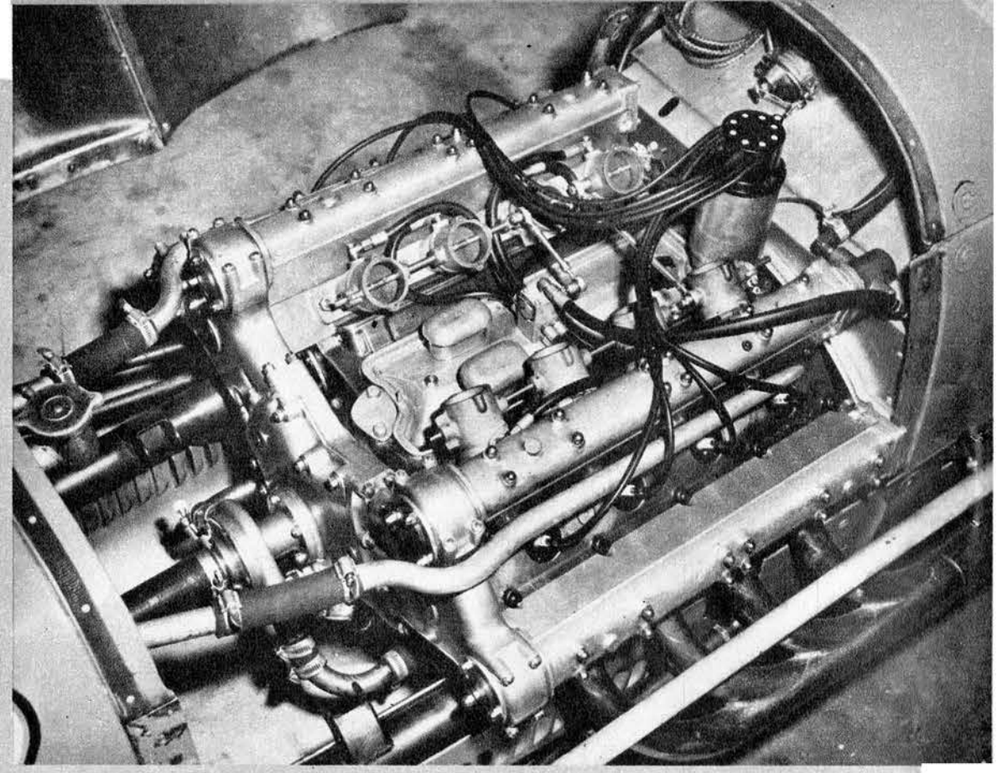


Photo courtesy
Los Angeles Herald-Express

AMERICA'S HOTTEST HOP UP

By George Hill

WE AT Hop Up feel that this fabulous Studebaker conversion designed and built by Willie Utzman is, without a doubt, one of the most beautiful pieces of machinery ever constructed around a production block.

We also feel that you will want to know a few of the facts about the man responsible for the designing and construction of this engine conversion.

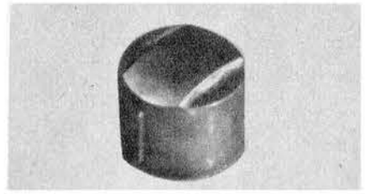
He is the man who spent many sleepless nights and countless hundreds of hours designing and building this 370 horsepower package of dynamite. He is also the man who J. C. Agajanian had enough confidence in, to spend the necessary capital to finance this engine.

Newspapers and racing publications have columns about the heroic and super human drivers but little about the men behind the scenes who work tirelessly for months, creating the machines that afford the driver his opportunity to demonstrate his ability for but a few short hours on the speedway.

Granted, it takes a good driver with plenty of coordination and judgment to handle the race car of today on a track built many years ago for much slower speeds, but more should be said about the men who spend years developing these beautiful cars and their engines.

Utzman's history, as with most of the drivers and mechanics from the west coast, includes many summers of hot rodding on the desert dry lakes of Southern California.

Willie was born in Los Angeles in 1904 and attended San Fernando High School but did not become interested in automobile mechanics until the year 1927. The reason for this is probably that, in those days we did not have the number of automobiles, or rather dated and aged automobiles available for



Cam lobe sweeps across convex surface of valve "cup". Valve stem rides inside cup and clearance is set by shims of varying thicknesses. Projection on side of cup rides in slot in block to keep cup from rotating. Valve cup is shown right side up in this photograph.

youngsters to tinker with. However, in 1927, Willie acquired the *urge*, and began collecting parts from 1923-24 Fords. Soon he was driving a souped-up "T" with a Winfield flat head.

Ford started producing the model A in 1928, but it was two years later, in 1930, before Willie acquired one. This engine he stripped completely. In rebuilding it he used all Winfield equipment including the head, cam and the famous Winfield carburetors.

Time clocks were not used, in those days, and the process of elimination was used to decide who was top man of the meet. However, in 1930, some of the members of this group began clocking with the use of three watches. An average taken of the three watches was the official time established for the car.

Willie's model A was one of the first to exceed 100 mph at one of these meets, using the clock system. He feels that had they known at that time what they know now about gear ratios, cams, and tune up, the cars would have been traveling in excess of 115 mph.

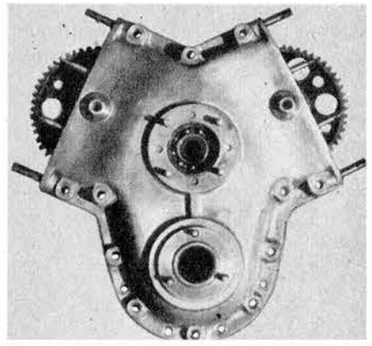
They had no quick change center section for a Ford rear end, no Zephyr gears for the transmission that help so much in acceleration, and mainly, no knowledge of the present day super fuels. At that time, the best fuel they had

Water pump bolts onto front gear case.

available was Gilmore Red Lion gas, which was rated at 85 octane. This limited compression ratios considerably.

The engines were capable of higher speeds but the mechanical know-how in respect to chassis and drive line construction left much to be desired.

Utzman, in his attempt to obtain more horsepower, recognized the importance of cu. in. and was the first man to use a 4" piston in the Model "A". These were made for him by Jahns, one of the oldest manufacturers of racing pistons in this country. The use of this added displacement gave him quite an advantage over the smaller engines and became so controversial



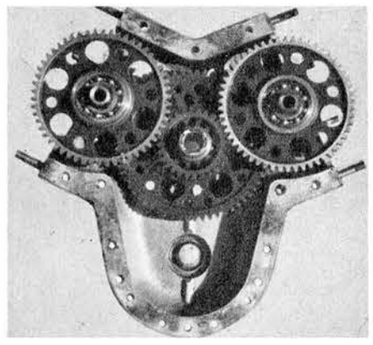
Front view of gear case. Special water pump mounts on four small studs that can be seen protruding towards camera. Pump is driven through serrated insert, in a ball bearing race.

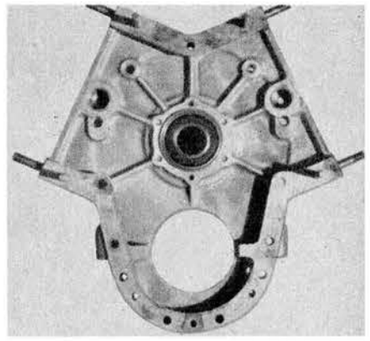
as to almost have his car barred from competition. Why is it that a man, when advancing a competition design, must always be penalized or forced to run under a handicap? The same thing is happening even today.

Willie then decided that amateur racing was not for him. He wanted to enter into stiffer competition where a man's engineering ability might pay off not only with cash but with respect for his contributions to the advancement of race car design.

His first race car used the engine from his Model "A" roadster. The

Inside of front gear case showing the arrangement of gears. The large center gear is driven from the gear on the front of the crankshaft which occupies the empty space at the bottom of the casting. Cam tower gear case attaches to studs next to idler gears.





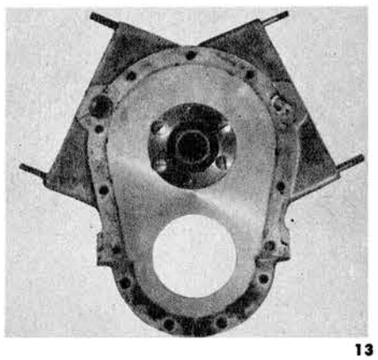
Rear half of gear case looking at the forward (gear) side of the casting.

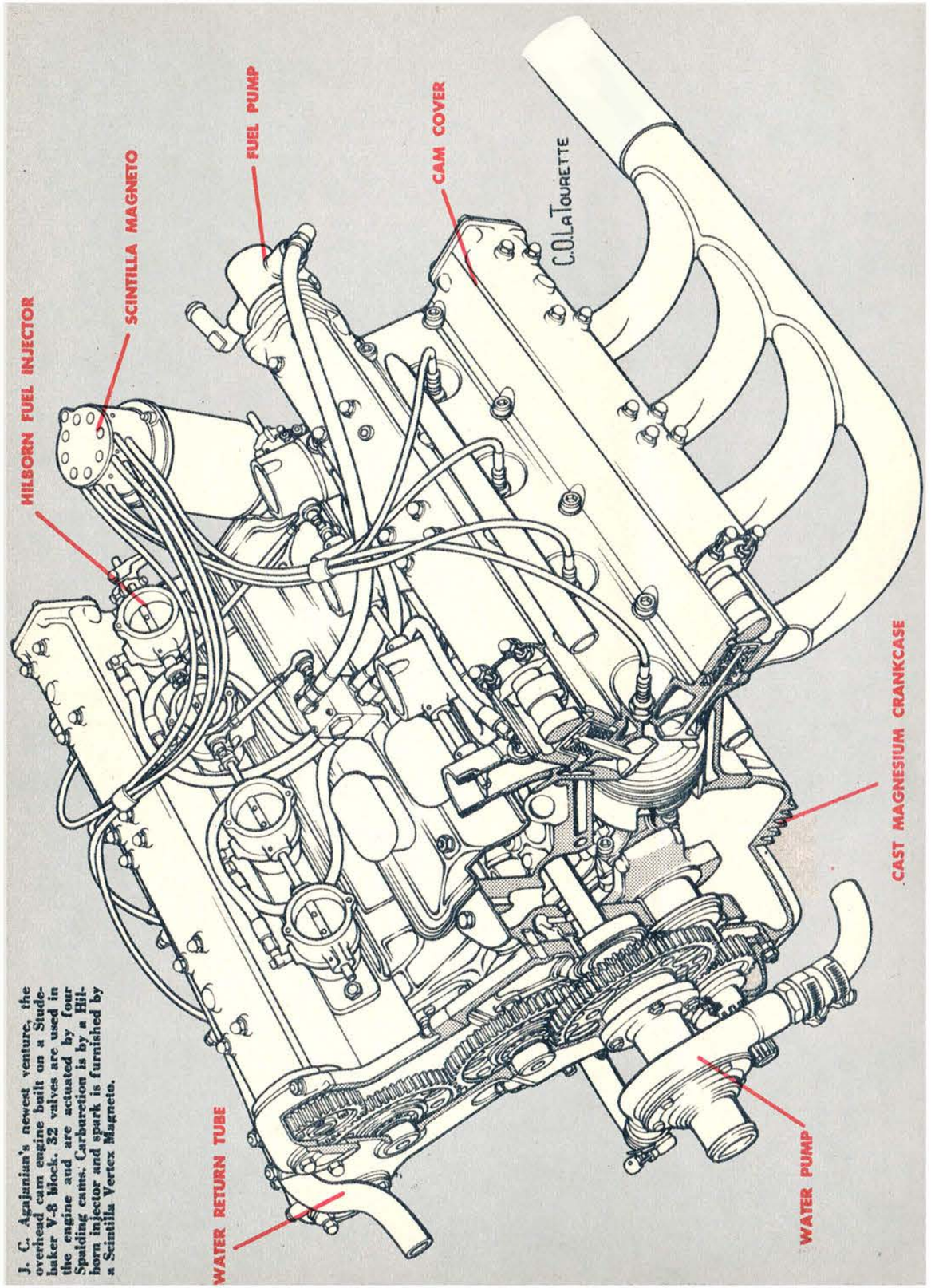
chassis he purchased from the Rand Bros. of Glendale, Calif. The driver was Rex Mays. This was the first time for the car and the first for Rex. They went well together. Willie was proud of both, even though Rex at that time was so quiet and soft spoken that no one believed Willie when he claimed to have a future champion driving for him. As we all know, the immortal Rex Mays was one of the greatest and most loved race drivers this country has produced.

It soon became apparent that Rex's driving habits were more consistant than the operating habits of the temperamental flat head engine. Drivers such as he were in great demand by the owners of the more expensive cars equipped with special overhead cam engines. Rex began driving the main event cars and Willie took his car to the dry lakes to test it under various atmospheric conditions. He found that the flat head engine tuned to perfection would, in only two hours time, due to changes in humidity, drop many horsepower. He decided then to leave flat heads and learn all he could about the overhead cam engines.

In 1938 Bob Swanson and Mel Hansen, drivers of the midget Offys owned

Rear half of gear case looking at the side that attaches to the block.

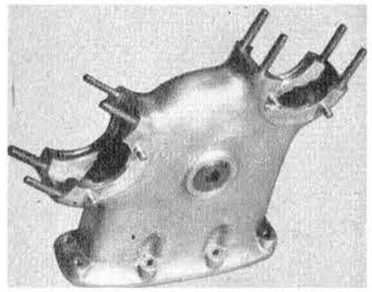




J. C. Agajanian's newest venture, the overhead cam engine built on a Studebaker V-8 block. 32 valves are used in the engine and are actuated by four Spalding cams. Carburetion is by a Hilborn injector and spark is furnished by a Scintilla Vertex Magneto.

by Tommy Lee, were instrumental in the employment of Willie as full time mechanic for their mounts. This was his first experience with the expensive Offenhauser engine. His first job was to completely assemble one of the car's engines which had been handed to him in a wash pan! The subsequent performance of the cars sold Tommy Lee on Willie's ability and also sold Willie on the obvious superiority of this type engine.

When Lee sold his cars, Willie bought one for himself. The first night out



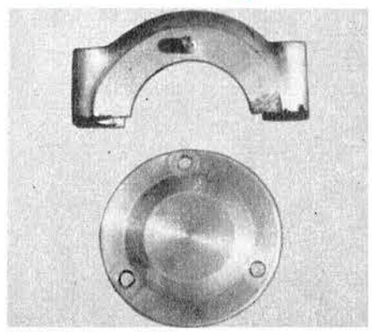
Front view of upper gear cover for L.H. side of engine. Cam gears ride in opening on each side of casting.

Jimmie Miller piled it up at Gilmore Stadium, demolishing the car. This was on a Thursday evening. Sunday afternoon the car, with engine completely rebuilt, was on the track at Oakland, Calif. Here is where the ingenuity and drive acquired in his years of hot-rod activities paid off.

Freddie Agabashian had over 2000 miles of driving experience on this one mile track, took the car out and cut two seconds from the fastest lap he had ever turned there up to that time. At the end of the 1939 racing season Willie's Offie was siting in third place in Coast Championship Standings.

Then came the war and Willie went to work for Douglas Aircraft Corp. Here again his ingenuity was soon recognized and he was assigned to the B-17 line where his main job was to figure

Cam gear covers for upper castings.

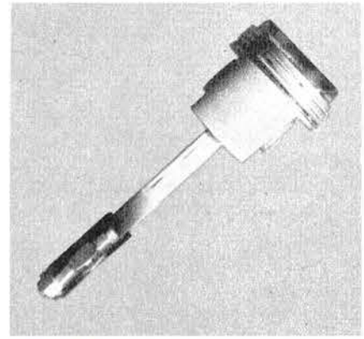


methods of repairing and correcting mistakes made on the assembly lines.

His last two years have been spent working for "Aggie" on the multiple overhead cam Studebaker engine. Willie had the design and Aggie had the necessary capital.

The Studebaker block was used for two reasons. The sturdy casting had very thick cylinder walls and came stock with a cu. in. displacement well within the limits for Indianapolis. Also the crankshaft and bearing sizes would be adequate for the tremendous punishment subjected to an engine in a 500 mile race.

Alterations to the block were as follows: All the water passages on the face of the block were machined and plugged and a new series of holes, much smaller, were drilled. These were eleven in number and of two sizes. Seven were 7/32" diameter located between the cylinders at the top of the block and four were 1/4" diameter directly below the exhaust ports to cool the lower side of the head. The exhaust ports are completely surrounded by

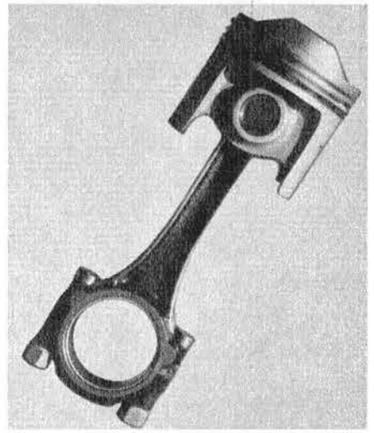


Side view of special "slipper skirt" three ring piston and Olds connecting rod as used in four cam Studebaker.

water. Two of the soft plugs (sometimes called "freeze" plugs) were removed from each side of the block and water headers were fabricated and mounted at these points.

The cylinders were bored out 3/16 inches over stock, giving a bore of 3 3/16 inches.

In place of head gaskets copper rings are set into the face of the block, surrounding the top of the bore, 1/8 inch back from the opening. These rings fit into grooves cut into the block to a depth of .0039 in. The ring extends from the groove .006 in. above the face of the block and is compressed by the head to seal the compression. The water passages are isolated by spreading a coat of No. 2 Permatex over the complete surface before installing the head. Needless to say a new set of copper

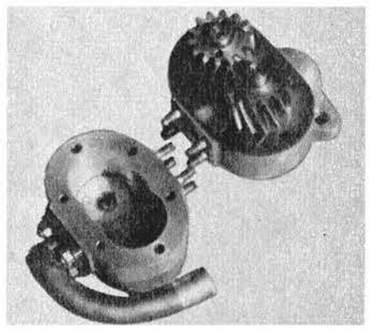


End view of piston and connecting rod.

rings must be installed each time the heads are removed.

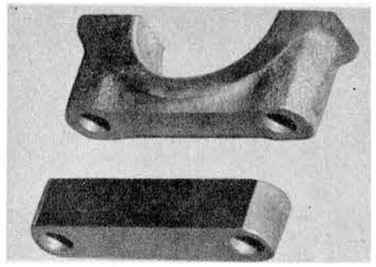
The stock oil pump has been replaced by a special made high output pump mounted in stock position.

The scavenger pump mounted on the front of the crankshaft is another Utzman innovation. A five inch piece was cut from the front end of a Ford solid drive shaft and contained part of the spline. One end of this piece was machined down and threaded so it could be screwed into the front of the Studebaker crankshaft. A stock Ford speedometer gear was then installed on the splined end of the short shaft in its normal position.



Inside view of oil pump which pumps and scavenges using two pairs of gears.

The oil pump which scavenges the dry sump is mounted below this unit. A shaft which has a Ford speedometer *drive* gear on one end meshes with the speedo gear on the short shaft and drives through this shaft to the oil pump. The driven gear of the oil pump turns two more stock Stude oil pump gears and with the three gears mounted in line, a two pump action is achieved. One scavenges the rear of the cast magnesium crankcase while the other draws from the front end. Both outlet lines



Three center mains of five main engine were beefed up with 4130 chrome-moly bars as shown here. No trouble was expected from this source but it is one of the protective measures decided on.

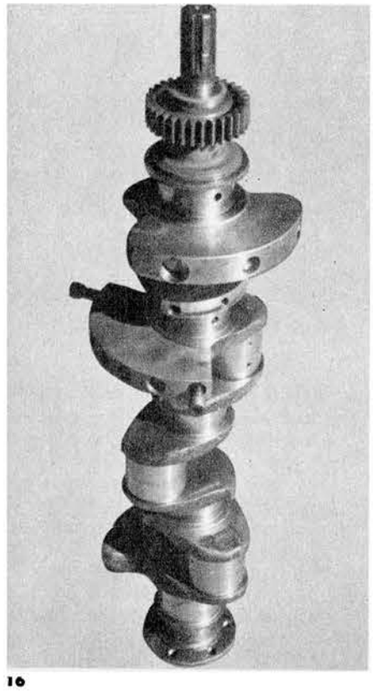
are joined to return the oil to the oil tank through a single line.

The crankshaft also has a few modifications. A rough forging was ordered from the factory, as Utzman wanted to use bearings a bit larger than those installed in stock Studebaker engines. The size decided on was .2 inch over stock and the smallest throw on the raw forging was only .235 inch over stock. Fortunately it did clean up at .200 inch over. A tribute to the plant which forges cranks for Studebaker.

Each crank pin has a .600 inch diameter hole drilled the length of the pin, and ½ inch off the centerline of the throw. This is to keep the counter weighting as low as possible. Four 1/16 inch diameter holes furnish oil for each crank pin.

The rod bearings are 2 3/16 inches in diameter and .950 inches wide. These special bearings, both rod and main, were made by the Cleveite Corp. of Cleveland, Ohio. Their engineers figured the main bearing loads to be 2900 psi on the front main and a maximum of 4400 psi. on No.'s 2 and 4. No.'s 3 and 5 were less than the front or No. 1 main bearing. The load on the connecting rod bearings was figured at 5000 psi.

Crankshaft has four special balance weights machined for it, one of which is shown here, partly fastened. Each is attached to crank by 3 Allen screws.



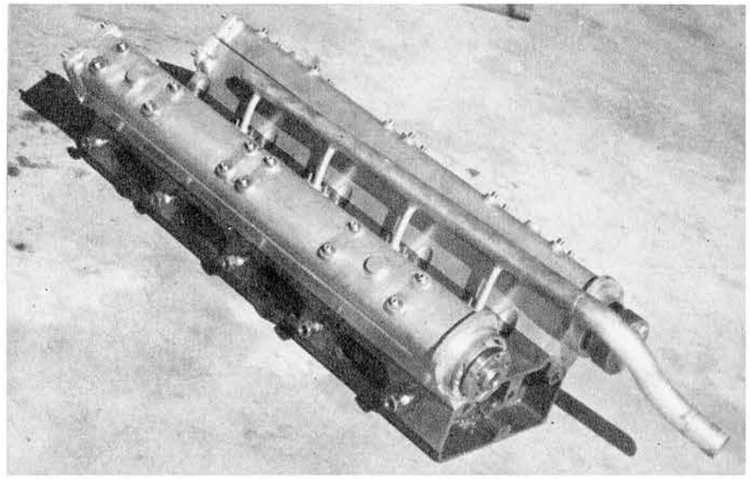
The oil pan used in the dynamometer test runs has been replaced with a cast magnesium crank case having a wall thickness of ¼ in. This case will not only help to hold down oil temperatures but will also, to a certain extent, tend to stiffen the lower half of the cylinder block and main bearing webs. A stiff lower end will hold crank shaft flexing to a minimum.

The heads were cast at the McCauley Foundry in Berkeley, Calif. Eighteen allen screws are used to bolt each head to the block. Compression chamber is the pent-roof type utilizing four valves per cylinder.

The wrist pins are made from 4130 tubing measuring 1 inch in outside diameter with a wall thickness of .125 in.

The pistons, made by J. E., are slipper skirt-type with domes protruding ½ inch into the compression chamber giving a compression ratio of 12.8 to 1.

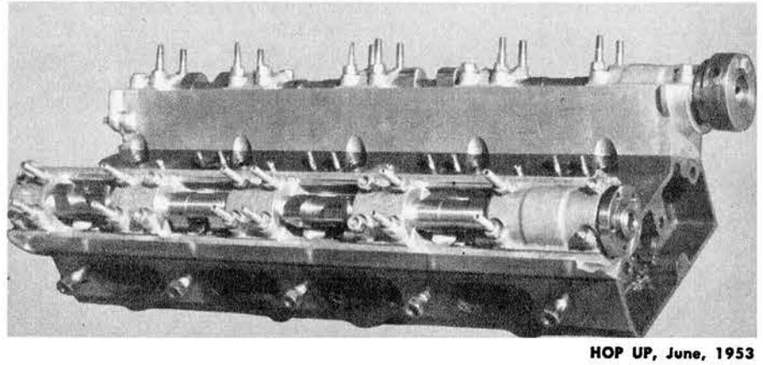
Two 1/16" compression rings are used along with an oil ring measuring 5/32 in.

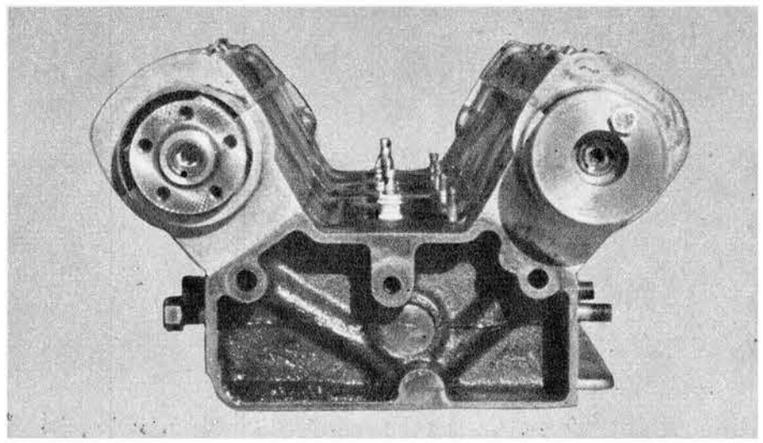


R.H. head showing exhaust ports at bottom, exhaust cam cover, the water log which runs forward to the radiator and behind it the intake cam.

Two intake valves are located in the upper side of the pent-roof combustion chamber and two exhaust valves in the lower side. A single oval shaped intake port branches out to the two intake valves, inside the head, then in turn, the two exhaust valves (per cylinder) feed out to the collector pipe through a single oval shaped port. Ports of this shape are used to keep the height of the head to a minimum, as round ports would make the heads approximately one inch higher than they are.

R.H. head with cam covers and water tube removed. Each cam (ground by B. Spalding incidentally) has eight lobes because there are two intake valves and two exhaust valves per cylinder.



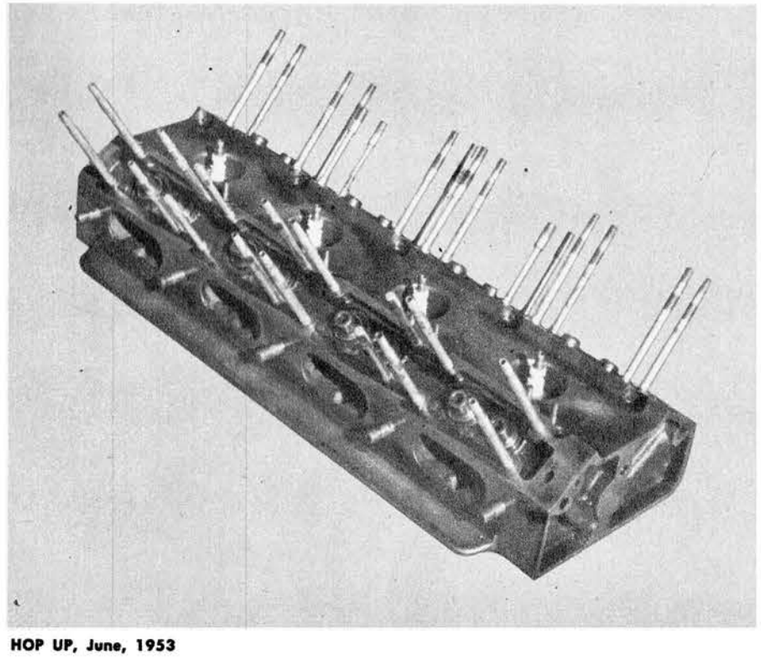


Front view of right hand Stude head.

The valves both intake and exhaust, are stock Studebaker but have been altered in length and machined to use Offie locks and keepers. Stock Studebaker valve heads are made of 2112, stainless steel, with alloy steel stems.

Two springs are used on each valve. These springs were originally designed by Art Sparks for use in Triumph motorcycle racing engines. Difference in tension of 130 lbs. on the exhaust and 150 lbs. on the intake valves is accounted for in the cam lobe design. The exhaust lobe has a tangent bank with 1/32 in. less lift than the intake which is ground with a concave flank and having 5/16 in. lift.

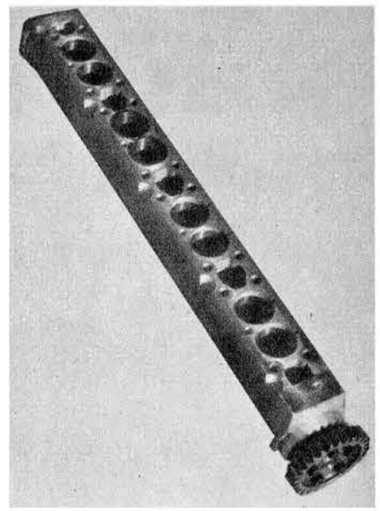
L hand head with cams removed. Valve guides can be seen above intake ports.



The four cams were ground from 4615 carborizing steel by Bill Spalding to Utzman's specifications. They are mounted on the heads in a manner similar to the Offie.

Ten gears are involved in the gear train driving the cams. The crank gear drives a special cluster type gear used in place of the stock timing gear. The smaller gear on this cluster gear drives the two idlers which in turn drive the upper idlers. The four cams (two on each side) are driven by the upper idlers. The four idler gears are identical in size and construction. The four cam gears have the same number of teeth as the small idler drive gear on the central drive cluster.

All ten gears are made of 4340 alloy steel and were subjected to a nitriding process.



Bottom view of cam case. Valve cups (shown in photo on page 14) ride against cam, guided by holes in case.

The engine is fired by a specially prepared Scintilla Vextex Magneto from Joe Hunt, prominent magneto specialist, located in Los Angeles. This magneto mounts on the rear of the engine in place of the stock ignition. Drive from the front of the engine is furnished by a shaft made to replace the stock cam shaft. Stock Studebaker drive gears are used at the rear.

The fuel injection system, built by Stuart Hilborn, is furnished fuel by a pump driven off the rear of the left intake cam shaft.

Extensive dynamometer testing has resulted in a few exterior changes on the engine but the basic design and function proved more than satisfactory to designer Utzman and backer Agajanian.

Using straight methanol the engine produced 370 horsepower at 7100 rpm.

Utzman plans on using a 3.70 to 1 gear with 800 by 16 tires on the Speedway which should hold the engine to 7500 rpm.

We feel that this tremendous horsepower output coupled with the dyno-proven dependability of the engine with the driving skill of Chuck Stevenson will be a combination hard to beat at this year's brick yard classic.

Many factors enter into the eventual triumph at this event but we feel that if the race were to be decided upon by the amount of sweat, tears, ingenuity and thoroughness invested, the aforementioned combination will bring home the bacon and we at Hop Up will be rooting for them all the way.