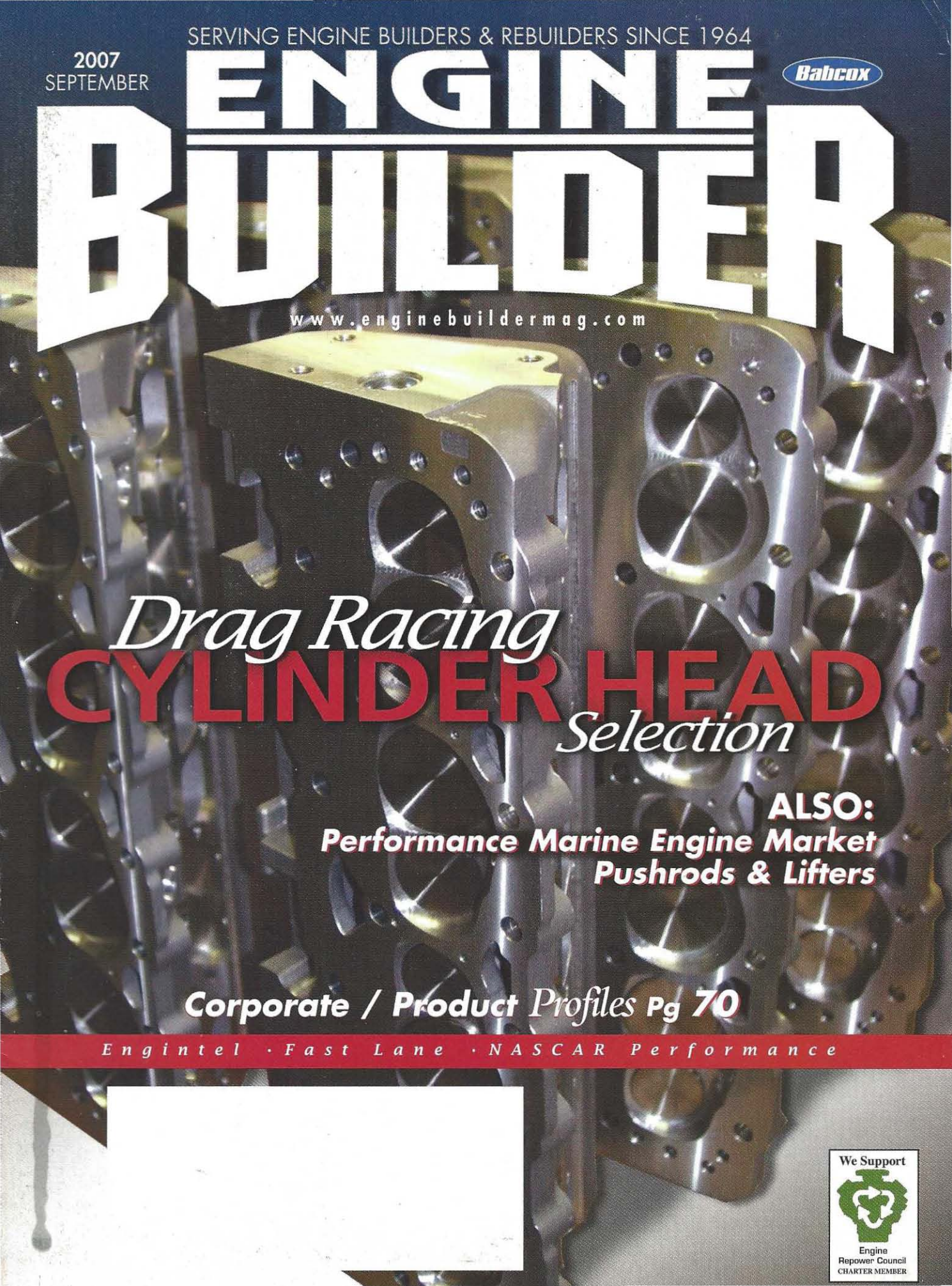
SERVING ENGINE BUILDERS & REBUILDERS SINCE 1964

2007
SEPTEMBER

ENGINE BUILDER

www.enginebuildermag.com



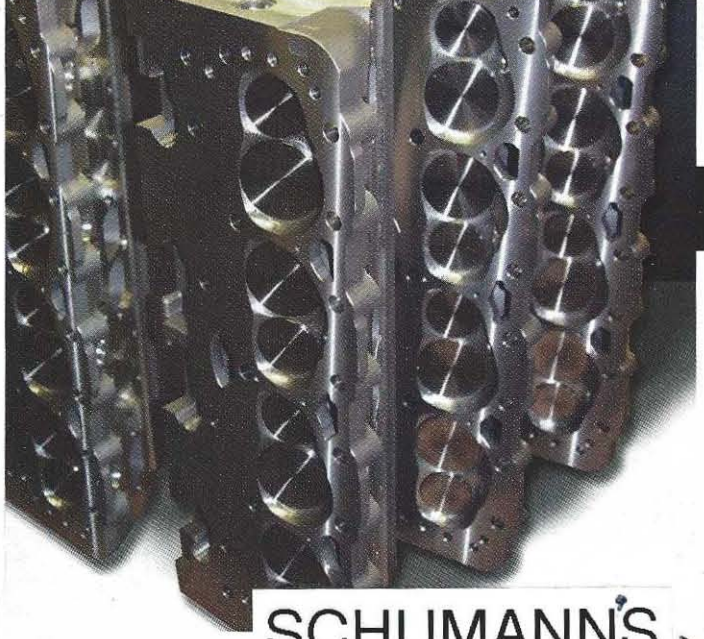
Drag Racing CYLINDER HEAD *Selection*

ALSO:
Performance Marine Engine Market
Pushrods & Lifters

Corporate / Product *Profiles* Pg 70

Engintel · Fast Lane · NASCAR Performance

Volume 44 • Number 9 • September 2007



SCHUMANN'S

FEATURES

ON THE COVER

54 Drag Cylinder Heads

If you're interested in making power for a drag racing application, don't buy heads based solely on the flow numbers. Drag racing cylinder head experts say there's more to a head than just its CFM number. Cross-sectional area, port shape and airspeed, airspeed, airspeed are the most important aspects, experts tell Senior Editor Brendan Baker.

44 Pushrods and Lifters

Pushrods and lifters have changed little since the earliest days of engines and may seem like yesterday's technology. Even so, there's little chance they'll be disappearing anytime soon. Technical Editor Larry Carley tells you what you still need to know.

64 Marine Engine Market

They may look the same, they may sound the same; but differences between marine and automotive engines are significant. If you're not swamped in boating business now, should you consider jumping into this market? Editor Doug Kaufman investigates.

Corporate Product *Profile*

70 Corporate Product Profiles

Leading *Engine Builder* advertisers have a chance to tell their corporate or product story. We encourage you to utilize this section to research new products or suppliers for your upcoming business buying season.

CONTENTS

COLUMNS & DEPARTMENTS

Cover design by Nichole Anderson;
Photo courtesy of Canfield Cylinder Heads

Read For Speed code: EB923
ENGINE BUILDER (ISSN 1535-041X)
(September 2007, Volume 44, Number 9): Published monthly by Babcox Publications LLC, 3550 Embassy Parkway, Akron, OH 44333 U.S.A. Phone (330) 670-1234, FAX (330) 670-0874. Periodical postage paid at Akron, OH 44333 and additional mailing offices. POSTMASTER: Send address changes to ENGINE BUILDER, P.O. Box 13911, Akron, OH 44334-3911.
A limited number of complimentary subscriptions are available to individuals who meet the qualification requirements. Call (330) 670-1234, Ext. 275, to speak to a subscription services representative or FAX us at (330) 670-5335. Paid Subscriptions are available for non-qualified subscribers at the following rates: U.S.: $69 for one year. Canada/Mexico: $89 for one year. Canadian rates include GST. Ohio residents add current county sales tax. Other foreign rates/via air mail: $129 for one year. Payable in advance in U.S. funds. Mail payment to ENGINE BUILDER, P.O. Box 75692, Cleveland, OH 44101-4755. VISA, MasterCard or American Express accepted. Publisher reserves the right to reject any subscription that does not conform to his standards or buying power coverage. Advertising which is below standard is refused. Opinions in signed articles and advertisements are not necessarily those of this magazine or its publisher. Diligent effort is made to ensure the integrity of every statement. Unsolicited manuscripts must be accompanied by return postage.

welds the hardened steel ball onto the end of the pushrod. Instead of just cutting the tubing off flat and welding on the ball, they now radius the end of the tubing to match the circumference of the ball. The result is a weld that has about 300 percent greater contact area and increases the shear strength to 12,000 psi – which is about three times stronger than before with only a small increase in cost.

Another pushrod supplier said it is switching to a new centerless grinding process to finish its pushrods, resulting in a much straighter pushrod. The new pushrods will be available around the beginning of 2008 in .050" length increments for all popular applications.

How Important Is Weight?

Common sense tells us that reducing the weight of the pushrods increases the rpm potential of the valvetrain, and reduces the spring pressure needed to maintain valve control at high rpms. But as racers have learned, weight is much more critical on the valve side of the rocker arm than the pushrod side. Why? Because of the leverage effect of the rocker arm.

If a rocker arm were a straight 1-to-1 ratio with no multiplication in lift, any increase in weight on either side of the rocker would have the same net effect. But most rockers have a 1.5, 1.6, 1.7 or even higher lift ratio. This means the valve end of the rocker travels much further vertically than the pushrod end. The leverage effect of the rocker arm ratio multiplies the force exerted by the spring as it shoves the pushrod back down to keep the lifter from jumping off the cam lobe. So if the pushrod is a little heavier but a whole lot stiffer, it doesn't really hurt anything. In fact, it really helps high rpm power by reducing pushrod flex and valvetrain harmonics that can cause the valves to bounce and float.

A lot of engine builders say they have found gains of 15 to 25 horsepower on the dyno by just changing the pushrods in an engine to a stronger, stiffer design. Others are finding even more power by playing around with pushrod lengths and different rocker arm ratios and styles.

Increasing the lift ratio adds horsepower with little or no loss in low rpm torque, idle quality or vacuum. By opening and closing the valves at a faster rate, the engine flows more air for the same number of degrees of valve duration. High lift rocker arms also reduce the amount of lifter travel needed to open the valves, which reduces friction and the inertia of the lifters and pushrods that must be overcome by the valve springs to close the valves.

On the other hand, increasing the rocker ratio also increases the effort required to open the valves because of the

As you can see here, larger diameter pushrods previously only found in all-out race applications are trickling down into street performance applications. Pushrods as large as 9/16" diameter are not unheard of. Photo courtesy of Comp Cams.