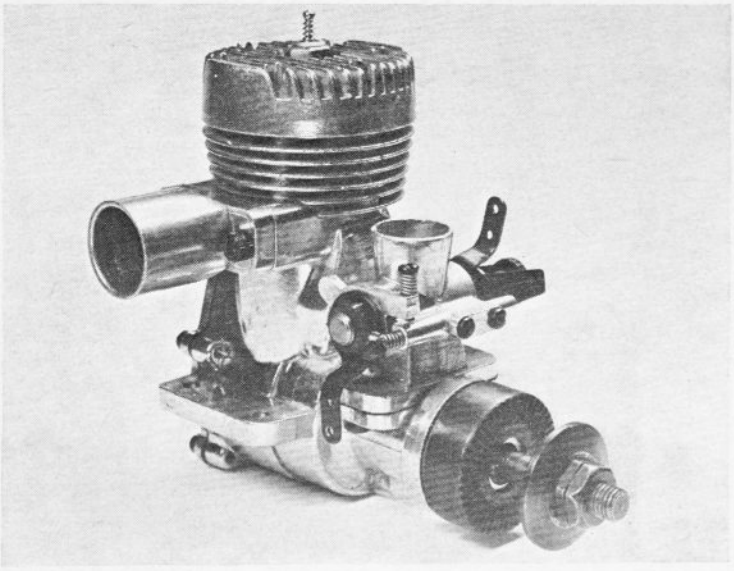


Peter Chinn tests the FOX 45BB

THE FOX 45BB is the top model in a group of four Fox engines in the .40-.45 cu.in. class. The other models consist of a smaller bore, .40 cu.in. version of the 45BB, plus .40 and .45 cu.in. versions of a simplified model having a bronze bushed main bearing instead of ball bearings, different cylinder porting and a lapped cast-iron piston in place of the BB model's ringed aluminium piston.

Our test model came direct from the U.S.A. without silencer, but a British-made expansion chamber type silencer, previously used for tests on a plain bearing .40 was used, supplied by John D. Haytree, the Fox importer for the U.K.

Design and construction summary

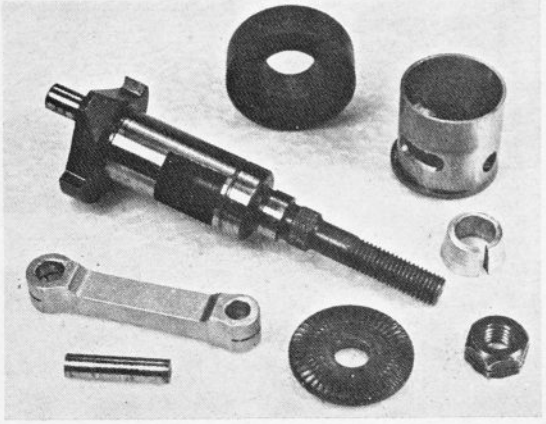
Main casting and backplate. The main casting consists of the crankcase, most of the cylinder casing and the entire front housing in pressure die cast aluminium alloy. It has a highly unorthodox rear end in which the backplate, instead of merely uncovering the crankcase barrel, also incorporates the lower rear part of the cylinder casing, so that its removal exposes not only the crank chamber but also the rear of the cylinder liner up to and including the rear transfer port. It was, in fact, to simplify the problem of coring the casting for the three transfer channels required by the engine's Schneurle scavenging system, that this form of construction was chosen: the front and side channels are incorporated in the main casting, while the rear one is formed in the tall backplate. A thick gasket and six screws are used to ensure a gas tight joint.

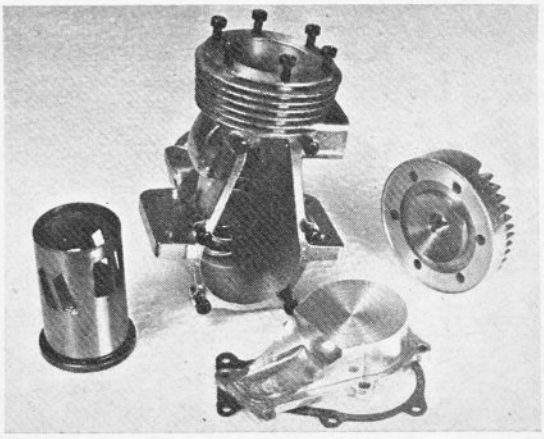
Cylinder-liner. Drop-in steel cylinder liner with .059 in. wall thickness and incorporating unconventional unconventional multiple ports. Exhaust port divided into three, timed to open and close at 75 deg. each side of BDC and flanked on each side by a pair of long transfer ports milled through liner at an angle of approximately 16 deg. to cylinder axis to direct gas flow away from exhaust port. These ports are timed to open and close at 60 deg. each side of BDC and are supplemented by a long centrally divided third port which opens and closes at approximately 52 deg. each side of BDC.

Piston and connecting-rod assembly. Cast aluminium alloy piston with flat crown, port window on bypass side and single orthodox compression ring. Machined aluminium alloy connecting-rod, unbushed, with oil slits at both ends. Solid 0.182 in.dia. gudgeon pin retained by wire circlips.

Cylinder-head. Pressure diecast aluminium alloy with machined combustion chamber. Combustion chamber shape is a shallow cone with a small central depression surrounding the glowplug. The head is secured with six Phillips screws and is installed without a gasket. The measured nominal geometric compression ratio of our test engine was 8.0:1.

Crankshaft and bearings. Large diameter (15 mm. o.d., 10.8 mm i.d.) counterbalanced, hardened steel crankshaft with 7/32 in. o.d. solid crankpin. Rectangular 13 mm. long





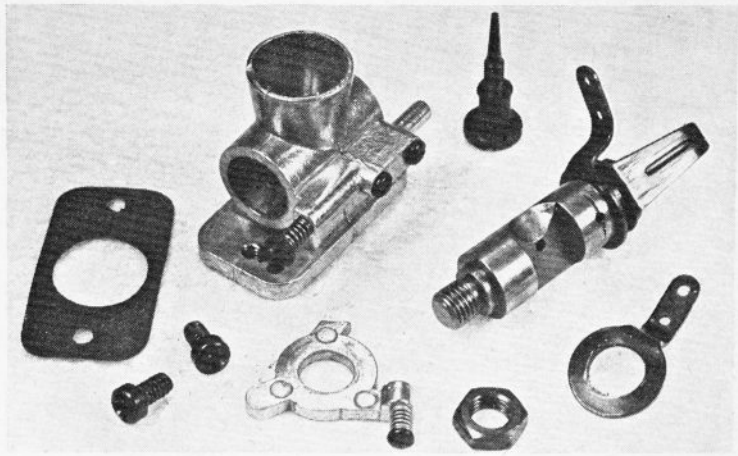
valve port timed to remain open from 40 deg. ABDC to 52 deg. ATDC. Shaft supported in one 15 x 28 mm. 10-ball steel-caged ball journal bearing at rear and one $\frac{3}{8}$ x $\frac{7}{16}$ in. 7-ball steel-caged ball journal bearing at front. At the front end the shaft has a $\frac{1}{4}$-28 UNF thread for the prop nut and a short knurled length on which an aluminium split taper collet is fitted for the blued steel cup-type prop driver, partially enclosing the front bearing.

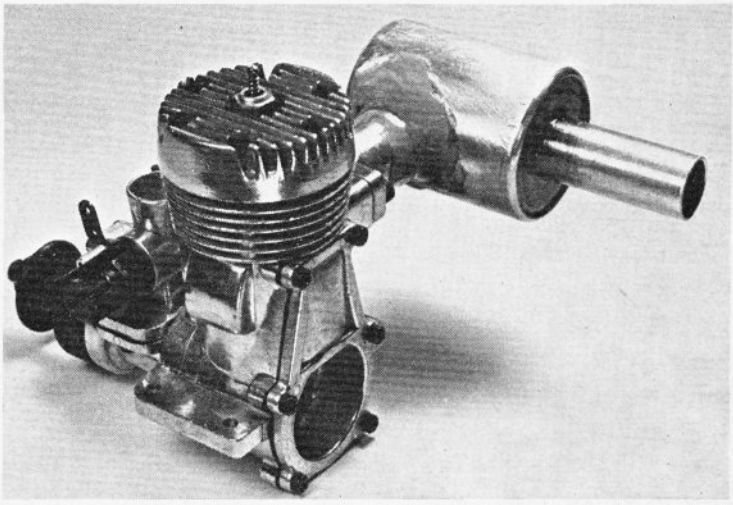
Carburettor. The special Fox carburettor is flanged-mounted, with two screws, to a saddle on top of the crankcase front housing and is the same as that fitted to the Fox Eagle 60 model. It incorporates separate idling and high-speed jets, each with its own mixture adjustment. Part-throttle mixture controlled automatically by movement of throttle valve. Carburettor body of pressure die cast aluminium alloy. Steel throttle valve, taper ground for close fit within carburettor body. High speed needle-valve installed in left side of carb. Idle mixture needle located forward in right side of carb body. Throttle actuating arms on both sides of carburettor.

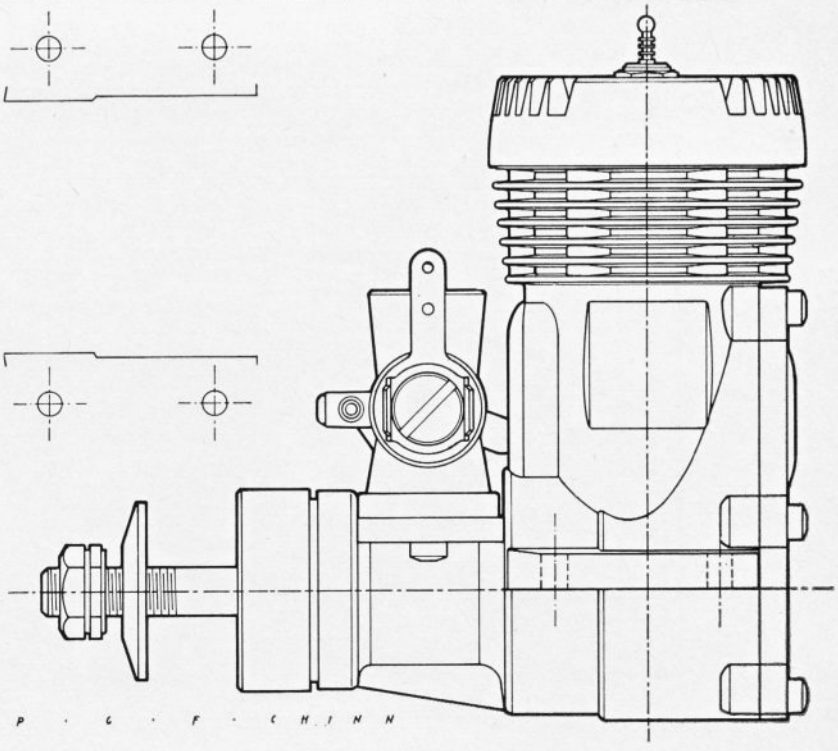
Silencer. The Fox-U.K. silencer is a fabricated cylindrical expansion box designed for use with the optional round-outlet exhaust stub supplied for the 40/45 engines. (The outlet stub itself is attached to the engine with two screws). The silencer may be fitted to the outlet stub with self-tapping screws, or the joint may be made with epoxy resin. Our silencer was an early sample in which the inlet tube had become loose in the silencer casing and we therefore resorted to liberal use of epoxy for sealing both joints, as may be seen in the photos.

Test performance

Our test sample was run in on a straight 3-to-1 mixture of methanol

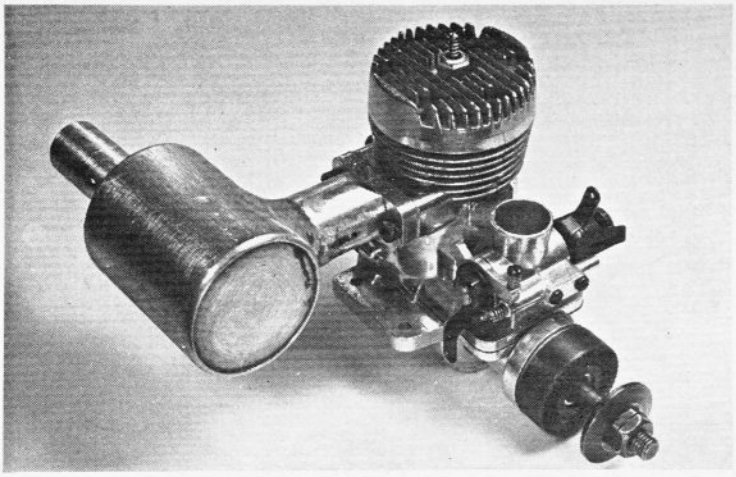






GENERAL INFORMATION

Manufacturer: Fox Manufacturing Company, 5305 Towson Avenue, Fort Smith, Arkansas 72901, U.S.A.
U.K. Importer: John D. Haytree, Shutterton Industrial Estate, Dawlish, Devon EX7 0NH.
U.K. Distribution:
(i) Irvine Engines, Unit 8, Alston Works, Alston Road, High Barnet, Herts.
(ii) Model Aircraft (Bournemouth) Ltd., Norwood Place, Bournemouth, Dorset.
(iii) Ripmax Ltd., Ripmax Corner, Green Street, Enfield, Middlesex.
Type: Shaft rotary-valve, throttle-equipped glowplug engine with Schnuerle scavenging two ball-bearings and ringed aluminium piston.
Bore and Stroke: 0.850 in. x 0.790 in.
Stroke/Bore Ratio: 0.929:1
Displacement: 0.4483 cu.in.—7.346 cc.
Measured Nominal Compression Ratio: 8.0:1
Checked Weights:
(i) 335 grammes—11.8 oz. (less silencer)
(ii) 380 grammes—13.4 oz. (with silencer).



and castor-oil and was found to be quite free-running from the outset. Initial tests were carried out on our standard 5 per cent nitromethane R/C test fuel but this was found to be too "cool" under light loads and the relatively cold weather conditions prevailing at the time of testing and a recheck was therefore made on 15 per cent nitro. Glowplugs used were Fox idle-bar 1.5 volt long-reach with platinum-rhodium element as supplied with the engine. Atmospheric temperatures at the time of testing were 10-11°C (50-52°F) and barometric pressure was 1024 mb (30.24 in.Hg.)

Starting and running

The starting and handling qualities of the 45BB were very good. The engine had good piston seal as delivered and started readily both hot and cold. It was quite docile and showed no viciousness when hand-started on a variety of props.

Running qualities were also good. Vibration was at a low level and noticeably less than with the plain bearing Fox 40 previously tested: the lower weight of the 45BB's aluminium piston and, to a lesser extent, its lower compression-ratio, being contributing factors here.

Power—with silencer. A check on prop speeds recorded with the silencer installed indicated a willingness on the part of the 45BB to swing quite large props without loss of power or any sign of stress. We obtained 9,100 rpm on a 13x5½ Top Flite standard, 9,800 on a 12x6 Top Flight maple, 11,000 on a 12 x5 Top Flight standard and 11,250 rpm on an 11x8 Robbe glassfibre-nylon. On the 11x6 sizes, 11,700 were recorded on a Top-Flight maple and 12,200 on a Power-Prop maple. On the 10x6 sizes, a Top Flight maple was turned at 13,300 and a Taipan glassfibre nylon at 13,600 rpm. These later are about the smallest sizes that one would normally need to use but, just for the record, we also checked a pair of 9x6s—Top Flight maple and Taipan glassfibre-nylon—and obtained 14,300 and 14,800 respectively.

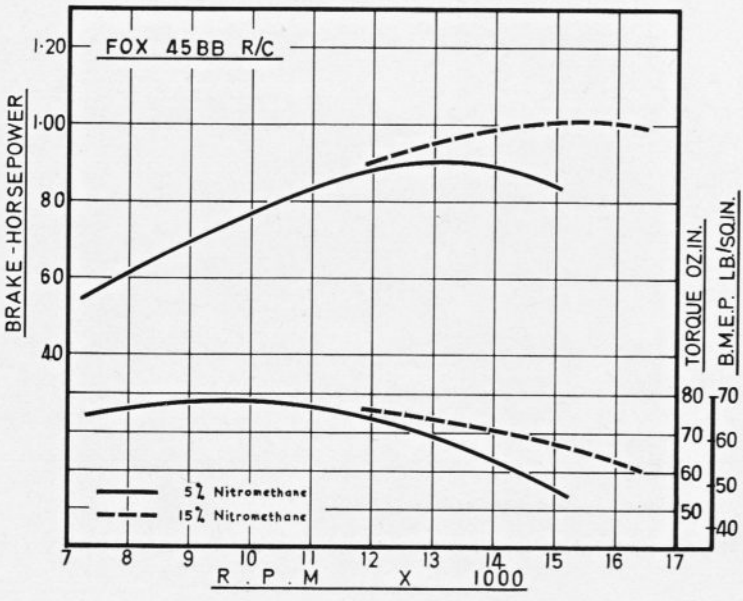
Torque tests indicated a maximum torque of 78 oz.in. at between 9,500 and 10,000 rpm and a peak power output of just on 0.90 bhp at 13,000 rpm.

Power—less silencer. The small lightweight silencer with its very large tailpipe (13.5 mm. i.d.= 143 sq.mm.) does not markedly affect power output (it does not "silence" very much either) and it was no surprise to find that removing it added only about 100 rpm to the engine's speed at the peak of the power curve, rising to a maximum of 200-300 when the engine was propped for speeds a couple of thousand revs beyond its peaking speed.

Removal of the silencer did, however, serve to confirm a suspicion that a combination of the engine's low compression-ratio (it is actually slightly less than 6-1 if one takes into account the late closure (75 deg. ABDC) of the exhaust port), mild fuel and cool weather conditions, were resulting in late ignition and loss of power under light loads and high rpm. Since the 45BB is not fitted with a head gasket, it was not possible to check the effect of raising compression ratio by fitting a thinner gasket. It was therefore decided to run a repeat series of tests using a fuel of higher (15 per cent) nitromethane content.

The results of this can be seen in the second set of curves. Although the higher nitro content had virtually no effect when the engine was loaded for speeds below 12,000 rpm, there was a marked improvement under lighter loads, resulting in a very much flatter torque curve and the extension of the bhp curve to a peak approximately 2,500 rpm higher at around 15,500, where the engine just topped 1.0 bhp.

Throttling. Bench idling at around 2,500 rpm on an 11x6 Power Prop was obtained. (To achieve this safely in the air, it might be as well to use an exhaust-pressurised fuel system). As we have found before, the Fox 2-needle carburettor is easy to adjust. Always remember: these carbs require the idle mixture to be adjusted first—*not* the high-speed needle.



Comment

A robustly constructed engine of good all-round performance. Some examples (like our test motor) may require medium nitro fuel to avoid early falling-off of power under light loads. Otherwise, easy handling, powerful and smooth running.