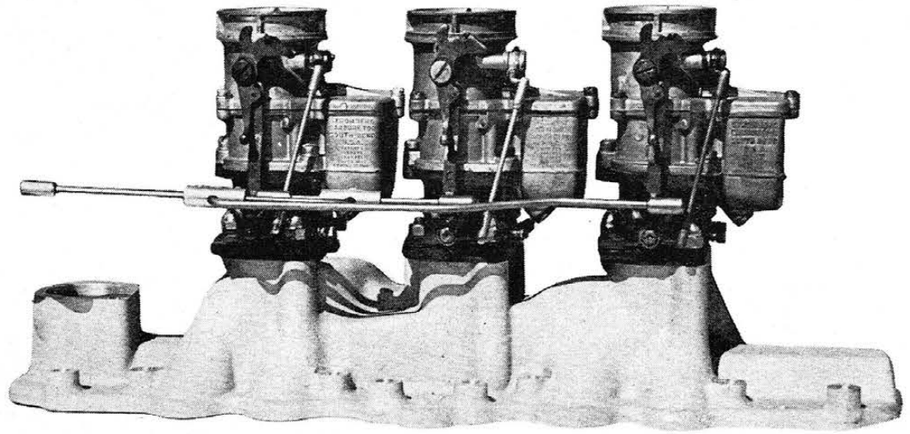
HOW TO DO IT:



CARBURETOR LINKAGE

BY BARNEY NAVARRO

HAVE YOU ever depressed the throttle of an old Ford or Mercury and gotten the feeling that it was hooked up with rubber bands? Was the throttle as hard to push on as a clutch pedal? Did it have an annoying tendency to stick open at the most crucial moments? If you had a stock machine, the chances are very slim indeed that you ever experienced these difficulties. If you had one that was equipped with dual or triple carburetion, odds are that you had these troubles.

Just because a car is equipped with multiple carburetion is no reason why the throttle should resemble a mechanical guessing game. Its action should be smooth, consistent and absolutely predictable. If throttle action is unsatisfactory, there is no pleasure in driving a car with multiple carburetion.

Many engines indicate an almost fanatical attention to mechanical details until you examine the throttle linkage. Every mechanical principle familiar to engineers is violated in one little collection of rods, couplings and springs. Analytical examination of the majority of multiple carburetion installations will rapidly expose the many faults.

The prime mistake, made on the conscientious car owner's installation, is due to a misconception. The misconception is that the left hand linkage is superior to the right hand type. In some cases the right hand type is so miserable that any left hand assembly would be superior, but at this point we wish to dwell more on principle than product so various right hand types will be discussed later.

Our opening paragraph called attention to only two makes of cars, Fords and Mercurys. This was not done because they are the only ones that have throttle linkage faults, but because their carburetors are more often employed than any others.

Pre-1949 Ford and Mercury carburetors are the only common carburetors that have double ended throttle shafts so they are the only ones plagued by the eccentricities of left hand linkage. These cars were equipped with hand throttles that operated from the left end of the throttle shafts. When used for this purpose, no difficulty was experienced, but when used to connect 2 or 3 carburetors together, a mechanical nightmare, that shouldn't happen to any car, took place.

Originally the carburetors were designed to be actuated from the right side by the foot throttle. Because of this the acceleration pump linkage is also on the right hand side. Such a practice is not coincidental but has a very definite purpose. Considerable force is required to operate the acceleration pump, much more than is required to open the butterflies. The throttle shaft is designed ridged enough to perform the task of opening the butterflies but beyond that point it will twist like a torsion bar. If left hand throttle linkage is employed on a 3 carburetor manifold, the throttle shaft of the rear carburetor must transmit all of the torque to open the throttles and depress the acceleration pumps of the two front carburetors. Considerable lag and bind is thusly experienced when the foot throttle is rapidly depressed.

The difficulty experienced while accelerating may not be noticed by a heavy footed driver who pushes the accelerator pedal to the floor each time he starts up, but letting the throttle back to an idle position will produce results that will frustrate the world's most uncritical driver. Each time a driver's foot is removed from the accelerator pedal, the engine will idle at a different speed. If a reasonably slow idle is attempted, the engine will die after every other stop.

When idling, an engine equipped with 2 or 3 carburetors uses throttle openings that are ½ or ⅓ of that used with one carburetor. Because of this, the idle position of the butterflies must be very precise. Precision in a left hand linkage is difficult because only one throttle stop is used. The throttle shafts of all of the carburetors must depend on the throttle stop of the rear carburetor for their idle position. When one considers the great flexibility of the 3 throttle shafts on a triple manifold, it is easy to see why the idle is inconsistent. A factor that contributes greatly to this difficulty is the tightness of the butterflies in the throttle bodies. Being that the butterflies must close much farther to maintain an idle with 2 or 3 carburetors, they have a tendency to fit the throttle bodies too closely when closed that far. When the accelerator pedal is allowed to snap back, inertia causes some of the butterflies, that aren't operating with their own throttle stops, to over-travel slightly and get stuck in the throttle body. The ones that stick close too far; the engine dies.

All of the foregoing problems may seem insurmountable after our gloomy presentation of facts, but be assured there is a solution. We previously stated that the carburetors were designed to be actuated from the right hand side. Therein lies the answer. Use linkage that connects the stock right hand throttle arms together and you'll be on the right track. You'll eliminate all throttle shaft torsion and a positive throttle stop will be available for each carburetor. Conversion to right hand linkage is actually only a good beginning—a sort of foundation to build on. The proper type of linkage and spring placement is of equal importance.

In the choice of linkage we again encounter the misconception that the adjustable aircraft type ball socket joints have some superior virtue. This could be quite true if the ball ends of the Ford carburetors were perfectly round spheres. None of them are round, so the adjustable ball sockets can't be adjusted tightly enough to eliminate play without creating a bind. The alternative to the expensive adjustable ball sockets is the cheap spring loaded type similar to the original Ford part. Being spring loaded, the ball ends of the throttle arms can actually be oval in shape and still operate without play.

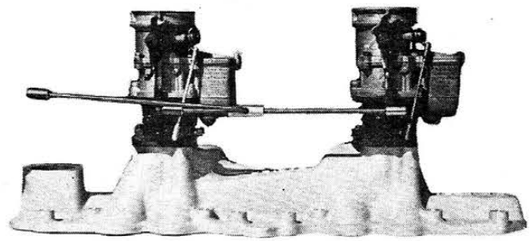
A strong criticism of the spring loaded type is heard every time we suggest them, but this is usually due to improper placement of extra return springs. If the extra return spring is placed on the throttle arm of the forward carburetor a great deal of trouble will be experienced. This will cause the springs of the spring loaded ball socket joints to give because their effect will be cancelled by the return spring. An irritating delayed action will result from this practice. The proper location for an extra return spring is on the actuating arm which is mounted on the firewall of the car. Correctly using a return spring will cause the carburetors to close without producing the resistance to opening at the carburetors.

One of the greatest objections to right hand linkage stems from the practice of using a ball, fastened to the coupling that joins the throttle rods together, to connect a ball socket-ed throttle rod to the actuating lever on the firewall. By using a ball in this manner, considerable lost motion is experienced when the accelerator pedal is depressed or released. The lost motion is caused by the fact that force applied to the connecting throttle rods is not applied at the center line. The ball is approximately ½ inch off the center line so it rocks up and down before the throttles move. The only arrangement that will eliminate this difficulty is to apply the force directly on the center line. Instead of a ball being mounted on the coupling to connect the actuating rod, the actuating rod should have a right angle bend and fit through a hole in the center of the coupling. Pushing and pulling on the throttle linkage cannot produce a rocking action because the force is applied on the center line and the small angle between the actuating rod and the connecting rods produces a triangle effect to further assure proper action.

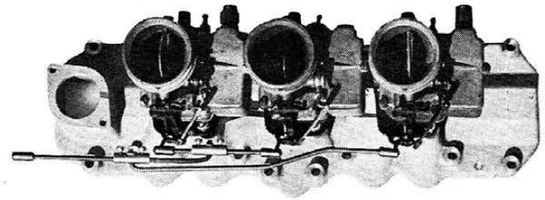
A factor that receives a great deal of neglect and contributes greatly to the lack of success of right hand linkage, is the condition of the carburetor throttle arms. Unless the relationship between the ball positions and the throttle shafts of all of the carburetors is exactly the same, it is impossible to obtain satisfactory performance from a right hand linkage system. Even brand new carburetors must be checked for similarity of throttle arms because rough handling before leaving the factory often causes them to get bent. It is essential that good mechanical reasoning be applied when checking these points.

It is important, with left *or* right hand linkage, that actuating forces be transmitted equally between carburetors, with a minimum of alien stress introduced to work a hardship on the carburetors themselves.

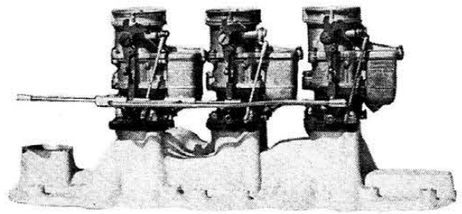
There are good linkage systems, both right and left. It is not the purpose of this article to condemn any one type of set-up, but rather to point out the good and not-so-good features of several kinds of linkage systems.



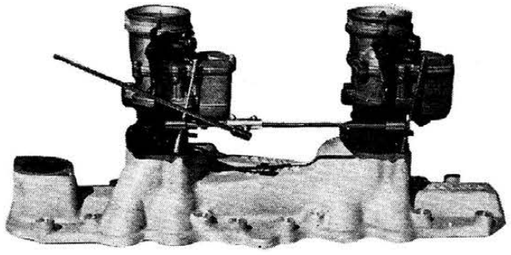
Mock set-up of carburetors on manifold is to illustrate types of carburetor linkage. Here, dual set-up is activated by shaft extension which pivots in connecting rod hole, on center line, eliminating torque. This is a good system



With a triple carburetor set-up, linkage problem is more difficult. Top view graphically shows a spring ball type of linkage which is good. Note adjustable linkage arms



Side view of same system. Linkage is designed to keep thrust motion in one plane, eliminate hardship on carbs which would be present if arms did not work as a "team"



This linkage, again with duals, would be better if the actuating arm pivoted in connecting rod, rather than as illustrated—off center. Here, connecting rod will rotate, giving undesirable twist action (torque) and side thrust

This is the same set-up as above. The actuating arm, under tension, twists connecting arm for wasted motion. Compare ball socket locations in these two photographs