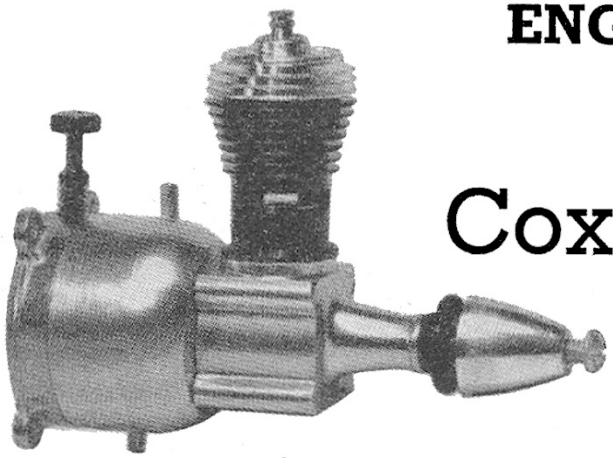
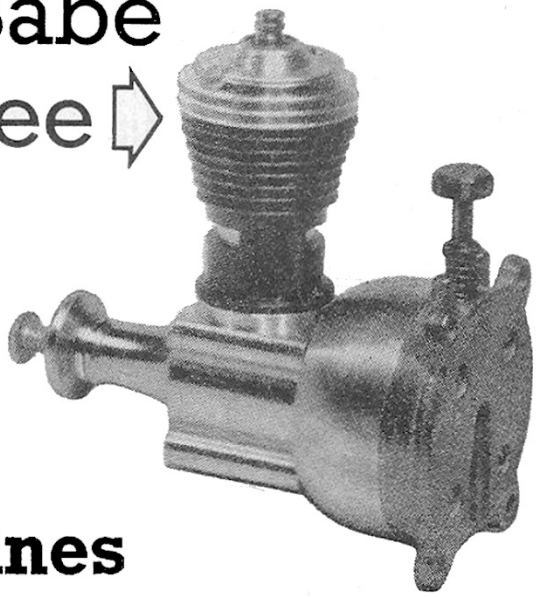
Cox Baby Bee & Cox Golden Bee

ENGINE ANALYSIS No. 82

by R. H. Warring



Cox Babe Bee



and the Cox Golden Bee

·8c.c. glowplug engines

The Cox .049 Bee is a brilliantly conceived baby glow motor, much copied but very rarely equalled cither for quality of production or performance. The basic Cox design is simple and straightforward, yet there are three subtle differences somewhere which make all the difference between an “outstanding” and an “ordinary” engine.

The two versions of the Cox Bee, the Babe Bee and the Golden Bee, are pure and simple “sports” motors for Sunday flying, mass produced to sell at a very low price. Basically they are identical engines, differing only in the length of tank. For an extra dollar the purchaser gets a larger volume control line tank and a gold anodised finish to the tank and crankcase plus something extra in the way of performance.

Where this extra performance comes from is a little difficult to say. Cylinder, crankcases and shaft units are identical, yet the Golden Bee gives more torque all along the line and peaks at a higher r.p.m. than its “un-glamorised” counterpart, with the difference sufficiently marked to be very noticeable. And the difference which produces this is a slightly bigger intake diameter on the Golden Bee and different venturi form with a 11/64 in. diameter opening at the reed, as compared with 9/64 in. diameter on the Babe Bee.

Apart from the tank, which forms the crankcase back-plate and carries the reed valve, all other components are interchangeable. This even extends to the pistons and cylinders the piston taken from the Babe Bee performed equally well when fitted in the Golden Bee, and vice versa a feature which, as far as we are aware, is exclusive to Cox production technique.

In point of fact, piston cylinder fitting on the assembly line is by purely random selection. Cylinder bores and pistons are finished under temperature controlled conditions to within a maximum deviation from an exact size of nine-millionths of an inch. This is the permitted tolerance. In actual production the limits are closer and if batch inspection shows a deviation approaching four-millionths, the reason is sought and corrected.

That is half perhaps three quarters of the solution. The rest is in finishing the bore and piston truly circular when, by producing both mating components under identical conditions, Cox Engineering have achieved

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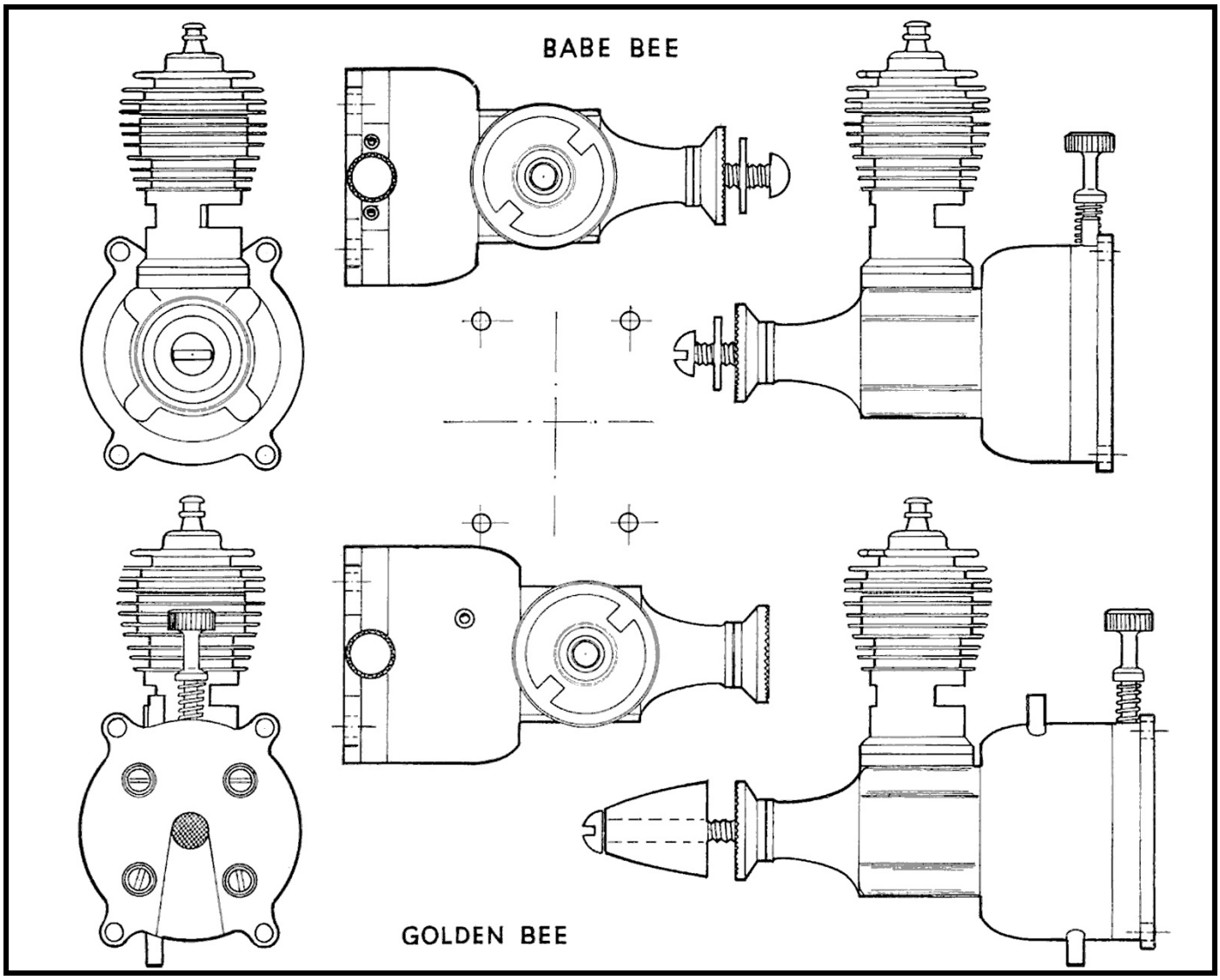
virtually the ultimate in mass production applied to small engines. Because the pistons and cylinders are so accurate there is no question of having to select and match components during assembly, nor any need to give the finished engines a test run because they are bound to be right. And the customer gets an engine which needs no running in the running fits are already as fit as they will ever be!

The rest of the production is just straightforward engineering utilising mainly bar stock materials. The only casting employed is the tank back-plate. The crankcase is machined from extruded section light alloy, the cylinder from mild steel and the tank unit, cylinder head and propeller driver from dural. The crankshaft and connecting rod are machined from steel and hardened.

The finned cylinder screws into the crankcase, seating without a gasket to seal. Diametrically opposed exhaust ports are machined in the cylinder walls with a single transfer passage machined in a crescent section from inside the walls between the exhaust ports. The transfer almost completely overlaps the exhaust. The cylinder bore appears to be reamed and honed to finish.

The head, incorporating an integral glow plug, is machined from light alloy and screws into the top of the cylinder, seating on a copper gasket, threaded diameter of the head being appreciably greater than the bore (hence the “step” in the cylinder side view at the top). The combustion chamber formed in the head is hemispherical.



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The platinum element is designed for 1.5 volt operation (i.e., one dry cell battery) a point which British users should bear in mind as it will burn out readily on a 2 volt accumulator. During extended running, much of it at very high speeds with doped fuels, no element failure was experienced on test.

The piston is purely cylindrical in shape, thin walled and machined with a spigot to take the connecting rod ball end. Inside and top of the piston are copper plated before hardening, yielding hardened piston walls but a relatively soft spigot and top which can be peened over to capture the connecting rod little end. The ball and socket fit is virtually free from slack without being tight in any way. The slender connecting rod is also machined from steel and hardened and the big end bearing, again free from slack. Crankpin diameter is .1085 in.

The crankshaft is machined from steel, relieved in diameter over the centre portion of the bearing length and then ground to finish over the actual bearing surfaces. The crankpin does not appear to have been ground. Only a light grinding appears to have been used. The main bearing is formed in the crankcase unit drilled and then cither reamed or broached to final size. An oilway runs down the length of the bearing, terminating just short of the front end, to ensure adequate distribution of lubricant. Bearing fit is typical of glow motors relatively slack so that the shaft can be rocked but not excessively so. The .2173 in. diameter crankshaft itself terminates in a splined section immediately in front of the bearing on to which is press tilted the light alloy propeller driver. The propeller shaft is formed by a .120 in. diameter machine screw which is extended in the case of the Golden Bee to accommodate a spinner.

The reed induction unit is perfectly straightforward. The tank back-plate casting carries a down lube into which accommodates the needle valve, opening into a central hole. This mates with a tapered central passage in the lank itself, together forming the actual venturi. The front end of the tank is a plug tit in the back of the crankcase and has a reed housing machined on its face. The single cruciform reed is located by a wire spring clip.

Fuel pick-up point is a slub “tee” on the down lube, integral with the tank back-plate, to which is fined a length of plastic lube carrying a light internal coil spring. This spring had the effect of holding the lower (open) end of the fuel tubing in the correct position in the tank a simple neat and worthwhile feature which again exemplifies the care which has been taken to produce as near as possible a “foolproof” sports engine. Four screws bolting through the lank and into the crankcase hold the tank unit which also carries lugs for radial mounting of the engine. There are no lugs for beam mounting. The only questionable feature is the amount of air space left for induction when the engine is radially mounted on a firewall. Only a relatively shallow V-shaped passage is left, formed in the casting, up which air can travel to enter the central intake (masked by a gauze to act as a filter). Obviously, this is quite satisfactory in practice.

Running of either engine we found to be sweet and smooth over a wide range of load-speeds. We found very little, if any, difference in r.p.m. with given propeller loads with nitrated and undoped fuels although with straight fuel adjustment was a little more tricky and it was not so easy to get consistent two stroking at high speeds. A doped fuel with about 15 per cent, nitromethane appears to be about the best for easy handling of the Babe Bee or Golden Bee, although by no means essential for good running.

Strangely enough, for such a popular sports engine, we would not rate the starling characteristics as “excellent”. Rather we would say that it was an “easy” engine to start, as opposed to “very easy”. A prime through the exhaust port is virtually essential for positive starting. With the smallest sizes of propellers there is an appreciable tendency to kick-back very smartly and being a reed valve engine it starts just as readily in either direction and is just as prone to run backwards as forwards from a normal flick. Once the characteristics of the

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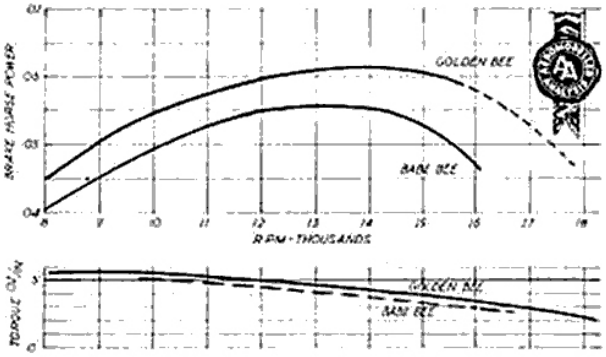
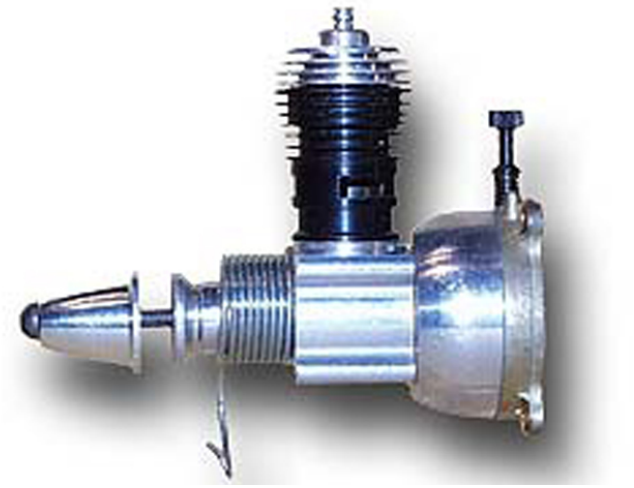
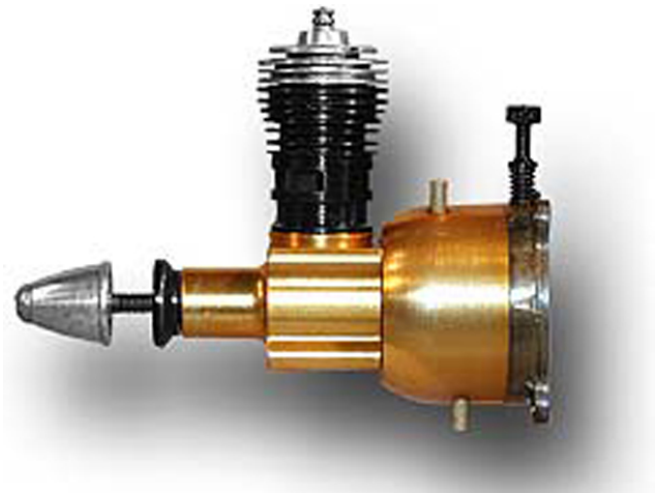
engine are appreciated, however, it represents no trouble at all to start and adjust. The needle valve control is fairly positive, without being critical, except for an abrupt cut if the mixture is leaned out too far. General running characteristics we found to be most consistent.

As to power performance, the Golden Bee achieved a peak B.H.P. of slightly in excess of .06 around 14.000 – 15.000 r.p.m. with a very Hat power curve .055 B.H.P. being exceeded over the range 10.000 – 16.500 r.p.m., which represents a remarkable performance for a sports glow motor of this size. The Babe Bee was just that much slower with all propeller sizes, and that bit more reluctant to run really fast. It sounded happiest at around 12.000 – 14.000 r.p.m. whereas the Golden Bee was still most happy at load speeds above 16.000 r.p.m.

As to value in this country, even adding import duty and other charges, either of the Cox “babies” is still a good “buy” for any class of aeromodeller and even the most critical of customers would find it difficult to fault them as a sports engine. The only point we would add is that it would have appeared worthwhile to lit a spring starter, as is done on these engines when lilted in the Cox “ready-to-fly” control line models, if only to reduce the possibility of “backward starting” which can be worrying and puzzling to a beginner. We would still recommend the Cox Babe Bee or Golden Bee to any beginner, however and to the expert looking for a good “049” for sports flying.







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