

Ford motor mogul, Bob Corn, uses the latest factory facts to build a

MIGHTY MINI-BLOCK COBRA

AS YOU WOULD expect from any self respecting Ford engine engineer, Bob Corn bought a Mustang, new, sharp and sporty looking. Obviously very desirable race material, but the family was too intent on riding around in it, so Bob never seemed able to get down to serious racing. Instead, Bob Corn had to content himself with working on other people's race cars, a job at

BY ALEX WALORDY

which he was and still is much in demand. But you can't keep a speed freak down. Before too long Bob's Mustang began to receive its share of improvements and became a pretty fast street machine in its own right. Then, of course, it had to be tested at the strip on weekends. The next step was full

scale racing in C Modified Production, where you get a much freer hand in preparing the car without worrying about rule bending.

The metallic blue *Cobra* jet was kicked off with a 289 engine. Since class rules allow 10 pounds of car weight per cubic inch-2890 pounds, was the legal limit. The *Cobra II* tipped the scales at 3100 lb, the times suffered, but they



For instant traction, you need all the weight on the back and so Bob keeps his front wheels just barely touching the ground.

didn't suffer very much. For instance, Bob managed to gather some very clean time slips in the Indy Nationals in '67 such as a 12.28 and 111.80 followed by a 12.16 and 113 mph. Not bad for a 289 Mustang.

By the following Spring Nationals at Englishtown, New Jersey, he had the times down to consistent 11.90's. Next, came a logical change from a 289 to a 302—this brought the allowable minimum weight up to 3020 pounds and a little trimming cut the Mustang weight to 3050. As can be expected, the et's improved to 11.79 at Milan, Michigan and 11.87 at this year's Indy. Not bad again, considering that a 12.0 second time eventually took the class at the Nationals. Mind you we're not talking about some special that gets a friendly wave through at the local strip, but a machine which Bob Corn and his driver and brother-in-law, Doug Thompson campaign at National events—meaning strict inspections and a bone-legal car.

The performance is gained without as much as an air scoop on the hood, just the ticket so that the guy with a stock Mustang sitting behind the rail can say to himself, "With those big slicks, my car would go too."

Where does all that power come from? A pair of fresh air scoops and flex hoses practically leap out at you as you raise the hood. Take in a little more detail, such as the late style Shelby two four-barrel manifold. You can tell it from earlier ones by the rounded appearance of the ports and the faired in sweep from the carb to the port.

Bob Corn and Doug Thompson get their string of wins and low et's on Holley carbs and are now incidentally members of Holley's select Winner Circle. They began their Holley experiments with a set of 600 cfm four barrels, the ones that were released for the Shelby-American Le Mans package. Next came a try out for the newer 650 cfm Holleys. Runs made back to back on the same day gave as much as .2 second difference proving again that the carbs are a worth while soup up area. The 650's, incidentally, are really 715's with truck boosters. It sounds confusing, so let us explain. Look down the throat of any Holley four-barrel and you will see a set of four venturis. Inside the venturis are smaller booster venturis which amplify the signal form the main venturis and also improves the fuel break up. The boosters used on trucks are designed to break up an atomized fuel better while the 715 boosters were made to pass more air. Here, with the

small engine displacement more than enough air is getting in at 650 cfm capacity and the truck booster helps fuel distribution. The secondary opening is controlled by a cam and tailored so that while the primary is still opening, the secondaries begin to flow air and fuel to get them started and avoid a lag or bog.

Delving further into the engine we find a pair of Shelby Le Mans heads.

For a simple comparison, stock intakes on a 302 or a 289 high performance measure 1.74 inches. The ones on the Shelby heads are 1.875 and Bob is now going another sixteenth to 1.93 inches. Exhausts have grown from 1.42 to 1.625. The main difference in the heads is not in valve size but in combustion chamber shape. They are considerably more open on the 289 and breathe



The stock springs are supplemented by 35-inch traction bars, air lifts and helper springs.



Retaining tangs from an extra set of main bearing shells are used in the main bearing caps.

better. The extra cc's are taken up by a set of TRW forged pistons with pop-ups large enough to bring compression back to 12-to-1.

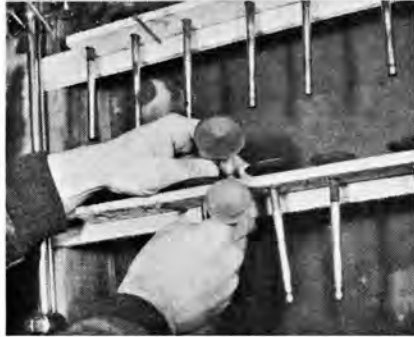
Most everyone in the know, claims that a 302 does not run well with pop-up pistons but it looks like the problem was solved by getting the right piston and head combination. As an extra bonus, the TRW pistons are also 100

grams lighter than stock.

Both the heads and the intake manifold in this package are available directly from Shelby. The rest of the block follows a pretty standard building pattern. To gain improved oiling Bob uses the grooved upper main bearing shells in the top and bottom positions. The tangs that retain these bearings in the cap wind up to be on the wrong side

and rather than rework the cap to match, Bob simply cuts them off.

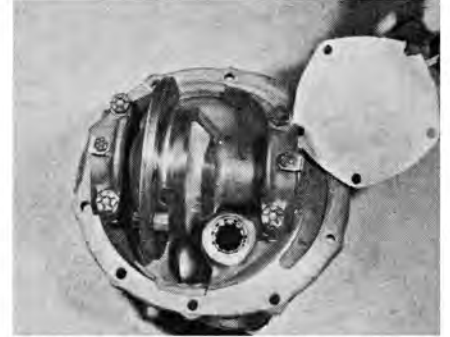
It doesn't take more than a casual look under the car to spot the bigger oil sump. This one holds eight quarts of oil as opposed to four in the stock pan. Add to this an extra quart of oil in the filter, and there are nine quarts to cool the engine during eliminations. It took two truck oil pick ups and four cuts



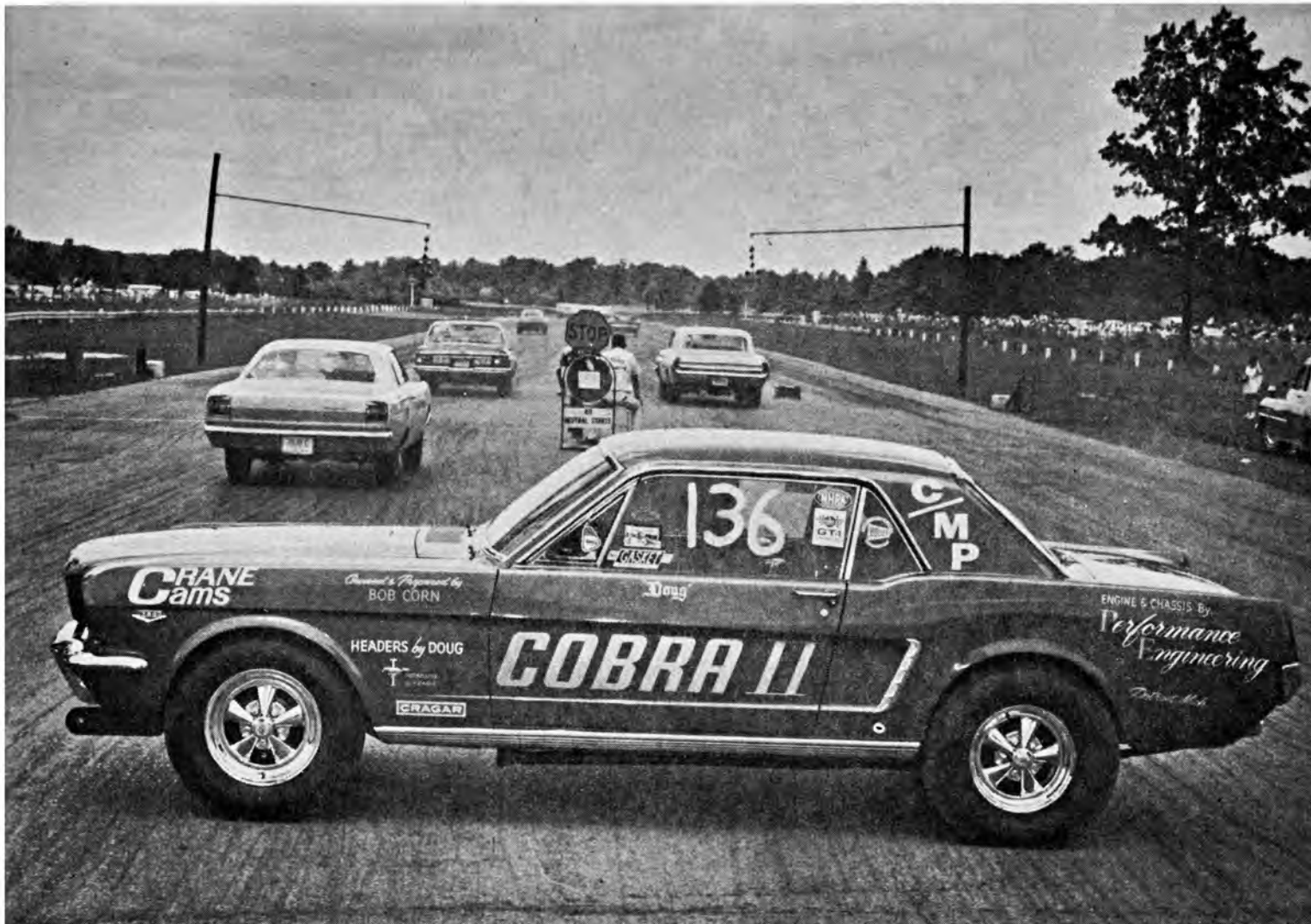
Corn goes with gigonda valves-exhaust are 1.62-inches while intakes are 1.93-inches.



Dayco Racing Belt stands up well to the 8000 rpm shifts. Prestretching could be the reason.



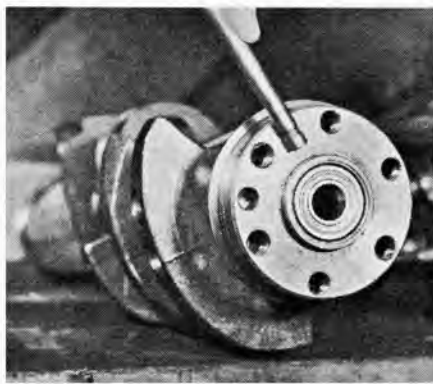
Center section is set up for towing. It has cover plate instead of flange for rear U joint.



Bob Corn's Modified Production Mustang turned 11.7 et at Milan, Michigan, ran 11.9 at Englishtown in the Spring Nationals and 11.87 at Indy.



Slick-shifted four-speed close ratio trans is used with a light weight solid hub clutch disc.



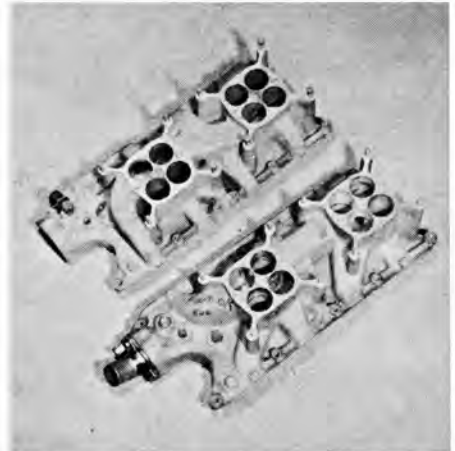
Sealed ball bearing replaces the bushing in crank. It eliminates wear and gear jumping.



Doug Thompson driving. His quick takeoffs keep bringing him back to the winners circle.



Deep sump oil pan holds eight quarts plus one quart in the oil filter for a total of nine.



Top, Shelby intake manifold had squared off galleries. Bottom manifold used by Bob Corn has smoother transitions. Below, front end leveled by adding spacers at ball joints.



plus a corresponding amount of brazing to make one pick up suitable for racing.

Little is left of the original valve train. The cam is a .550 flat tappet—a Crane Engineering special. You could have guessed as much from looking at the front fender of Bob's car. It operates a set of Johnson flat tappets that weigh 70 grams (quite light) and can be bought from anyone who handles PC parts. The push rods are stock and so are the rocker arms. However, the slot on the rocker arms is elongated to ac-

commodate the higher lift cam. The valve springs and retainers are Crane, just like the cam.

To put the finishing tuning touches on the engine, Bob added a special transistorized ignition system of a type Autolite originally developed for the Le Mans cars, but somehow never managed to sell to Ford Division in volume. Spark advance starts at 1000 rpm and reaches the full 40-degree value at 5000 rpm. Since the car jets out of the gate between 6 and 7 grand and is power

shifted at 8200 to 8300 rpm, the shape of this advance curve is of no consequence. The horsepower peak incidentally, comes in between 7200 and 7400 rpm. Bob stopped trusting electronic tachs early in the game, and decided that a Jones mechanical tach was a better investment than a pile of scrap blocks in the back of the garage. To go with the rpm, the Doug header stacks have been made appropriately short—26 inches—and the collector length is just 10 to 12 inches.



Experimental ignition system is transistorized. Positive lock clamps hold down the distributor cap. Drive for mechanical tach was added. Shelby-American did extensive work on combustion chambers and increased valve seats. CC's are made up by using piston pop-ups.

To launch his 3000 pounds of car out of the gate, driver Doug Thompson uses a Weber 29 pound steel flywheel in conjunction with an undamped light-weight clutch disc (one without the springs in the hub). The pilot bushing in the flywheel is replaced by a standard commercially available ball bearing, sealed on both sides. This, Bob Corn claims is a big help because the standard bushing wears, allowing misalignment, after which the trans jumps out of gear. Another contribution to staying in one

piece is a set of solid engine mounts to replace the rubber ones. We couldn't get much of an explanation on this score except possibly that there are no engine motions to upset the clutch linkage action. Bob has run the car this way all season, and the transmission did stay together so maybe there's something to it.

The close ratio four-speed with a 2.32 low is used with 5.83 rear axle gears. The close ratio trans allows the mill to operate on both sides of the

power peak. For instance a 2.78 First with the same rear axle would cause the engine to overwind in low and underwind in Second (here the engine speed would drop off too far). As Bob Corn says, "Forget about torque and think horsepower. With a suitable gear ratio you can always translate horsepower into torque."

One nice thing about C/Modified Production is that you can change the suspension around to your heart's content as long as it looks stock. Bob went about his suspension changes in typical engineering fashion by first deciding on what would do the most good. Theoretically all the weight should be off the front end, and on the driving wheels at the back. This is particularly true of a lower horsepower engines where the problem is to get the car moving. Since you want traction right now, the front must come up quickly. Hey! Not that fast!—the car may start to bounce and porpoise—but not too slowly either. The combination Bob picked includes a set of six cylinder front coil springs and some highly worn front shock absorbers. Since the springs have a lower rate than the eight cylinder ones—they sag more inches under the same load—the car was leveled out by adding a couple of ball joint spacers. The result is a very even take off with the left front barely skimming the ground and the right front giving some steering control but not taking too much away from traction. The car just rises and goes. To prove the point still further, Bob took movies of the action then reran them in slow motion showing excellent traction out of the gate.

The high performance 289 rear—it accepts the Galaxie center section—has a set of large welded brackets for the traction bars. The bars themselves measure 35 inches in length, the longest that could be conveniently fitted under the floor pan. It wasn't always this way for the car began with the stock springs and some store bought traction bars that tied themselves into a big bow on the first go around. Sadder but wiser, Bob had the new ones welded by Jim Antieau's Welding in Inkster, Michigan. They held—the geometry is similar to that of a '65 Comet which Wayne Gapp and Bob Corn campaigned in previous years.

The stock rear springs are bolstered by a pair of air lift bags run at 25 psi. Add to this a pair of accessory coil springs around each of the two heavy duty rear shocks. Good bite or bad, the rear is smooth and steady, and also free
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track racing; 43 for drag racing. Auto-lite-AT2, A22, A23, or A903 for track racing; AT4, A42 for drag racing. Champion - J61Y, J60R, J86Y, or UJ60P for track racing; J63Y, J6J, or UJ64P for drag racing.

Spark Advance - 14 degree initial advance giving 38 to 40 degrees at high rpm.

Valve Lash - .030 Intake, .030 Exhaust for production Cam #3849346. .022 Intake, .024 Exhaust for service Cam #3927140.

Maximum Speed for Optional Cam - 6800 - 7200 rpm, for track racing, 7800 rpm for drag racing.

Maximum Oil Temp - 300 degree in oil pan.

Minimum Fuel Pressure - 4 - 5 psi at high engine speeds.

In operating conditions where fresh air is ducted to the carburetor (fresh air hoods, plenum air cleaners, etc.), it is necessary that an air cleaner element or low restriction element be used to diffuse the air entering the carburetor. If no diffuser is used, the engine mixture distribution will be upset, causing poor power and misfiring at high engine speeds.

THE SNAKE continued

But, for '69 Ford has its new unit ready. It's called the Traction-Lok differential and it's available with performance ratios of 3.50, 3.91 and 4.30 from the factory. Lower gears (higher numerically) are available for do-it-yourself installations. This differential locks tighter in proportion to the driving torque applied than the old unit. A decrease in fixed loads, together with an improved clutch and special gear angles, provide a wide range of performance under all conditions. It's ideal for street or strip use, but still nowhere as efficient as the gear-type locker for sophisticated drag machinery.

Ford also has a new clutch that's really perfect for high horsepower street and strip applications. It's a dual-disc affair which was originally designed for trucks and later proven under enduro conditions in the *Mach 1* Mustangs driven by Mickey Thompson to 350 records at Bonneville. The original dual-disc clutch discs were too heavy, causing the snychros to work themselves to death in the transmissions. They had a tremendous amount of hard shifting problems when the units were first released for truck service. However, the improved version used in the *Mach 1* Salt record-breakers features lightweight

discs and floater plates and have no ill effects of shifting. The improved unit will be available to the public early in 1969.

There's also a new street/strip suspension available with 428 Cobra Jet cars fitted with four-speed transmissions. The same suspension is available on automatic transmission cars, except that the shocks are mounted conventionally instead of staggered. The staggered shock arrangement is designed to control spring wind up and wheel hop caused by the axle twisting under acceleration conditions. The left shock is relocated to the rear of the axle, while the right shock remains ahead of the axle. This setup partially restrains and damps out the twisting motion of the rear during full throttle starts. This provides the owner with an excellent starting point only, as the car still needs more performance oriented shocks, traction bars and possibly adjustable air bags for proper chassis preloading for strip tractions. Chevrolet went the staggered shock route last year with the Camaro, but the car still needed traction bars. To aid the suspension and traction aids there's an LPO (Limited Production Option) which specifies that the battery be mounted in the trunk over the right rear wheel.

Ford has obviously gotten the message and you can expect bigger and better things from Dearborn in mid-'69 and '70. They finally have come to realize that the street is where the action and the sales are, not at Indy or LeMans.

MINI COBRA continued

of chatter or hop. Some of the give in the rear suspension comes from the tires—a set of 9:50x14's—have seven inch tread width. The attempts at dropping tire pressures to 6 pounds for very slippery tracks were unsuccessful, as the slicks proved squirrely and lost too much at the top end. With eight pounds pressure, they worked well. "Traction is just not one of our problems," says Bob.

Win, lose or draw there is always that long tow home sometimes with a broken rear and that's when you see guys working into the night changing axle housings at the last minute. Bob comes prepared with a special center section that is set up for towing. He has no gears, just an aluminum coverplate instead of a flange for the rear "U" joint. After the last run, this "towing third member" is installed. It cuts down

(Continued on Page 70)

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on towing drag, gear wear, and it also is handy in case of problems.

The *Cobra II* is now running so close to the record that Bob is getting set for a lot of detail polishing. Watch that *Cobra II*—it's a comer with lots of experience under its belt. It could also throw some new light on what Mustangs can do to Chevis.

CHAMPS continued

favorites as Gary Ostrich, Tritak & Morgan, Roger Castor, John Hagen, Bob Lambeck and others fell to super power. In the Payoff round it was Dave Strickler from York, Pa. against Ed Hedrich of Berwyn, Pa. All thru the runs the 'Cudas were looking strong and come final—you see two '68 Chev Camaros neck and neck. Dave Strickler in *Old Reliable* powered by 302-V/8 engine took the win blasting the lights 11.89-116.12 to Ed's 11.48-120.64.

Super Eliminator winner was Norman Reis of Cincinnati, Ohio in his 1921 T. Roadster powered by a supercharged 440 Chevy engine. The twenty-nine yr. old entitles his car *Lick'm & Stick'm*.

Competition Eliminator title was copped by Ray Hadford of Seattle, Wash. driving the Jim Green owned Chevy powered Class C Dragster.

Street Eliminator Top Title winner was Fred Hurst of Dayton, Ohio. The Hurst entry was definitely the crowds choice and could turn on unbelievable power as he blasted thru the rounds in his '68 Plymouth encased in a '40 Willys Chassis and 428 Hemi-Powered.

Stock Eliminator title award went to Dave Boertman of Muskegan, Michigan. His 1959 Chevrolet bright yellow wagon was curtly named the *Budget Breaker*.

The World Finals at Tulsa proved to be one of the most exciting drag events of this or any other year.

PDA continued

Gustin-Kramer Chevy through in 7.80 seconds. Top time in the bracket was 197.80 mph, clocked by Bob Williams of Lakeside, Calif. Dwight Hughes of Selma recorded low et with a run of 7.74.

All in all it was one of the finest meets drag fans have seen in many moons.



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