

# ENGINE TESTS

No. 38. The FROG "50"

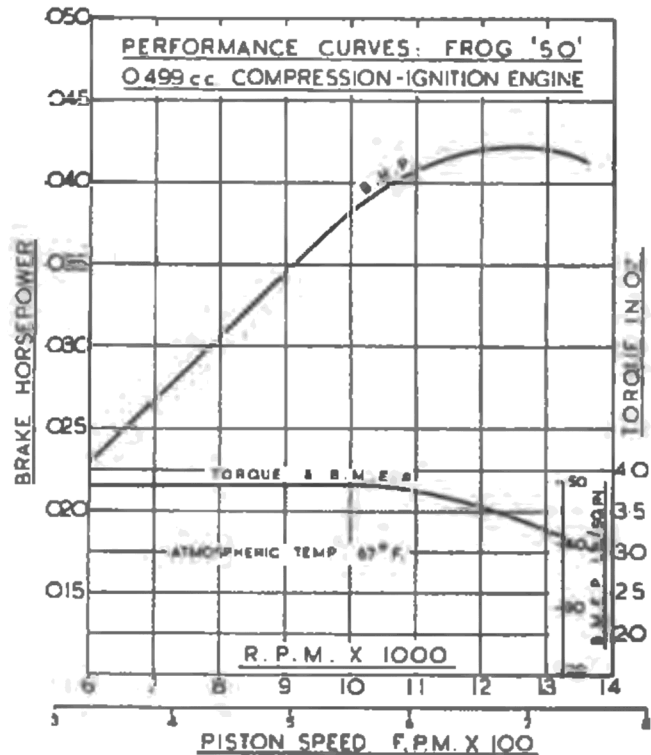
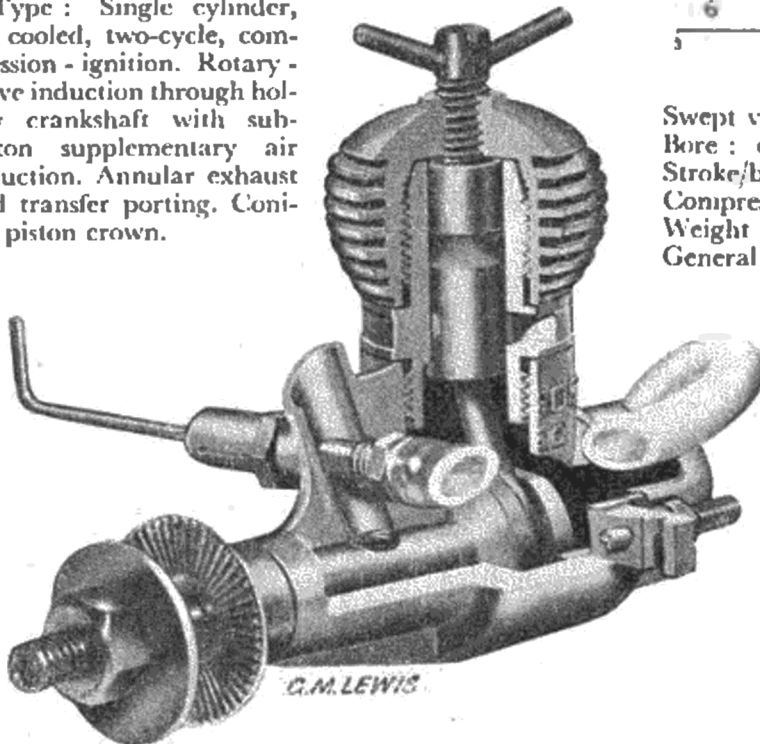
**T**HE most compact and just about the lightest of current  $\frac{1}{2}$  c.c. engines is the new Frog "50." It is also the lowest-priced; which price, however, has not been achieved by any sacrifice in quality. The unit is well made, both in respect of the quality of the die-casting and machining.

Basically, the "50" is a scaled down version of the "150" model introduced last year and dealt with earlier in this series. The only notable design modification is the use of a slightly higher stroke/bore ratio. Externally, the appearance of the engine differs only in the use of a die-cast metal tank (in place of the transparent plastic one on the "150") and in the vee-type compression lever and slightly deeper cylinder fins.

At the time of writing, Frog "50's" have not yet become generally available at home, the bulk of production being exported, and the co-operation of the manufacturers was, therefore, gladly accepted in the supply of a unit for test purposes. By the time these words appear, "50's" should be a little more plentiful.

### Specification

Type: Single cylinder, air cooled, two-cycle, compression-ignition. Rotary-valve induction through hollow crankshaft with sub-piston supplementary air induction. Annular exhaust and transfer porting. Conical piston crown.



Swept volume: 0.499 c.c. (0.0305 cu. in.).

Bore: 0.343 in. Stroke: 0.330 in.

Stroke/bore ratio: 0.962:1.

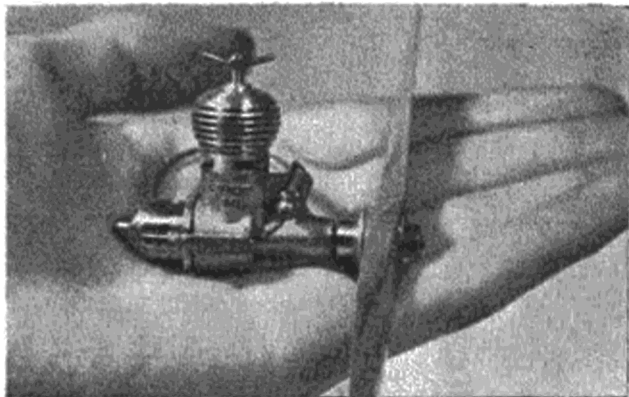
Compression ratio: Variable.

Weight: 1.2 oz. (including tank).

General structural data: Die-cast aluminium alloy crankcase and rear cover. Hardened steel cylinder, ground and honed and threaded into crankcase. Mechanite piston and contra-piston, ground and lapped. Silver-steel gudgeon pin, tight press fit in piston. Forged hiduminium RR.56 connecting-rod. Hardened steel crankshaft, ground and lapped. Spray-bar type needle-valve assembly. Beam or radial mounting. Detachable fuel tank, attached with single screw to crankcase cover and may be rotated for inverted or side-mounted running.

### Test Engine Data

Total time logged: 2 hours.



This picture shows the small size of the engine.

Fuel used : Ether (40 per cent.), castor-oil (30 per cent.), kerosene (30 per cent.) plus, 2 per cent. amyl-nitrate.

**Performance**

In submitting the "50" engine for test, the makers stated that a r.p.m. check had shown it to be about 2,000 revs down on the potential performance, and it was suggested that this improvement would be realised after about two hours' running-in. Such an improvement, of course, calls for a very big increase in horsepower as delivered at the shaft and the engine was therefore run-in for the period specified and a check kept on the power being delivered.

After a few preliminary runs to check for any undue tightness, the engine was loaded to produce an even speed of 9,000 r.p.m. At the end of half an hour of intermittent running, an improvement of approximately 16 per cent. b.h.p. was obtained. During the next hour, a further 14 per cent. b.h.p. was registered. No further increase was detected beyond this period.

The engine showed a negligible loss of power when running hot. It was, therefore, given two continuous runs of 15 min. each at 10,000 r.p.m. Power checks were taken at the beginning and end of each run. The engine held even readings throughout each run.

The fuel used throughout the tests, and for running-in, was the mixture given above, which the makers advise for this engine. The use of "etherless" type fuels, such as Frog "Powa-Mix," is not recommended for use with the "50."

The "50" was then run over a speed range of 6,000/13,500 r.p.m. to obtain readings for the torque and b.h.p. curves. At the lower speeds there was some fluctuation and the "50" definitely seems to prefer to run at speeds above 8,000 r.p.m., than below this figure. The best torque figure obtained was

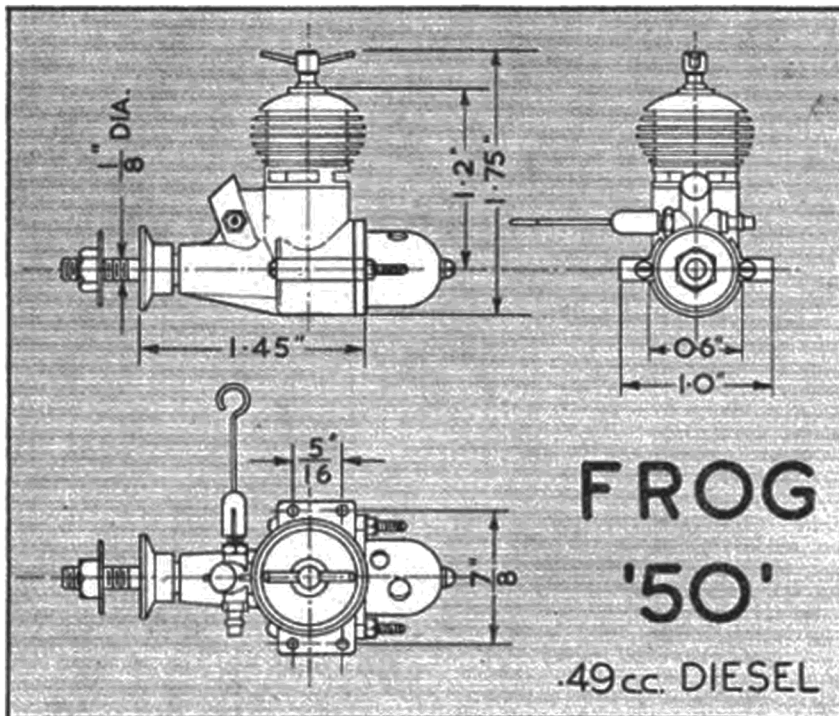
approximately 3.8 in. oz., which is very good, being equivalent to a b.m.e.p. of nearly 50 lb./sq. in. and this seemed to suggest that a good mechanical efficiency had been achieved following the 2-hour running-in period. It is, of course, just possible that further prolonged running-in may result in a slightly higher figure being realised at the top end of the speed range, accompanied by a higher peak b.h.p. and r.p.m., but the decline of the torque curve is, in fact, at quite a normal rate, while the actual figures of just over 0.042 b.h.p. at around 12,600 r.p.m. is, of course, a very good performance for a 0.5 c.c. unit.

As regards general handling characteristics, we have only one complaint to make and this, in any case, may only apply to the example tested. On the test engine, the contra-piston was unduly tight which not only made adjusting it rather uncomfortable but, more important, complicated the tests by making it impossible to reduce compression once the engine was running. Thus, every re-adjustment to suit load had to be made towards the critical setting by increasing compression, and not by hacking off from excess compression. If, when running, the engine began to indicate symptoms of being over-compressed for the load, it was necessary to stop the engine, prime and flick to return the contra-piston re-start and re-adjust to a lower setting.

It must be emphasised that this is very unlikely to be a fault common to all "50's." It is mentioned only because it is the purpose of these tests to report on all such effects encountered. In all other respects the engine behaved perfectly and it was not thought that a request to the makers for a replacement test unit was warranted.

Most very small high-performance diesels tend to be slightly more critical to starting adjustments

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## **Engine Tests**

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than other Class "A" capacities, but generally respond satisfactorily to one particular approach. With the Frog "50," the compression-lever was slackened off one-quarter to one-half a turn from the normal setting. The needle-valve was left at its running setting (approximately five turns open), the engine choked for about half-a-dozen flicks and primed with a few drops of fuel through the exhaust port. This procedure was found to produce a certain start within a few flicks. In general, the "50"

likes to be fairly "wet" for starting—but, of course, care should be taken to avoid getting too much raw fuel into the combustion chamber.

Mention has already been made of the Frog "50's" ability to hold high r.p.m. for long periods without loss of power. The most useful speed would appear to be 10,000-12,000 r.p.m., the lower figure corresponding to that approximately obtainable with the standard Frog 6 × 4 plastic airscrew, on which the engine starts and runs very well indeed. For scale models, a slightly larger and thicker section prop can be used to limit revs to about 8,000 r.p.m.

Power/weight ratio : (as tested) 0.57 b.h.p./lb.

Power/displacement ration : (as tested) 85 b.h.p./litre.