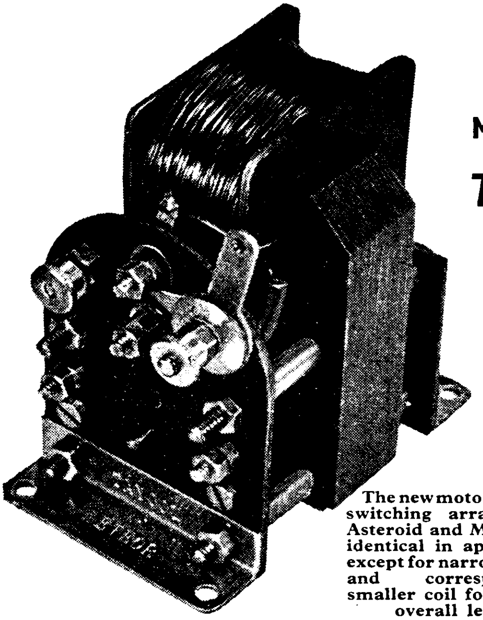
MODEL MAKER MARINE MOTOR TEST No 4

THE NEW TAYCOL METEOR & ASTEROID

CONDUCTED BY RON WARRING



The new motor, showing switching arrangement. Asteroid and Meteor are identical in appearance, except for narrower field, and correspondingly smaller coil former and overall length

THE new Taycol *Meteor* and *Asteroid* motors are developments of the Torpedo Mk. II and Target, respectively, and performance is substantially the same as these earlier versions. (The Torpedo was fully reported in the December, 1955, issue of the MODEL MAKER). Main difference lies in an alteration of the switching arrangement, simplifying the terminal end connections and providing easy manual switching from forward to reverse, for which purpose a switch plate is now mounted under one of the battery terminals.

The basic difference between the two motors is that the *Meteor* (like the Torpedo) has a more powerful field than the *Asteroid* (developed from the Target). An identical arrangement is, however, adopted for connecting the split field coils and forward-reverse switching, the two end plates being exactly the same. Both are similarly designed for 6 to 12 volt operation, the *Meteor* having a maximum B.H.P. of around .006-7 on 6 vols and approaching .015 B.H.P. on 12 volts. The *Asteroid* is rated at .0035 B.H.P. max. on 6 volts and .008-9 on 12 volts.

The switching arrangement adopted uses the split field coil windings independently (Fig. 1), switching one in circuit for normal forward running (which is clockwise with the spindle viewed from the terminal plate end—anti-clockwise on the "drive" end); and the other coil for reverse direction running (see Fig. 2). Field strength for reverse running is appreciably lower giving, nominally, "half speed" for any given load in reverse. This has been done deliberately with model boat application in view, a lower speed reverse drive invariably being preferred for control. The direction of rotation of the motor, it should be noted, remains the same irrespective of which way round the battery leads are connected to the terminals.

For remote control operation of the reversing switching the manual switch must be removed completely and the two appropriate field coil terminals connected to the remote control switch, e.g. typically a relay, as shown in Fig. 3. This gives full speed ahead or half speed astern, at will. Equally, of course, a three-position control switch of appropriate form may be preferred, giving ahead and reverse and stop (intermediate position).

Performance of either motor on 12 volts is extremely good, although the current drain is also high due to the low electrical resistance of the windings. The stall torque of the *Meteor* on 6 volts approximates to the maximum torque developed by a good 1 c.c. diesel which underlines the designer's statement that proper "engineering" couplings be used between motor shaft and propeller shaft, preferably attached with grub screws engaging on a flat filed in the respective shafts. Certainly it is possible to find couplings slipping on switching smartly from "forward" to "reverse" with high voltage operation. The further point also arises that screwed-on couplings and screwed-on propellers will tend to be *unscrewed* as the drive takes up in reverse.

At lower voltages, e.g. 4-6 volts, we found the reverse speed to become substantially less than half the forward running speeds, for the same load. In the case of the less powerful *Asteroid*, self-starting in reverse was not good under about 6 volts and quite unreliable at 4 volts even under no load. The *Meteor* behaved very much better in this respect, although reverse speed performance tapered off considerably with decreasing supply voltage. The current drawn for a given load remained substantially the same, however.

Apart from the difference in field strengths involved, forward direction running is also favoured by the commutator being set with lag. When forward running, in fact, the *Meteor* realises the amazingly high overall efficiency

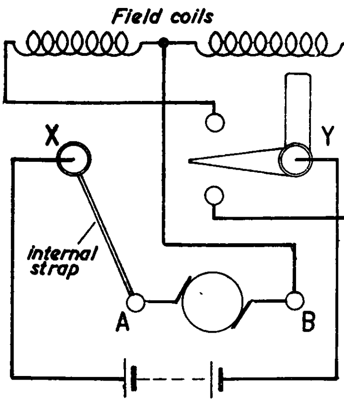
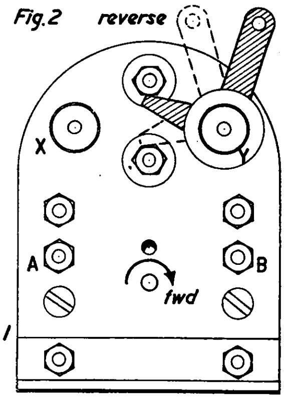


Fig. 1

Fig. 2



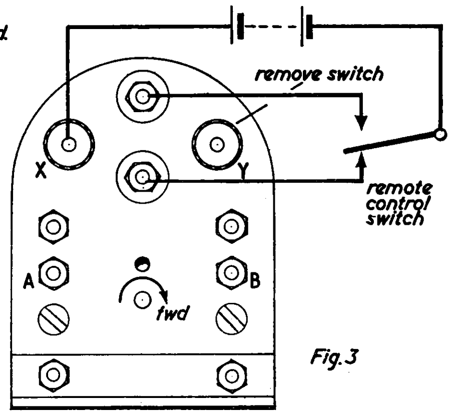


Fig. 3

figure of 50 per cent. at around 4,000 r.p.m. on 6 volts. Free running speed on 6 volts approaches 7,000 r.p.m., and on 12 volts nearly 10,000 r.p.m. At a typical practical load-speed, however, the current demand may well be in excess of 1 amp. at 6 volts and around 2 amps. on 12 volts, making the selection of wet batteries more or less obligatory for the power supply.

This would also favour the use of a relatively small diameter fine-pitch propeller for marine use, so that the operating r.p.m. of the motor can be kept high, so resulting in minimum current consumption. Also the motor will be operating nearer to the r.p.m. corresponding to peak efficiency, meaning that the maximum amount of electrical energy is being converted into useful work.

W. N. Baker, designer of the Taycol motors, mentions in a note that the *Meteor* and *Asteroid* are intended for high speed operation. This, of course, is consistent with a propeller peripheral speed of around 5,000 ft. per min., at which speed marine propeller efficiency is considered to be at its highest.

Nothing like this speed is normally achieved with electric motor drives in model boats. At 4,000 r.p.m. drive speed, for example, a propeller diameter of some 4¾ in. would be called for. Optimum operating r.p.m. for a 2 in. dia. propeller on this basis is 9,500 r.p.m.; and for 1½ in. dia., 12,700 r.p.m. The latter size is probably the largest which the *Meteor* could accommodate for high speed running, achieving a speed of some 5,000 r.p.m. on 12 volts and 2,000-2,500 r.p.m. on 6 volts. Obviously the higher voltage operation is to be preferred, both for increase propeller efficiency and a proportionate saving in current consumption. Also both the *Meteor* and *Asteroid* can be run for long periods on 12 volts, under reasonable loads, without overheating or fear of burning out the coils.

Constructional details of the *Meteor* and *Asteroid* apply as in the "Torpedo" report. The only difference in appearance between the two motors is the narrower field—thirteen laminations as against twenty-five—and a corresponding reduction in coil former size and motor overall length. Small pulleys are attached to the drive end of the spindle with Allen grub screws.

BRIEF SPECIFICATIONS

Taycol Meteor	*Taycol Asteroid*
Mounting dimensions (base mounting) 2⅜" x 1⅜"	**Mounting dimensions (base mounting): 2" x 1⅜"**
Mounting hole size: ⅛" dia.	**Mounting hole size: ⅛" dia.**
Overall height: 2⅝"	**Overall height: 2⅝"**
Overall width: 1⅝"	**Overall width: 1⅝"**
Overall length: 2¾"	**Overall length: 2¼"**
Weight: 13¼ ounces	**Weight: 9 ounces**
Drive spindle: 3/32" dia.	**Drive spindle: 3/32" dia.**
Rotation: anti-clockwise "forward" (viewed from drive end) half-speed reverse by manual switch.	
Design voltage: 6-12 volts	**Design voltage: 4-12 volts**
Current consumption (at typical load-speed): 6 volts—1 amp. 12 volts—1.7 amps.	
Suitability to remote control: by removing manual switch	**Suitability to remote control: by removing manual switch**
Armature: 3-pole	**Armature: 3-pole**
Commutator: disc	**Commutator: disc**
Brushes: phosphor branze	**Brushes: phosphor bronze**
Motor type: series wound	**Motor type: series wound**
Electrical resistance (nominal): 1.3 ohms.