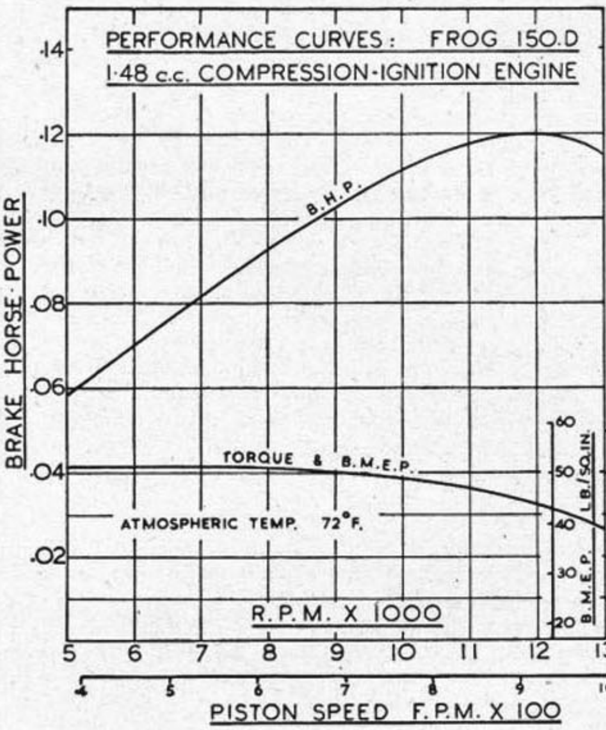
# MODEL *Aircraft* ENGINE TESTS

## NO. 28. THE FROG "150"

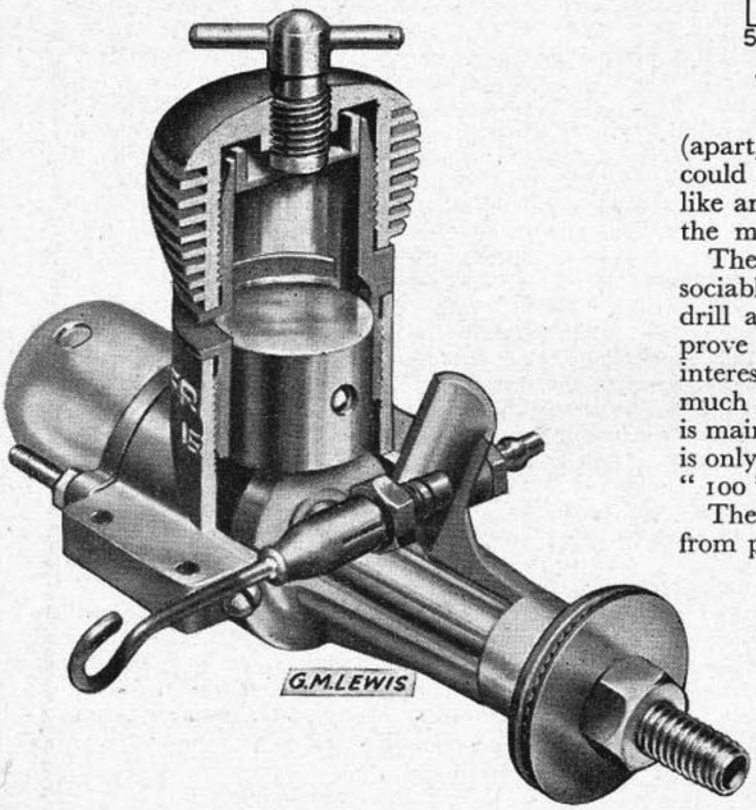
THE latest addition to the ranks of Class 1 engines is the Frog "150." This unit, which will also be available in a glow-plug ignition version, replaces the 1 c.c. "100" type and the 1.66 c.c. "160" and "180" models. The new engine is a little lighter and has far greater power than the old "100" and is very much more compact than any of the three earlier engines.

The Frog "100," in its original production version, was among the earliest of British diesels marketed. It was an engine which, for its capacity, had a good performance and the 7s. 6d. all-in repair service which the makers later instituted must have surely made it one of the most economical of engines to own, regardless of how ham-fisted the owner might be. Despite the fact that thousands of modellers must have been introduced to power flying on these engines, the old "100" could reduce the most experienced modeller to tears; one could either start an "100" or one couldn't. It required a technique different from almost any other engine



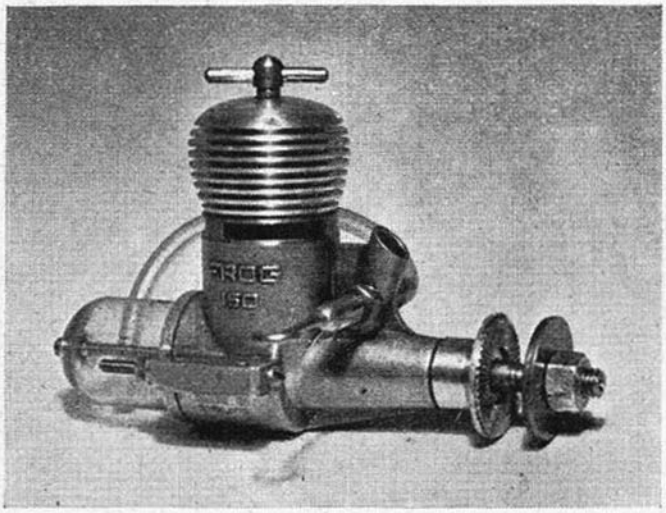

(apart, perhaps, from the "180") and, this applied, could be started with astonishing ease. But treated like any other diesel, it was capable of making even the most expert look very silly.

The new motor, the "150," we find, is much more sociable. It demands nothing more than the usual drill as applied to engines of this type and should prove popular with modellers of all grades and interests. As already mentioned, the new model is much more compact than the earlier engines. This is mainly due to the reduced stroke/bore ratio, which is only 0.92/1, as compared with nearly 1.47/1 for the "100" and 1.13/1 for the 1.66 c.c. motors.




The construction of the "150" is entirely different from previous Frog practice in small diesels and, in general is now similar to that employed by the most popular and successful annular port diesels. The use of 360-degree porting is, of course, another feature not previously seen in Frog engines.

Unlike the majority of present day model engines the "150" is supplied complete with a neat transparent plastic tank. This as on the bigger "250" and "500"




models is attached with a single screw and can be rotated and locked in any position for upright, inverted or side-mounted operation.

As we have now had reason to expect of the products of International Model Aircraft, these engines display a consistently maintained high standard of production, despite a very moderate selling price. Die castings are very clean and machined parts are well finished.

**Specification**

Type : Single-cylinder, air-cooled, 2-cycle, compression-ignition. Rotary-valve induction through hollow crankshaft. Annular exhaust and transfer porting. Flat top piston.

Swept volume : 1.48 c.c. (0.0903 cu. in.).

Bore : 0.500 in. Stroke : 0.460 in.

Compression ratio : Variable. Stroke/bore ratio : 0.92 : 1. Timing : Rotary-valve opens 38 deg. after BDC, closes 10 deg. after TDC. Exhaust-port opens and closes 70 deg. before and after BDC. Transfer-port opens and closes 53 deg. before and after BDC.

Weight : 3 oz. (less tank).

General structural data : Die cast aluminium alloy crankcase and rear cover. Hardened steel cylinder, ground and honed and screwed into crankcase. Meehanite 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.

**Test Engine Data**

Total time logged : 1 hour.

Fuel used : Mercury No. 8.

**Performance**

As had already been suggested the "150" starts easily. The instruction leaflet issued with the engine calls for priming through the exhaust ports with two or three drops of fuel to secure a start from cold. However, this was not found to be essential and the engine would start quite easily by simply choking the intake for a few preliminary flicks. Whatever system of starting is used, therefore, is largely a matter of preference.

The controls, contra-piston and needle-valve, were found to be easy to adjust and not unduly critical. The needle-valve held its setting firmly at all speeds, the normal setting being $1\frac{3}{4}$-2 turns open, according to load.

The lowest speed at which the engine was operated was just over 3,000 r.p.m., at which the "150" ran quite smoothly and showed a good torque reading. Such a speed, of course, would seldom be required for normal operational use, but at slightly higher r.p.m., such as might be employed for free-flight scale use, the usefulness of these qualities can be appreciated, and are in contrast to the characteristics of some model engines designed for high revs which become critical at the lower speeds of 6,000 r.p.m. and less.

Reducing load to allow r.p.m. to rise showed that torque was well maintained up to 9/10,000 r.p.m., beyond which a gradually increasing decline was evident up to the maximum speed tested of just over 13,000 r.p.m. The corresponding b.h.p. curve thus gave the peak output and speed in conveniently round figures of 0.12 b.h.p. at 12,000 r.p.m., a very good performance indeed and one which compares favourably with other engines in this capacity class.

In the region of 9,000 r.p.m. a slight vibratory period was picked up but otherwise running was even and smooth. The common tendency to loss of power after a start from cold, and as the engine

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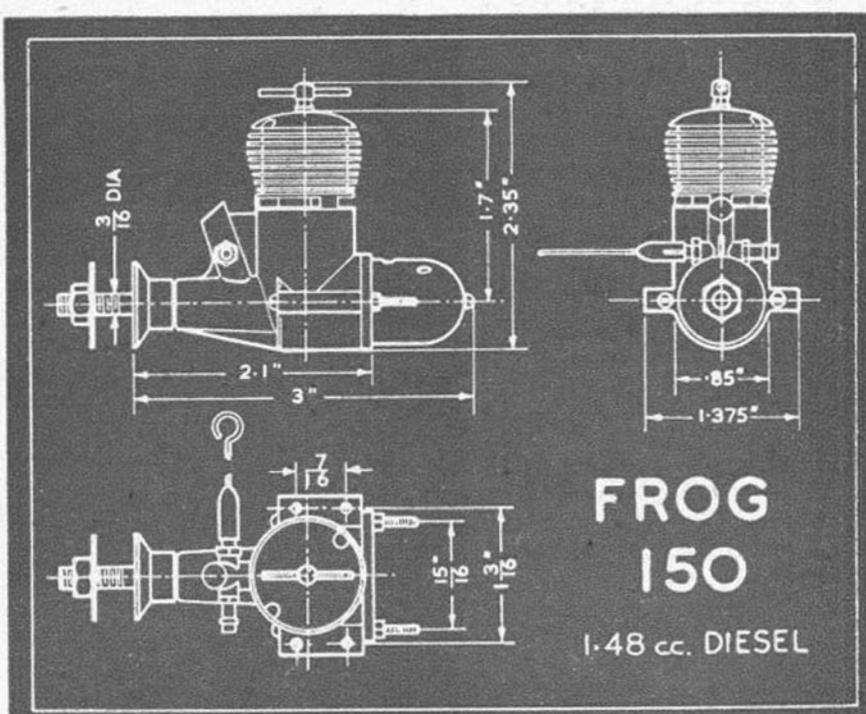

warms up, was detected but this was less apparent at the higher revs than at moderate speeds. When using the fuel tank supplied, which is attached to the rear cover, " boiling " of the fuel occurred after running for half a minute or so at high speeds, due to engine heat, but this would not be expected to occur under normal free-flight conditions of moderate speeds and short runs. For high-speed C/L work, a separate tank would normally be employed, of course.

To allow maximum power to be developed in various types of models, it is desirable to keep the propeller dimensions within reasonable limits consistent with aerodynamic considerations. For competition power-duration models, it is suggested that 8 × 4 props of medium blade area be tried. These should allow r.p.m. to reach 9,500/10,000. For semi-scale types, of course, some decrease in power is tolerable and at the same time better results may be obtained with a slightly larger prop such as a 9 × 4 or 9 × 5. For C/L stunt, 7 × 6 and 8 × 6 should cover all normal requirements. To obtain maximum results with speed models, some experiment with prop types and sizes is inevitable, but it is suggested that diameter, pitch and blade area should be such as to allow the engine to approach 12,000 r.p.m. on the ground so that the peak r.p.m. are slightly exceeded in the air. Normally, a diameter of not more than 6 in. will be called for, pitches being about 9 in. with thin, narrow blades.

Power/weight ratio (as tested) : 0.64 b.h.p./lb.
Power/displacement ratio : 81 b.h.p./litre.