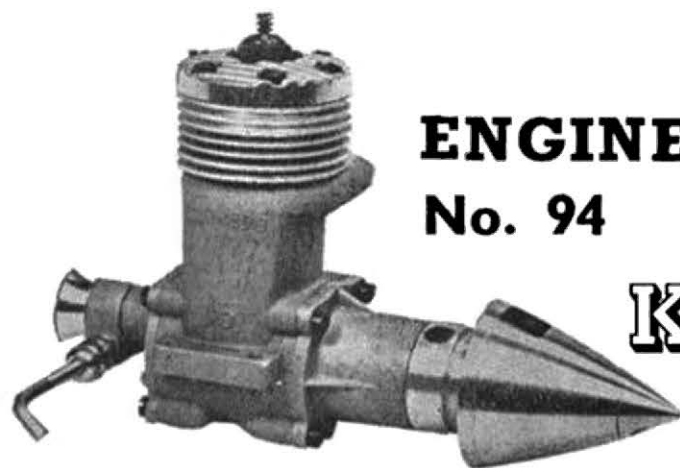


THIS WISNIEWSKI DESIGN which was put into production as the K and B Torpedo "Series 61", is strictly for the enthusiast. Designed to run on high nitro methane content fuels (the makers specify 40 to 55 per cent. nitro, but higher proportions can be used still further to boost performance) and peaking at around the 20,000 r.p.m. mark it yields a fabulous power output of around .2 B.H.P. per c.c. It can *only* be kept running satisfactorily under all conditions by pressure feed, but starting characteristics remain excellent even on the smallest sizes of propellers and needle adjustmen , although fairly critical, is not difficult. In fact, it is an advantage with this type of engine to have a fairly sensitive needle valve control to be sure of getting optimum settings.

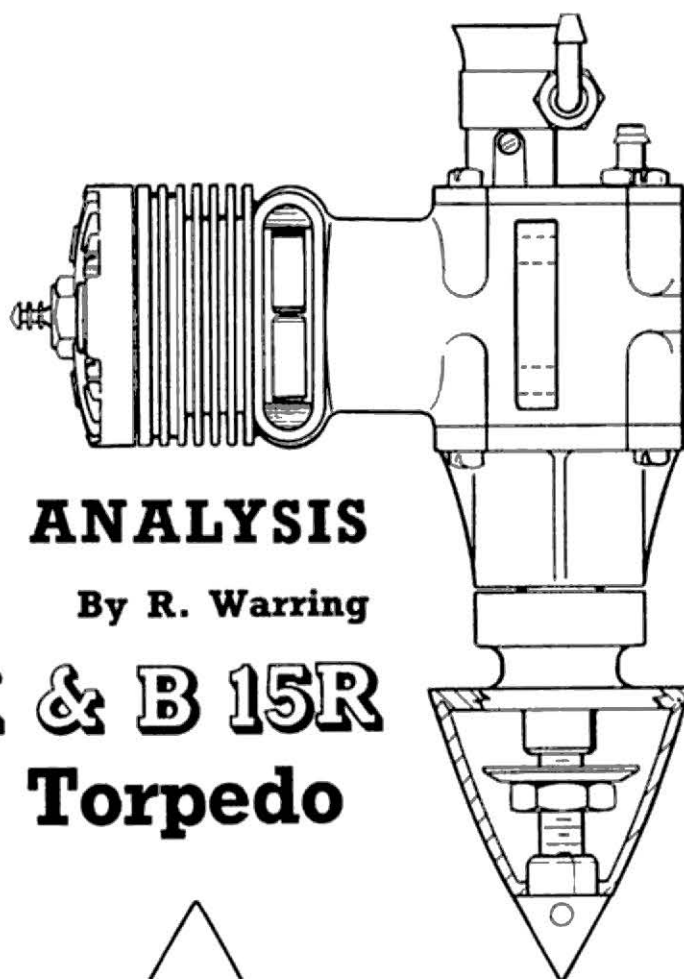


ENGINE ANALYSIS

No. 94

By R. Warring

K & B 15R Torpedo

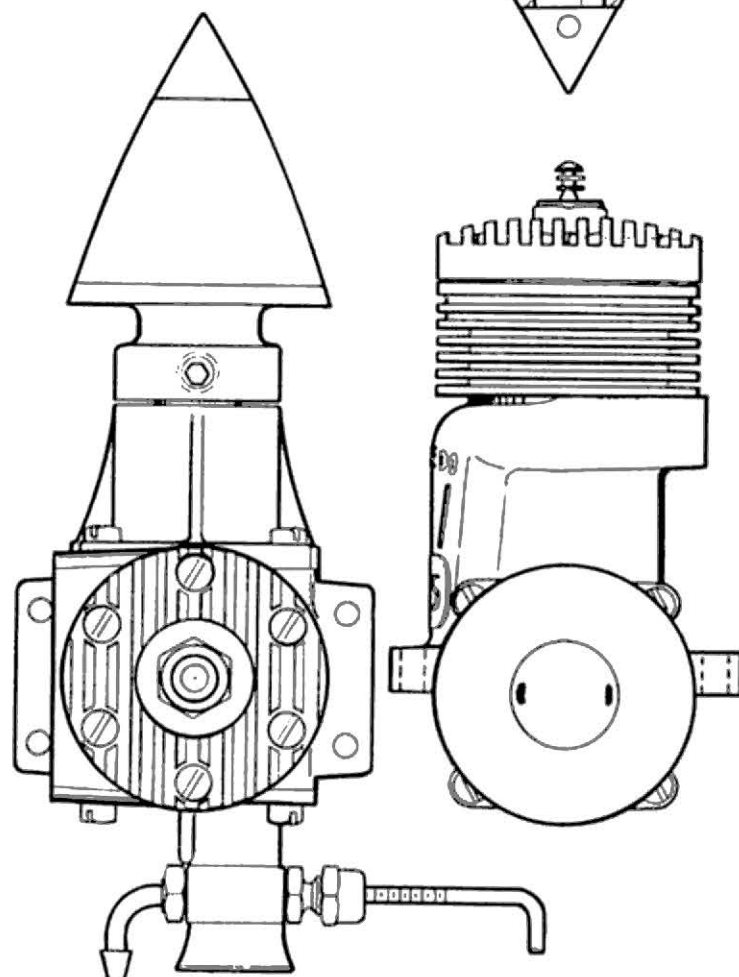


An excellent performance is still maintained on straight fuels or low-nitro fuels, without detracting from handling characteristics. In fact, there is very little difference in performance on a straight fuel and up to 25 per cent. nitro methane—yeilding a peak B.H.P. figure of around .36 at 18,000 r.p.m. Anything above 40 per cent. nitro methane however, and the 15R really begins to wind up. More than that, we suspect that there would be an even greater increase in r.p.m. in the air.

On such a performance basis it seems the ideal choice for contest work—control line or free flight. It also leaves scope for further "tuning" or re-working, particularly in the latter of the combustion chamber head shape—and the manufacturers also supply special ball races which we think would still further benefit performance (at the rather fabulous price of 12 dollars per set). Against this, however, must be weighed some drastic limitations.

The limitations are concerned with maximum performance running, meaning a nitro content of at least 50 per cent. and consequently a very expensive fuel mixture (apart from the difficulty of finding sources of nitro methane at all these days in this country). With a high-nitro fuel and operating at speeds of 18,000 r.p.m. and above the 15R then needs virtually one new plug per run. No plug we tried—K and B, KLG old and new types and A-M—stood up for more than two high speed runs and most failed on one. So high-nitro performance seems to mean doubly expensive operation.

The 15R employs a very original crankshaft layout, comprising a hardened main shaft $\frac{1}{4}$ in. in diameter terminating in a circular disc. Two scallop shaped cuts are then taken out of the top of this disc to yield a heavily counterbalanced (overbalanced) shaft, but retaining the circular shape at the walls—see Fig. 1. The crankpin is pressed into a hole drilled in the disc and a thin light alloy or aluminium rim fitted over the disc (the purpose of this merely being to blank off the scalloped out volume and so



ENGINE ANALYSIS

reduce effective crankcase volume. So far all very neat, except that we have little faith in the virtues of a pressed-in crankpin, especially on high-speed engines. The real trouble, however, lies in the fact that only some 16 thou. thickness of metal is supporting the crankpin on one side and 33 thou. on the other. There just is nothing like enough metal there to provide proper support and anchorage for the pin and in the case of the test engine, the pin did eventually break away. Wisniewski's engines have run to 27,000 r.p.m. on load and 22,000 r.p.m. is normal in speed flying, so we *may* have had a faulty shaft. Nevertheless, manufacturer John Brodbeck, has modified in the light of our findings.

Spinner a standard fitting

The remainder of the crankshaft assembly is also unusual—although in this case quite practical. The shaft is reduced in diameter slightly between the races, hardened and ground over the journals and projects approximately $\frac{1}{8}$ in. in front of the bearing housing. Onto this fits a die-cast light alloy propeller driver (which also acts as a backplate for the spinner), locked to the shaft by means of a socket head grub screw with a square

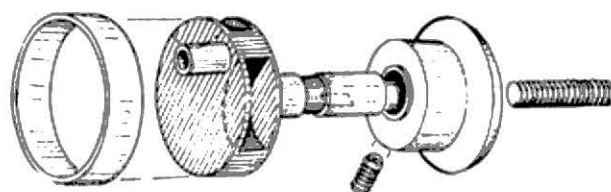


Fig. 1. Crankshaft construction showing cased webs.

head cup point locating on a flat on the shaft. The propeller shaft then simply consists of a length of $\frac{3}{8}$ in. diameter studding screwing into the driver. The shoulder on the propeller driver, however, means that the back of the propeller hub at least, must be drilled out $\frac{1}{8}$ in. diameter to clear. A spinner nut and spinner is a standard fitting and incorporates a unique lock fit with the backplate.

The rest of the engine follows more or less orthodox loop-scavenged "racing" glow motor design, although utilising rear-rotor induction and with the principal exception on the materials side that the piston and crankpin are "electrolized"—which we interpret as meaning hard chrome plated (*i.e.*, deep chromium plating as opposed to normal chromium plating used for decorative purposes which is very thin). The

crankcase unit embodies the cylinder jacket and stub exhaust, with separate front (bearing) and rear units secured with screws. Although the cylinder unit can be turned through 180 degrees the engine is intended to be run with the exhaust to the left.

The front unit houses the two lightweight $\frac{1}{4}$ in. diameter ball races, carrying the crankshaft. The rear cover carries the rear-rotor disc and a stub tube on the outside for fitting the induction tube proper. The rotor disc is an injection moulding in what appears to be a graphite-impregnated hard nylon or similar plastic. The back of the disc is substantially relieved to reduce rubbing area and thus friction. The disc itself is mounted on a steel pin pressed into the back cover. The entry port is opened out smoothly to provide a divergent passage swept by the rotor disc. A very small hole near the bottom opens into the pressure tapping point, this hole also being swept by the rotor disc and thus "timed" by it to open over a period corresponding to the generation of compression in the crankcase. A pressure tap fitting is supplied to screw into the back of the crankcase.

The intake tube has a bellmouth entry with peripheral jet holes at the throat fed from an annular space in the surrounding collar. The needle valve operates directly in the end of the fuel feed pipe screwed into one side of the collar, the needle valve housing screwing into the opposite side of the unit. The method of locking—using a domed nut to apply "squeeze" to the split housing—

Specification and power curves

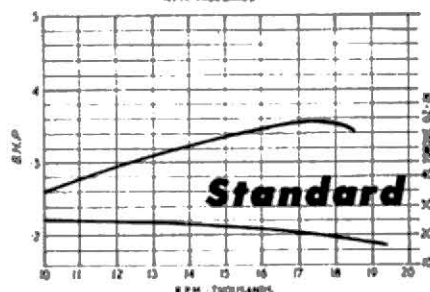
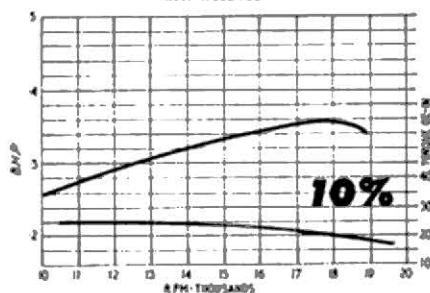
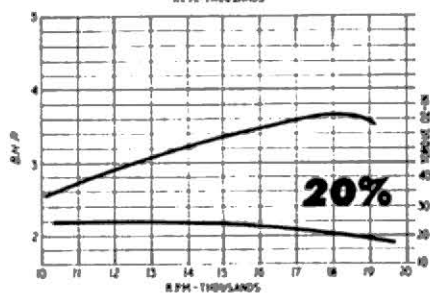
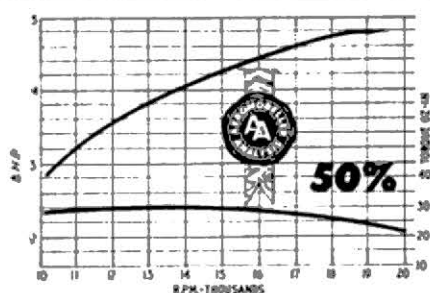
Displacement: 2.485 c.c. (.1516 cu. m.)
 Bore: .5995.
 Stroke: .537.
 Bore/Stroke ratio:
 Bare weight: 4.9 ounces.
 Max. Power: .355 B.H.P. at 17,500 on straight fuel.
 .36 B.H.P. at 18,000 on 10% nitro methane.
 .37 B.H.P. at 18,300 on 20% nitro methane.
 .48 B.H.P. at 19,250 on 50% nitro methane.
 Max. torque: 26 ounce-inches at 11,000 r.p.m. on straight fuel.
 30 ounce-inches at 13,000 r.p.m. on 50% nitro methane.
 Power rating: .143 B.H.P. per c.c. on straight fuel.
 .193 B.H.P. per c.c. on 50% nitro methane.
 Power/weight ratio: .0725 B.H.P. per ounce on straight fuel.
 .098 B.H.P. per ounce on 50% nitro methane.

Material Specification.

Crankcase unit: light alloy pressure die-casting.
 Cylinder liner: Meehanite.
 Piston: steel, hard chrome plated.
 Crankshaft: steel.
 Propeller driver: light alloy pressure die-casting (incorporating spinner backplate).
 Propeller shaft: $\frac{3}{8}$ in. N.S.F. studding, spinner and spinner nut as standard.
 Connecting Rod: light alloy forging.
 Gudgeon Pin: hollow, silver steel.
 Crankpin: steel, "electrolized" (press-fitted to crankweb).
 Main bearings: two $\frac{1}{4}$ in. diameter lightweight ball races.
 Induction: rear rotor disc (plastic).
 Front bearing housing: light alloy pressure die casting.
 Crankcase back cover: light alloy pressure die casting.
 Intake tube: light alloy, peripheral jets, transverse needle valve.

Manufacturers:

K. & B. Mfg. Corp.,
 Los Angeles 58, California, U.S.A.
 Retail price in U.S. \$19.95.



leaves a lot to be desired for easy adjustment. The method of anchoring the intake in the backplate by means of a small grub screw could also be improved upon. The screw is far too near the end of the stub pipe with the result that it is all too easy to split the casting on tightening up.

The cylinder liner is quite soft, but of generous thickness for a glow motor. It is extremely close fit in the crankcase unit and seats on a flange at the top. Rectangular exhaust and upper transfer ports are milled through the walls, there being some 90 per cent. overlap. Lower transfer ports comprise two 7/32 in. diameter holes side by side registered with similar holes in the piston skirt. The large area transfer passage is cast in the crankcase unit.

The piston is of relatively sturdy construction with good bearing area for the 5/32 in. gudgeon pin. A filleted rectangular deflector is machined on the top and the rubbing surfaces hard chrome plated ("Electrolized"). The gudgeon pin is hollow, fully floating and fitted with one end pad only on the engine received for test. Piston-cylinder fit is good, approaching tightness at top dead centre even after substantially more than the nominal running-in time specified by the manufacturers.

The connecting rod is a very nice forging with the .1785 in. diameter big end drilled with two holes for lubrication. The big end is relatively narrow—3/16 in.—but with very little axial clearance in the crankcase there was still some rubbing on the rod. The bulk of the crankcase volume is filled by the 1/4 in. thick web with its aluminium retaining ring and the 3/16 in. thick rotor mounted on a 7/32 in. deep "plug" on the back cover.

The cylinder head is a conventional pressure die casting, mounting the plug centrally and contoured to form a hemispherical combustion chamber with a slot to clear the deflector on the piston. Some considerable signs of metal "etching" were in evidence after running on high nitro fuels. The head is attached with six screws equi-spaced circumferentially.

Summarising, an engine which offers an exceptional power performance on high nitro fuels whilst still remaining very easy to handle—with instant re-starting without choking. It must be run on a pressurised feed (or gravity feed will do). Whilst it can be started without a pressure feed it cannot be adjusted for continuous running without a forced fuel feed. Performance on straight fuels is as good as most previous 2.5 c.c. glow motors on high-nitro fuels, although the 15R is obviously happiest running on 40 per cent. nitro methane or more. Plug consumption is prohibitive on 50 per cent. nitro fuels.

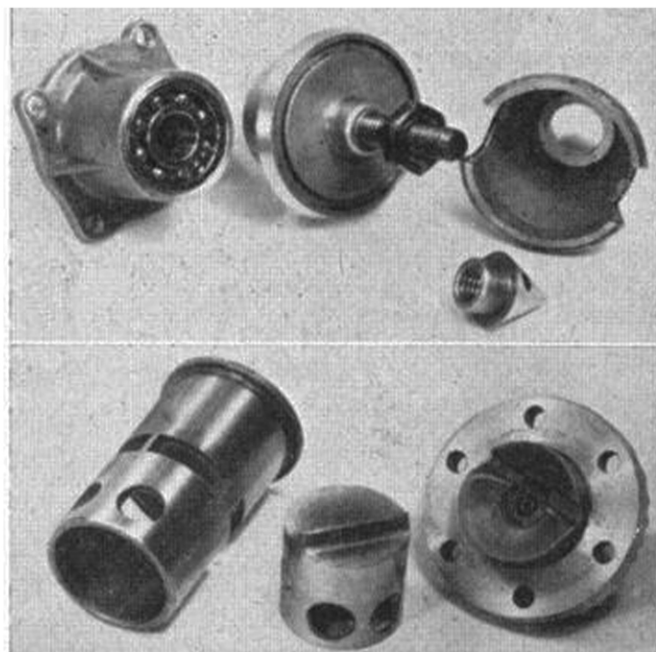
Here is a "stock" engine which is on a level with the best of "tuned" 2.5's—with undoubtedly extra performance to be found over the test figures by striking the right compromise, for a given application, between fuel and plug.

Propeller — R.P.M. Figures

Nitro-Methane %	0%	10%	20%	30%	50%
Fuel	Frog	Record	Castor 25% Methanol 55%	Castor 25% Methanol 45%	Castor 25% Methanol 25%
	Redglow ***	Nitrex			
Top Flite					
7 x 6	15,200	15,300	15,300	15,800	17,400
8 x 4	15,000			15,500	17,300
8 x 6	12,000			13,000	
9 x 4	11,800				
K-K (Nylon)					
7 x 4	17,000	17,000	17,000	18,000	19,400
7 x 6	14,000	14,200	14,200		15,900
8 x 4	15,000	15,000	15,000	16,000	16,800
Frog (Nylon)					
7 x 4	17,000		17,400	18,000	19,000
8 x 4	14,500	14,500	14,800	15,000	16,400
Trucut					
7 x 4	17,800			18,200	20,000
8 x 4	15,500		15,400	15,500	17,200

*** Although Frog Redglow contains no Nitromethane, it is not a "straight" fuel, since it contains a small proportion of other ignition additives.

MANUFACTURER'S RECOMMENDED PROPELLERS
C/L Speed 5 1/2 in. to 5 1/2 in. dia. 10 in. to 11 in. pitch.
Free Flight 8 x 3 or 8 x 4.



Front end and spinner assembly in upper picture, piston/cylinder and head below. Some speed enthusiasts use a higher compression head with wedge section chamber instead of hemispherical as shown here for production type.