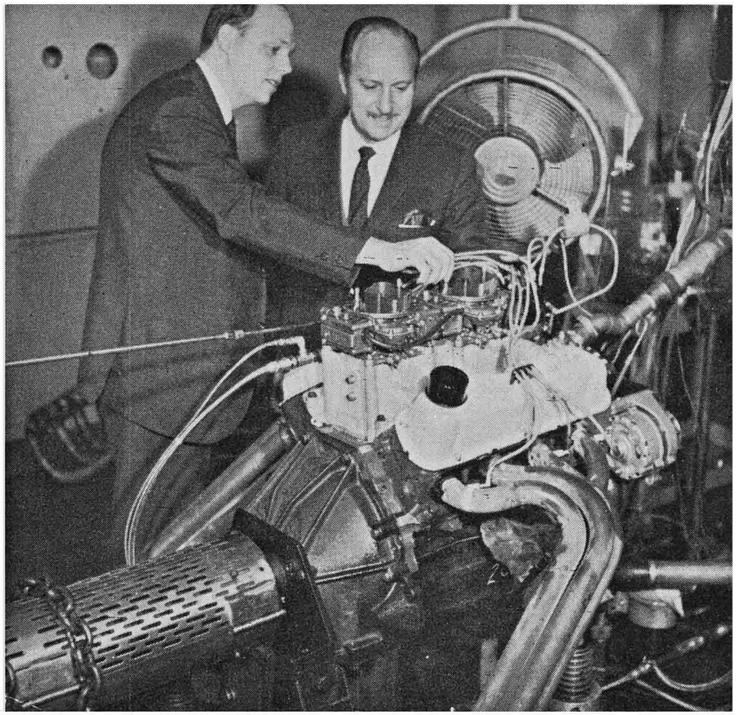
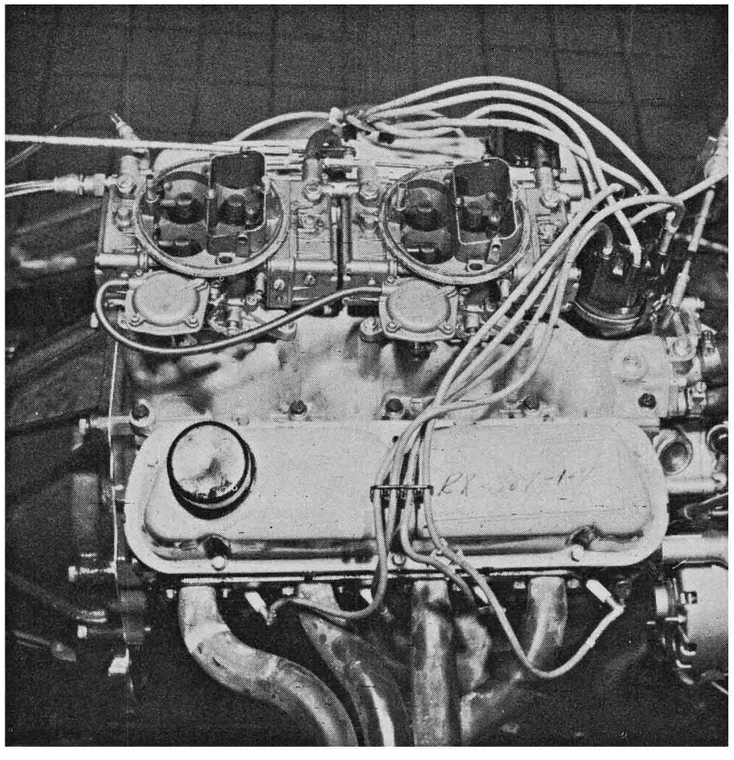


Hank Lenox and John Carlini check out changes on a full race 302 before a dynomometer run.



The street scene 302 gets regular head gasket-racing machine gets metallic "O" rings.

UNDER NORMAL circumstances, the mid year introduction of an engine that is politely rated at 240 horsepower and 5000 rpm from 302 cubic inches is enough to make people go "ho-hum" while they head for the nearest hamburger stand. On the other hand, we can assure you that a 302 eight-barrel which Ford has just released is going to rewrite the record book in so many ways it isn't funny.

The names of the engines are a lot more descriptive than their official power rating. The first—the mild and modest street version—is called a 302 8V DSO. The DSO stands for "Dealer's Special Order" which should give you a pretty fair clue as to performance. Another clue dawns very quickly as you sight down these enormous tunnel bores and look at the king size valves. Tunnel ports, you see, no longer are the exclusive province of the 427, and now come in a 302 mini-version.

As if this were not enough good news, Ford has also released a 302 eight-barrel competition version which is sold directly to you on a pallet ready for shipment. Here, the sky is the limit, for this engine will be putting out more than the first Ford Indy pushrod engines. Selling the engine on a pallet for racing is very helpful in these days of government regulations, since it eliminates the need to certify it for emission control or road use. Thus Ford was able to pull out all stops without worrying about a few unburned hydrocarbons one way or the other.

Now it so happens that the DSO engine is sold with hydraulic lifters and a pair of Ford 4300 carburetors as well as slightly smaller valves, 2.01 inches on the intake and 1.53 inches on the exhaust valve diameter. Its main benefit is "breathing potential." Once you install mechanical lifters and the rest, we leave the horsepower rating to your imagination. The rumor mill around Detroit which is usually pretty well informed speaks of 400 to 450 if you transform the DSO into a competition version.

The DSO street version and a competition engine have many castings in common, such as the block, cylinder heads and manifold, but as we describe them, side by side, you'll see that the competition version is far more advanced. A relatively modest amount of machine shop work will readily upgrade the DSO but it will probably not pay to rework it all the way.

RATED MEEK, RUNS WILD

When the Ford engineering honchos power-rated the new 8-barrel 302-cube engine at 240 hp, they must have been feeding it a mixture of diluted rose water. The truth of the matter is you can now buy 600 horses on a Fomoco pallet

BY ALEX WALORDY

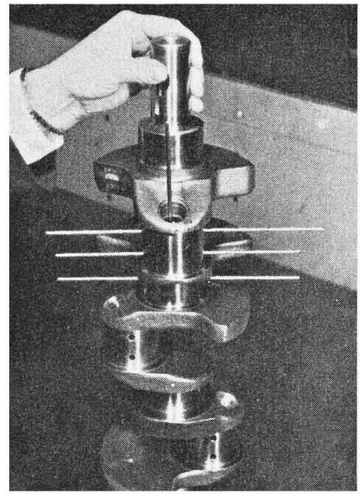
The intake manifold is common to both engines and stands unusually high above the block. You can readily spot the breathing potential just from the enormous rounded contours of the individual ports. The conventional 180 degree design is similar to the one of the old high-riser, and balance passages between the two four barrels smooth out the idle and mid-range. Since the manifold ports are .060 inches smaller than the cylinder head ports, the mis-match results in a small ledge. Any liquid fuel flowing along the manifold walls will automatically be pulled off this ledge by the air stream and sprayed out. If the ledge had been smaller and in the opposite direction, that is the cylinder head ports stepping into the path of the air stream, there would have been some loss of flow, but not this way.

The heat cross-over passage of the DSO manifold is simply heliarced shut for use in competition. Street carburetion consists of a pair of Ford 4300 four-barrels. The race machinery will run with 600 cfm Holleys. On the short tracks, the capacity may be increased a little to help high rpm while long fast tracks like Daytona will have less carburetion to lengthen engine life. You can tell from the carburetor capacity alone that this engine is intended to rev and breathe.

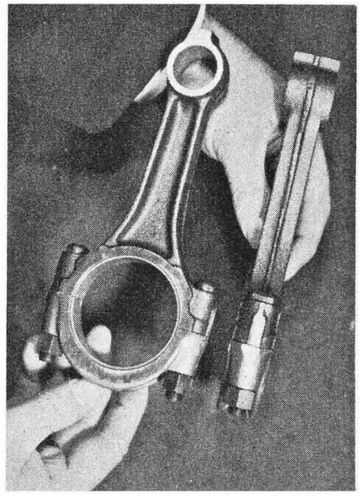
The cylinder head casting, which is common to both engines, runs the intake ports straight toward the manifold without any need for detours around pushrods. The pushrods simply go right "through-the-middle-of-the-house" and are enclosed in a small tube which fits tightly, top and bottom, to seal against the manifold walls. The ports are round, following Ford's racing practice, and offer the least surface area and drag. They also help maintain an even round section right on up to the valve. A considerable amount of air flow work was done on them. One result was to raise the floor of the port quite a bit to form a smooth bend and to provide a straightening action that directs the incoming air all around the valve, instead of to one side.

Both engines carry essentially the same "stress head" valve as Ford has used in all their racing wedges. These are tulip head valves with a thin head of carefully controlled shape so all the metal is stressed evenly. The valve heads are purposely flexible so that they will conform better to the seat. A number of quality points have been added, such as chrome plated stems, hard wearing tips and polished heads which eliminate any stress rising tool marks.

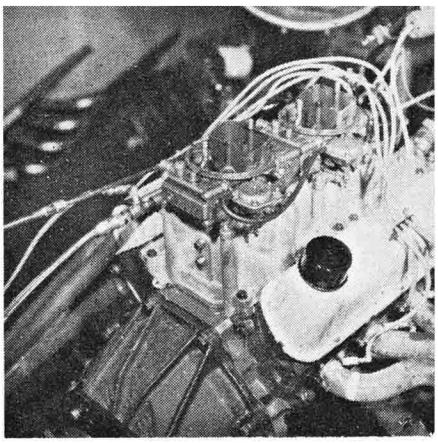
As we mentioned, the race head has considerably bigger valves, 2.14 inches on the intake instead of 2.01, and 1.57 on the exhaust instead of 1.53. Also, on the race version these valves run in pressed-in mehanite guides that offer better wear resistance as well as ease of replacement.



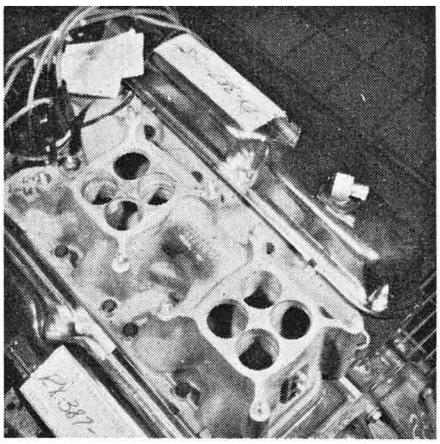
Crank is crossed drilled at the mains and has hollow journals that serve as oil traps.



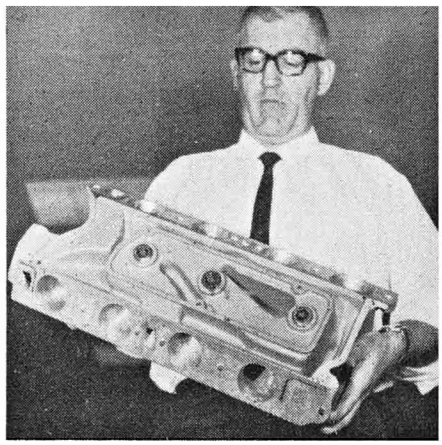
These high performance rods offer a lot more strength in the web area than stock 225 rods.



The intake manifold is mucho high, and it's topped by a pair of big Holley quad carbs.



Balance passage between the two four barrels helps smooth out low end performance.



We sure hope this cat doesn't hurt himself as he shows off the "sewer sized" ports.

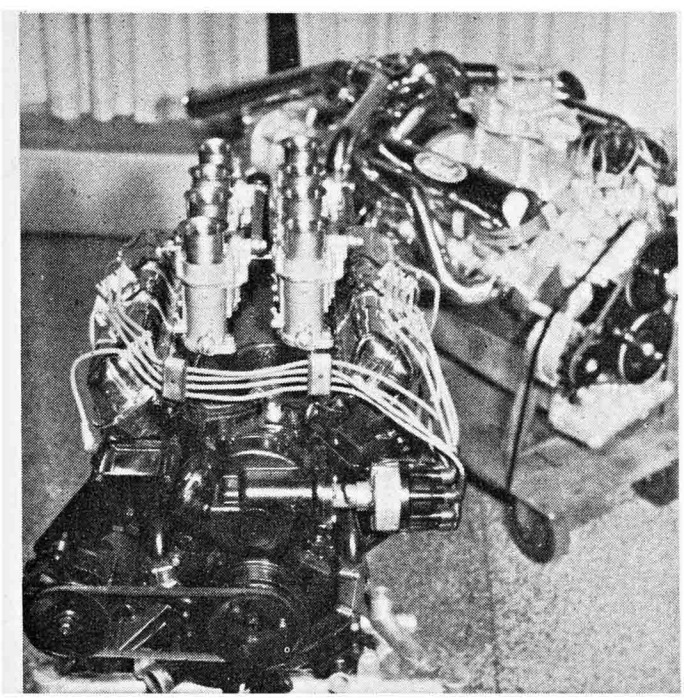
There is another little point, too, which doesn't meet the eye right away, for the center lines of the guide are spaced out further apart on a race engine, hence more room for the valves. The DSO cylinder head casting has enough metal in it to allow for the changes if you wish to do your own machining.

A point which should be of interest to anyone running a Ford is that the race seats are radiused so that there is only a line contact between the valve and the seat. According to people who ought to know, breathing improves throughout the range at all lifts, not just during the initial opening of a valve. Also, and this we can't explain, the valves pound in less with a rounded seat than with a flat seat ground in a conventional manner. It seems that the engine is perfectly willing to tell you the answers, but is sometimes a bit hazy about explaining "why."

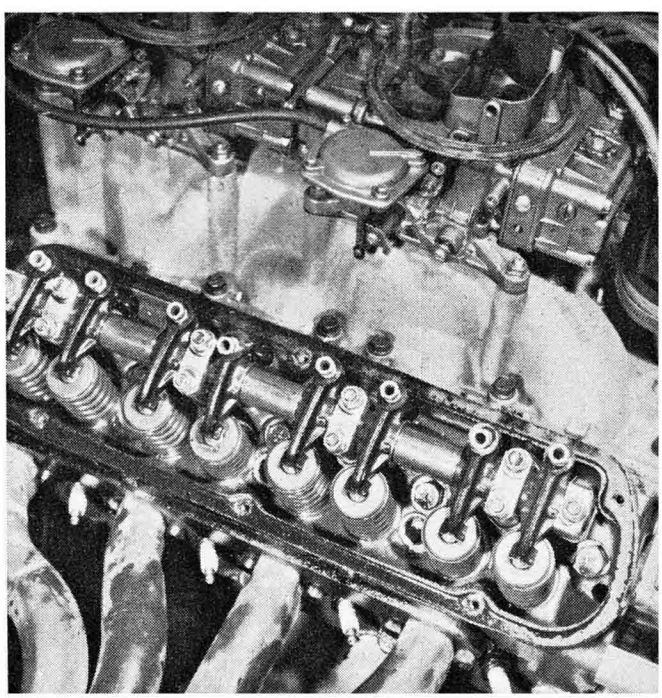
The DSO engine will have some conventional production ball socket, rocker arms, and studs. The race engine, on the other hand, offers the surprise of your life in the form of an old-fashioned unbending, unyielding rocker shaft, complete with forged rockers. Why? Well, just to give you an idea, the monkey motions of a bathtub rocker and stud can use up to 10 degrees of cam timing. The rocker arms and shaft give a more precise timing and less loss of it.

The rocker stands are held down with pairs of bolts on pads ma-

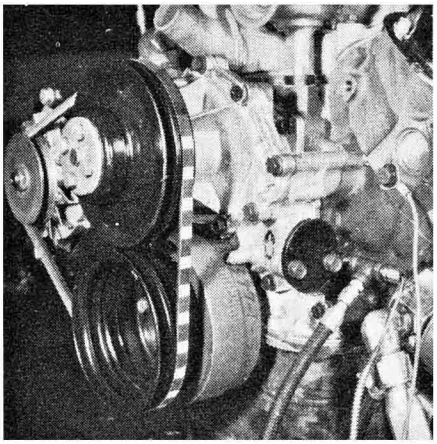
The big extruded pistons were definitely designed with racing in mind!



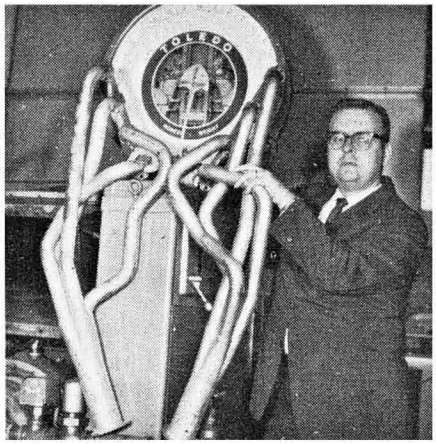
The new race version of the tunnel port engine, puts out as much power as the first Ford pushrod engine at Indy. Any questions?



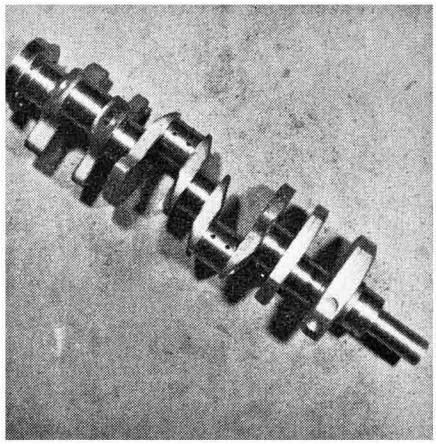
Forged rockers and a rocker shaft instead of individual studs maintain accurate valve timing in the power-packed race engine.



Giant damper is used at the front of the race engine. It's same size as one on GT 40 racer.



Headers were designed for this race engine which pulls 430 dyno hp from 302 cubes.



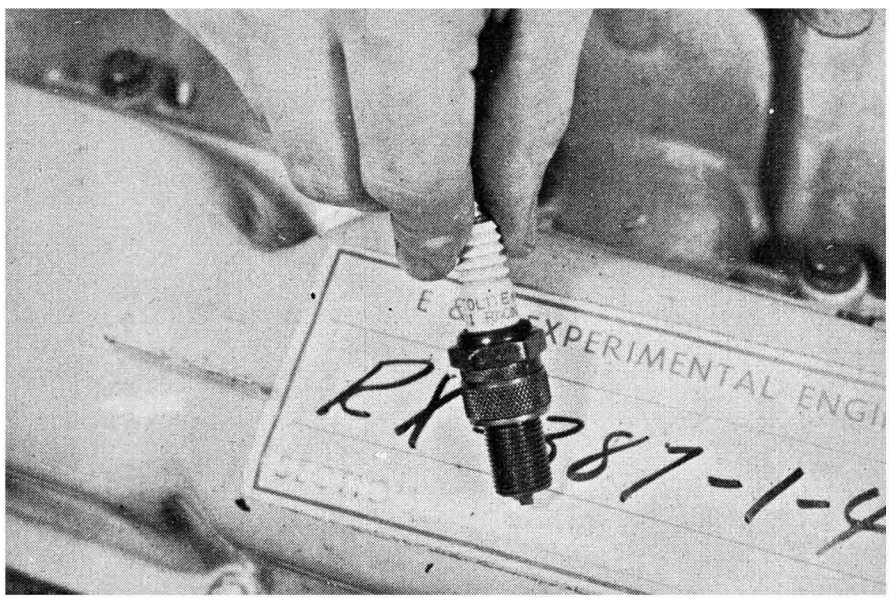
Connecting rod journals are capped at each end with cupped plugs and retaining rings.

chined in the cylinder head so that if you make the change, a little extra drilling and tapping will be necessary. The rockers, incidentally, were adapted from a Ford truck engine and provide a handy self-locking adjustment. The advent of the rocker arms brought with it a change in the oiling. Instead of feeding the oil through the pushrods, it is now supplied directly through drillings in the block and cylinder head to the rocker shaft.

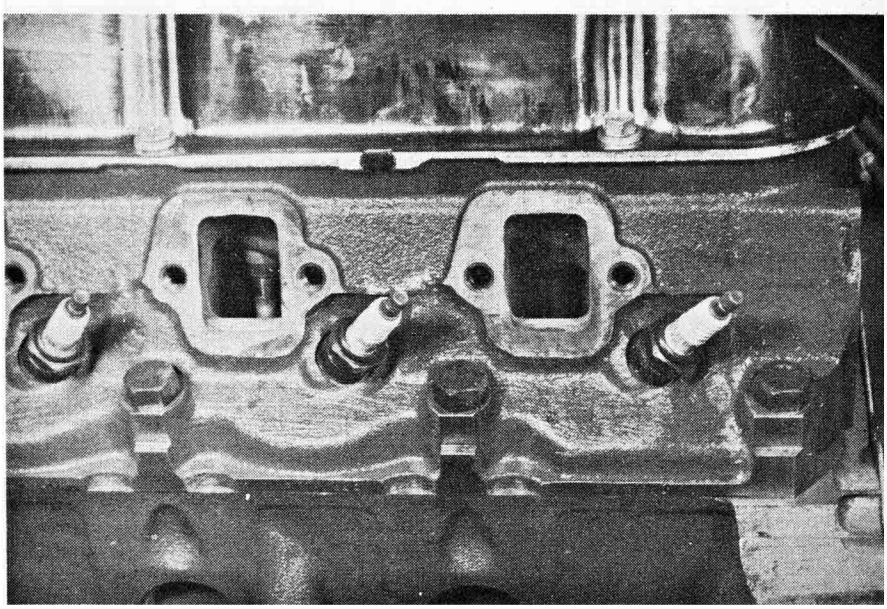
The new head offers some interesting changes in the cooling system as well. A switch from 18 mm plugs to the thinner 14 mm plugs, as well as an increase in plug reach, gave considerably more room for water passages. Here there is more water around the plug and also a fuller water jacket around the exhaust valve than there was in the old GT 40 race head. This, in spite of much bigger ports.

To eliminate any potential leaks between the block and head, the race version uses a "dry deck" design. Here, most of the coolant passages are permanently welded shut on the cylinder head deck and individual "O" ring seals nesting in counter bores are used at each cylinder bore. In fact, the cylinder head deck doesn't even contact the block directly and is spaced a good .010 inches away from it, insuring full sealing pressure around each cylinder. At each of the few remaining coolant passages and oil gallery, rubber "O" rings located by counter bores are provided. To top it all off, a thin piece of fishing line made of a special Hylomar compound provides a seal around the periphery of

(Continued on Page 72)



Thin 14mm 3/4-inch reach plugs allow room for more cooling water in spite of bigger ports.



The exhaust ports have been increased in size and they've been straightened out.

11.70 at 177.95 mph against Riffle's 10.76 at 126 mph and a big NHRA Winternationals win.

Top Stock Eliminator honors went to John Barkley and his 11 year old Chevrolet who found the handicap given to Magazine Editor, Jim McFarland, and the Sox and Martin's '68 Barracuda to his liking. Barkley, a machinest off-duty, was definitely the "underdog" of the meet. He took on the best factory-sponsored machines and was through the lights first. His first victim was Rog Holder's F/S Comet, and in the second round he put away Garry Brookshire's '68 Pontiac with a 14.60 and 80 mph.

In the next round Barkley got the handicap and made it hold as he beat Everett, Washington's Pete Kost and his '68 Olds. In the semi-final he washed out Bob Lamberk's Chevy. This brought him wheel-to-wheel with Jim McFarland and the Barracuda. Barkley made the best of his head start and held on to take the measure of the likeable magazine editor with a 14.59 and 89.64 to 12.99 and 108.17.

The attendance figure of 78,000 for the three-day meet makes this one of the best attended race car events in the Southland. As are all NHRA meets, this one, with more than 700 machines entered, was run smoothly and efficiently. And down the road a little way is the Summernationals.

RATED MEEK continued

the head. If a DSO head is converted to race use and dry decked as we have just described, tiny steam holes are needed at the front of the head and block to vent out any air pockets. For drag racing there is little point to it. Incidentally, the deck thickness at the DSO head is .420 inches, .100 thicker than on production 302's.

The 302 block has a generously designed bottom end with four bolt main bearing caps, and is common to both the DSO and race versions, except for a small oil drilling to feed the rocker shafts. To save costs, the DSO crank is a nodular iron casting; While that of the all out race engine is a steel crank which closely follows the experience gained with the racing 427 wedges. This means a forged steel crank with 180 degree cross drilled mains and hollow connecting rod journals, capped at each end with supped plugs and retaining rings. These hollow journals form an oil resevoir that feeds the rods continuously under full pressure and also act as a final dirt trap. Centrifugal force throws any dirt that escapes the filter outward and packs it against the side of the hollow opening, keeping it from reaching the bearings. Hollowing out the journals also lightens them and makes the crank easier to balance.

Among the other steps taken to insure good oiling, we might cite grooved lower main bearing shells, a common practice among all builders of hot 289's. The grooves in these shells are put in with a carefully radiused cutter to eliminate sharp shoulders, together with the attendent stresses and potential failures. Also, the pressure relief spring on the race pump is set at 85 pounds pressure instead of 55. Since the racing crank is intended to turn at higher rpm than the DSO, it is fitted with a bigger inertia damper designed to tune out higher frequencies. The race crank also benefits from a nodular iron flywheel instead of the straight cast iron one used on a street machine. Finally, to reduce drag the rope seal at the back of the crank is replaced by a neoprene lip seal.

The connecting rods on the 302 are .060 inches shorter than the ones of the 289 to accommodate for the extra crank stroke and the wrist pin's in the same location in the piston as the 289. To gain some extra strength, bigger 3/8th rod bolts replace the 5/16 ones and therefore had to be spaced out a little further away from the journal. Instead of a notch broached straight across the rod to retain the rod bolts and keep them from turning, this rod has a spot faced relief which leaves two strengthening rail sections extending around each bolt. The rods, we might add, are only 25 grams heavier than those of a 289, remarkably little considering the gain in strength.

A street type tunnel port has a fairly low 10.0:1 compression ratio, designed to help with emission control and durability, while the race machine has 11.5:1 and a piston with a slight pop-up. Pop-up pistons have never been very much in favor with the all out racers because they resulted in a loss of power due to the spark plug and valves getting shrouded. These, however, together with the broadened combustion chamber, have proven excellent.

The extruded pistons were designed with racing in mind. For instance, the sides of the towers extend beyond the skirt, leaving room for full floating pins and their retainers. The pins on the race engines, incidentally, have tapered bores which reduce weight and increase strength. Also, the race pistons will have special oil feed holes leading from just under the oil control ring directly to the wrist pin. Thus, every time the piston comes down, the oil ring helps scrape oil toward the pin.

The extruded pop-up piston will have the narrow 1/16-inch moly compression rings as well as a moly oil ring to put the finishing touches on this remarkable power plant. One incidental bit of intelligence which we picked up is that the production version of the tunnel ports were deliberately designed to keep the sale price within the reach of a normal wallet, so the 302 promises to be a volume item rather than a limited release pipe dream. It may well change things on the racing map.

PURE FIREBIRD continued

The '67 engines ran best with 40 to 42 degr. total advance.

Incidentally, all vacuum systems to the distributor are disconnected