



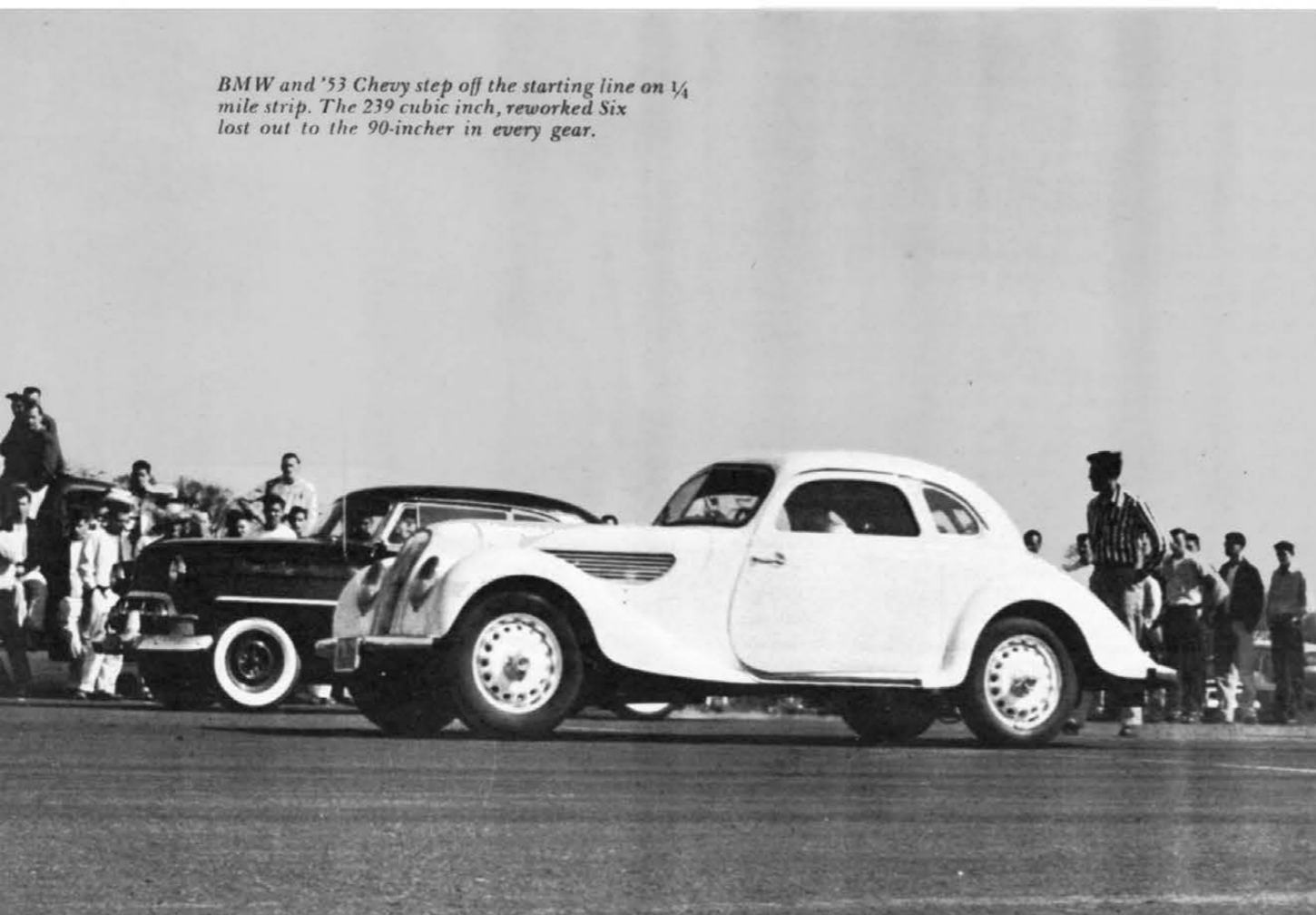
Tach below instrument panel, on left, was installed by Chuck Rhodes. Speedometer is marked in kilometers.

THE TWO CARS lined up in the starting chute. The little white coupe looked diminutive and helpless beside the bulk and noise of the modified '53 Chev. The starter pointed his flag toward the driver in the white car and received a "ready" nod. The driver in the black coupe also nodded "ready." The flag went up and the air filled with the nervous high-pitched rapping of exhaust pipes as each driver raised his rpm level. The flag dropped and the two vehicles smoked off the starting line. The Chev hesitated a fraction of a second while one rear wheel did its best to melt the asphalt. By the time it took hold, the little white car was nearly a length ahead. The two wound out in low with the Chev gaining and finally heading up

By PETER G. SUKALAC

90" Giant Killer

BMW and '53 Chevy step off the starting line on 1/4 mile strip. The 239 cubic inch, reworked Six lost out to the 90-incher in every gear.



Front view shows classic grille and fender line that has typified BMW since early thirties to present.



nose to nose as the driver shifted to second gear—but, the little white jobby kept right on winding making a slight gain, then so quickly into second that only a change in engine note told the story. The Chev was abreast again when the driver dropped into top gear and really stood on it, too late—for the engine in the white car kept right on winding tighter and tighter. Again the two were abreast of each other, then the driver in the little car hit third and gradually, but definitely, started to pull the big black coupe. When the two flashed by the flagman at the end of the quarter mile, the small car was nearly a full length in the lead and the driver was given the nod. As the two cars idled back to the pits on the return strip, the announcer's voice boomed out over the excited babble created by several thousand spectators. "The winning car is a 1939 BMW featuring a destroyed engine of 90 cu. inches, owned and driven by Chuck Rhodes of Eugene, Oregon. The 'lil fella just pulled a '53 Chev coupe powered by a modified 239 cu. inch mill running a cam, carburetion and reworked head."

Hard to believe? Yes, it is! There are few sports machines, or more correctly, sports tourers, that will stay with Detroit iron on their home ground, the 1/4 mile drag strip. With rare exception, the trophy winning drag car racer is loaded with gobs of torque as the direct result of a large bundle of displacement. Unless he likes being "wiped out" by less romantic iron the sports car enthusiast generally refuses to enter his pride and joy in such events. Rather he caters to the type of thing his machine was developed for, touring and an occasional rally or road race. Who, then, did this brash youngster think he was to put his head in the lion's mouth?

To begin at the beginning, Chuck Rhodes, a long time auto enthusiast, had a few years to put in for Uncle Sugar. Two of these were spent in Germany, Stuttgart, to be exact. Here young Charles put in his "on duty" hours barking knuckles on Air Force equipment while carrying out various T.O.'s as a mech. His off-duty hours were spent in circulating among the garages and dealers' shops to see just what was new or interesting in foreign iron. One day Chuck happened across a newly-rebuilt 1939 BMW cabriolet. The little coupe sported a neat six cylinder 1971 cc vertical valve mill that did a creditable job performance-wise. Liking the car's looks and handling, he tossed some marks in the owner's direction and returned to his barracks no longer a slave to the GI busses.

After driving the car for some time, Chuck felt that the car lacked the performance he needed if he were to stay with the cars his buddies drove at the various rallies and road events. The two litre engine put out but 60 hp, which, though given willingly, was hardly enough for street use, let alone sports events. Having heard about the type 328 head so popular on these cars before the War, Chuck set out to find a pre-war dealer who could help him find one of these overhead outfits. Perseverance pays off when scrounging parts in Germany, as well as in the old USA, for after a great amount of searching our lad found not only a head, but an entire mill. The mill was not stock, though, for it had been destroyed by replacing the old factory piston and rod assembly with a kit built up by Veritas, a defunct hop-up shop previously located in Messkrish, Germany. The theory behind the building of the kit was twofold: first the 2.60 inch bore and 3.78 inch stroke of the two litre engine gave too high a piston speed which

resulted in rapid wear and inherent unreliability; secondly, the engine, even at its best, was no match for the scarlet two litre Ferraris, Alfas, etc.

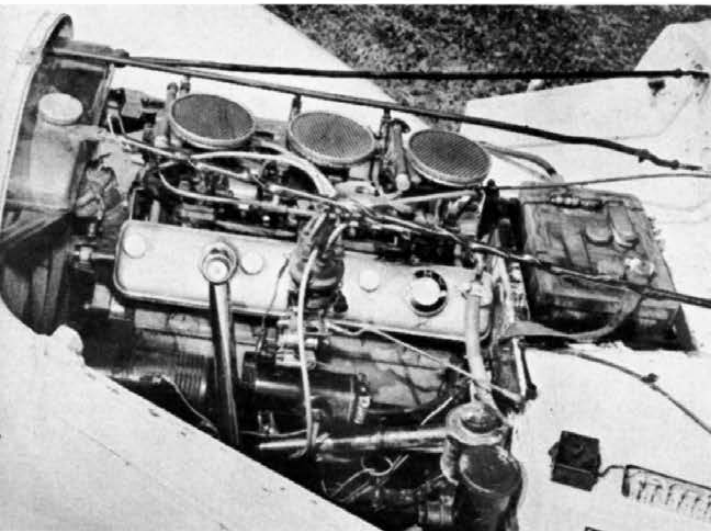
The deal sounded good to Chuck, and he pulled the 327 mill out of the coupe and replaced it with its hairy-chested brother, the 90 inch block, complete with type 328 monkey-motion head. The difference in power was pronounced, especially in third and top gear, and the mill was still smooth in operation. When the time came for Chuck to return to the States, he had driven the little jewel a total of 20,000 miles and had chalked up many a trophy win at various meets.

Back home in the fall of '55, Chuck picked up the November issue of SPORTS CARS ILLUSTRATED and read therein that the Bristol could be warmed over by a few basic modifications to the intake system and carburetors.

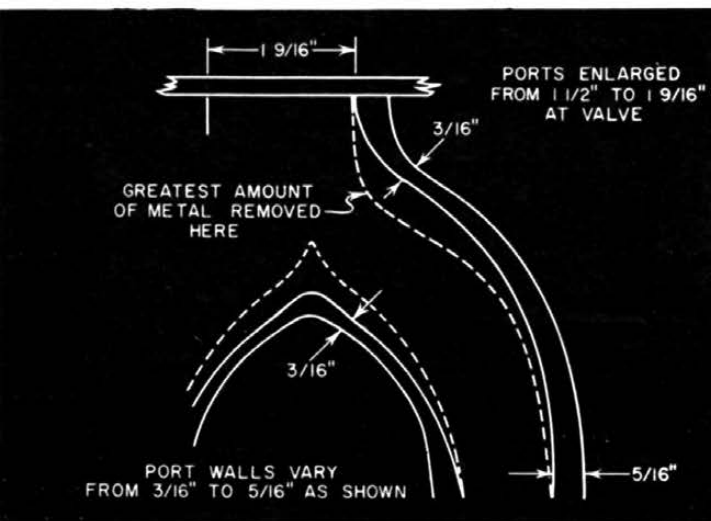
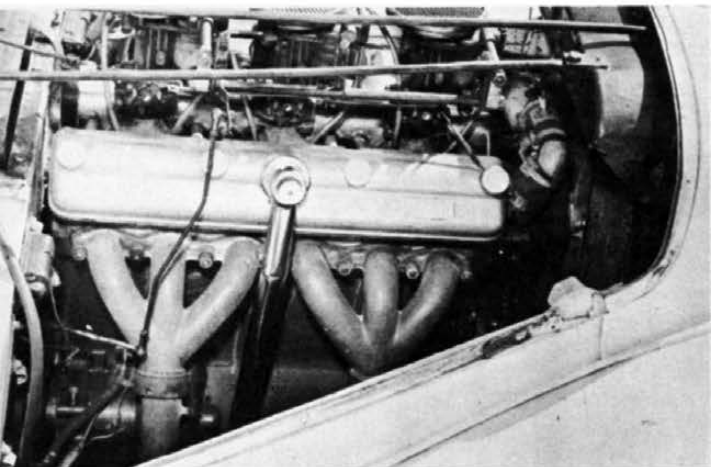
Knowing of the similarity between the Bristol and the BMW engines, it seemed logical to him that the same modification should be applicable to the upper end of his 90 incher. The little mill had been experiencing extreme valve float at 5200 to 5400 rpm which limited the car's performance in gears. This was reason enough for an internal look. Besides, he had had a burning curiosity regarding the appearance of the Veritas-BMW set-up ever since he had installed the rig in Stuttgart.

Without further ado, Chuck pulled the husky little rascal off its mounts and disassembled the head and dropped the pan. Valve timing on the engine was not known to him, so using a degree wheel he checked for this all important information fully expecting a "wild" layout. To his surprise the cam was mild, by modern standards, with the intake opening 4° BTC and closing 46° ABC, and the exhaust opening 44° BBC and closing 3° ATC. Total lift at the exhaust valve measured 7/16 of an inch and 5/16 of an inch at the intake. The valves were large for the small bore with the exhausts measuring 1 1/2 inches and the intake 1 1/16 inches. The bore measured 66mm and the stroke 72mm. This figured out to a capacity of 1478cc. Using the time tried oil and cc glass, Chuck checked the compression ratio, which measured out exactly at 8.5:1. Continuing the tear-down, the piston, rods and crank were all pulled and laid on the bench. The crank was stock and bore factory markings. The rods were of stock length but were polished and bore no markings. The pistons were likewise unmarked, but differed from the stock-type inasmuch as the pin bosses were closer to the crowns and the crowns themselves were raised for greater compression. Chuck boxed up the pistons, rods, the crank, flywheel and clutch assembly and sent the stuff to Portland, Oregon, for a complete balance job. Work was then begun on the head and intake system. According to the information on the Bristol, an easy 26 percent gain in performance could be had by removing a like amount of metal from the manifold and ports. Chuck measured the

Souped 90 incher has modified porting system, light Bristol pushrods, 3 Solexes, Bosch distributor, DSM coil, Mallory condenser. Lever controls spark inside.



Exhaust system remains same. Twin headers flow into two exhaust pipes, meet at car's midpoint, form one tailpipe exhausting in front of right rear wheel.



wall thickness of the intake passages and found the "meat" extremely thick. (See diagram) The next two weeks of his spare time was spent cleaning away the excess metal. The walls were reduced to approximately $\frac{3}{16}$ to $\frac{5}{16}$ of an inch, a total reduction of about 30 percent. Where metal could not be removed it was smoothed and all edges and corners removed. The head was then surfaced to make for a perfect gasket fit.

Attention was then turned to the valve train. The valves were lightened slightly by cutting and then polished. The major reason for the floating at 5200 rpm was apparent when the valve springs were checked—they were weak enough to be compressed by hand, even though they were of stock tension. The answer here then was the inclusion of an inner spring. Wayne Chevy inner springs were of the right diameter, but were too long. So, a set of these were shortened and installed. The addition of the inner springs increased the open tension by 50 pounds.

On examining the lifters and pushrods, Chuck noticed that they seemed quite heavy. He wrote to the Bristol parts house in Chicago, Illinois, and asked for a complete set of lifters and rods for the Bristol. When these arrived they were compared for length, diameter and weight. The Bristol parts were lighter. The exhaust lifters and pushrods were installed as-is, but it was necessary to shorten the intake rods $\frac{3}{32}$ of an inch and cups mounted in place of the original balls before these could be installed.

By this time the stuff from the machine hop had returned and Chuck began the careful job of reassembly. The ignition, consisting of a Bosch UK6R dual point battery-fed distributor was left as-is with a stock timing of 46° BTC. The three Solex pots, however, were given the treatment described in the article on warming a Bristol. The Type IF Solexes were reworked by enlarging the Venturis to $1\frac{1}{16}$ inches, and main jets to 112 x 58; the air bleeds in the discharge nozzles were drilled to .064. The discharge wells and correction jets were then smoothed and streamlined. As a final step the butterflies were thinned. The pots were then buttoned on and the completely rebuilt mill dropped on its mounts.

Out on the strip for a test run the newly run-in engine sounded healthy. The time on the standing quarter mile for the 2650 pound coupe was 76 mph; with a rolling start this jumped to nearly 86 mph. This with a road gear of 3.70. A measured mile was traversed, with a rolling start, at 103 mph. That's terrific performance for any car in the 1 1/2 litre class. This was one time when the old rule of the "most inches" didn't hold true. If any loss of performance resulted from the destroyed engine, it was not apparent. Rhodes now winds this wee mill to 6000 rpm with safety, something that just wasn't done with the old long stroke engine. He also is able to hold the tach at 4700 rpm in top gear for long periods of time without heating and minus the roughness and vibration of the old 328 stroker. #

Details of enlarging ports. Walls were reduced about 30%, which according to Bristol information netted a gain of 26% in flow performance.