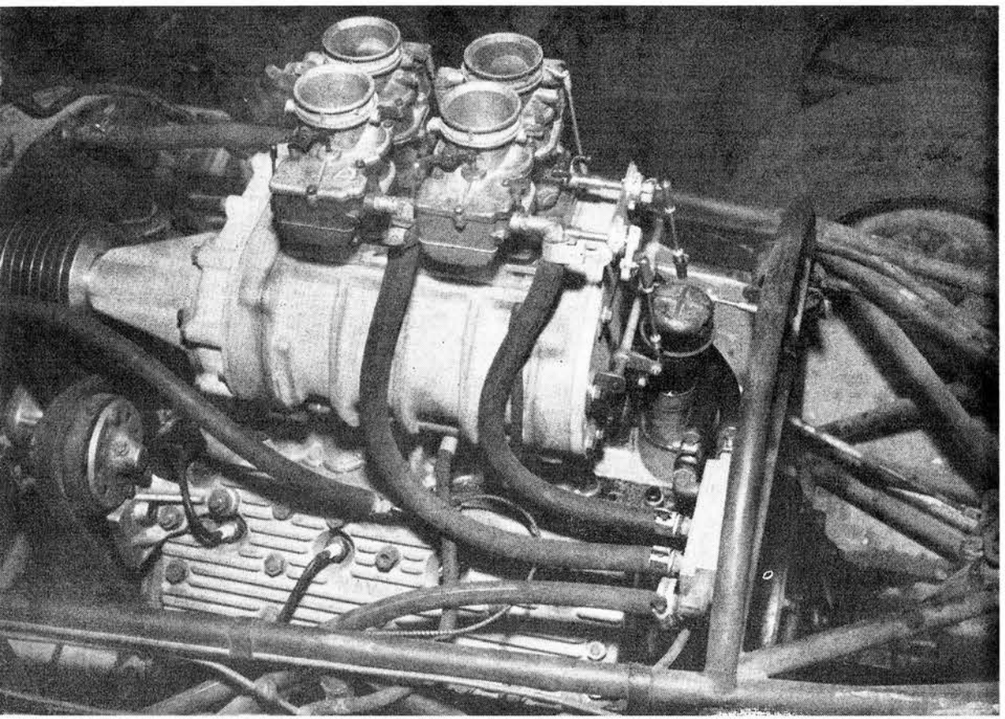

Beatty's Blower

By Wayne Thoms

THIS is a success story—at least it is a portion of a success story. By the time you read this the action will have been played through to a major climax, and the results of the Bonneville speed runs will tell whether Tom Beatty's work has been in vain these past months. Beatty, who hails from Glendale, California, has converted a blower (supercharger for the technically minded reader) that was originally designed for a four cylinder GMC diesel engine into a machine that makes his Mercury powered, belly tank streamliner do things that this engine should not possibly be doing—that is, traveling in excess of 200 miles an hour.

Let's talk for a moment about the man who has constructed this machine. Tom is a friendly fellow, but so modest and soft spoken that we had to pry most of the information about his project out of him. However, his lack of garrulousness is more than made up for by his ability to make an engine keep on going in the face of mechanical conditions that would bring the average engine to a shrieking halt. His shelves are lined with trophies that speak for themselves of speed records set over the past five years of straightaway competition on the desert dry lakes and at the annual Bonneville meets.

Tom, of course, is a skilled machinist and mechanic, and was fortunate enough to have access to machine tools of all types. Had these not been available, the work he did would have been virtually impossible since anyone of limited means would have had to job all the machine work out commercially.

The conversion of this particular type of blower was not an entirely new project for Beatty. He had collaborated with Barney Navarro five years ago in a similar conversion on the GMC type 371 blower. This was the model designed for the three cylinder diesel engine. As might be supposed, this model was slightly smaller than the present one, which is the 471 series. The small one ran quite satisfactorily for Beatty until it was finally sold by Navarro, who owned it. In fact, it was good enough to push the belly tank along at 203 miles per hour last year at Bonneville, the car attaining that speed through the first trap. According to Beatty, by the time he was in the third trap, his tachometer was clocking 215. At this inopportune moment a head gasket decided to give up and the melting of two pistons ended the '52 speed trials for Tom.

He discovered in converting this second blower that it was like starting all over again. There were no specifications available from the previous job and so much time had elapsed that both his and Navarro's memories were faulty. The total project used up three months of labor at two to eight hours of work every night, plus Saturdays and Sundays. A man must really love his hobby to be able to spend as much time at it as this, and Beatty apparently does.

Perhaps, at this point, a brief explanation would be in order of what makes a supercharger beneficial. Normally, the fuel in an unsupercharged internal combustion engine is brought from the carburetor, where it is mixed with the proper amount of air, vaporized, and then drawn through the intake manifold, which directs it into the combustion chambers for firing. The intake manifold operates under a vacuum in order to suck the vaporized fuel into the combustion chambers. This is a basic and highly simplified version of what actually happens.

Now, imagine that as the fuel is vaporized, it is drawn into a separate chamber before it reaches the manifold. At this stage, pressure is built up in some manner and the fuel is forced into the manifold, rather than pulled in under a vacuum. Fundamentally, this is what happens in the process known as supercharging.

In actual operation, the "Jimmy" blower, as it is affectionately known, is one of the simplest, being of the single stage variety. Perhaps in its simplicity lies the secret of its efficiency and success in this particular blower conversion.

The main blower box houses two ten inch long rotors which can be roughly compared to steamboat paddlewheels that are intermeshed and turning in opposite directions. There are three hollow vanes or lobes on each rotor which revolve at very close tolerances. The vanes are not flat, but have a cross section that resembles a three leaf clover with room for the leaves to mesh without quite touching as they turn. As the rotors do not touch each other at any time, they require no lubrication. Highly effective seals prevent air leakage at the ends of the lobes, and also prevent oil, used for lubricating timing gears and rotor shaft bearings, from entering the rotor compartment. In addition, the rotors are made in a twisted or helical form. This creates a positive flow of air as it is forced into the combustion chamber, without any pressure variation or surge. A constant pressure air flow is absolutely essential in the two cycle diesel engine for which this supercharger was designed and apparently it has been a good thing for Beatty's Mercury as well.

The rotors actually revolve from the center outward, so that the fuel, straight alcohol, is forced around the outside perimeters of the case and is swept into the manifold. This is a fact worth remembering, since casual observation would assume that the fuel would be forced into the manifold in the most direct manner possible—right through the center. Not the case, however. More boost is possible by pushing the fuel around in an arc and then releasing it for burning.

The terrific pressure obtainable with this blower is better understood when you read what happened to the engine during a recent trial. 1. Two cracks in one of the heads. 2. At least four cracks in the block. 3. Two quarts of water leaked into the oil. 4. A broken spark plug completely inoperative. 5. One piston so hot that the center had sagged noticeably. 6. A stud near this piston that had turned blue from the heat. All of these troubles were discovered after a lakes run of 194 miles per hour, and against a slight head wind at that! Beatty realized that something

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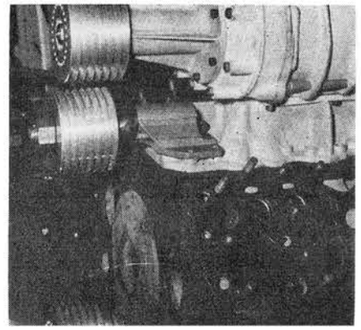
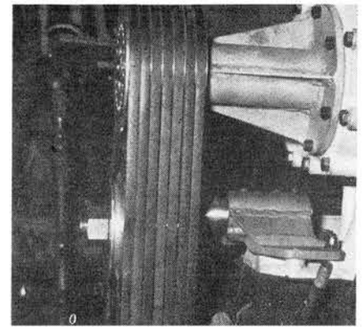
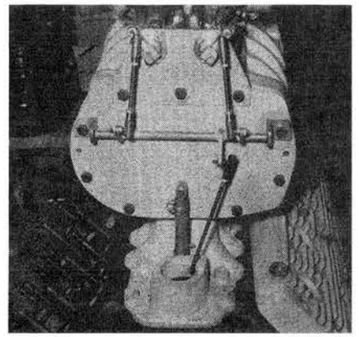
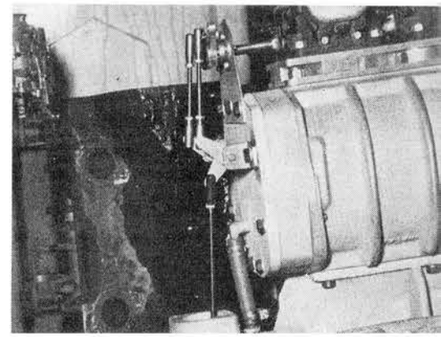


***PULLEYS** are fully exposed here to show the details of this fine construction*

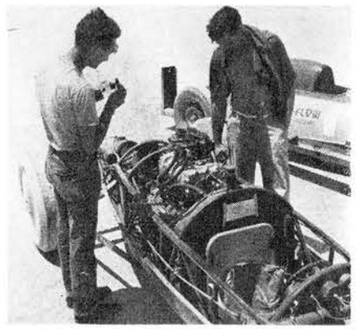


***SEVEN** Ford belts are used in addition to the regular stock water pump belt*

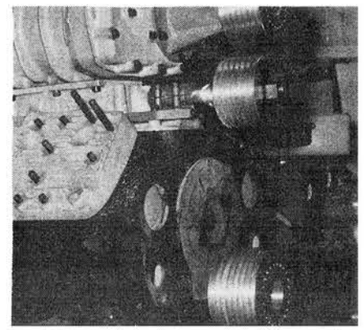




***MONKEY-MOTION** throttle linkage is attached to rear blower housing plate made by Beatty. Each arm works an extended throttle butterfly rod for two carburetors*

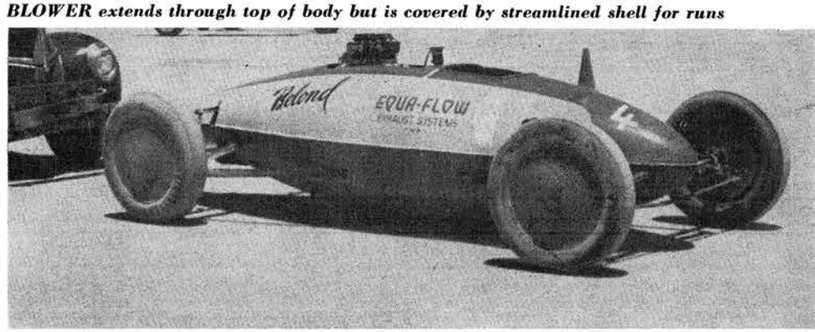


***TOM BEATTY**, left, takes spark plug check before he makes a fast lakes run*



***UPPER** pulley is the main blower drive. Center pulley is an idler for adjustment*

***BLOWER** extends through top of body but is covered by streamlined shell for runs*



FORMULIZED FORD

(*Continued from page 61*)

completion of the day's running but the figure can hardly be used as much of the Fordillac testing was done while the stock Ford was parked by the side of the road.

The results of all the tests started us on various corrections. The Carter four barrel was taken off and a Rochester replaced it. The reason for this was that the Carter although modified could not flow the fuel through its chambers as readily as the Rochester. The increase in float level and float travel—of course—had to be made in the Rochester. The fuel line from fuel pump to carburetor was also increased to 5/16. The fuel pump was disassembled and one of the check valves was stuck—thus explaining the fuel pressure trouble in the straight-away runs.

The only thing we found lacking in the operation of the car was the amount of fuel pressure available. It was definitely inadequate for the type of test we had in mind. However, Bill does not plan on ever utilizing the full rpm range available in his conversion and he is more than happy with the car as it is today.

It answers his every need and when the heavier front springs are installed to improve the handling of the front end he will be in a most enviable position as the owner of this Formulized Ford.

BEATTY'S BLOWER

(*Continued from page 33*)

was wrong only when the car began running a bit rough. An unblown engine with all these difficulties would never have made it down the course. So far, it has always been the engine which has broken down and not the supercharger.

At peak engine speed of 5000 rpm, he is able to realize 55 inches of mercury boost from the blower, which is to say that he has a gain of slightly over 12 pounds per square inch of pressure in the blower chamber above normal atmosphere, which is 14.7 psi at sea level. For safety's sake, he has machined the rotors for clearance greater than factory specifications, since he is both turning more rpm's and building greater pressures inside the chamber than it was originally designed for. According to Beatty's calculations, the rotors turn at approximately 1.25 times engine speed with his present drive pulley arrangement.

The total conversion job, in addition to requiring a large amount of time and labor, took more than a little bit of ingenuity and engineering. One problem led to another, and before Tom was through, he had fabricated at least eight major components for the unit.

Some of the parts involved casting, some milling and machining, others welding, and finally, as a topper for mechanical arrangements, we have the throttle linkages. The engine is currently running four Stromberg model 48 carburetors converted for alcohol. It was a touchy project to get them all synchronized and functioning simultaneously. Unfortunately, the photos fail to do this mechanism justice and it must be seen in action to be appreciated. Tom calls it his "monkey motion," and though it looks a bit strange to see all those linkage rods working when he pushes on the foot throttle, there is no perceptible lag anywhere in the system and it has proved most efficient. While not strictly a part of the supercharger, the fuel pressure set-up should be noted here. A hand pump has been installed which feeds the required seven to eight pounds pressure per square inch to a fuel log located on a plate just behind the oil filler pipe.

Beatty's only complaint about the carburetion is that he can't get enough of it. In other words, he would like to devise some way to get more fuel into the blower and consequently more speed. He feels that the limit has been reached at four in the number of carbs he can add and continue to gain in efficiency under the present arrangement. From here on in, it is a question of either designing his own carburetor or building some sort of fuel injection system on the blower.

As regards physical changes to the blower unit, the only internal change that could affect fuel flow was the previously mentioned tolerance increase to the rotor

vanes as a safety factor. Externally, it was necessary to cut a front mounting flange off the outside of the rotor housing. This unit was actually designed to attach to the diesel engine on the side of the block, and operate with one rotor above the other, hence there were items such as these flanges which were superfluous and had to be cut away.

A complete new back plate was designed and built so as to have a base for the throttle linkages and clearance for the oil filler pipe. When the original is installed in a GMC truck, there is a more complex end plate which drives some other accessories. Returning to what is now the front of the blower, it was necessary to make an extensive modification, in that a new drive shaft was machined and a drive shaft housing fabricated. The drive shaft, which is now nine inches long, had to be extended to mate with the engine pulleys. Tom machined it from an old axle and it is piloted to the rotor drive gear with a flange and bolted on with six bolts.

Barney Navarro cast a special intake manifold for the blower, and then Beatty had the task of chopping out the insides for the greatest possible area obtainable. A good deal of this was plain old-fashioned hand work where no power tools could reach the manifold interior.

The carburetor adapter plate, which was milled from a piece of aluminum plate stock, was another tricky project. The problem was to get the four carbs set close enough together so that the alcohol could flow into the blower without restriction, yet keep the throttle shafts in alignment for the purposes of attaching the linkages. Still he must be able to bolt the carburetors successfully to the plate leaving room for the plate to be attached to the main housing. The photos are far better at depicting the solution than I am at describing it. The only thing they do not show is the fact that eight holes were drilled in the adapter plate at an angle of seven degrees slope inward so that the fuel may flow into the housing via the most direct route possible. If figuring an angle so closely seems like splitting hairs, just try building an engine sometime that will exceed 200 mph and see for yourself how carefully each move and dimension must be calculated.

A total of eight belts is used throughout the engine. Seven of them drive the supercharger and one is reserved for the water pump. The pulley system was another of the components that had to be worked out and manufactured. The original unit was gear driven. An idler pulley housing was built and mounted on the front portion of the intake manifold. The object was to swing the idler pulley out and as low as possible without interfering with the water pump belt, which cuts across directly beneath the idler shaft. Therefore, a total of three pulleys was constructed. Two with seven grooves, and the main pulley, operating off the crankshaft, with eight.

The sum total of the workmanship that has gone into the conversion of this supercharger is the best all the way through. We could dream up superlatives for days to describe it, but the facts speak for themselves. At no point could we find any evidence of corner cutting or lowering of standards. Naturally, such practice would be ridiculous in the construction of this type of machine. Every possible contingency must be calculated and allowed for, regardless of how remote it may seem at the time of construction.

We hope the construction and performance of this blower will be a guidepost to other hop-up enthusiasts. As you know, most of the recent record shattering speeds have been turned with nitro derivative fuels. From all indications, these mixtures are going to become more scarce before they are again generally available. Nitro-methane has been taken over almost completely by the government, and this fuel, when cut with methanol, has been one of the mainstays of the speedsters at the drags and the lakes. Naturally, speeds will drop without the super-hot fuels that have been available in the past. We believe a major portion of the answer lies in the realm of more supercharging by more people in order to perfect the technique and to keep pushing the speeds even higher.