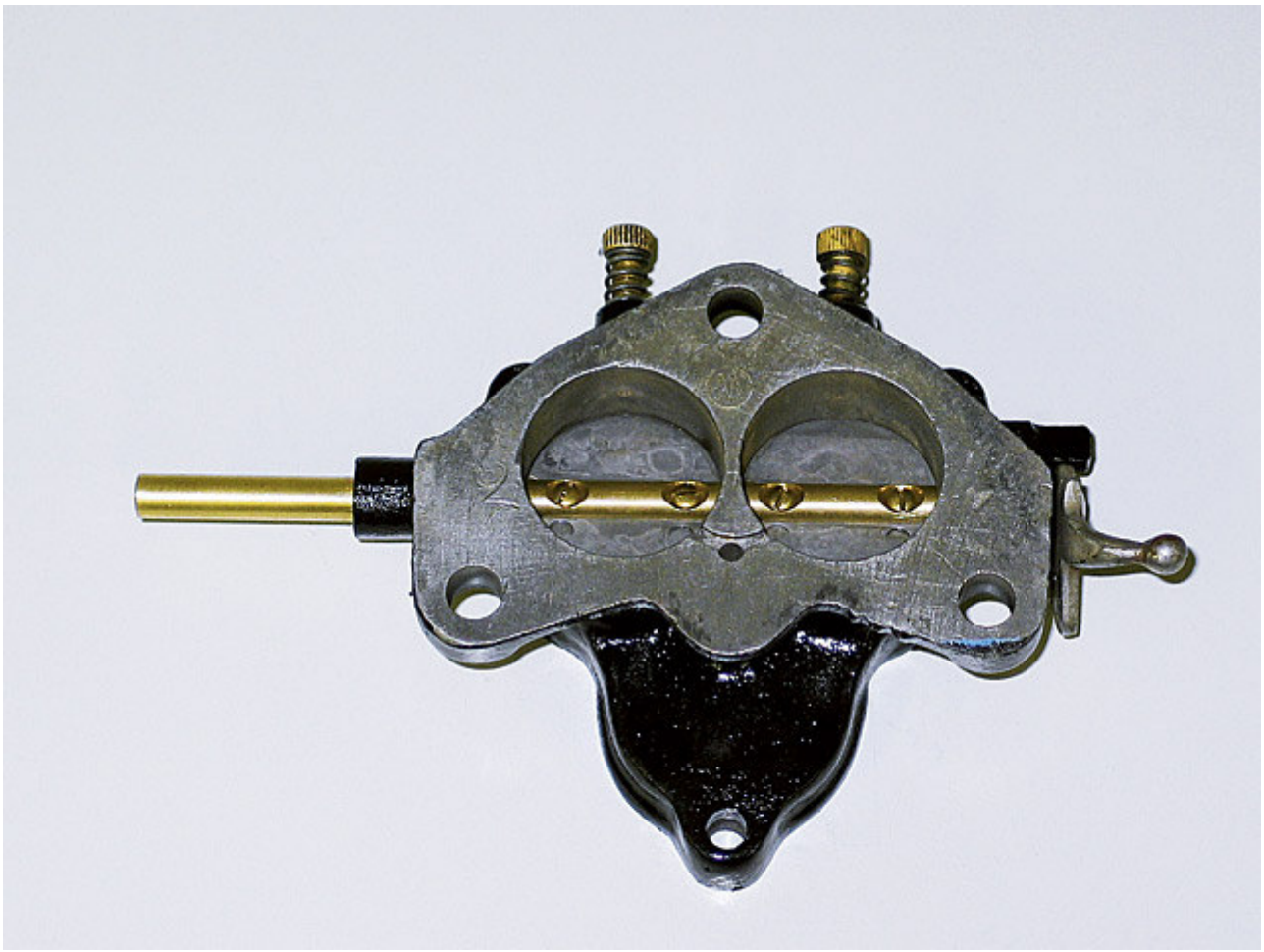

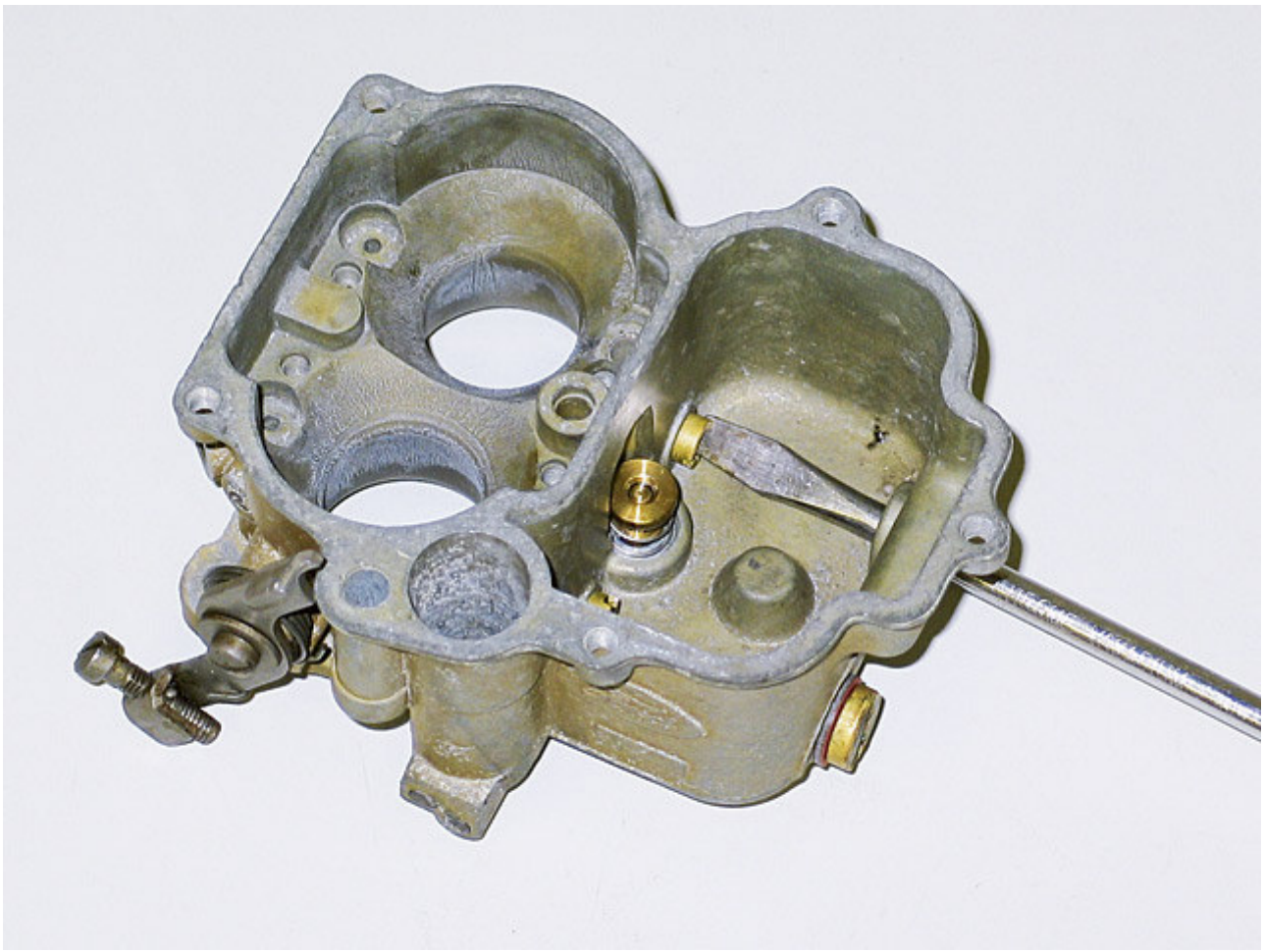

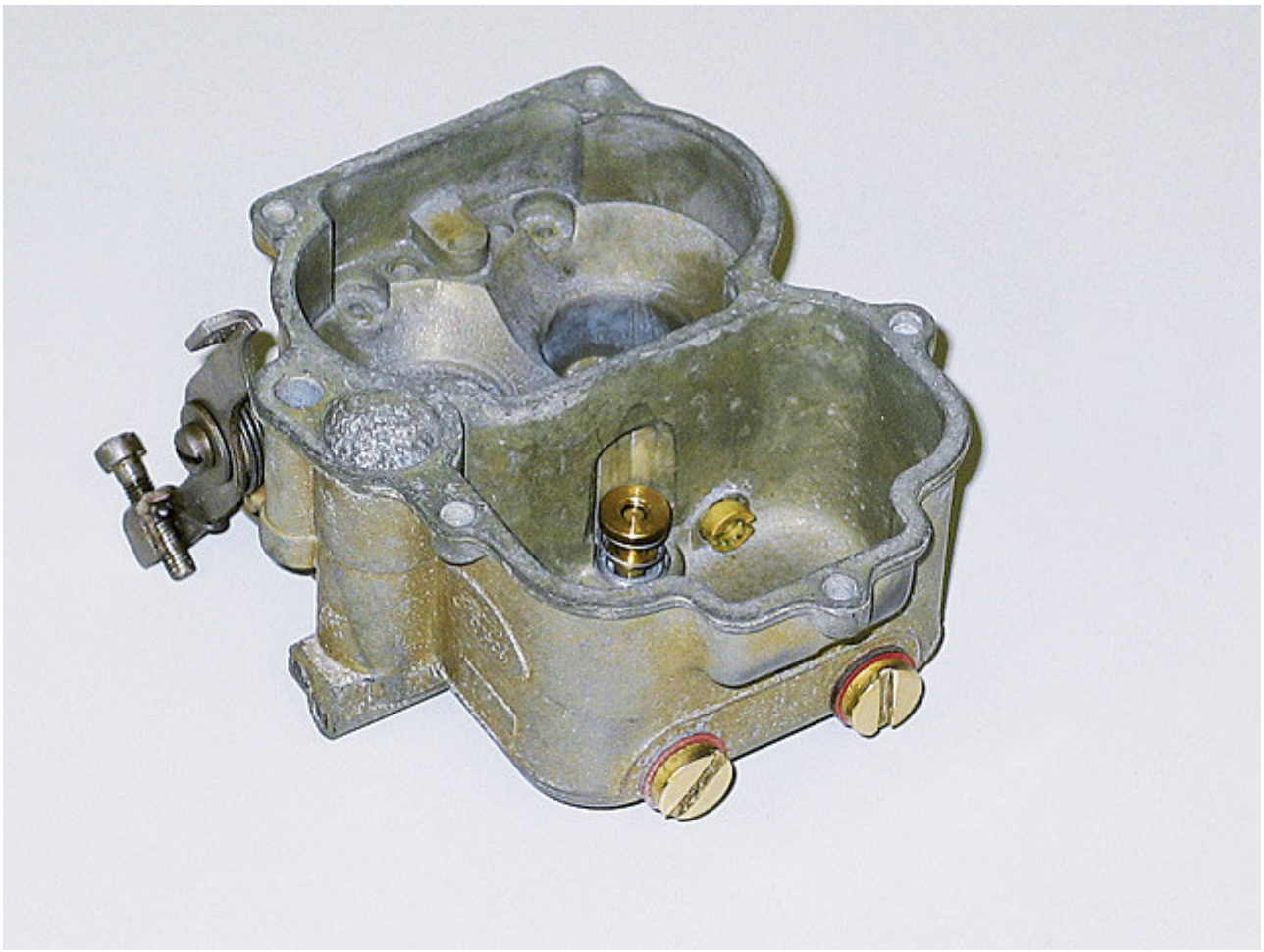

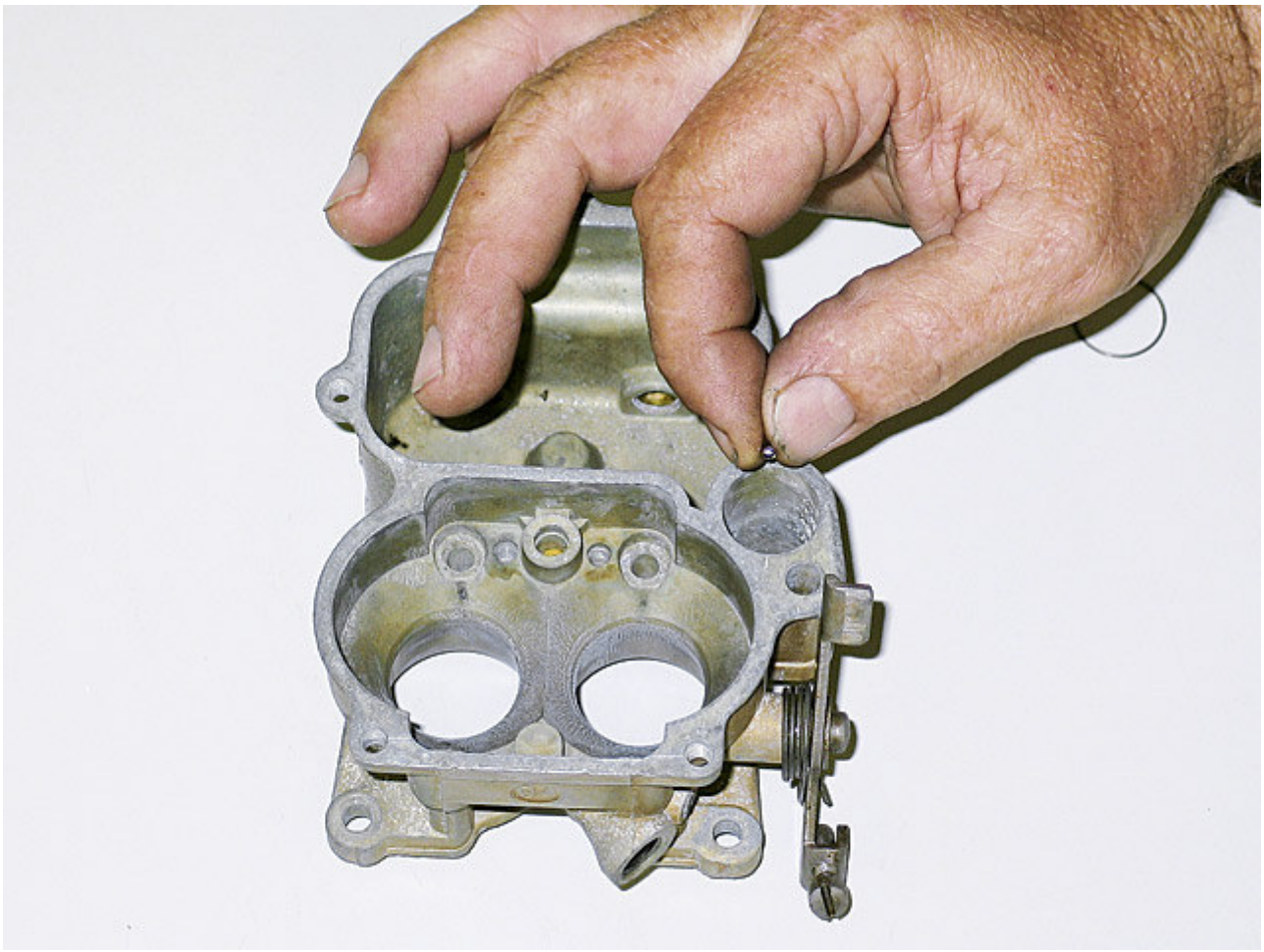

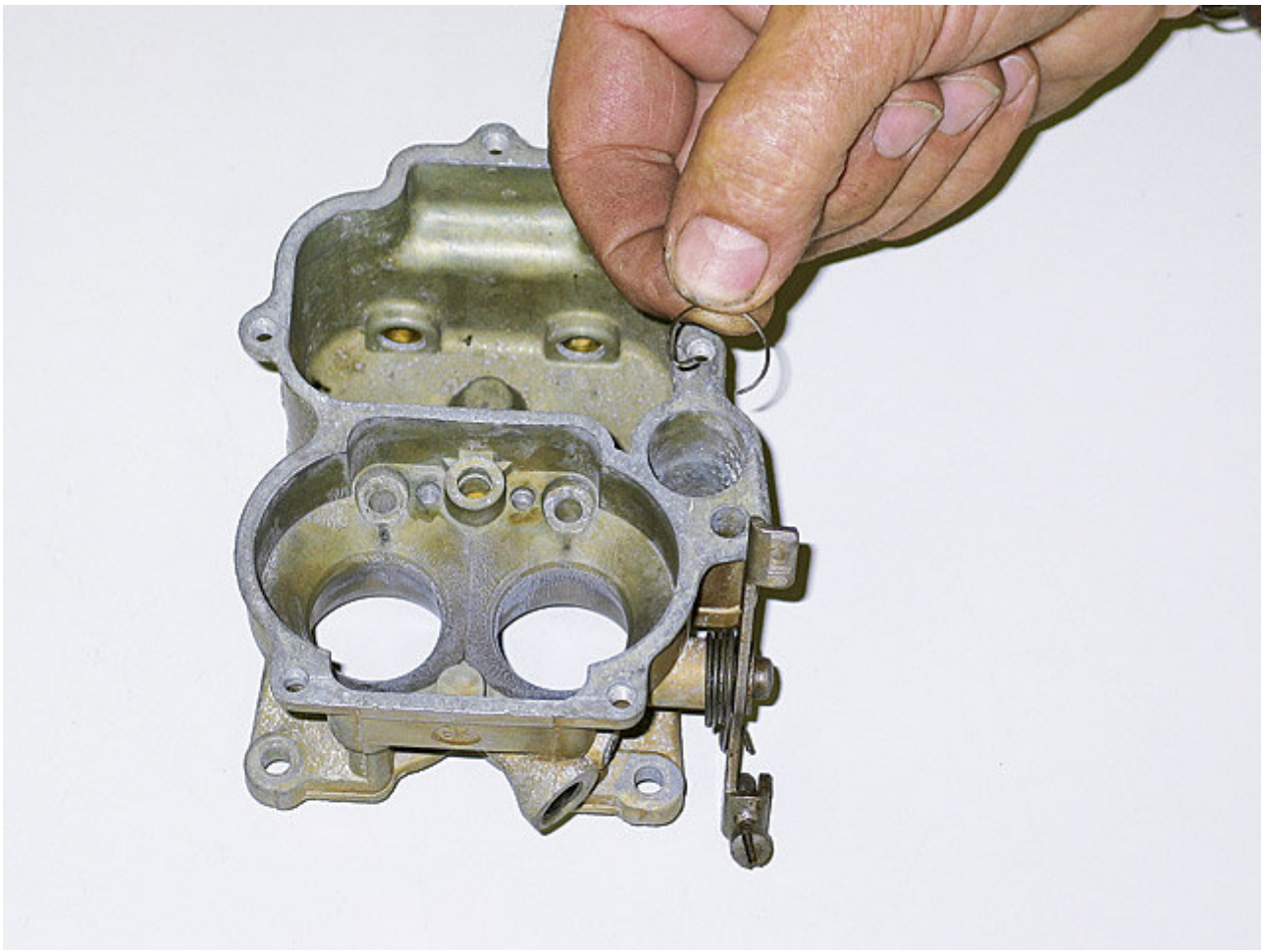

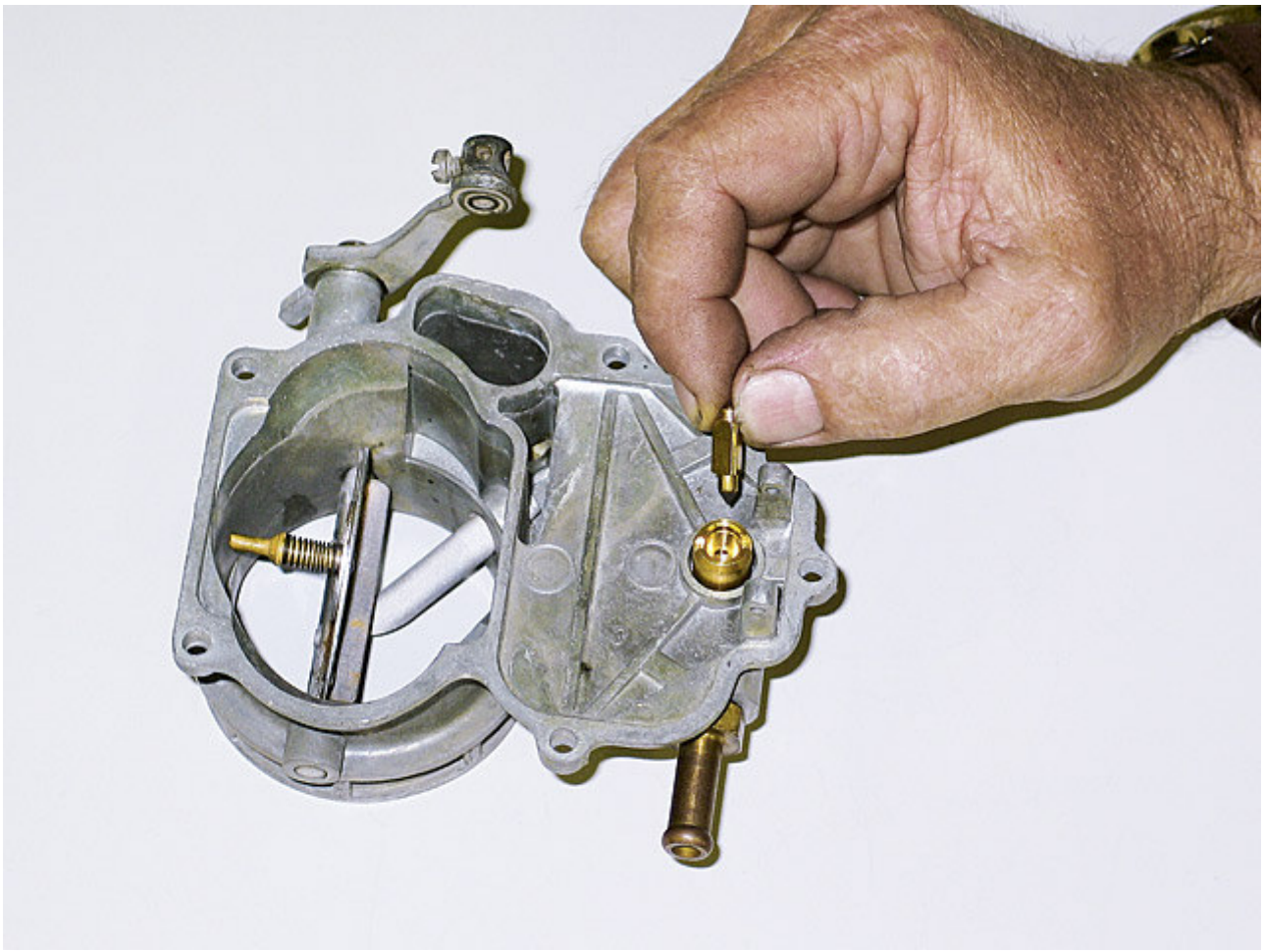

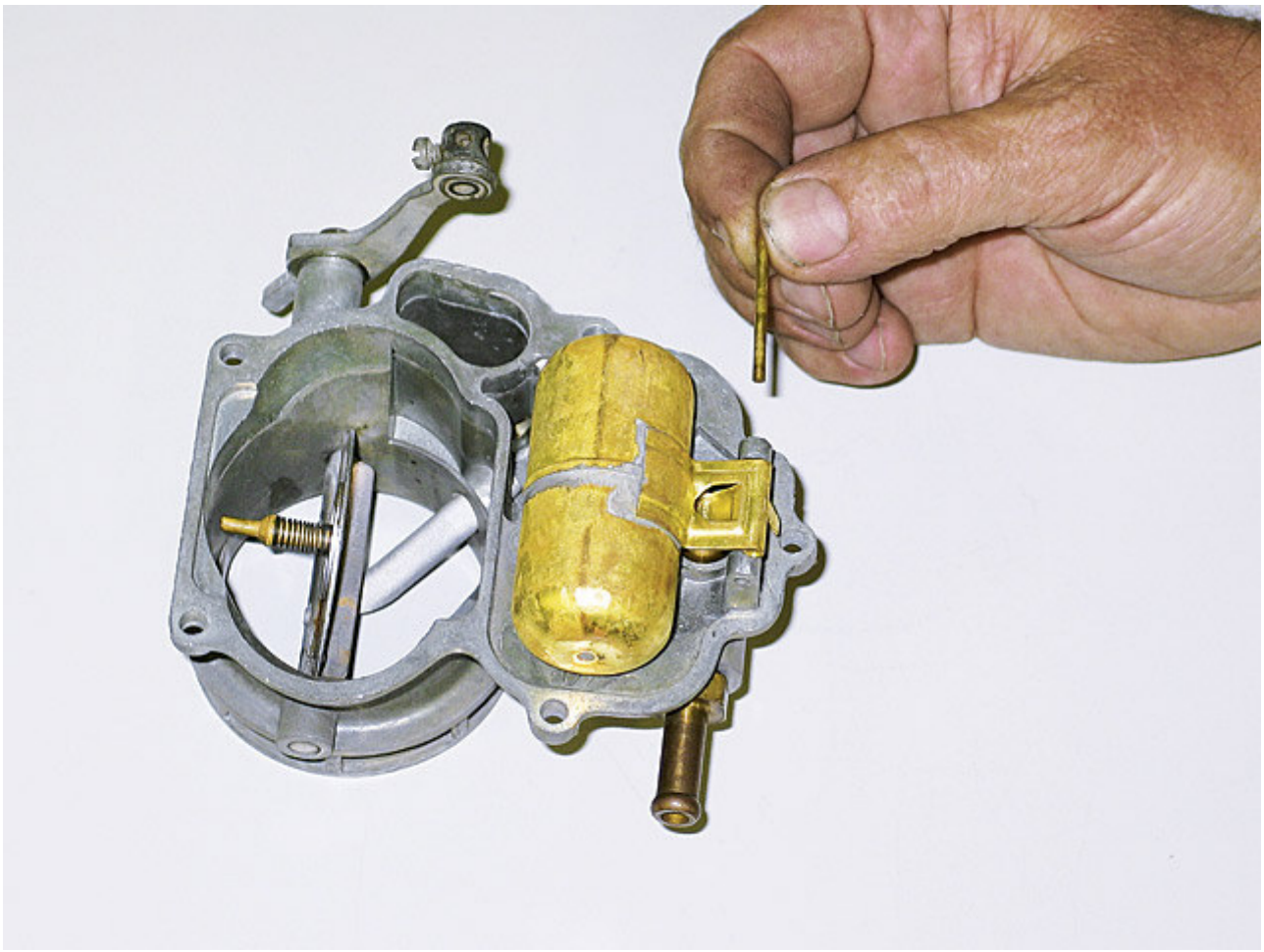

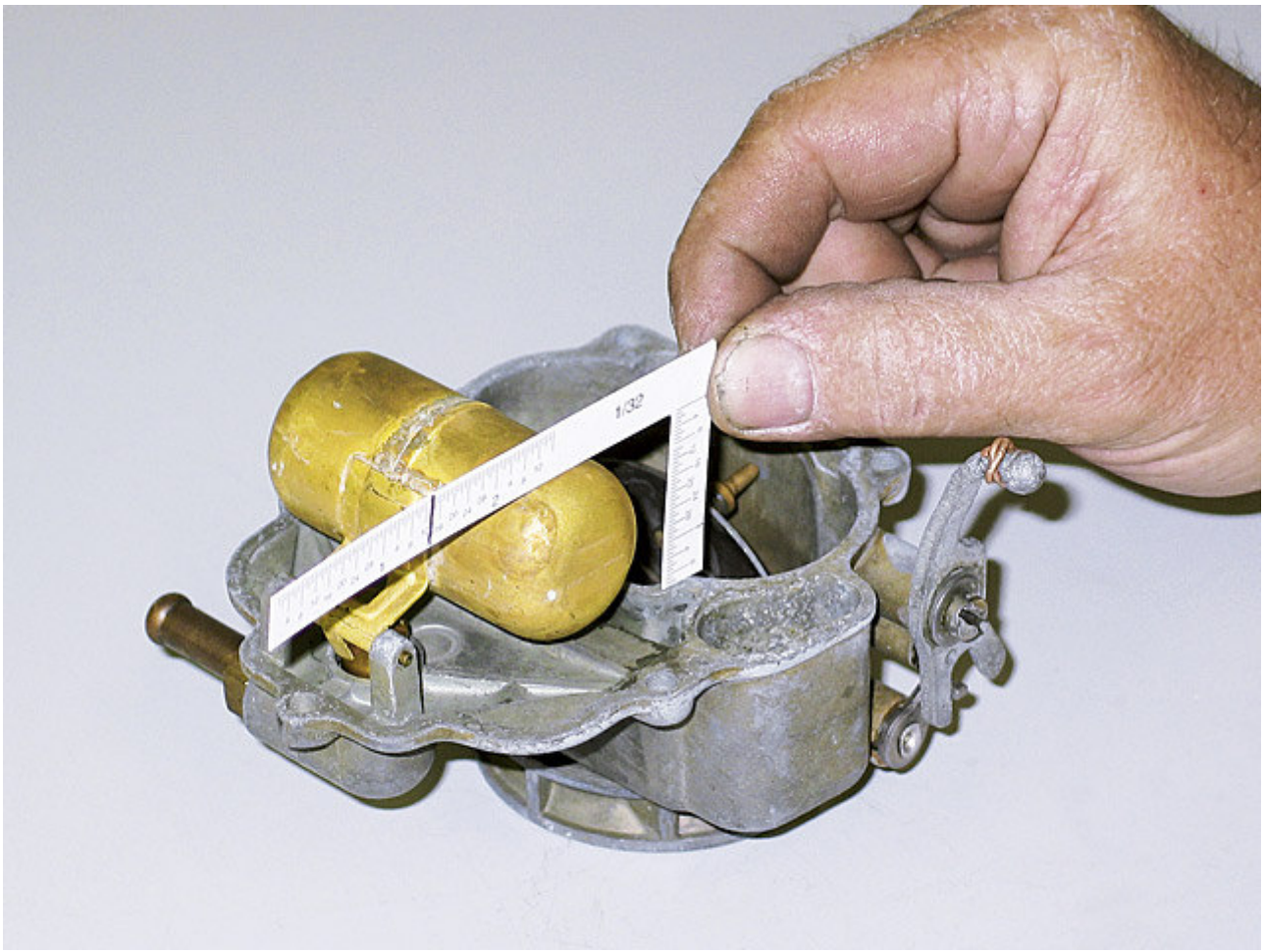
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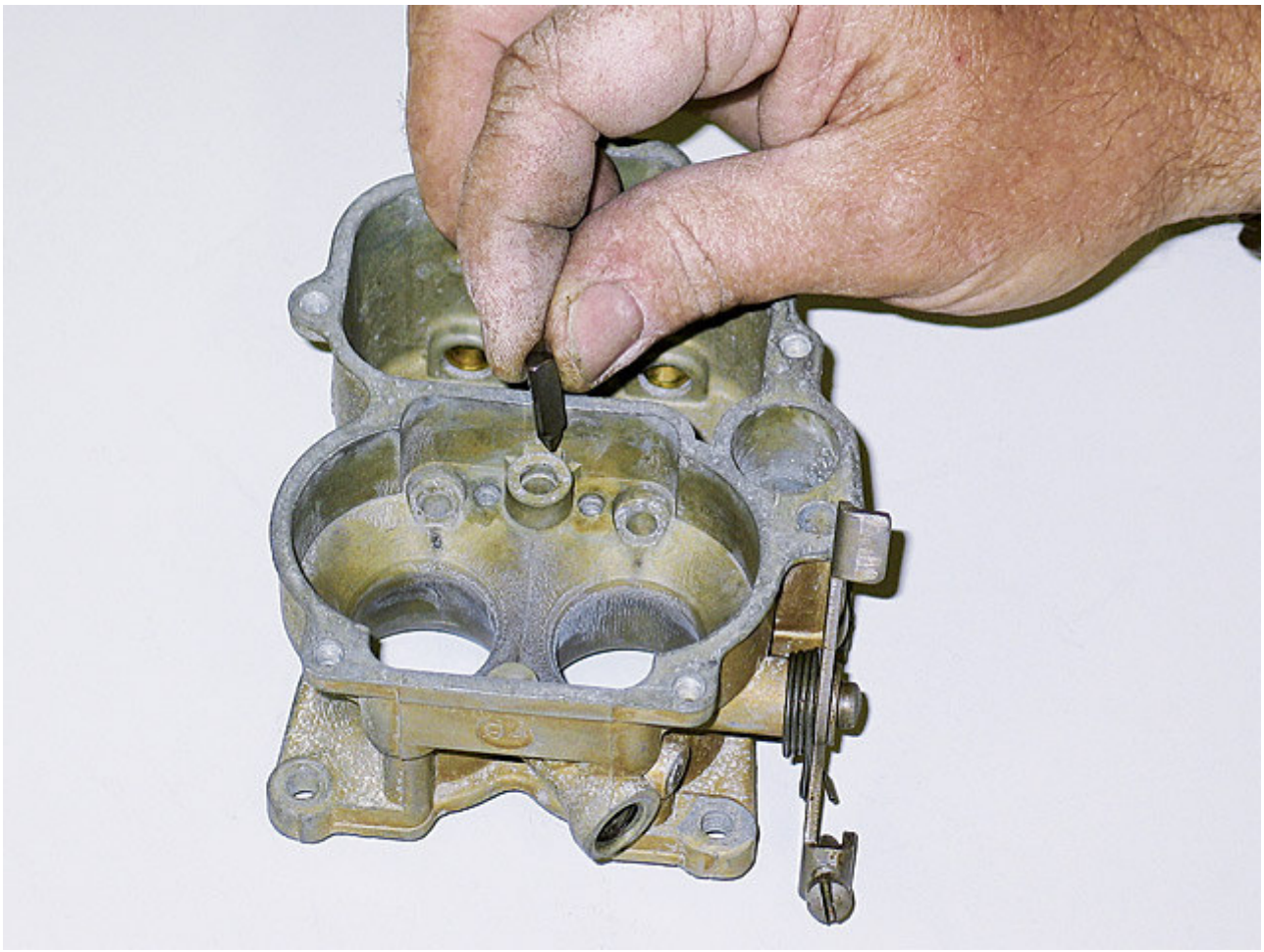
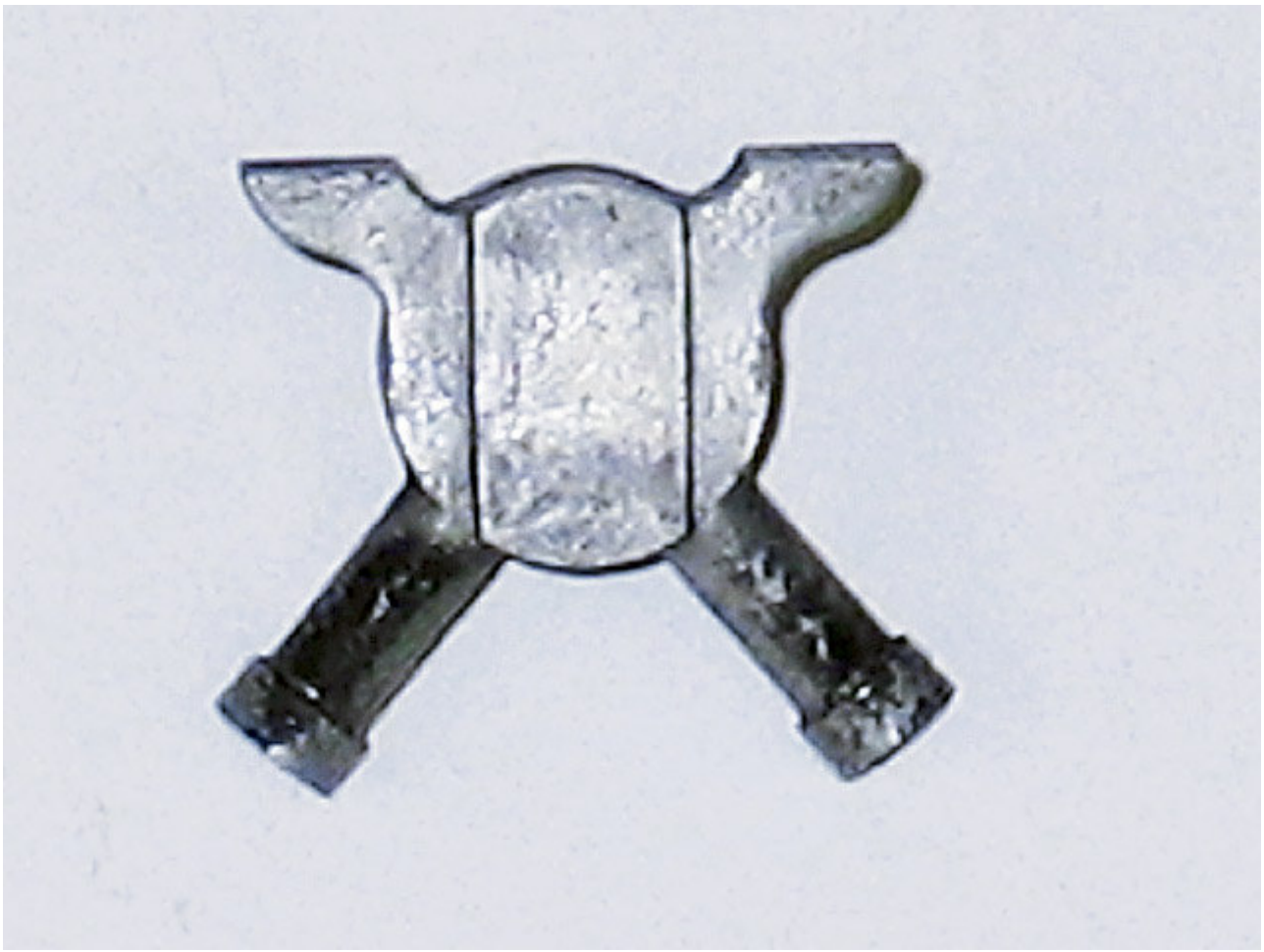
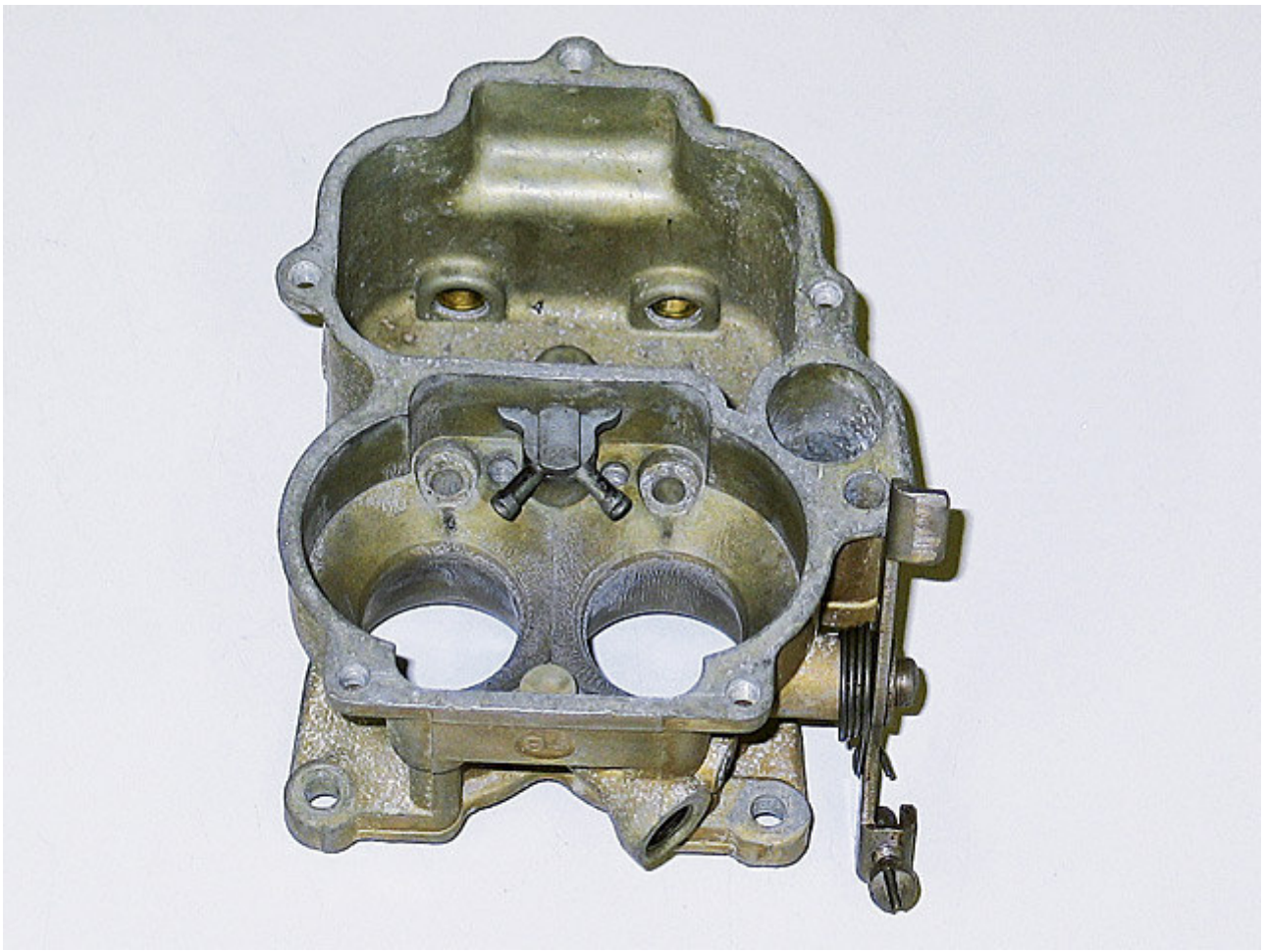
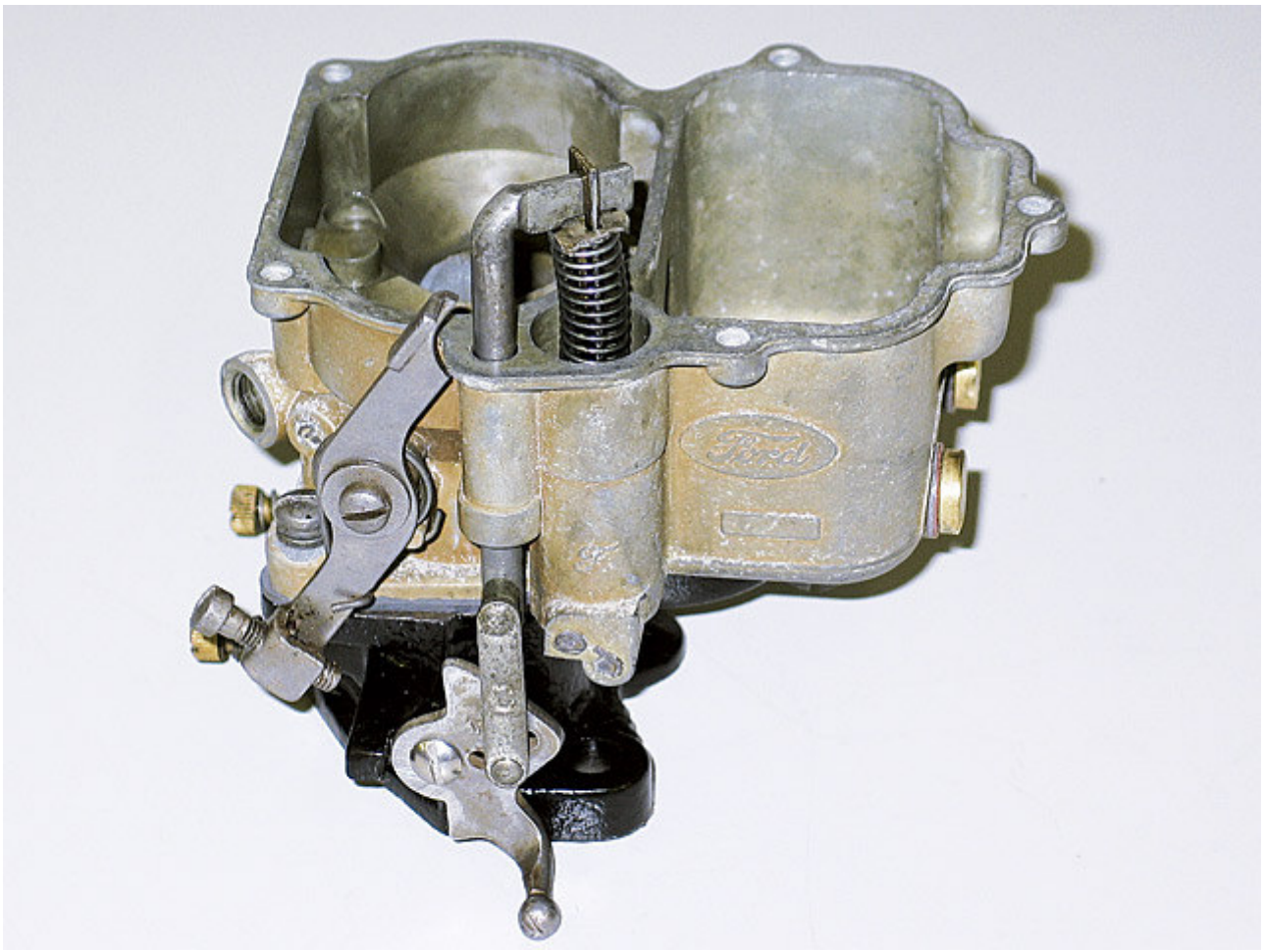


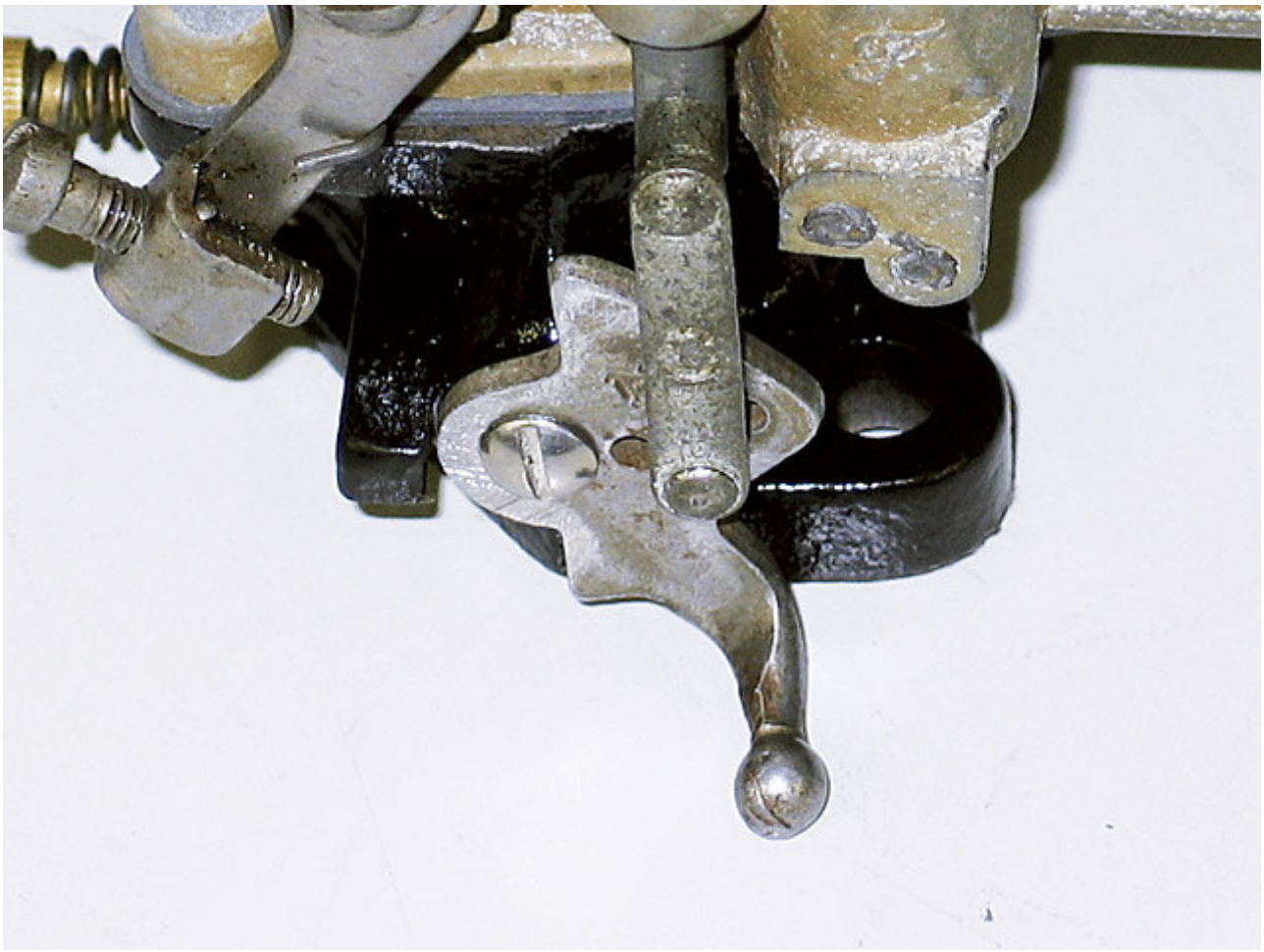




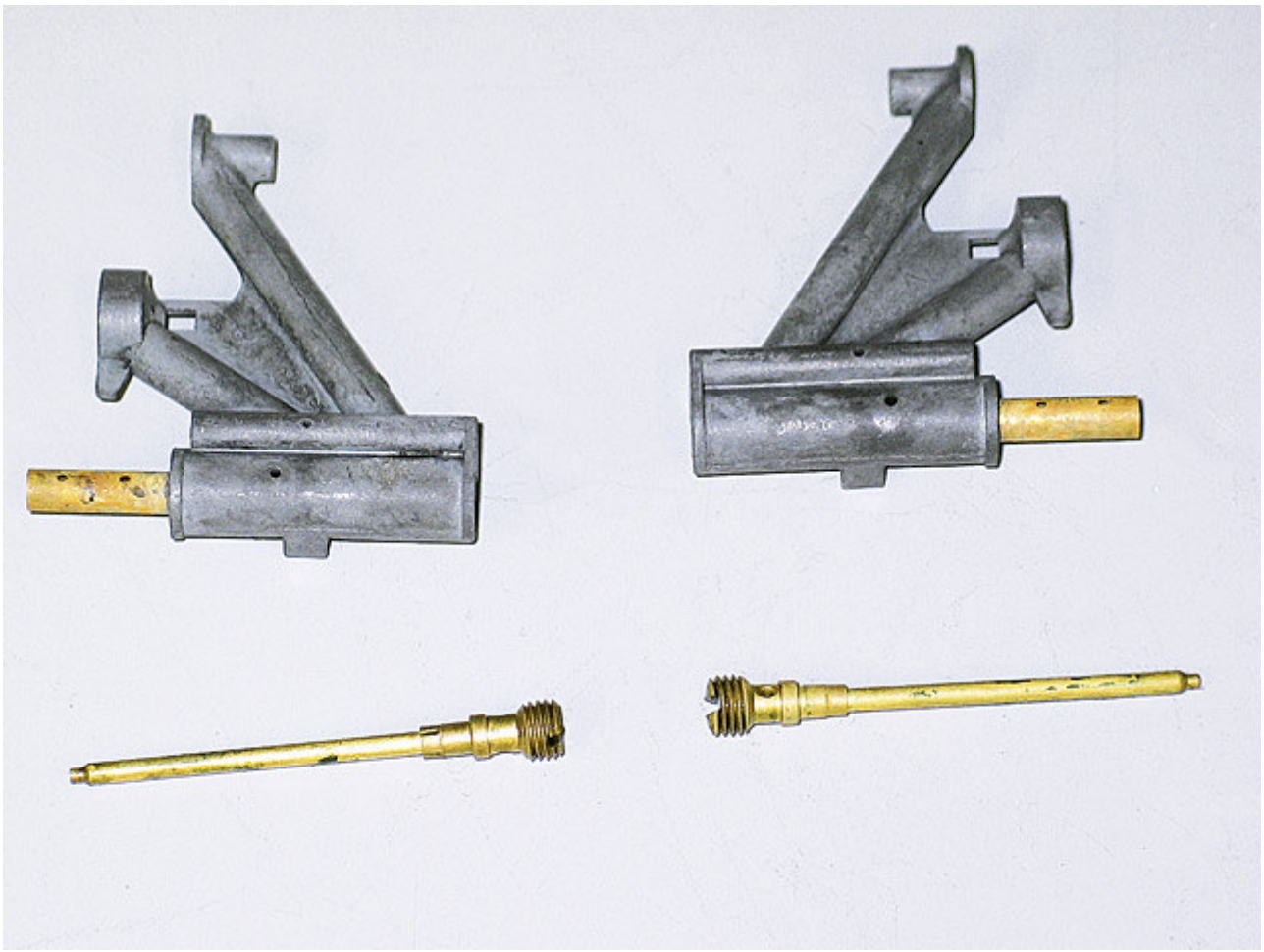
When installing the base, make sure to match the holes in the gasket with the base and the body. In some cases there will be holes in the gasket that are blocked, however, the gasket shouldn't block matching holes in the base and body.



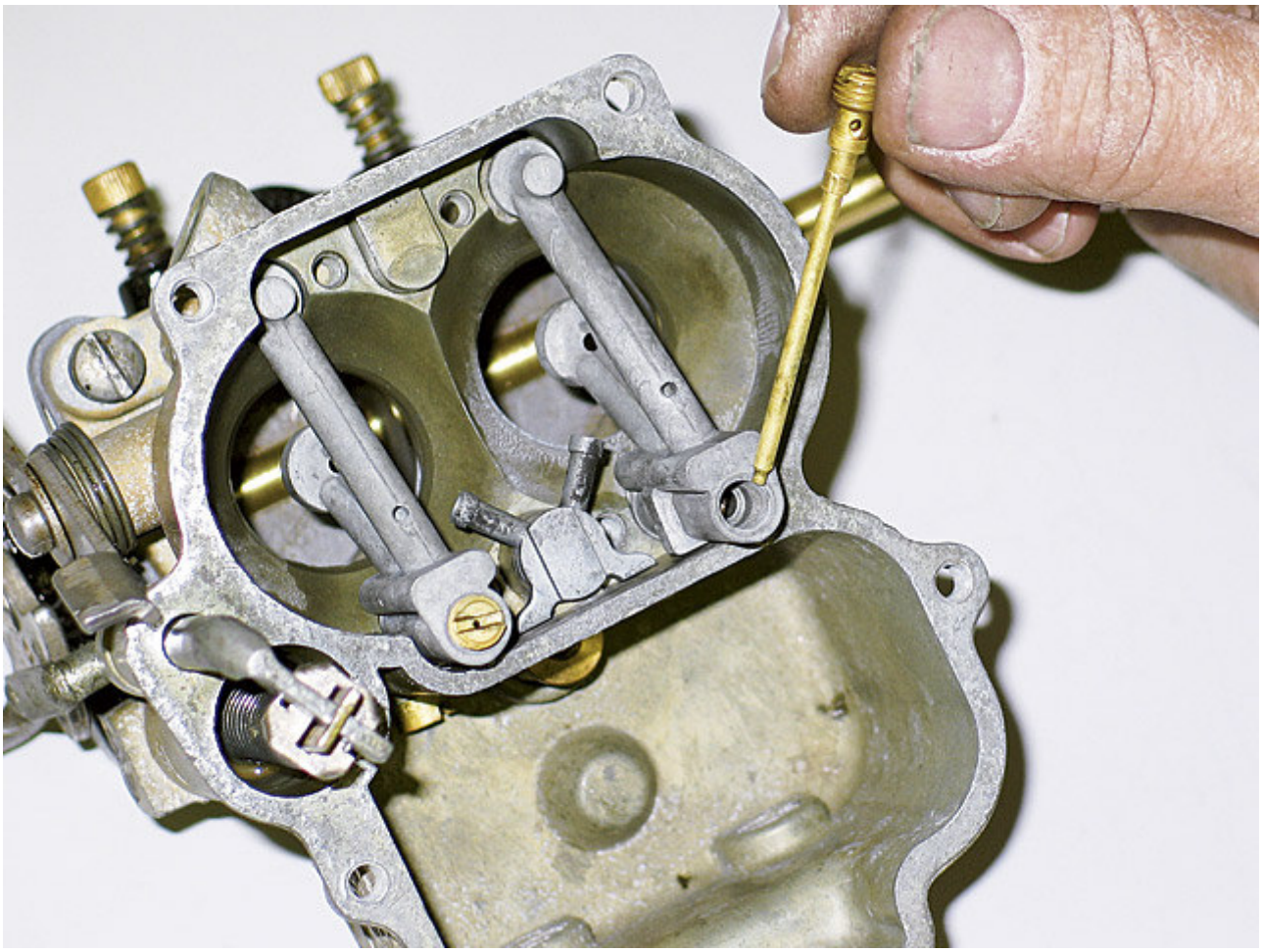
The choke lever and accelerator pump linkage are installed in the body. Note that the accelerator pump link has three holes for adjustment; we started out in the center hole.



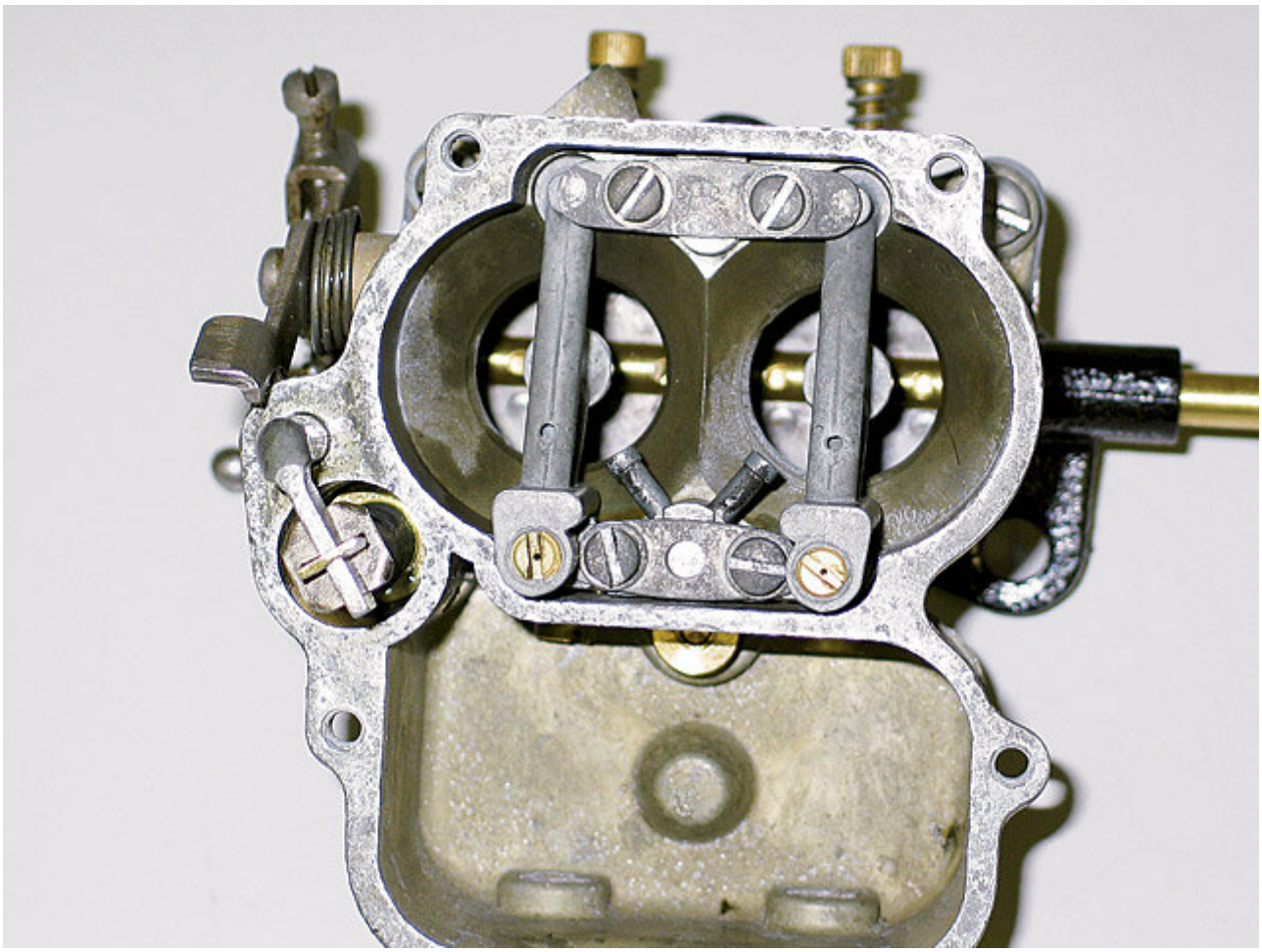
A single screw secures the throttle lever to the shaft; a drop of thread locker is a good idea. Also, check the condition of the ball on the throttle linkage.



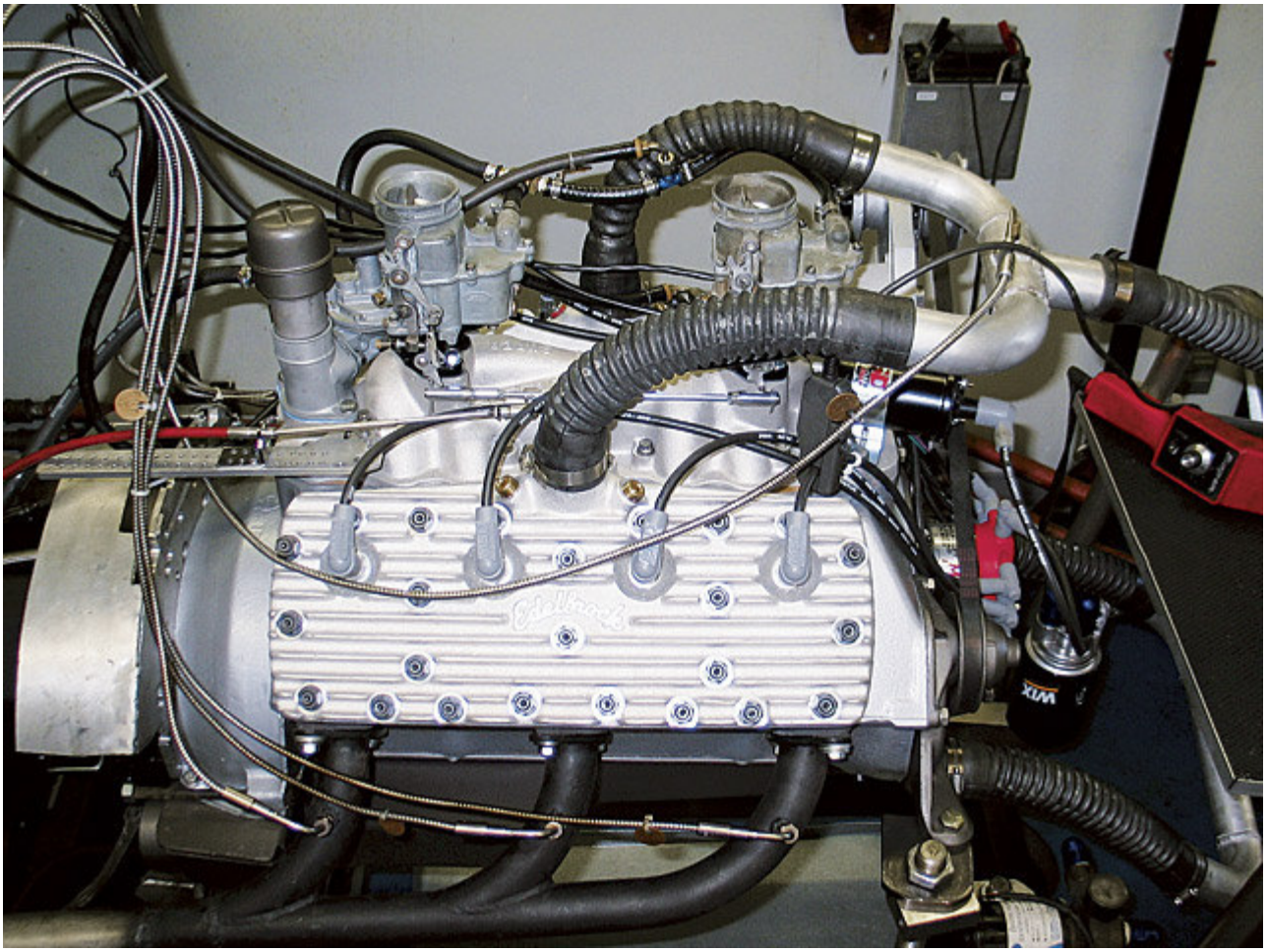
These are the spray bars (top) and idle tubes. They must be matched sets, and don't rely on the fact that they came out of the same carburetor. Parts may have been switched over the years.



The idle tubes screw in place--use a screwdriver that fits and don't get carried away making them tight.
A pair of retainer straps holds the spray bars and the accelerator pump nozzle in place. All that's left is to install the top.



Before installing the top, check the gasket surface to ensure it's flat. Sanding them on a flat surface can flatten slightly warped tops.



We ran the John Beck-built Flathead at Eric Weinrich's Dyno-Motive. The engine ran perfectly with stock .049-inch jets and 4.5-inch Hg power valves.