ROAD TEST JUDSON-VW

JUDGING by the volume of our technical correspondence on the subject, the question of whether or not to supercharge is a burning issue with several thousand VW owners.

A road test report, involving at most a few hundred miles, cannot hope to cover adequately the questions regarding durability and longevity. However, we can determine the exact amount of performance gain, and we can and shall deal with the theoretical aspects of supercharging from the standpoint of engine wear and tear.

Nearly two years ago (October, 1955) we tested the Swiss-made MAG supercharger installation on a VW sedan. This is a well made but expensive kit, and the boost in performance was worth-while but not sensational. We have also driven two cars equipped with the Fageol "Pepco" supercharger. This unit really gives a boost (0 to 60 in under 16 seconds) but it is definitely noisy and, as we shall explain later, it probably should be run at a lower pressure.

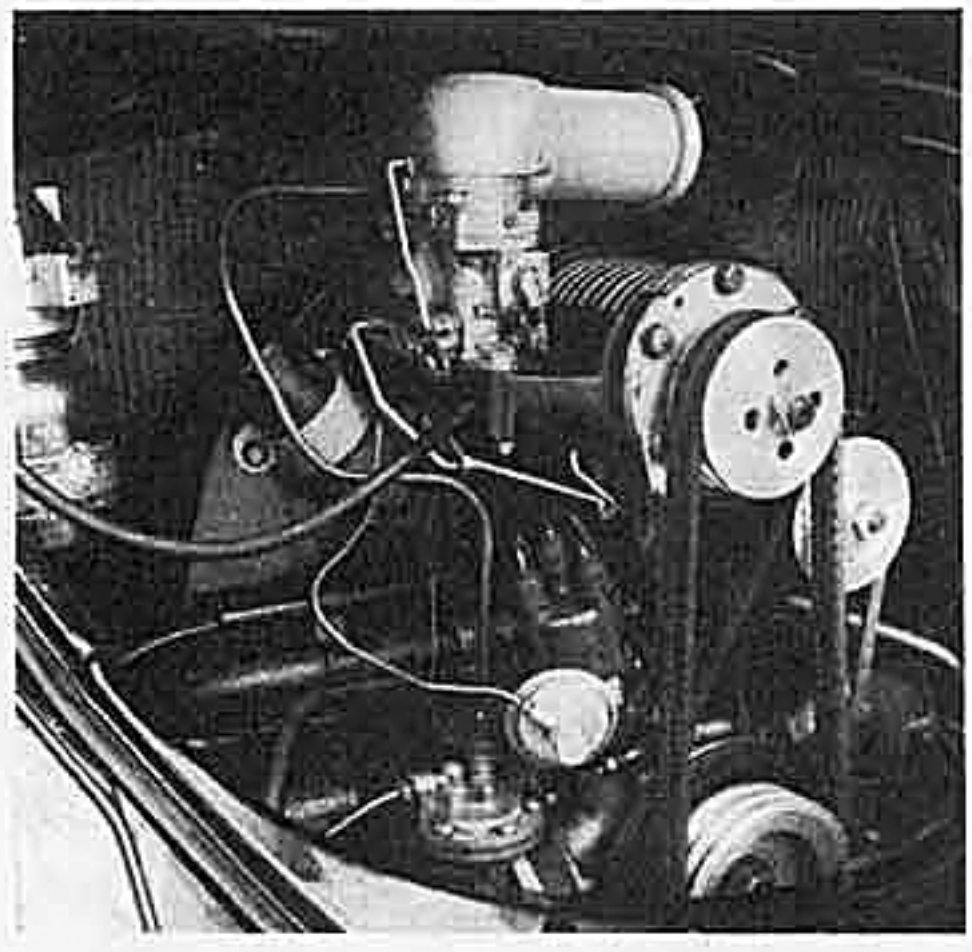
The Judson supercharger is a good all-around compromise, with enough manifold boost (about 5 psi at peak revs) to give a worth-while performance gain. In our experience, which includes driving three such cars, the performance varies somewhat from car to car and from year to year. A well tuned 1957 VW, blown, can improve upon the figures quoted in this report. However, a comparison table gives a quick summary:

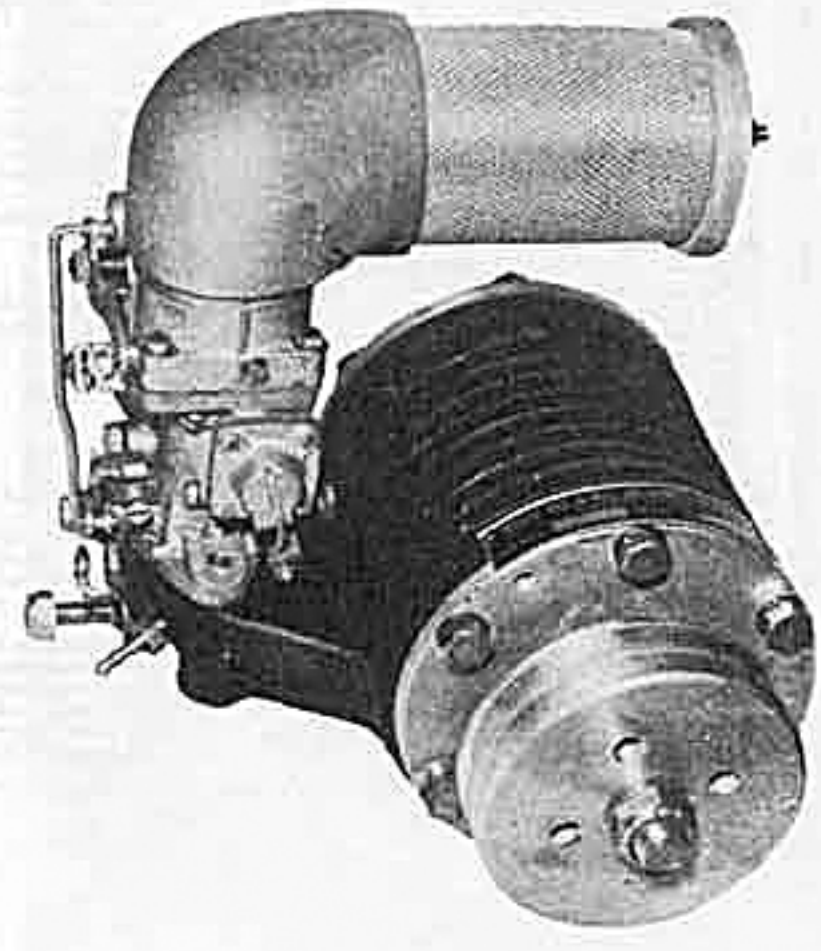
	Stock	MAG	Judson
top speed, avg.	70.2	74.5	83.8
0-60 mph	28.0	22.0	18.0
ss ¼	23.2	22.4	19.8
lb/ton (4th)	140	160	170

Two high-speed runs gave identical times equivalent to 83.8 mph. The speedometer stood nearly straight down, at approximately 87 mph. Bill Corey, our "Tune-Up Clinic" contributor, is Western distributor for Judson, and the car was his demonstrator. He reports speedometer indications on level roads of well past what would be 90 mph (the speedo reads only to 80) but a VW is well known for its good response to a light tail wind.

The rate of fuel consumption depends, even more than usual, on how the blown car is driven. Driven normally, under relatively steady cruising conditions there is a drop of only 2 or 3 mpg. Driven really hard, as during the test, it uses fuel at the rate of 25 mpg.

A Volkswagen owner can detect a slight change in the character of the interior sound when the supercharged engine





PHOTOGRAPHY: POOLE

is running. However, the difference is more in note than in volume, for the Judson is unobtrusive at any speed.

The big question with most prospective purchasers is whether the engine will stand up to the extra pressure of the blower, and whether the time between overhauls will drop.

Unequivocally, a driver who consistently uses the extra performance at all times must expect more wear and tear. On the other hand, an owner who will drive the Judson-VW with reasonable discretion will find it hard to prove that engine life or durability has been sacrificed to any measurable extent. For example: steady cruising at 60 mph requires about 13.8 bhp, regardless of whether the engine is blown or not.

A supercharger supplies the cylinders with more air and fuel than they could normally induct via atmospheric pressure. This extra air and fuel is what gives the added bhp and torque, but *it is not required, or used, under steady-speed cruising*. However, when the accelerator is pushed to the floor, the supercharged engine sustains heavier loads, and this condition is worth closer examination. It has been shown* that an engine supercharged at 7.5 psi manifold pressure gives the

the supercharger gives a kick where it's needed

same increase in peak cylinder pressure as does a change in compression ratio from 5.00 to 8.00:1. But the mean (or useful) cylinder pressures go up by 54% for the blown cylinder, as compared to only 9.5% for the compression ratio rise.

All engines are designed to take an overload for short periods. The VW unit, with its restricted valve and port areas, is certainly a de-tuned engine with an even larger-than-normal reserve for overload.

However, in the case of the VW, there are two special circumstances which must be considered: the crankshaft and the air cooling. The VW crank is not designed to sustain overspeeding. For that matter, neither is the valve gear. The crank is made from forged steel, to give proper grain flow, and the principal alloying elements are .35% carbon, 1.1% manganese, and 1.2% silicon. All the bearing surfaces are induction-hardened to about 57 Rockwell-C. Although the blown VW engine will actually attain 5500 rpm, it is highly recommended that a speed of 3400 rpm be held as a limit.

We used 4500 rpm to get the best possible performance, but in our tests we also took data using 3400 rpm as a limit. The corresponding speeds in each gear are 16, 31, 47 and 70 mph. The results are plotted as a dotted line on the acceleration graph. Performance is reduced very little:

	4500	3400
0-30	5.4	6.0
0-40	8.1	9.7
0-50	12.5	14.7
0-60	18.0	21.0
ss ¼	19.8	21.0

The cooling limitation mentioned is based on the fact that, in any given engine, the heat loss is directly proportional to the amount of fuel being consumed. When you use the extra Judson performance, you use more fuel and put more load on the cooling system. The VW cooling arrangement is not disadvantageous in any way except that the cooling fan runs at twice crankshaft speed. Therefore, when the factory-recommended maximum rpm of 3400 is reached, the fan is turning at 6800. Any fan speed above this figure is inadvisable because fan efficiency begins to fall off.

In short, we recommend the Judson supercharger with reservations. Do not exceed 3400 rpm except on rare occasions, and do not drive for long periods (as in the mountains) with full throttle. On a sensibly driven VW, the extra urge of the Judson supercharger is well worth-while and a definite safety factor.

*"Supercharging for Increased Performance," *Product Engineering*, October, 1954.

ROAD & TRACK ROAD TEST NO. 146

VOLKSWAGEN SEDAN

with Judson supercharger

SPECIFICATIONS

List price (supercharger)	$149.50
Wheelbase, in.	94.5
Tread, f/r	50.8/49.2
Tire size	5.60-15
Curb weight, lb	1660
distribution,	43/57
Test weight	1980
Engine	flat 4, ohv
Bore & stroke	3.03 x 2.52
Displacement, cu in.	72.7
cu cm.	1192
Compression ratio	6.60
Horsepower (est.)	50
peaking speed	4000
equivalent mph	82.5
Torque, lb-ft (est.)	70
peaking speed	2200
equivalent mph	45.4
Gear ratios, overall	
4th	3.61
3rd	5.41
2nd	8.27
1st	15.8

CALCULATED DATA

lb/hp (test wt)	39.6
Cu ft/ton mile	61.9
Engine revs/mile	2910
Piston travel, ft/mile	1220
Mph @ 2500 ft/min.	123

PERFORMANCE, Mph

Top speed, avg.	83.8
best run	83.8
3rd (4500)	62
2nd (4500)	41
1st (4500)	21
see chart for shift points	
Mileage range	24/32 mpg

ACCELERATION, Sec.

0-30 mph	5.4
0-40 mph	8.1
0-50 mph	12.5
0-60 mph	18.0
0-70 mph	28.0
Standing start ¼ mile	19.8

TAPLEY DATA, lb/ton

4th	170 @ 42 mph
3rd	270 @ 35 mph
2nd	400 @ 27 mph
1st	520 @ 17 mph
Total drag at 60 mph, 100 lb	

SPEEDOMETER ERROR

Indicated	Actual
30 mph	31.2
40 mph	39.2
50 mph	46.9
60 mph	56.0
70 mph	65.3
80 mph	75.0
87 mph	83.8