

HEADERS

AMERICA'S MOST MISUNDERSTOOD SPEED EQUIPMENT

by Ivan T. Galanoy

WHEN one wide-eyed, youngish enthusiast recently wandered into a Midwestern speed shop and blandly asked for "Some eight to one headers please" (he actually wanted a pair of high compression cylinder heads), it just about summed up the misunderstanding, the confusion, the rough estimates, the guesswork, the pro and con, the snake oil ballyhoo and the vast amount of misinformation which has been circulated—and accepted—about those aluminum-painted swoops of fabricated steel known to the trade as "exhaust collectors" and to the enthusiasts as "headers."

Within a period of three months late last year, one automotive magazine reported that, to all intents and purposes, headers were worthless, an aircraft manufacturer asked the government for an increased contract for the construction of a new type of aircraft header, a trucking company spokesman indicated that the installation of headers had cut truck traveling time by 20 per cent, a Detroit engineer mentioned that headers would rapidly become "optional" equipment on American stock cars, a small town judge made a newspaper statement attacking "hot rod" exhaust systems and a doctor asked his garage to install outside headers on his trim import, "because they look fast."

For everyone who was interested in his automobile and its performance, headers and their addenda, pipes, straight-through mufflers, had suddenly come to the fore, had suddenly, (if you listened to and believed one group), offered amazing power increases at a minor cost. If you listened to the other group, you would have found headers, duals, straight-throughs attacked as worthless, expensive, fuel-consuming and ugly.

Standing bright and clear above the innuendo of both sides, of the statement and the countercharge, was the unalterable fact that all high performance cars, the rods, sprint cars, track jobs, and most of the screaming, high performance imported bombs contain headers as a built-in, important part of the exhaust system.

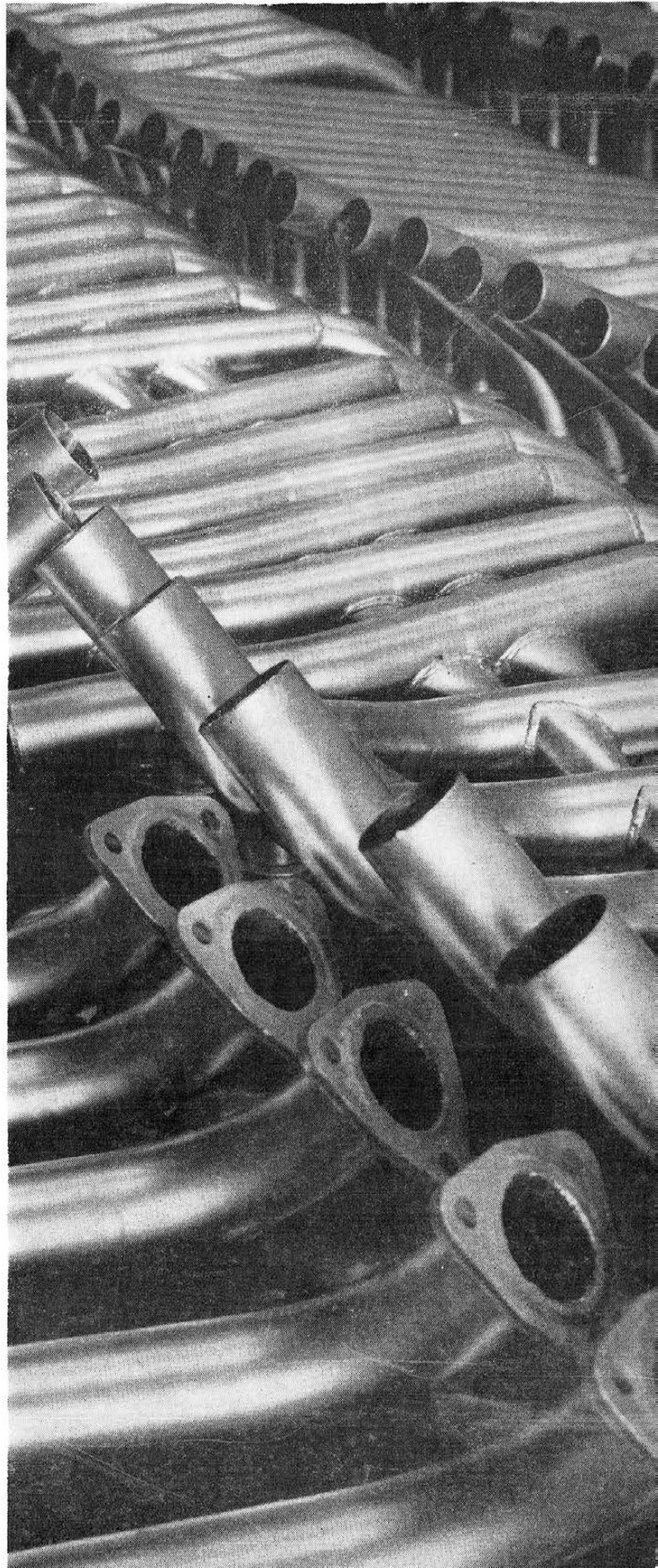
Also verified is the fact that there are close to one million headers in use today, in use on stock or close-to-stock American cars right now. The manufacturers of headers, duals, straight-throughs indicate that sales are up, that the factories turning out this special exhaust equipment are busier than they've ever been before and that there has been a complete reverse in customer appeal . . . with over 65 per cent of their product going on very late or brand new stock automobiles.

Of late, also, enthusiast conversation about torque, wheel horsepower and all-around performance has picked up the new "balanced" exhaust systems as a theoretical method to more horses for less dollars.

To take a good inside look at all of this speculation about some 18-gauge tubing and to wipe all of the hogwash away from this subject for once and for all, ten days of tests and trials were set up with an engine currently considered one of the best American designs, the new 150 hp Red Ram Dodge V-8.

The automobile, however, was no ordinary Dodge. It was the light blue four door sedan which, with a convertible, shared honors in the capture of 196 AAA stock car records on the salt at Bonneville early last fall.

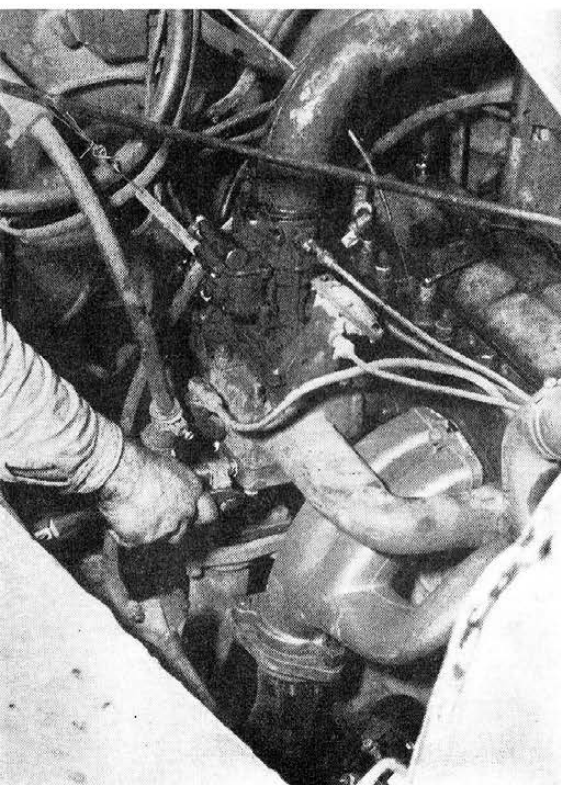
The idea behind the tests was to check claims and counter-claims, toss in some speculation, use a few mathematical formulas and a bit of rumor, add them all up . . . and then





After initial test and preliminary to the final one, stock exhaust (right) was replaced with improved system (left)

Unobstructed view of header installation is impossible on V-8. Here an in-line six gets the complete header treatment



look at the electric instruments to see if fact resembled fancy in any way. Testers were not interested in acceleration figures or top speed figures for two reasons: the human element at the controls, and the basic plan behind the research, to find out what headers can do and if they're practical for stock cars and everyday drivers.

The researchers then questioned speed shop owners handling all equipment, garage mechanics, drivers, rodders, enthusiasts of all types to gather opinions on the "balanced" exhaust systems (headers, pipes, mufflers), manufactured by six different organizations in the United States. Douglass equipment was selected as representative of well engineered, well constructed exhaust systems.

It was decided to use the Clayton chassis dynamometer at Nicson Engineering Company in East Los Angeles to make sure readings were accurate and the car performing to maximum efficiency. The headman, Nick, ran the tests.

What did we find out? Plenty. We ran those tests over and over to check any possible inaccuracies or any inconsistencies, we ran them all in the same gear, we ran them on the same gasoline, we ran them under the same atmospheric conditions, and we ran them hard, hard enough to keep a water hose spraying on the rear tires from time to time to keep the tread on the tires. We took horsepower readings, back pressure readings, rpm readings, mercury readings, and every conceivable type of reading which could reflect the true performance of three distinct types of exhaust systems—stock, dual exhausts with stock manifolds and straight-through mufflers, exhaust headers with dual exhausts and straight-through mufflers.

The essential differences between a stock manifold and a header lie in the design and the interior finish. Stock manifolds have an exhaust collector bolted fairly close to the engine and the header manufacturers indicate that this and the rough cast interior cause back pressure which cuts down engine efficiency. Headers, however, are designed in gradual curves, with the collector built as far as practical away from the engine. The manufacturers also attempt to design

dual exhaust lines with no sharp turns, indicating that sudden bends in the pipe are to blame for high back pressure readings. In addition, baffles have been removed from the specially designed mufflers and the core has been surrounded by steel shavings (or in some cases, fiberglass) to deaden the exhaust sound.

The first test on the world champion Dodge showed a maximum 94 hp at the rear wheels at 4,000 rpm or 45 mph. When the rpm count was dropped to 3,800 or 40 mph, the horsepower dropped off to 90. At 30 mph or 3200 rpm, it was 85 hp and at 25 mph or 2500 rpm, it was 75 hp. These readings were taken with the stock Dodge manifolds, a crossover pipe and a stock Dodge muffler.

Douglass then installed dual exhaust pipes, straight-through steel packs and tail pipes. Stock Dodge manifolds were retained.

One important factor during these tests was the location of the maximum rpm output range. Many uninformed enthusiasts believe that the automobile engine is producing its maximum horsepower only when the engine is revving at peak. The Dodge engine revs up to 4,700 rpm (factory recommended top, although the Bonneville drivers were revving it over 5,000), actual horsepower and rpm curves show that most engines lose power in the higher rpms. It requires a complex instrument like the dynamometer to compute the maximum horsepower rpm, and on the test Dodge it was 4,000 in 2nd gear.

With dual pipes, steel-packs, stock manifolds, the engine was revved up to 4,000 rpm . . . and the horsepower needle started clambering, didn't stop until it had reached 109. That is a 15 hp increase at the same speed, same rpm . . . with the elimination of a crossover pipe! At 3,800 rpm the engine was delivering 98 horses, at 3,200 it was 87 and at 2,500, 77 hp.

The car was then tested with Douglass headers, exhaust lines and steel pack mufflers, what the manufacturers call a "complete, well balanced exhaust system." And this test surprised everyone including the testers. With the complete exhaust system, the engine was putting out 112 hp at the rear wheels . . . or more than the 1950 and 1951 Cadillacs had put out on that same dynamometer.

Tests run by Nicson Engineering on the Clayton chassis dynamometer produced figures listed below. Those in top group indicate rear wheel horsepower

	2500 RPM	3200 RPM	4000 RPM
Stock	75	85	94
Duals	77	87	109
Duals, Headers	77	87	112

Back Pressure Comparisons in Pounds			
	STOCK	DUALS	DUALS-HEADERS
Peak rpm (4000)	4.7	2.6	.8
Low rpm (2500)	2.5	1.1	.4

At 3,800 (remember, this is low speed, 40 mph), the Red Ram was breathing deeply, tossing out 105 hp. At 3,200, the reading was 87 and at 2,500, the reading was 77.

But the important story is in the back pressure comparisons, that back pressure which can create turbulence in the stock manifolds, restrict free breathing of the engine. The completely stock Dodge was delivering 3.3 pounds of back pressure on the left side at the crossover pipe and 2.4 pounds of pressure on the right side at 45 miles per hour. With the installation of dual exhausts and straight-through mufflers, the back pressure dropped to an even reading of 1.3 pounds in both lines . . . at the same speed. The addition of headers slashed that back pressure to 1.0 on the left side and .8 on the right side. Amazing? You bet.

In another comparison, the 25 mph reading on back pressures with the stock car was 2 pounds on the left side and 1.4 pounds in the crossover pipe. With the installation of a complete exhaust system, that reading dropped to .4 pounds on both sides . . . almost an immeasurable quantity!

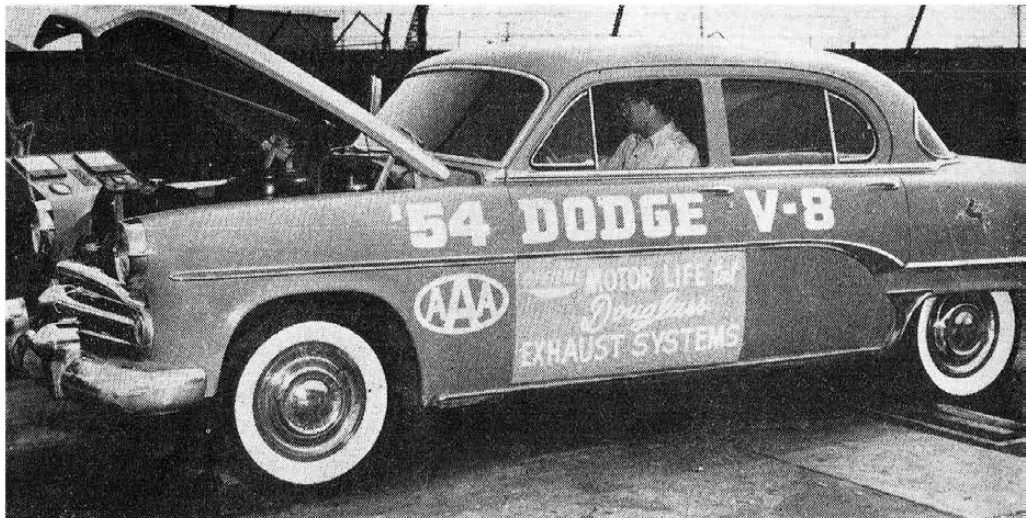
The tests also gave short shrift to those critics who have indicated that headers and straight-throughs waste gas. With the stock exhaust system, the fuel-air ratio was 12.9 to one at 4,000 rpm with 0 vacuum. With headers, duals and straight-throughs, that ratio dropped to 12.4 to one at the same 4,000 rpm with 0 vacuum. The car actually needed a leaner gasoline mixture after this exhaust equipment was installed.

In addition, the engine ran some 10 to 15 degrees cooler under load. This type of measurement is not one which shows readily after exhaust systems are installed, but, rather, does its work quietly without gauge readings of any type inside the American stock car.

But perhaps the most important factor involving headers and dual pipes is their simplicity, ease of installation and ease of maintenance . . . none. The components have no moving parts, are welded and bolted together and on your car and completely forgotten from that point on.

With all of these obvious advantages then, why doesn't Detroit incorporate duals and headers? Detroit has. The Cadillac now has duals, the new Chrysler has duals, the Chevy Corvette has them and Fords, for the past few years, have had holes punched in the frame for the passage of a second exhaust line. So far as headers are concerned, Detroit has recently been appraising their exhaust systems, redesigning the manifolds, introducing new manifolds with good flow, little restriction. But still, the back pressure, as in the Dodge, builds up. A well-designed header solves that, helps the exhaust gases flow smoothly and evenly through its curved racy-looking design.

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Chassis dyno tests were run by Nicson Engineering Company in Los Angeles. The AAA abbreviation painted on side of the '54 Dodge was left over from Bonneville

Writer Galanoy observes the results of one test. Repeated checks were made with equipment under a wide variety of conditions to insure absolute accuracy



Following complete installation, the Dodge was also tested on various surfaces where it showed exceptional acceleration. Here it makes a fast run on dirt road



