PETER CHINN tests the

COX TEE-DEE .09

1.5 c.c. Glow Plug Motor

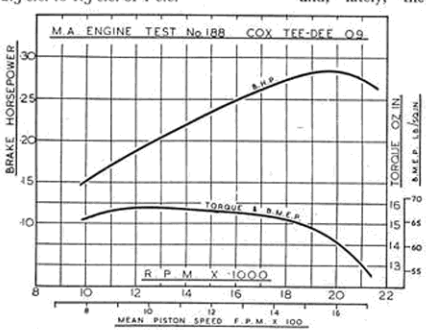
"... another quite outstanding Cox contribution to the contest modellers requirements."

THE Cox Tee-Dee 09 glow engine is the first American motor to be built to the 1.5 c.c. class limit. At the present time, the 1.5 c.c. class is not a recognised F.A.I. competition category but, for many years, the 1.5 c.c. engine has been a popular size with manufacturers in the U.K. and on the continent. It has found favour with modellers not only for general use, but also for certain contest applications, particularly F/F and, of course, for the more recently instituted "Half-A" team-race class.

Moreover, one of the rule changes mooted in some quarters for the F.A.I. F/F power class has been a suggestion to reduce the engine capacity limit from 2.5 c.c. to 1.5 c.c. or 1 c.c.

There was, therefore, a good case for any enterprising U.S. manufacturer interested in this size of engine to modify the current American equivalent size—i.e. the 0.099 cu. in. or 1.6 c.c. motor—to fall into line with European grouping. So far, the L. M. Cox company have been the only firm to do this. The Tee-Dee 09, introduced a few months ago, has a piston displacement of 0.0914 cu. in. or 1.497 c.c.

This engine is especially worthy of our attention for a number of reasons. Firstly, all the most powerful 1.5's at present manufactured in the U.K. and in continental Europe are diesels, whereas the Cox 09 is a glowplug motor and, lately, the advances in glow engines in the 2.5 c.c. class have put them well ahead of the diesels in all-out performance. Secondly, the Cox Tee-Dee design, already well established in 0.16, 0.33, 0.8 and 2.5 c.c. sizes, has proved to be one of the most outstanding model engine designs ever produced. Both these factors point to higher performance than we have previously encountered in the 1.5 c.c. class. In fact, our tests revealed a peak power output that puts the Tee-Dee 09 in a class of its own—better, even, than the best contest-tuned team-racing 1.5 diesel produced to date.



The engine is, of course, a shaft rotary-valve type, plain bearing motor with the usual Cox cylinder design and a combined cylinder-head/glowplug unit. Design and construction closely resembles that of the other Cox Tee-Dee models, previously dealt with in this series.

One of the special features of the design is the induction system and its components. The counterbalanced crankshaft has a large (3/8 in.) diameter journal, permitting a 17/64 in. bore gas passage through it. This latter, and the 0.370 in. long rectangular valve port, are the biggest yet seen on an engine of this size. The shaft runs in an alloy sleeve which is an extension of the crankcase, the whole being machined from extruded bar stock instead of a casting. A flat is machined across the bearing sleeve to expose a rectangular intake aperture matching the port in the shaft. This is then surrounded by a special moulded housing carrying a threaded boss into which the carburettor is screwed. The housing is shaped in such a manner as to form an accumulator chamber between the carburettor and rotary-valve. It is a firm fit over the bearing sleeve and is held in place by a threaded locking ring at the front end.

The carburettor itself follows long established Cox contest engine practice and employs three surface jets (for better fuel atomisation) in the venturi

throat, which are fed from a collar carrying the needle-valve. Typical of Cox attention to detail, the alloy collar has a steel thread insert for the needle-valve and a leaf spring, working on a knurled section of the needle-valve, provides just the right amount of friction to hold the needle-valve setting without making adjustment uncomfortably stiff.

The one-piece cylinder has two diametrically opposed exhaust ports of generous area and two internal groove type transfer passages. The glowhead has a shallow trumpet shaped internal contour similar to that of the Tee-Dee 0.049 and 0.15 models. The piston has a flat crown and hardened skirt and is assembled via a non-detachable ball joint, with the connecting-rod.

Construction throughout is to the usual high Cox standards.

Specification

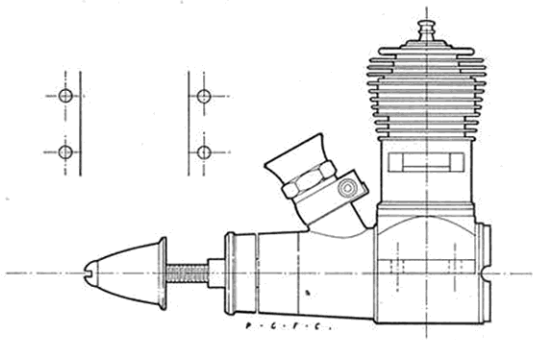
Type: Single cylinder air-cooled, reverse-flow scavenged two-stroke cycle, glowplug ignition. Crankshaft type rotary-valve induction with sub-piston supplementary air induction. Provision for rotary-valve timed pressurised fuel system.

Bore: 0.497 in. Stroke: 0.471 in.
Swept Volume: 0.0914 cu. in. = 1.497 c.c.
Stroke/Bore Ratio: 0.948: 1.
Weight: 2.75 oz.

General Structural Data

Crankcase and main bearing sleeve machined from extruded aluminium alloy bar with screw-in rear cover. Hardened and ground steel crankshaft with crescent counterbalance, $\frac{3}{8}$ in. dia. divided main journal and 5/32 in. dia. crankpin. Shaft end knurled for pressed-on gold anodised alloy prop driver and tapped for prop retaining screw. One-piece non-hardened steel cylinder, blued on external surfaces and screwed into crankcase. Lightweight steel piston with ball and socket joint to hardened steel connecting-rod. Screw-in alloy cylinder head with integral glow filament and seating on soft copper gasket. Moulded front housing and carburettor boss secured with screw-on alloy locking ring.

COX TEE-DEE .09



ACTUAL SIZE

Screw-in carburettor intake with gold anodised needle-valve body having steel thread insert for blued steel needle. Beam mounting lugs.

Test Conditions

Running time prior to test: 1 hour.
Fuel used: 30 per cent. nitromethane, 25 per cent. Duckham's Racing Castor-Oil, 55 per cent. I.C.I. methanol.
Air temperature: 60 deg. F. or 15.6 deg. C.
Barometer: 29.6 in. Hg.

Performance

Two Cox Tee-Dee 09's were received direct from the Cox factory for test. Cox engines do not require running-in in the ordinary sense and the makers state that they can normally be given their head after only 1 min. of rich mixture running. After about 10 min. running, therefore, our two engines were checked on various props, preparatory to selecting the best for further running and full test.

The phenomenal power of the Tee-Dee 09 was immediately apparent during the prop tests of the two engines, which averaged better than 13,000 r.p.m. on an 8 × 4 Power-Prop, over 20,000 r.p.m. on a 6 × 4 Top-Flite wood and 18,000 on a 7 × 3. Minimum practical operating speed of the Tee-Dee 09 is 10,000-11,000 r.p.m. (corresponding to 8 × 6 props). Below these speeds, the engines were overloaded and tended to lose power on warming up from cold.

On dynamometer test, the best of our two 09's reached a maximum torque of some 15.8 oz. in.—equivalent to a b.m.e.p. of 67 lb./sq. in. which is the highest ever recorded for a 1.5 c.c. motor. Beyond the speed at which maximum torque was realised, the decline was very small right up to 18,000 r.p.m. and, as a result, peak b.h.p. was achieved at close to 20,000 where an output of over 0.28 b.h.p. was indicated. It is interesting to note, incidentally, that on a specific output basis, this closely approaches the b.h.p./c.c. of the .15 engine on the same fuel. (Here we must emphasise the fact that this high performance is only obtainable on a fuel containing at least 30 per cent. nitromethane. No British proprietary fuel obtainable at the present time is capable of liberating the 09's full potential and U.K. users will, therefore, find it expedient to mix their own fuel. A mixture such as that given in the formula above is very suitable. Henry J. Nicholls Ltd. can supply the nitromethane.)

Handling and running qualities of the Tee-Dee 09 were very good. Starting was easy and while some vibration was encountered at medium speeds, the engine was notably smooth at speeds upwards of 15,000 r.p.m. In all, another quite outstanding Cox contribution to the contest modellers' requirements.

Power/Weight Ratio (as tested): 1.6 b.h.p./lb.

Specific Output (as tested): 189 b.h.p./litre.

"Breakdown" photograph showing the components of the Cox Tee-Dee .09.