STUDE LARK WITH R-3 PERFORMANCE

A new image for Studebaker is being established in the field of performance with custom-built Avanti power and chassis options now available in the Lark

by RAY BROCK

photos by Eric Rickman, Studebaker

hum ROAD TEST

Studebaker has been in the business of building transportation vehicles for quite a few years now and they've gone through many phases. They started way back in the days before the automobile was invented with covered wagons rolling off the assembly lines in South Bend, Indiana. After the switch to horsepower derived from gasoline instead of hay, Studebaker became one of the automobile pioneers.

Look through records of early Indianapolis 500-mile races and you'll see where Studebakers were among the faster cars on the track. Top drivers of the era chose Stude and the car had quite a performance reputation. Just prior to World War II, one of the hottest cars on American roads was the Studebaker President, a big, straight-eight powered car that had pretty sneaky body lines for its day and could really cover ground.

Then right after the war, there was the double-ender Stude. Remember that one? Everybody else in the automobile business had dusted off their pre-war dies and with a few trim changes, started making the same cars they'd had back in 'forty-two, but not Studebaker. They brought out a brand new body style rounded off front and rear that sold like hotcakes. Of course there had been no cars available to civilians since late 1941 and any automobile sold like hotcakes. Some practical jokers who bought Studes actually went so far as to put signs denoting "front" and "rear" on their cars so pedestrians would know whether these models were coming or going.

By the late 'forties and early 'fifties, Detroit production had caught up with consumer demands and competition between manufacturers became torrid so new styles and mechanical features became big selling points. Studebaker really startled the industry in 1953 when they introduced the Loewey-designed, way-out model which many automotive buffs still claim to be the slipperiest car ever built. Styling changes were minor during the next few years but Studebaker became the economy champ of the era with a thrifty little six, coupled to an ove
wind-cheating shape.

Through the late 'fifties and early 'sixties, though, Studebaker did not have anything particularly exciting to talk about. The larger, wealthier companies in Detroit brought out new styles more often than Studebaker could afford to match. New engines, new models, big advertising budgets; Stude couldn't keep up with the pace and sales started slipping. Studebakers weren't fast, they weren't stylish, and compared to some of the new small-engine compacts on the road, they weren't particularly economical. There was no longer an image connected with the name Studebaker.

For the past couple of years, though, things have been happening in South Bend to restore image to Studebaker. Management changes were made and a new, young president named Sherwood Egbert took over reins of the corporation. Diversification into new fields – chemicals, appliances, tractors, space technology – thirteen divisions in all, have placed the corporation on sound footing and now the big push is on to bring the automotive division back onto the black side of the ledger. The first tipoff on things to come was the mid-year introduction of the Avanti in 1962. It was a styling sensation but Avanti hit production snags that prevented dealers from making immediate deliveries, so got off to a very slow start sales-wise.

The Avanti did a lot for Studebaker's styling image, though, and management soon followed up this accomplishment with a performance program that made enthusiasts take note. One of the acquisitions during Studebaker's diversification program was Paxton Products, supercharger manufacturer, of Santa Monica, California. Together with the physical properties of Paxton, Studebaker also acquired the talents of Andy, Joe and Vince Granatelli, a brother team with considerable experience in the field of performance. Their first job was to go to work on the Studebaker V8 and see what could be done to increase its power and reliability.

By late 1962, Paxton-blown Avantis had established a
and International speed records on the Bonneville salt flats under supervision of the United States Auto Club. Speeds as high as 175-plus were registered in the trim Avanti and with high-performance engines, Hawk and Lark bodies were clocked above 140 and 130 respectively. The performance push was on and it is still going strong right now. For the latest results, check "Bonneville Wrap-Up," page 80.

There were many items introduced on the Avanti which management felt would appeal to potential customers in the Hawk and Lark lineup of automobiles and, although some

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BELOW – HRM's Dick Wells drove the R-3 test Lark over famed Bonneville salt flats at 150 mph with exhaust opened, a fresh set of spark plugs and high speed tires. At the 4300 foot elevation, blower output at 6000 rpm reached 6 pounds.

STUDE LARK *continued*

were offered in 1963, the '64 model year is when customers are really being encouraged to "build a car to meet their needs." Every engine, transmission, chassis and brake feature that is standord or optional on the Avanti is now available in both the Hawk and Lark lines. When Studebaker's West Coast public relations representative gave us this information last summer, we conceived plans for a car we felt should really be tested by HOT ROD.

We had already tested the Avanti R-2 and R-3 models and had been quite impressed but for an encore we had something different in mind. Sneak views of the '64 Lark line and dimensions of the cars made us decide that the Lark might be just the car to make an impression at the drag strip. Our PR contact agreed and said that he'd order a Lark to our specifications which we could use as a magazine project in drag racing with perhaps competition in NHRA's Winternationals the final segment of the test.

The car we ordered was a 1964 Lark Daytona two-door hardtop equipped with R-3 engine, four-speed transmission, Twin-Traction limited-slip differential, heavy-duty suspension, disc front brakes with power assist, power steering, Halibrand 15-inch magnesium wheels, bucket seat interior, radio and heater. Sounds sort of hard to believe all this could be wrapped up in one package, doesn't it?

The Daytona Lark is only 190 inches in overall length, or just under 16 feet. Wheelbase is only 109 inches, almost identical to that used by Corvair and Falcon. Tread both front and rear is within a fraction of 57 inches. Car width is an even six feet and height is just under 55 inches.

This is a "compact car" in length, wheelbase and appearance but not in interior space or power teams. Standard production Lark Daytona models are equipped with a two-barrel 259-inch V8 engine rated 180 horsepower but engine options that have been part of the Studebaker lineup for years include a four-barrel version of the 259 with 195 hp rating, a two-barrel 289-inch V8 rated 210 hp and a four-barrel 289 with a 225 horsepower tag.

Prior to Avanti introduction and the "R-series" engines, the 225 horsepower model was the top of the list for Studebaker but now performance is all-important and Stude is offering some of the healthiest V8's in the industry, inch-for-inch.

R-1 is the standard engine for the Avanti. It has the same 289-inch displacement as the 225 hp model but has more compression (10.25 versus 8.5) and a larger four-barrel carburetor. The R-1 is rated 240 horsepower.

With 3.73 rear axle ratio, limited-slip differential, test Lark proved to have abundance of traction even on very steep dirt roads, climbed hills like a goat.

Next on the optional engine list is the R-2 and this one gets a good boost in performance from a centrifugal blower manufactured by Paxton Division of Studebaker. It has 289 cubic inches displacement, only 9:1 compression and a single four-barrel carburetor but that supercharger, which has a designed delivery of approximately 6 pounds per square inch, gage, gives the R-2 a horse-per-inch, 289 horsepower.

R-3 engine option is the next one on the list and this is the top of the power ladder. These R-3 engines are meticulously assembled at Paxton Products, then sent back to South Bend where they join the assembly line to fill dealer orders. The R-3 has 304.5 cubic inches displacement, 9.6:1 compression, a hotter camshaft than the R-2, cylinder heads with larger valves and ports, much more exact manufacturing tolerances, and the Paxton supercharger.

Reluctant to place an exact power rating on their performance engines, Studebaker rates the R-3 at 335 horsepower, but to date has not advertised this figure.

An R-4 option is also available and this, too, is a hand-built engine by the Paxton Division which is then delivered to South Bend. The R-4, although latest in the R-series, does not have the advantages of forced air induction from a blower but is equipped with dual four-barrel carburetion. Most of the components used in the R-4, heads with large ports and valves, camshaft, clearances, etc., are the same as the R-3 but with carburetion instead of supercharger, the power rating drops to 280 hp.

Getting back to the R-3, which is the engine we chose for our test Lark; this is a very hot item although unbelievably smooth for everyday use. Paxton receives finished, bare cylinder blocks from Studebaker's engine plant and then starts their special assembly. First, each block is carefully checked and machined if necessary to give cylinder decks exactly parallel to the crankshaft, square to the bores and the proper height from crank on either side. Next, each cylinder is individually bored .093-inch over the 289 bore size to $3^{21}/_{32}$-inch and the top edges of these bores chamfered to match cylinder head combustion chambers and provide valve clearance. Finally, before engine assembly starts, the completed block is dye-checked to make sure it is perfect.

The crankshaft used in the R-3 is the same forged steel crank used in all 289-inch engines but with extra bearing clearances. With the $3^5/_8$-inch stroke and the extra $^3/_{32}$-inch bore, the R-3 has a final displacement of 304.5 cubic inches, or 5 liters, and this places the engine right at the top limit of National and International Class C displacement.

Bearings used in the assembly of the R-3 are heavy-duty and of either aluminum or copper-lead composition. Clearances average .001-.002 more than standard assembly procedures throughout the engine. Pistons are made to Stude specifications by Forgedtrue.

Cylinder heads used with the R-3 engines have larger ports than standard 289's and chambers are fully machined to give exact, equal chamber volumes. Large, $1^7/_8$-inch intake valves and $1^5/_8$-inch exhaust valves are fitted to the heads. Most R-3 engines are equipped with single valve springs but inner springs are also available to match an extra high-performance camshaft designed for all-out racing.

The standard R-3 camshaft is relatively mild for a high-performance engine when compared to those used in the hot 427-inch V8's being built nowadays. It has 276° duration for both intake and exhaust and 48° valve overlap. This "mild" timing is the reason the R-3 engine idles so smoothly and points out one of the beautiful aspects of supercharging an engine; wild cam timing is not needed to fill the cylinder since extra pressure is available to do the job. Stude's part number for the 276° cam is 1558819. For those interested in the hottest cam, a 288° version (part number 1560816) can be ordered and this one has 56° overlap, still mild by today's standards. The latter cam-

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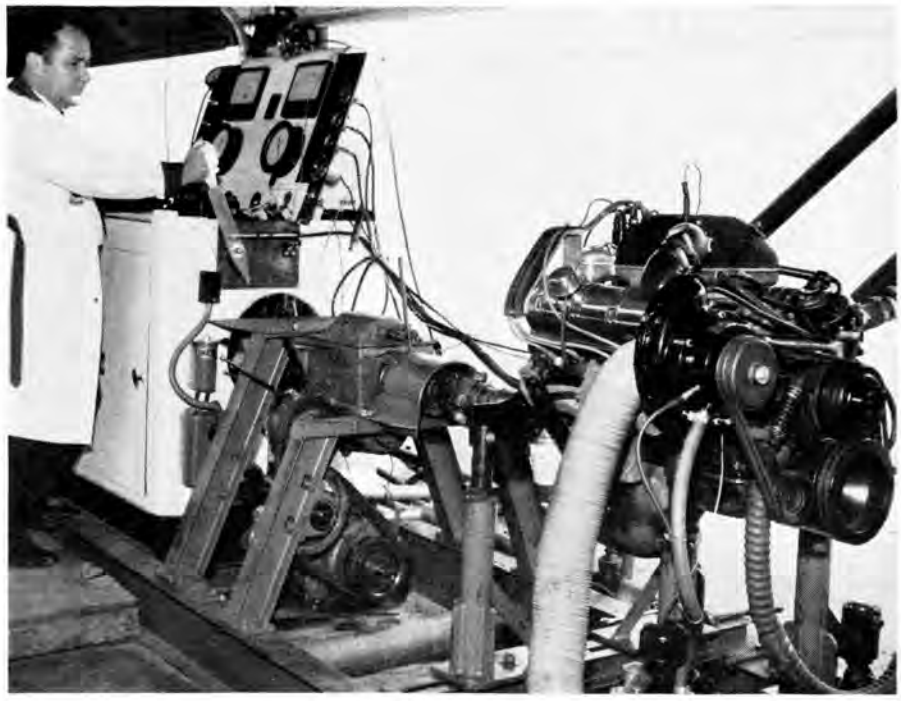
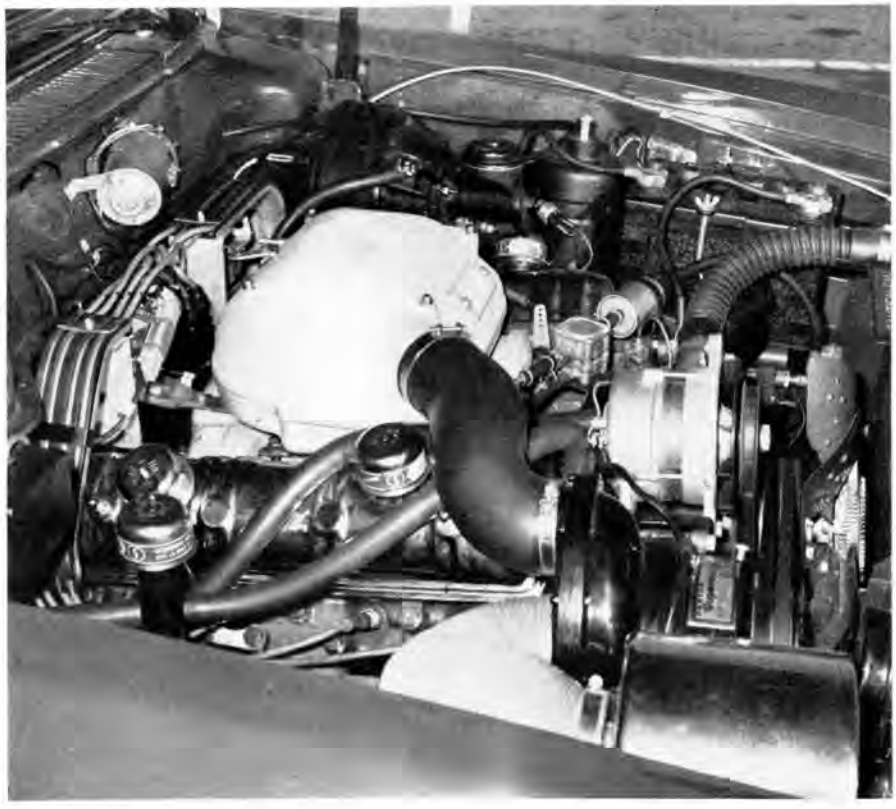


All R-3 and R-4 high-performance engines are assembed and tested at Paxton Products before being shipped to Studebaker. Andy Granatelli checks an R-3.



R-3 installation uses cast aluminum air box enclosure for four-barrel carburetor. Alternator and transistor ignition are by Prestolite, supercharger is Paxton.

shaft requires optional inner valve springs in addition to the standard outers.

Stude's V8 is one of the few engines around today that uses timing gears instead of sprockets and timing chains. Gears are stronger, more precise and wear less than chains but they are also more expensive. Standard Stude V8's use a cast iron crank gear and fiber cam gear but for the R-3 engine, the cam is fitted with a stronger, aluminum gear.

Without going into every detail of the R-3 engine build-up, we can vouch for the exacting procedure used in their assembly, having witnessed most of the operations. After R-3 engines are complete, Paxton places each one on a dynamometer. They go through a special break-in cycle involving several different rpm ranges, water temperatures and oil changes. Then cylinder heads are re-torqued, valve lash is reset and the engine is timed for maximum output. The final test in this three-hour cycle is to make sure each R-3 engine equals or exceeds the 335 hp rating.

Only after all of the above steps are taken is the R-3 engine ready for Studebaker. It is strapped to a skid, shipped to South Bend and ready to run full throttle the minute the completed car drives off the assembly line.

Prestolite's transistor ignition is standard equipment with the transistor pack and diode heat sink mounted just behind the grille in the cool air stream. The alternator used by Studebaker is also made by Prestolite. An air cleaner arrangement on our test car which was prototype, but is reportedly scheduled for production, has the cleaner housing recessed in the right front fender well and a sheet metal scoop to pick up cool air behind the grille.

Extra options for R-3 buyers who intend to race their car exclusively include an extra-capacity oil sump with electric recirculating pump for the blower and a high-capacity 12-pound electric fuel pump to ensure adequate supply to the carburetor. A fuel pressure regulator in the line prevents too much pressure to the carb float bowls.

TOP – Short overhang and excellent ground clearance of Lark make the car ideal for rutted, rocky country roads.

CENTER – Optional Halibrand magnesium wheels fit standard lug pattern. Knock-offs are held in bore with O-ring.

LEFT – Heavy-duty suspension package includes stabilizer bar linked between rear wheels. Note finned drum.

We could fill several pages with copy about the R-3 engine but we won't. It has a lot of parts and pieces found only on a supercharged engine. The Paxton blower is driven by dual V-belts tensioned by a spring-loaded idler. Pressure output varies slightly from engine to engine but at the recommended shift point of 5500 rpm, ours registered 6 pounds at the aluminum air box which enclosed the Carter four-barrel. Paxton recommends a 5800 red line speed on the R-3 with single valve springs and at this engine speed our blower gage registered 8 pounds. With a fixed engine-to-blower ratio, pressure will increase with engine speed and when the engine speed goes over the 5000 mark, pressure goes up in a hurry.

The Lark's chassis is basically the same as that used for the Avanti and with heavy duty suspension components, short wheelbase and abundance of power, the Lark was very "quick" on corners although with the heavier, steel body it is not quite on a par with the Avanti.

Suspension layout is similar to that used by many American automobiles with coil springs and unequal length A-arms up front, semi-elliptical leaf springs at the rear. The heavy-duty chassis package with which our car was equipped included front coil springs with 15% higher rate, an extra leaf in the rear springs to increase their rate 15%.

A front stabilizer bar is standard equipment on all Larks but in addition, a rear stabilizer bar is added in the H-D package. Traction bars from brackets on top of the rear axle housing, forward to the frame rails in front of each rear wheel, are also included in the H-D kit. They prevent acceleration "squat" and wheel-hop, as well as "dive" on stops. Also included in the chassis package are heavy-duty shock absorbers on all four corners.

The optional magnesium wheels are made by Halibrand and although simulated knock-offs, they bolt right to the conventional lug bolt pattern. They are 15-inchers and have 6-inch rim width. The knock-off nut is a slip-fit into the wheel's center bore and is held in position by a large O-ring instead of set screws. This permits easy removal or rotation to fit a wrench on the lug nuts.

Optional brakes were borrowed from the Avanti with Bendix discs on the front, finned cast iron drums at the rear. The Bendix units are made under license to Dunlop with cast iron, 11½-inch diameter discs attached to the front hubs. A cast iron caliper is bracketed to the spindle and straddles the disc with hydraulic cylinders forcing two-inch square lining segments against each side of the disc. This type of brake

is extremely good, makes straightline stops, has excellent fade-resistance and is unaffected by dirt or moisture. It does require higher hydraulic line pressure, however, since the units are not self-energizing. To produce this extra line pressure, a vacuum-assisted power brake unit is part of the disc brake package.

Rear brakes are conventional shoe type with 11-inch cast iron drums finned for rapid heat dissipation. Shoe width is 2 inches. To be compatible with the disc front brakes and high line pressure used, a small rear wheel cylinder is used to actuate the rear shoes. Parking cables are also fitted to the rear brakes.

Taking time out from the mechanical description of the Lark, we have to interject the comment that these brakes are tops in all ways when it comes to halting a car. Pedal "feel" is good, there is no noise sometimes associated with disc brakes, there is never "swerve" on sudden application and the price of less than $100, including power assist, is quite reasonable.

R-3 engines can be ordered with either a four-speed transmission or Stude's Warner-built automatic transmission. From past experience with an R-3 Avanti and automatic, we can verify that the two units go together quite well but with an engine that gets its performance upstairs when the blower boost comes on, a four-speed is a much more practical selection.

Two sets of ratios are available in the Borg-Warner four-speeds: 2.54, 1.89, 1.51 and 1:1 for the standard gearbox; and an optional gear set of 2.20, 1.66, 1.31 and 1:1. Obviously, with a low numerical rear axle ratio, the set with 2.54 low is best for all-around use. With a high numerical axle such as for drag racing, the 2.20-low is best. Our Lark was equipped with 2.20's.

Rear axle ratios for R-3-equipped cars run from 2.87 to 4.89 with all ratios considered optional and none listed as standard. In other words, buyers of Studebaker cars who choose the R-3 option may also choose the ratio they want and have it factory-installed. The Spicer-type rear axle which does not have a removable center section discourages frequent gear changes so a customer should be sure of what he wants when he orders a hot Stude. All ratios are available with optional Twin-Traction limited-slip differential.

While Studebaker was conducting their series of record-breaking runs at Bonneville last October, Managing Editor Dick Wells took our test Lark to the salt flats and joined the factory team for a day with some high speed runs. The Lark was equipped with 3.31 rear axle ratio, outfitted with a set of Sears Allstate Bonneville high speed tires, fitted with a new set of Champion spark plugs and an open exhaust replaced the mufflers.

With the added comfort of a roll bar installation by Paxton Division, Dick "cruised" through the USAC timing lights at a speed of 149.98 mph for the flying mile and in the last section, where USAC also had kilometer traps set up, was clocked at 150.04 mph. Dick said the ride was smooth as silk with the tach registering just 6000 rpm and blower boost at 6 pounds. At sea level, blower boost between 5800 and 6000 would have been approximately 8 pounds but the 4300 foot elevation of the salt flats cuts pressure.

Although the ultimate plans for our test Lark called for extensive drag strip participation, it takes a lot of time to be competitive in class so instead of installing a 4.55 or 4.89 axle ratio after the Bonneville runs, we decided to use "street" gearing and try the Lark on all types of terrain and under many conditions before we went draggin' for keeps. The ratio installed in the Lark was 3.73:1 with Twin-Traction.

As we mentioned earlier, the R-3 powerplant is surprisingly docile and we used it for transportation through Los Angeles traffic. When first delivered, the R-3 straight-through, glasspack mufflers were too loud for comfort and we spent most of the first day with one eye on the rear view mirror anticipating a motorcycle with a red light. Fortunately, we didn't pick up a citation before we turned the car back to Paxton for a conventional dual exhaust system which quieted the monster. In later drag strip tests, the car will be equipped with header outlets that can be uncapped for maximum noise and performance.

In the mountains north of the Los Angeles basin, we found the blown Lark to be quite adaptable to both road and altitude. Handling was very good and on the roads we chose with twisting switchback turns, the short wheelbase and power made the Lark a hard package to match. We encountered altitudes well above 6000 feet and the engine ran flawlessly. This is because the enclosed carburetor compensates for altitude changes. As the car is driven to higher elevations, blower boost is less for a given rpm, and pressure on the float bowls is also lessened, causing decreased fuel flow through the jets.

Prior to high speed runs at Bonneville, Lark timing was checked by Prestolite representatives. Sears Allstate Bonneville style tires were also used for high speed safety. Sears tires were used on all Studebakers during record runs.

We found a home for the Lark on rutted, dirt roads through some of the foothill sections of the mountains. With a minimum of body overhang, front and rear, plus short wheelbase, 15-inch wheels and excellent ground clearance beneath the car, we found the Lark to be the best American-produced sedan we've tried in years on less-than-ideal roads. Ruts, rocks and washout sections that would have left the normal sedan high and dry didn't even phase the Lark.

Acceleration tests on a lonely stretch of level road proved the R-3 Lark had plenty of get up and go, even with the 3.73 rear axle ratio and large diameter tires. The Lark had been equipped with tires of butyl compound to give best tractive qualities but even so, we had to be careful with starts on clean, dry asphalt to prevent excessive wheelspin. 0 to 60 mph checks averaged right

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STUDE LARK

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around 6 seconds flat but we had to shift from first to second at about 53 mph to keep from exceeding the 5500 rpm shift speed recommended by Paxton and wheelspin on the 1-2 shift made the speedometer needle jump so that it was difficult to guess just where it indicated 60 mph. 0-80 speeds were just about 10 seconds flat and with a steadier speedometer at this speed, we were reasonably accurate.

The only good place to check the Lark for acceleration performance, however, is the drag strip and that's where we intend to put the car to work. There's only one problem here, however, and it is all based on Stude's refusal to advertise power ratings of their R-series engines. NHRA requires an advertised rating to compute against car weight for classification in Stock classes. Stude has in the past used the statement that these engines produce "more than enough power to suit the needs of the driver". This still does not tell how many pounds of Avanti or Lark there are per horse, so as we go to press, NHRA will not classify the cars "stock". They have to compete in Gas Supercharged class.

The horsepower figures we gave when discussing the high-performance engines, 240 for R-1, 289 for R-2, 335 for R-3 and 280 for R-4, were obtained by telephone conversation and not from printed fact sheets. Studebaker has refused to publish these ratings and it is suspected that even these were derived only after consulting NHRA's rules book and weight chart. The thing that makes these cars hard to classify even if advertised ratings were published is the fact that blower pressure cannot be checked.

Blower boost means power and the more the boost, the more an engine will deliver, within other design limits of the engine. Just how easy it is for an owner to tamper with blower output through internal modifications, or ratio changes, we don't know but it would appear that a sharp owner could "tune" quite a few more horses out of the blower. Agreed, the engine or blower might be overstressed and scatter, but it also might go like a bomb for a while.

So, like we said, we plan to do some dragging with this Lark. We don't know what class we'll be in but we hope that Studebaker files the necessary classification papers so we can run in a Stock class. The car feels quite impressive, really starts to move above 3000 rpm, and it would be a shame not to have a shot at some trophies.

We'll keep you informed as to how we make out in later issues. ■■