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NOW!... QUIETEST, safest, most exciting sports fun in the model hobby field!

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THIMBLE-DROME

O-FORTY-FIVE Special

READY TO RUN in 2 minutes (No special tools required.)

$12.95

Car without power but with tether and bridle for manual operation. Wheelbase 4⅜" L. 8½" – H. 3⅛" **$1.98**

While engine can be installed in this car, we do not recommend that it be used for this purpose.

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GET THESE *WONDERFUL* NEW SPECIFICATIONS!

Power pack completely self-contained in one unit. Includes: .045 cu. in. displ. engine- -fuel tank—enclosed fly wheel —enclosed case-hardened steel planetary reduction gears (4:1 ratio)—built-in muffler with manual control for quiet operation in City, yet plenty of real bark in Country—automatic lubrication of gears and bearings—tail pipe that takes exhaust out in rear. Equipped with spin-start wheel. Entire above unit (with rear wheels mounted) locks in die-cast aluminum body—*with just one screw.* 11 oz., 30 m.p.h. (with the thrills of 60!)—first radically new development since the Roy Cox "Champion 15"!

L. M. Cox MFG. CO. 730 POINSETTIA ST. SANTA ANA, CALIF.

ANNOUNCING

THE RACE CAR HIT OF THE CENTURY!

All in One . . . Ready to Run

Nothing More than Fuel Needed

COMPLETE IN ITSELF, MOTOR . . . GEAR DRIVE . . . HI-SPEED WHEELS, TIRES . . . AND HOT PLUG

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The new Thimbledrome "CHAMPION '15"—Model 303C-15. Factory built, bench assembled and tested —Ready for fun.

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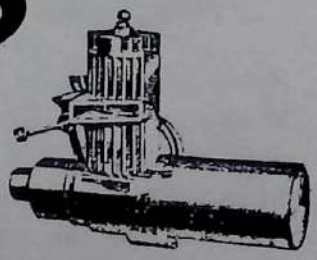

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NOTE: Motors, gear drives, drive wheels and front-end units are available separately if desired. Individual retail prices on request.

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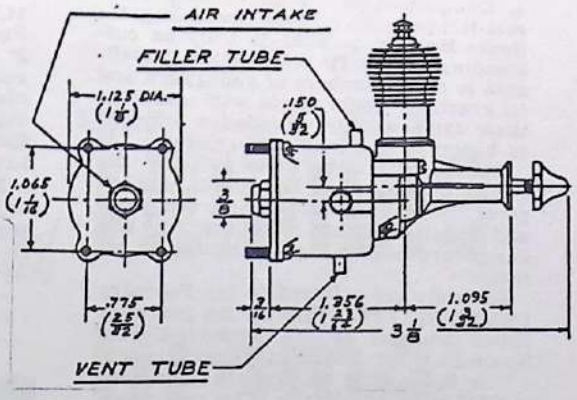

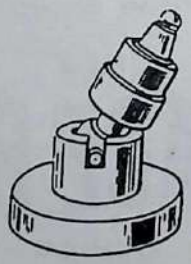

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Combination flywheel and universal joint designed to couple most other engines to THIMBLE DROME rear end gear unit. Just $2.50

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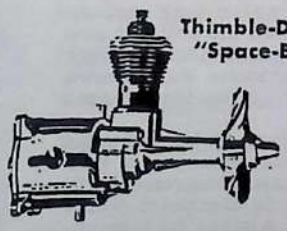
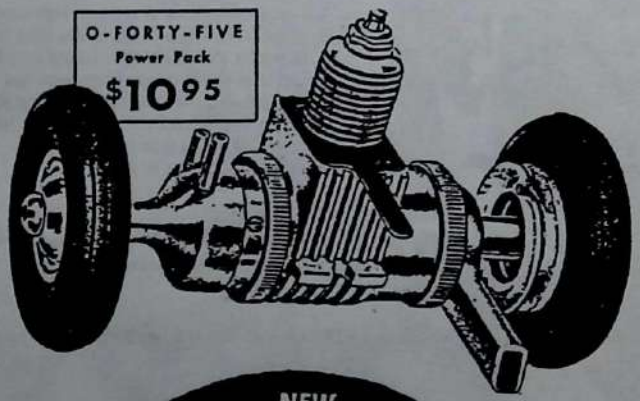


Thimble-Drome "Space-Bug"



A.T. 05/1949

the tank. It is threaded to receive the engine crankcase.

The needle valve is turned from steel alloy and is hardened and ground. It has a knurled knob for adjustment, and a steel spring to keep fuel adjustments. The reed housing presses onto a turned shoulder on the fuel tank.

The reed housing is turned from aluminum alloy, and has a pressed index point for reed positioning. Two reeds are used. They are die-cut from beryllium copper and surfaced. A die-cut aluminum ring is used as a backplate.

The die-cast aluminum crankcase is mounted by four machine screws to the fuel tank. A bronze crankshaft bearing is used. The upper crankcase is threaded to receive the cylinder. The cylinder is turned from alloy steel, and has seven fins and two large exhaust and two intake ports, which are milled. The upper portion of the cylinder is micro-finished to match the piston. The lower portion is of slightly greater diameter to reduce friction.

The light piston is turned from steel alloy, then hardened and ground, then micro-finished to match the cylinder. The piston is very slightly domed on top. It has an internal retaining ring to hold a steel socket, which in turn retains the ball end of the connecting rod. The connecting rod is turned from high-strength aluminum alloy.

The head itself is turned from aluminum alloy and has four fins. The head also has a built-in glow plug. The inside portion is domed. The head screws into the cylinder top. The complete unit with built-in glow-plug is comparable in price to regular glow plugs.

The balanced crankshaft is turned from one-piece alloy steel, then hardened. The bearing surfaces are then ground. The shaft has a knurled portion onto which an aluminum washer is pressed for a prop drive. The forward part is threaded for a prop nut. The prop nut is turned from aluminum alloy, part of which is milled to a hex for use with a wrench.

The Space-Bug bore is .406", stroke .385" and displacement .499 cubic inches.

The instructions for care and operation of the Space-Bug are complete and easily understood. It is noted that propellers, at the high speed run on the Space-Bug, should have each blade the same shape, with edges trimmed, and each propeller balanced by using a shaft through the center and balancing the unit on razor blades. This advice of course will improve the power output on slower running engines as well.

The Space-Bug was extremely easy to start both hot and cold, and when deliberately flooded. It was steady running and the needle valve adjustment was not critical.

Using Thimble-Drome glow fuel, the following speeds were obtained using an electric strobotac:

8" diameter / 4" pitch Veco: 15, 800 r.p.m.; 8" diameter / 2" pitch Tornado Plasticote: 17,300 r.p.m.; 7" diameter / 2" pitch Tornado: 15,200 r.p.m.; 6" diameter / 3" pitch Top Flite: 16,100 r.p.m.; 5¼" diameter / 4" pitch Power Prop: 19,200 r.p.m.; 5" diameter / 7½" pitch Aerobatic: 19,000 r.p.m.

Price complete is $6.95.

A Hop-Up kit is available for the Space-Bug engine which can be used to increase r.m.p.'s. It consists of a high compression head with special glow plug and a tank assembly with a large rear nut. The tank assembly differs from the standard engine by having a larger bore intake past the fuel jet. The large nut allows more air to be drawn in. The high compression head gives greater power per stroke.

The hopped-up racing version of the Space-Bug obtains its maximum power just under 20,000 r.p.m. and turns propellers at from between one and two thousand more r.p.m.'s than the standard Space-Bug. Its power is about 10% greater. The props recommended for the standard Space-Bug are suitable for this version.

Starting abilities with most fuels is almost as outstanding as the standard Space-Bug, in other words, extremely good. The fuel adjustment is not as broad, but is quite adequate. The engine runs hotter, but hot starts and flooded starts give no trouble. The kit sells for $3.50.

F.M. 02/1953

F.M. 10/1953

● Companion to the outstanding Thermal-Hopper and regular Space-Bug, the Space-Bug Jr. at $3.95 is truly an outstanding engine. Its price makes it available to great numbers of youngsters, and its excellent performance will encourage these same would-be modelers to go on to bigger things in model aviation.

Briefly, the difference between the Junior and the other Thimble-Drome engines is that the Junior has fewer parts and smaller porting. Workmanship and design are of the highest calibre in all cases.

Modelers are referred to the February 1953 FLYING MODELS for the first published analysis of the Thimble-Drome Space-Bug, for purposes of comparison.

The Space-Bug Jr. uses a two-piece molded nylon fuel tank. The rear piece includes four engine mounting lugs (with the same mounting dimensions as the Space-Bug); a plated brass insert for the needle-valve body, and an air filter screen which is heat-sealed in place. The forward portion of the fuel tank has the reed valve assembly pressed on its front. It includes a filler and vent tube.

A tongue and groove system is used for sealing between the nylon tank sections. The only gasket used on the entire engine is the thin fibre one which seals between the tank and rear crankcase. Four screws, recessed in the rear of the tank, thread into the crankcase.

These four screws must be tightened evenly and with little pressure—if they become loose, crankcase compression will be lowered, perhaps to the point where the engine will stop. Air can be seen entering past the seal if this occurs. The nylon, of course, is transparent, allowing the fuel level to be seen. But, more important, it is very tough and is able to absorb some energy in crack-ups.

The tank design also allows the needle valve to be on either side or the top and the engine can be independently placed up, down, or sideways. Mounting is radial. Either a ⅜" hole has to be drilled in the model firewall, or ¼" spacers such as 3/32" or ⅛" diameter ¼" long eyelets should be put under each lug to allow the intake to clear.

The intake port to the reed valve is very small. This, combined with smaller exhaust ports and only one fuel by-pass port in the cylinder, make an engine that is very easy to start and difficult to flood—an engine that is able to operate at low r.p.m.'s.

11" diameter propellers of medium pitch can be handled and there is enough power given out to fly a 10 ounce 3' scale free-flight model. Maximum power is obtained under 15,000 r.p.m. and can be obtained using a 5½" diameter / 3" pitch propeller for sport, a 5¾" diameter / 2" pitch prop for free-flight, or a 5" diameter / 4" pitch prop for speed.

The propeller should be balanced by sanding, and be centered by using tubing for bushings if the propeller's center hole is too large for the shaft. This will have to be done if a larger than 6" diameter prop is used.

The piston and cylinder of the Space-Bug Jr. are interchangeable with any other Cox engine. The head with glow plug is available at the regular glow plug price. Bore is .406", stroke .386", and displacement .049 cubic inches.

The Space-Bug Jr. was exceptionally easy to start under all conditions of deliberate flooding, low battery voltage, and using a variety of fuels. The needle-valve setting is extremely broad. It is recommended that the well written operating instructions be read by everyone before running the engine.

Using Thimble-Drome Glow Fuel, the following speeds were obtained:

5½" diameter / 2½" pitch Kaysun: 14,700 r.p.m.; 10" diameter / 6" pitch Power Prop: 7,800 r.p.m.; 7" diameter / 2" pitch Plasticote: 12,200 r.p.m.; 7½" diameter / 3" pitch Air-O: 10,100 r.p.m.; 6" diameter / 4" pitch Veco: 12,400 r.p.m.; 5¼" diameter / 3" pitch Power Prop: 13,600 r.p.m.; 5" diameter / 7½" pitch Aerobatic 14,100 r.p.m.

Price of the Space-Bug Jr., complete with tank, propeller, wrench and mounting screws, is $3.95.

LEADING THE WORLD
in 1/2A Value, Performance, Engineering

13. No break in—Crank up and fly.
14. No external fuel lines... And...
15. THE BIGGEST FEATURE of ALL

Only $3.95

NEW
SPACE BUG
JUNIOR

unsurpassed anywhere by any other engine for value
• economy • easy starting
• quality performance
• quality workmanship

PLUS all these other features

1. Amazingly easy to start—even when brand new
2. Almost impossible to flood
3. Non-critical—starts at any needle-valve adjustment
4. 4-cycles smoothly over wide range of slow speeds
5. 2-cycles with stutter or cackle at high speed
6. Up to 16,000 RPM with 5½ in. 2½ pitch prop
7. So precise pistons and cylinders are interchangeable
8. Fuel level visbile in light tough nylon tank
9. Equipped with extra-long-lasting TD Glow plug
10. Mounts in any position—up, down, right, left
11. Needle valve away from prop and exhaust
12. Very stable running in flight

L. M. COX MANUFACTURING CO., INC.
BOX 476, SANTA ANA, CALIFORNIA

Leadership in ½A... yours with Thimble Drome

Today's Most Advanced ½A Engines, Fuels, Reels, Accessories.

Ask your model sports dealer for the COMPLETE line that is leading the way in ½A design, engineering, performance, and convenience for the modeler.

LEADERSHIP IN Engines

Space Bug .049

Unchallenged performance in ½A! Bench mounted speeds up to 18,000 RPM! Even faster in the air. Every convenience for safe easy starting and convenient mounting.

$6.95

Thermal Hopper .049

Most powerful Free Flight ½A engine with new Multi-Jet carburetor that delivers sensationally smooth performance under varying flight conditions. No break-in. Easy starting.

$6.95

LEADERSHIP IN Fuels

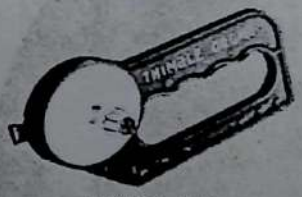
SPORT FUEL—Easy starting—fast running. A "pure" fuel not adulterated with additives for this and that, but super-refined and performance-rated for dependable operation.

Pt. 90¢

RACING FUEL—It's Jet fast. Definitely the hottest fuel on the market today. Proved faster by electronic stroboscope test.

Pt. $1.10

LEADERSHIP IN Accessories



SKYLON REEL—new Thimble-Drome reel for use with Nylon lines in ½A. Spools turn independently for adjusting control, wind in simultaneously!

$1.49

HANDY REEL—Takes any size flying wire, either stranded or solid. Low cost lets you have a separate reel for each size of line used.

$2.95

25¢

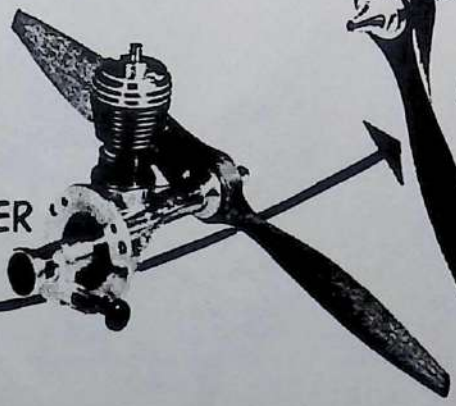
Invest 25c in a Thimble-Drome Finguard (now at your dealer's) and be rid of modeler's finger, blisters, and cracked knuckles!

L. M. COX SANTA ANA, CALIFORNIA

IN 1/2A

If it's top pulling power at high speed
or top pulling power at low speed
or top R.P.M.
or easy starting
or advanced engineering
or right and left hand rotation
or trophies
or if it's a combination
of any or all of these
you want—try
THIMBLE DROME

SPACE BUG



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Thimble-Drome Buy-Words for Better Flying!

FUEL!

Thimble-Drome Racing Fuel **$1.10**

Glow Fuel For stunt and sport **90¢**

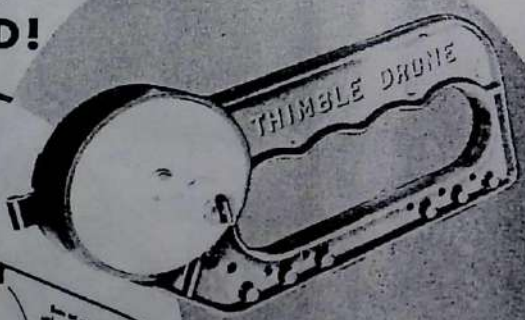
FLYING AID!

FINGUARD!

Protect your finger—have painless starting with this newest Thimble-Drome accessory. **25¢**

LOOK FOR THIS CARD AT YOUR DEALER'S

REEL!



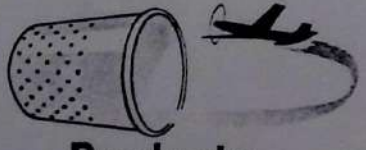
SKYLON— the light reel for ½A with Nylon lines . . . **$1.49**

HANDY REEL both lines AND wires **$2.95**

Space Bug Hop Up Kit

Adds 1000 to 2000 RPM to your Space Bug according to weather. A terrific deal for speed and for flying those large planes. Only **$3.50**

Thimble-Drome



Products

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MAN July 53

CARE AND OPERATION OF YOUR

Thimble-Drome "Space-Bug" Engine

The Most Powerful, the Fastest, the Easiest Starting Engine in the ½ A Class.

No other manufacturer of ½ A engines can truthfully make this claim.

Keep this engine immaculately clean, use **Thimble-Drome Fuel**, and it will maintain its winning characteristics for a long period of time.

This engine is precisely fitted at the factory for **immediate, easy** starting and immediate flight. A break-in period in the ordinary sense is not necessary for flight, in fact, a slow easy break-in is not desirable. Most of these engines will develop full power within one minute of running time; but a few, those which are slightly on the tight side, may not develop full power under three hours. Even these will develop sufficient power for average flying almost immediately. The only break-in required is very rich (slow) running the first 60 seconds after starting the first time. After 60 seconds it should be ready to go.
Elimination of break-in is **not** attained through loose or sloppy fitting but through very precise fitting, together with super fine wearing surfaces.

(A) PREPARATION FOR RUNNING

1. Mount the engine in the plane or if you want to give it some running first, mount it on a narrow board, about 2" wide and fasten the other end of the board in a vise or nail it to something. **Do not hold the engine directly in a vise.** The 4 ears at the rear of the tank are for mounting. Use the template, A-Fig. 1, to drill mounting holes and breather hole. **The screened nut, B-Fig 1, in the rear is the air intake hole and must be left open.**
2. Place propeller on the shaft with the flat side of the blades toward engine and lock securely with the propeller nut.
3. Get a new or thoroughly cleaned oil can and slip a piece of ⅛" neoprene tubing on the spout. This will be used for filling the fuel tank. If you prefer you can buy a fuel pump from your dealer to screw directly on to the fuel can.
4. Procure a 1½ volt dry cell battery, # 6 or equivalent, and connect it with 2 flexible insulated wires to a glow plug clip as shown in the diagram A & B-Fig. 2. Do not use a stronger battery. If you do the plug will burn out. The connections should be soldered to insure good contact and taped to prevent bare ends of wire from getting together and "shorting" the battery. Be sure the battery is a good one. Your dealer sells batteries, wire, and glow plug clips.

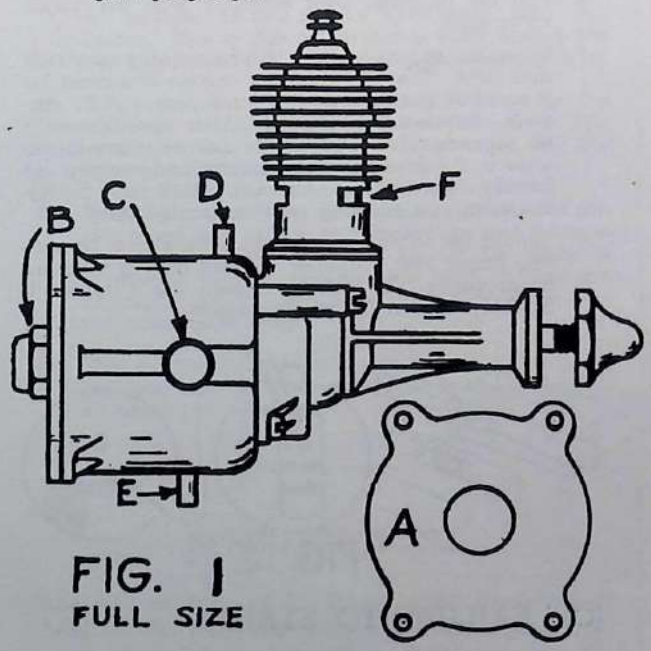


FIG. 1
FULL SIZE

5. Balance and trim the propeller. This is very essential for good performance. Sand off any bead of plastic along edges of blades. Fit a drill or shaft through the hole and rest the shaft on razor blades set in wooden blocks as shown in C-Fig. 2. Sand the heavy blade until the propeller will balance in a horizontal position. Care must be exercised to do the sanding without spoiling the airfoil characteristics.

(B) STARTING THE SPACE-BUG ENGINE

No matter how expert you are with small engines you will have better luck with this one if you follow directions exactly as listed and do each operation in the exact order given.

1. Close the carburetor needle valve, C-Fig. 1, by turning it clockwise till it stops. Do not force it.
2. Slip the filler hose of your pump or fuel can over the filler tube, D-Fig. 1, pump in fuel till it overflows through E-Fig. 1. Do not use gasoline. Use **Thimble-Drome Fuel.**

3. Connect the battery by snapping the clip on the glow plug, B-Fig. 2.
4. Open the needle valve (counter clockwise) exactly 4 full turns.
5. Turn the propeller to the position so that the exhaust ports F-Fig. 1 are wide open. Squirt 5 or 6 drops of fuel into the cylinder through one of the port openings. This is called priming.
6. Flip the propeller over snappily with the finger tip to start.
7. When the engine starts it will be running very rich and slow. The first time the engine is started let it continue to run very rich for a period of 60 seconds, the slower the better. After approximately 60 seconds, slowly close the needle valve clockwise to the best running position and remove the battery connection. Subsequent starts may be adjusted to best running position immediately.
8. Should the engine start backwards, stop it by putting finger over propeller nut and putting pressure on propeller. As soon as it stops flip it again. It is likely to start in either direction.

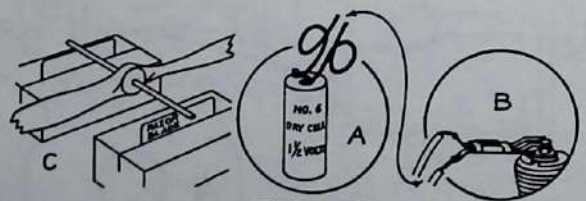


FIG. 2

(C) FAILURE TO START

1. If the engine coughs and spits a bit of fuel spray from the exhaust, it is too rich. Close the needle valve and continue cranking until the engine starts briefly. Open the needle valve again and crank it over. It should start immediately.
2. If it starts up with lots of power and dies immediately it is too lean. Open the needle valve a half turn, prime the engine, and crank it over again.
3. If engine fires with a burst of power then dies repeatedly after each time it is primed, and this is not cured by opening the needle valve more, the fuel jet is stopped up. If the engine has not been run for some time it is likely that it is only stopped up with castor oil. Choke the engine by holding a finger over the intake, B-Fig. 1, and flip the propeller over 3 or 4 times. This will remove the castor oil and the engine should start. If the same symptoms re-occur, the jet possibly has dirt in it and this should be blown out as per next paragraph.
4. Stopped up fuel line or jet. Remove the needle valve. Blow in to the filler tube, D-Fig. 1, with high pressure air such as available at service stations. **Never blow into the venturi tube, B-Fig. 1.**
5. If the engine refuses to fire at all screw the glow plug out and connect it to the clip. If the little coil inside does not get red hot, it is either burnt out or the battery is dead, or the connections are made incorrectly. Replace the battery or the plug, or correct the connections. Glow plugs are **never** guaranteed. Do not return the engine to the factory for a burnt out glow plug because the cost to you will be excessive. Buy one from your dealer.
6. Weak cranking sometimes retards starting. Crank with a snap.
7. If you are not using Thimble-Drome fuel, try it. **Never use gasoline or gasoline type fuels.**
8. Very heavy priming is often required for starting. These engines do not flood out as easily as most. Unless it is actually spitting out raw fuel it may need even more priming even though you have already primed it as much as most engines will stand.
9. If the plug, battery, and connections are known to be good, and if the jet has been checked for stoppage, and if the fuel is known to be the correct kind, yet the engine will not fire at all, it is possible there is dirt or a piece of foreign matter under the reed valve. This is very unlikely unless the venturi screen has been removed. If the venturi screen has been removed you may expect this trouble. The foregin matter can sometimes be removed without taking the valve assembly apart. If it is necessary to take it apart, pry the reed housing off with 2 screw drivers, using them on opposite sides of the cap simultaneously. Refer to Section D, Par. 4.

(D) OPERATING TIPS AND ENGINE CARE

1. Always empty the fuel tank on your last run by running the engine until it quits. Never put the engine away with fuel in it.
2. After the last run, oil the engine with a light oil (SAE 10 is good) and wrap it with cloth or otherwise protect it from dust and dirt.
3. If the engine gets dirt on it through crack-up, or otherwise, do not run it until it is thoroughly cleaned. **Take it apart,** wash it, oil it, and re-assemble.
4. Do not tamper with the reed valve assembly unless it is known that dirt is in the reeds. This is a very critical part of the engine and tampering can do no good. If it is necessary to remove the reeds, pry off the housing to get them out. All valve parts must be handled with extreme care and must be replaced in the exact position and in the exact order they were in before removal. To re-assemble, place the housing on a smooth hard surface. Put the valve components in place. Put the tank against the housing and with a piece of wood over the tank for a cushion, drive it lightly in to place.

OPERATING TIPS (D)—Continued

5. If the engine gets tight it is not frozen up. Do not send to factory. A new engine will sometimes tighten up a few times, especially after slow runs. This is more likely to happen and will occur more often to an engine that is properly fitted and has properly smooth wearing surfaces. Do not run it tight. This is caused from a shellac like deposit on the cylinder wall. Screw the head off. **Remove the cylinder** and scour the inside wall very lightly with a bit of fine or medium steel wool. Wash, oil, and replace. The engine will then turn over freely and run good. **Never** use sandpaper, emery cloth, abrasives of any kind, or scrapers. Such methods will ruin the cylinder.
6. Erratic running is caused by an unbalanced condition. Loosen the propeller and turn it over a half turn and re-tighten it. If this does not smooth out the operation of the engine, either re-balance the propeller or replace it. Erratic running is also caused from tightening due to shellacing of the cylinder. Refer to par. 5 this section.
7. Due to the very precise nature of the fitting of various parts a break-in period is not necessary. The engine is ready to start and ready to fly. With proper care, especially concerning clean operating conditions and protection from dust and dirt, as well as use of properly lubricated fuels, the engine will continue to improve in power and speed for many running hours.
8. During the first 2 hours of running time do not use a propellor that will lug the engine. A 6"-3 pitch, a 6"-2 pitch, or a 5"-4 pitch will do. Unless you are flying a very small or very fast plane do not use more pitch than recommended because lugging the engine will cause the cylinder to shellac up and get tight.
9. Certain kinds of weather, especially warm humid (sticky) weather will cause excessive shellacing in a new cylinder. There is no known way to eliminate this nuisance and the smoother the fit the more susceptable is the engine to this trouble.
10. Do not tighten the head too firmly. Set it up very lightly. Allow the engine to cool before removing head so it will loosen easier. Too much pressure against the exhaust ports to hold the cylinder from turning may force the cylinder out of round or even turn a burr into the bore. A new cylinder is usually required to remedy such damage.
11. **Do not** under any circumstances use a plastic propeller on this engine unless the manufacturer of such propeller expressly recommends it for use on Thimble-Drome engines and so labels it.
12. For those who want even more speed and power the factory makes available a racing kit which includes a special racing carburetor tank assembly and a racing head. While starting with this combination is slightly impaired it is still very good and the speeds are terrific. Try it. Do not install this combination until the engine has at least ½ hour of running time.
13. If the plane requires the engine to be mounted with the cylinder pointed down or pointed to the right or left, do not turn the tank over. Remove the 4 screws which hold the tank and crankcase together. Pull the crankcase off of the nose of the tank, turn it to the required position and replace the screws.
14. The first time you start your engine the excess castor oil from the exhaust will be dark colored for a few seconds but will clear up immediately. All engines do this if they have never been run before. This is due to excessive wear during the first few seconds as the wearing surfaces polish in.
15. To fly the plane clockwise around the circle the fuel tank should be turned over 90 degrees. The vent tube then becomes the filler tube, and the filler tube becomes the vent tube.
16. This engine has been developed expressly for airplane use and its use in automobiles and boats is not recommended. Engines cannot be made to give peak performance on both jobs. If they are recommended for both they do not give the best performance in either.
17. This engine will run at full power in either direction and may be used on a pusher plane using a standard propeller.

SPECIFICATIONS

Wt.—1.62 oz. Bore—.406", Stroke .386", Displacement .0499 Cu. In. Mounting radial, Overall height—2½", length 3¼", Width—1⅛", Shaft Size—⅛", Piston—no rings, Intake Valve—reed, Rotation—right or left.

RPM—subject to fuel and weather conditions. The following readings taken from Electronic Stroboscope manufactured by Communications Measurements Laboratory: Engine—picked at random—1 hour running time—Fuel, Thimble-Drome. Weather—Cloudy, overcast. Temperature—68, Humidity—58, Barometric Pressure 1012.5 Milibars, Dew Point—61, Eelevation 200 ft. above sea level. Test—Static, Propellers—Tornado Plasticote, trimmed and balanced.

Engine	Propeller Size	Pitch	RPM
Standard Engine	6"	3	over 16,000
" "	6"	2	over 17,500
" "	5"	3	over 20,000
Equipped with racing combination	6"	3	over 17,500
" "	6"	2	over 20,200
" "	5"	3	over 21,000
" "	Using flywheel		approx. 30,000

Static Thrust using a racing combination and 6"-3 pitch propeller—17¼ ounces.

WARRANTY

This engine is guaranteed against defects in materials and workmanship for 30 days from date of purchase. Your warranty card must be in our file, signed and dated by your dealer. Glow plugs are never guaranteed because of their delicate nature. No other guarantee is made or implied. If engine is returned to the factory within warranty, include 50c to cover cost of handling and return postage. **Do not take engine back to your dealer.**

FACTORY REPAIR SERVICE

Minor repairs, examinations, or adjustments—$1.00 plus parts. Complete overhaul (guaranteed new engine performance)—$3.75, including parts. On all COD shipments, purchaser pays postage and COD fees.

PARTS ORDERS

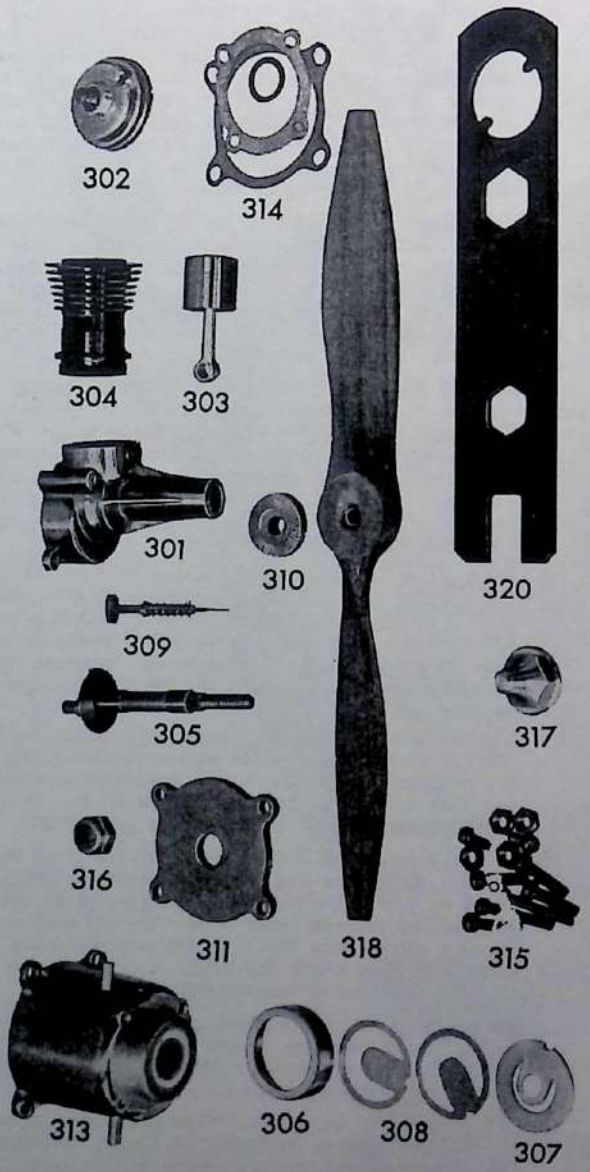
Purchase parts from your dealer. If not available, order direct from factory. No COD's please. Send remittance with your order. On orders less than $2.00 add 35c handling charge. In California add 3% sales tax.

Prices and design of parts subject to change without notice.

ENGINE PARTS LIST
For .049 Space-Bug

Catalogue Number	Part	List Price
301	Crankcase	$1.50
302	Cylinder Head & Glow Plug (standard)	.65
302 RH	Cylinder Head & Glow Plug (racing head)	.65
303	Piston & Rod	1.50
304	Cylinder	1.50
305	Crankshaft	1.75
306	Reed Housing	.25
307	Reed Back Plate	.25
308	Set of Reeds	.50
309	Needle Valve & Spring	.60
310	Propeller Drive Washer	.15
311	Fuel Tank Plate	.25
312	Fuel Tank with reed valve assembly	2.90
313	Fuel Tank	2.00
314	Gasket Set	.25
315	Set of Screws	.15
316	Fuel Tank Nut & Filter Screen	.20
317	Propeller Nut	.20
318	Propeller 6"-3 Pitch	.25
319	Space Bug Decal Set	.20
320	Wrench	.25
322	Racing combination: special carburetor and head	3.50

When Ordering Engine Parts, Use Catalog Number



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730 Poinsettia P. O. Box 476 Santa Ana, Calif.

The CLEANEST SWEEP

in the history of the NATIONALS

PROOF OF the Thimble Drome's superiority in the 1953 NATIONALS held in Philadelphia. T.D. engines placed as follows . . .

½A Speed Open—1st, 2nd, 3rd and 5th places
½A Speed Senior—1st, 2nd and 3rd
½A Speed Junior—1st, 2nd, 4th and 5th
½A Free Flight Open—1st, 2nd, 4th and 5th
½A Free Flight Senior—1st and 3rd
½A Free Flight Junior—1st and 2nd
½A—PAA Free Flight Open—1st, 3rd and 5th
½A—PAA Free Flight Junior and Senior—3rd, 4th and 5th.
½A—Clipper Cargo Junior and Senior Open—2nd, 3rd, 4th and 5th

Just think! The first Thimble Drome engine for aircraft was sold less than a year ago, and already because of advanced engineering and research in the use of aircraft model methods, "T. D." engines lead the field and were able to win—out of nine ½A events—seven First places, five with Thermal Hoppers and two with Space Bugs, six Second places, two with Thermal Hoppers and four with Space Bugs, six Third places, three with Thermal Hoppers and three with Space Bugs.

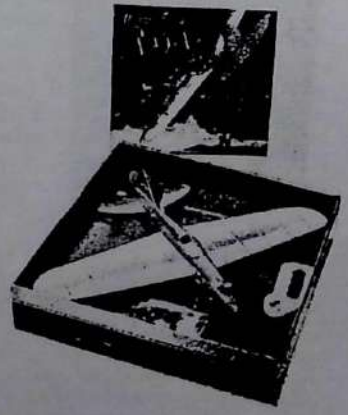
19 out of 27 places—First to Third!

In these nine events, 31% of engines used were Thimble Drome engines, but they won 77.7% of First places and 66.2% Second and 66.2% Third.

SPACE BUG .049
Superior to ANY ½A engine in Power, Speed, Easy Starting and Efficient Operation. Flies in ANY position. No break-in required.
$6.95

THERMAL HOPPER .049
Especially designed for Free Flight. Maximum performance and smoothness of flight.
$6.95

SPACE BUG, JR. .049
Crank it up and fly it! Ideal beginner's engine. Weighs only 1½ oz. Turns 14,000 RPM.
$3.95



TD-1 Completely assembled—ready-to-fly plane. Equipped with Space Bug engine. Controls with slight motion of handle—stunts, glides, climbs! $18.95

2-Minute Assembly kit—$15.95

FOR A CLEAN START TO A CLEAN SWEEP IT'S THIMBLE DROME!

L. M. COX
MANUFACTURING CO., INC.
SANTA ANA, CALIFORNIA

PACKAGED PERFECTION!

A Model Flyer's Dream Ship

Thimble-Drome TD-1

The Hobby Gift of 1953... To Give or To Get

TD-1—COMPLETELY ASSEMBLED, READY TO FLY featuring ALL METAL wing, body of high impact plastic, and SPACE BUG .049 engine. Package includes Skylon control reel, batt. wires, clip, filler hose, etc., etc. De Luxe full color gift box that is almost worth the price of admission by itself! $19.95

TD-1—TWO-MINUTE ASSEMBLY KIT for those who like to "build their own", including SPACE BUG .049 engine, less accessories. Beautiful 25 inch gift box $15.95

At All Hobby Counters

L. M. COX MFG. CO., INC.

Thimble Drome Planes, Engines, Fuel, Race Cars

Box 476 SANTA ANA, CALIFORNIA

CARE AND OPERATION OF YOUR

Thimble-Drome

"THERMAL-HOPPER"

ENGINE

The fastest and most powerful engine in the ½ A Class. VERY easy starting.

No other manufacturer of ½ A engines can truthfully make this claim.

Keep this engine immaculately clean, use **Thimble-Drome Racing Fuel,** and it will maintain its winning characteristics for a long period of time.

This engine is precisely fitted at the factory for **immediate, easy** starting and immediate flight. A break-in period in the ordinary sense is not necessary for flight, in fact, a slow easy break-in is not desirable. Most of these engines will develop full power within one minute of running time; but a few, those which are slightly on the tight side, may not develop full power under three hours. Even these will develop sufficient power for average flying almost immediately. The only break-in required is very rich (slow) running the first 60 seconds after starting the first time. After 60 seconds it should be ready to go.

Elimination of break-in is **not** attained through loose or sloppy fitting but through very precise fitting, together with super fine wearing surfaces.

(A) PREPARATION FOR RUNNING

1. Screw needle valve in **very carefully.** The threads are fine and starting cross threaded will necessitate new parts. These parts have been screwed together at the factory and are known to fit properly.
2. Mount the engine in the plane or if you want to give it some running first, mount it on a narrow board, about 2" wide and fasten the other end of the board in a vise or nail it to something. **Do not hold the engine directly in a vise.** Use the template, A-Fig. 1, to drill mounting holes and carburetor hole. **The screened nut, B-Fig. 1, in the rear is the air intake hole and must be left open.**
3. Place propeller on the shaft with the flat side of the blades toward engine and lock securely with the propeller nut.
4. Mount the fuel tank as closely as possible and for quicker starting mount it so the fuel level when full is lightly higher than the carburetor venturi. Connect the tank to the carburetor by slipping the fuel line over the fuel line fitting C Fig. 1.

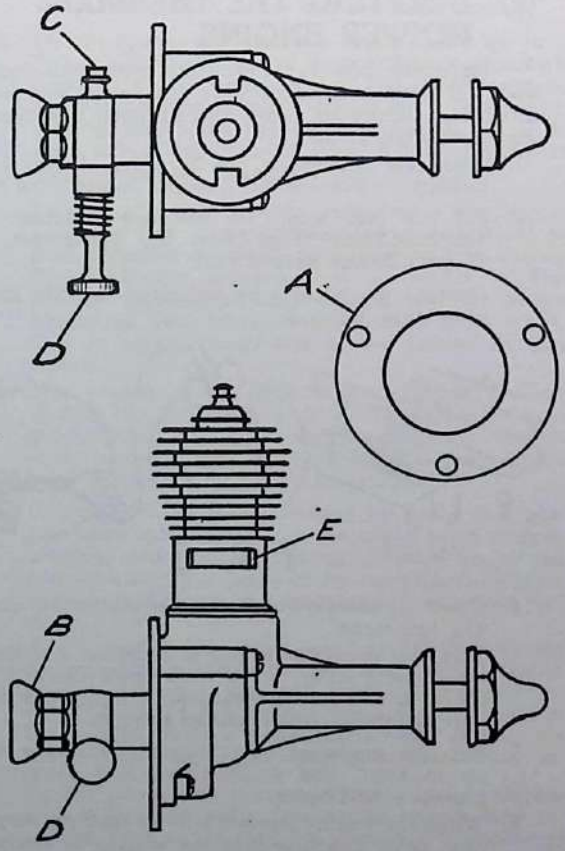


FIG. 1 · FULL SIZE

5. Procure a 1½ volt dry cell battery, # 6 or equivalent, and connect it with 2 flexible insulated wires to a glow plug clip as shown in the diagram A & B-Fig. 2. Do not use a stronger battery. If you do the plug will burn out. The connections should be soldered to insure good contact and taped to prevent bare ends of wire from getting together and "shorting" the battery. Be sure the battery is a good one. Your dealer sells batteries, wire, and glow plug clips.
6. Balance and trim the propeller. This is very essential for good performance. Sand off any bead of plastic along edges of blades. Fit a drill or shaft through the hole and rest the shaft on razor blades set in wooden blocks as shown in C-Fig. 2. Sand the heavy blade until the propeller will balance

in a horizontal position. Care must be exercised to do the sanding without spoiling the airfoil characteristics.

(B) STARTING THE THERMAL-HOPPER ENGINE

No matter how expert you are with small engines you will have better luck with this one if you follow directions exactly as listed and do each operation in the exact order given.

1. Close the carburetor needle valve. D-Fig. 1, by turning it clockwise till it stops. Do not force it.
2. Fill the fuel tank. Do not use gasoline. Use Thimble-Drome Glow Fuel or, better yet, use Thimble-Drome Racing Fuel.
3. Connect the battery by snapping the clip on the glow plug, B-Fig. 2.

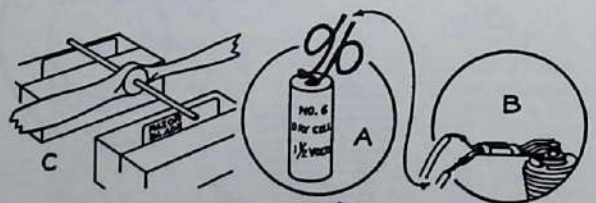


FIG. 2

4. Open the needle valve (counter clockwise) exactly 4½ full turns.
5. Turn the propeller to the position so that the exhaust ports E-Fig. 1 are wide open. Squirt 5 or 6 drops of fuel into the cylinder through one of the port openings. This is called priming.
6. Flip the propeller over snappily with the finger tip to start. Use a Thimble-Drome Finguard to protect your fingers.
7. When the engine starts it will be running very rich and slow. The first time the engine is started let it continue to run very rich for a period of 60 seconds, the slower the better. After approximately 60 seconds, slowly close the needle valve clockwise to the best running position and remove the battery connection. Subsequent starts may be adjusted to best running position immediately.
8. Should the engine start backwards, stop it by putting finger over propeller nut and putting pressure on propeller. As soon as it stops flip it again. It is likely to start in either direction. If the engine starts several times backward there is nothing wrong with it. The direction it starts is mostly chance. Lower compression will help it start the way it is cranked but it will run slower. Harder flipping in the correct direction or very easy flipping in the reverse direction may help.

(C) FAILURE TO START

1. If the engine coughs and spits a bit of fuel spray from the exhaust, it is too rich. Close the needle valve and continue cranking until the engine starts briefly. Open the needle valve again and crank it over. It should start immediately.
2. If it starts up with lots of power and dies immediately it is too lean. Open the needle valve a half turn, prime the engine, and crank it over again.
3. If engine fires with a burst of power then dies repeatedly after each time it is primed, and this is not cured by opening the needle valve more, the fuel jet is stopped up. If the engine has not been run for some time it is likely that it is only stopped up with castor oil. Choke the engine by holding a finger over the intake, B-Fig. 1, and flip the propeller over 3 or 4 times. This will remove the castor oil and the engine should start. If the same symptoms re-occur, the jet possibly has dirt in it and this should be cleaned out as per next paragraph.
4. Stopped up fuel line or jet. Remove hose. Open needle valve or remove it and blow into fuel hose connector with high pressure air. It may be necessary to remove the venturi screened nut, then remove the needle valve assembly and clean the jet holes in the venturi with fine wire. Never blow in to venturi.
5. If the engine refuses to fire at all screw the glow plug out and connect it to the clip. If the little coil inside does not get red hot, it is either burnt out or the battery is dead, or the connections are made incorrectly. Replace the battery or the plug, or correct the connections. Glow plugs are **never** guaranteed. Do not return the engine to the factory for a burnt out glow plug because the cost to you will be excessive. Buy one from your dealer.
6. Weak cranking sometimes retards starting. Crank with a snap.
7. If you are not using Thimble-Drome fuel, try it. **Never use gasoline or gasoline type fuels.**
8. Very heavy priming is often required for starting. These engines do not flood out as easily as most. Unless it is actually spitting out raw fuel it may need even more priming even though you have already primed it as much as most engines will stand.
9. If the plug, battery, and connections are known to be good, and if the jet has been checked for stoppage, and if the fuel is known to be the correct kind, yet the engine will not fire at all, it is possible there is dirt or a piece of foreign matter under the reed valve. This is very unlikely unless the venturi screen has been removed. If the venturi screen has been removed you may expect this trouble. The foreign matter can sometimes be removed without taking the valve assembly apart. If it is necessary to take it apart, pry the reed housing off with 2 screw drivers, using them on opposite sides of the cap simultaneously. Refer to Section D, Par. 4.

(D) OPERATING TIPS AND ENGINE CARE

1. Connecting rod trouble will result from running an engine that is tight. Tightening should be remedied as soon as it is noticed. Refer to Par. 5.
2. After the last run, oil the engine with a light oil (SAE 10 is good) and wrap it with cloth or otherwice protect it from dust and dirt.

OPERATING TIPS (D)—Continued

3. If the engine gets dirt on it through crack-up, or otherwise, do not run it until it is thoroughly cleaned. **Take it apart,** wash it, oil it, and re-assemble.

4. Do not tamper with the reed valve assembly unless it is known that dirt is in the reeds. This is a very critical part of the engine and tampering can do no good. If it is necessary to remove the reeds, pry off the housing to get them out. All valve parts must be handled with extreme care and must be replaced in the exact position and in the exact order they were in before removal. To re-assemble, place the housing on a smooth hard surface. Put the valve components in place. Put the backplate against the housing and with a piece of wood over the venturi tube for a cushion, drive it lightly in to place.

5. If the engine gets tight it is not frozen up. Do not send to factory. A new engine will sometimes tighten up a few times, especially after slow runs. This is more likely to happen and will occur more often to an engine that is properly fitted and has properly smooth wearing surfaces. Do not run it tight. This is caused from a shellac like deposit on the cylinder wall. Screw the head off. **Remove the cylinder** and scour the inside wall very lightly with a bit of fine or medium steel wool. Wash, oil, and replace. The engine will then turn over freely and run good. **Never** use sandpaper, emery cloth, abrasives of any kind, or scrapers. Such methods will ruin the cylinder.

6. Erratic operation or rapid drop from peak power soon after starting may be caused by any one or more of the following: Propeller out of balance, setting up undue vibration—re-balance or replace propeller. 2, shellacing of cylinder, causing tight fit. This occurs only on fairly new engines—refer to Par. 5 for remedy. 3, loose needle valve—replace with a new one or stretch the spring slightly to increase pressure on needle. 4, Incorrect head compression—usually low—remove a head gasket. If this does not smooth out operation noticeably replace the gasket. 5, Improper fuel mixture—try Thimble-Drome Racing Fuel.

7. Due to the very precise nature of the fitting of various parts a break-in period is not necessary. The engine is ready to start and ready to fly. With proper care, especially concerning clean operating conditions and protection from dust and dirt, as well as use of properly lubricated fuels, the engine will continue to improve in power and speed for many running hours.

8. During the first 2 hours of running time do not use a propeller that will lug the engine. A 6"-3 pitch, a 6"-2 pitch, or a 5"-4 pitch will do. Unless you are flying a very small or very fast plane do not use more pitch than recommended because lugging the engine will cause the cylinder to shellac up and get tight.

9. Certain kinds of weather, especially warm humid (sticky) weather will cause excessive shellacing in a new cylinder. There is no known way to eliminate this nuisance and the smoother the fit the more susceptable is the engine to this trouble.

10. Do not tighten the head too firmly. Set it up very lightly. Allow the engine to cool before removing head so it will loosen easier. Too much pressure against the exhaust ports to hold the cylinder from turning may force the cylinder out of round or even turn a burr into the bore. A new cylinder is usually required to remedy such damage.

11. **Do not** under any circumstances use a plastic propeller on this engine unless the manufacturer of such propeller expressly recommends it for use on Thimble-Drome engines and so labels it. The speeds attained by this engine will throw the blades off such propellers within a short while. This is highly dangerous as the blades fly like bullets.

12. This engine is equipped with a Standard Head # 302. The racing head, # 302RH, available from your dealer, will under certain weather conditions only, increase rpm as high as 700 rpm. Under other conditions rpm may be reduced.

13. Compression ratio determined by head and gaskets have much to do with the speed of an engine, starting, and smooth running. Always empty the fuel tank on your last run by running the engine until it quits. Never put the engine away with fuel in it.

14. The first time you start your engine the excess castor oil from the exhaust will be dark colored for a few seconds but will clear up immediately. All engines do this if they have never been run before. This is due to excessive wear during the first few seconds as the wearing surfaces polish in.

15. Do not under any circumstances, run this engine with a flywheel only. The terrific speeds with resulting heat would ruin the engine in a matter of seconds.

16. This engine will run at full power in either direction and may be used on a pusher plane using a standard propeller.

SPECIFICATIONS

Weight, 1.35 oz. Bore—.406", Stroke .386", Displacement .0499 Cu. In. Mounting radial, Overall Height, 2⅜", Overall Length, 2 3/16", Width, 1⅛", Shaft Size, ⅛", Piston—no rings, Intake Valve—reed, Rotation—right or left.

RPM—subject to fuel and weather conditions. The following readings taken from Electronic Stroboscope manufactured by Communications Measurements Laboratory: Engine—picked at random—1 hour running time—Fuel, Thimble-Drome. Weather—Cloudy, overcast. Temperature—68, Humidity—58, Barometric Pressure 1012.5 Milibars, Dew Point—61, Elevation 200 ft. above sea level. Test—Static, Propellers—Tornado Plasticote, trimmed and balanced.

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Static Thrust using a 6"-3 Pitch propeller—17¼ ounces.

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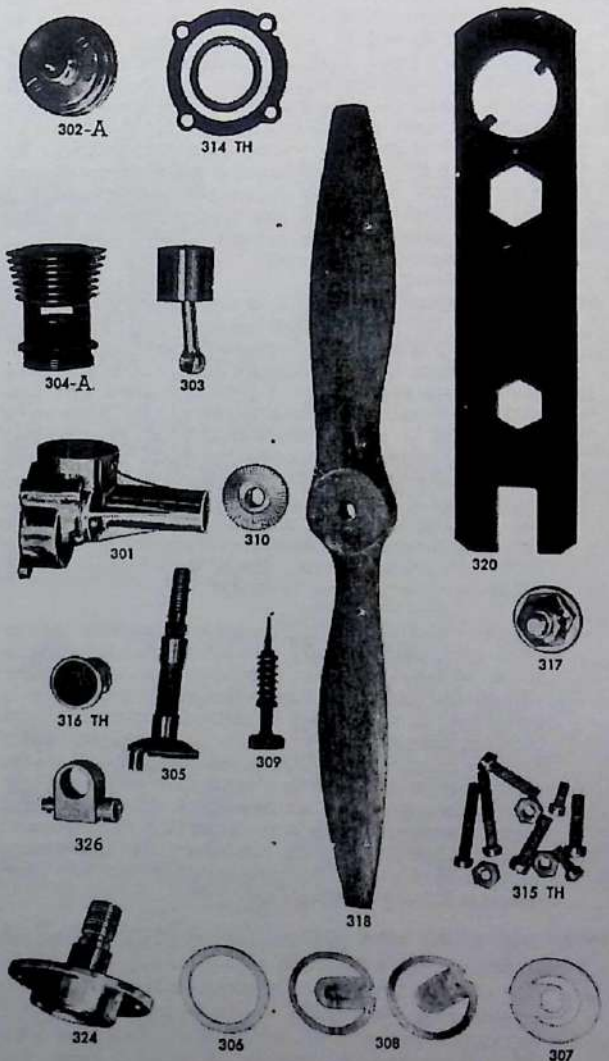
Prices and design of parts subject to change without notice.

ENGINE PARTS LIST
For .049 Thermal-Hopper

Catalogue Number	Part	List Price
301	Crankcase	$1.50
302-A	Cylinder Head & Glow Plug (standard)	.65
303	Piston & Rod	1.50
304-A	Cylinder	1.50
305	Crankshaft	1.75
306	Reed Housing	.25
307	Reed Back Plate	.25
308	Set of Reeds	.50
309	Needle Valve & Spring	.60
310	Propeller Drive Washer	.15
314 TH	Gasket Set	.20
315 TH	Set of Screws	.15
316 TH	Venturi Nut & Filter Screen	.25
317	Propeller Nut	.20
318	Propeller 6"-3 Pitch	.25
319	Space Bug Decal Set	.20
320	Wrench	.25
323	Carburetor, Complete	3.00
324	Carburetor Body	1.50
326	Needle Valve Body	.60

When Ordering Engine Parts, Use Catalog Number



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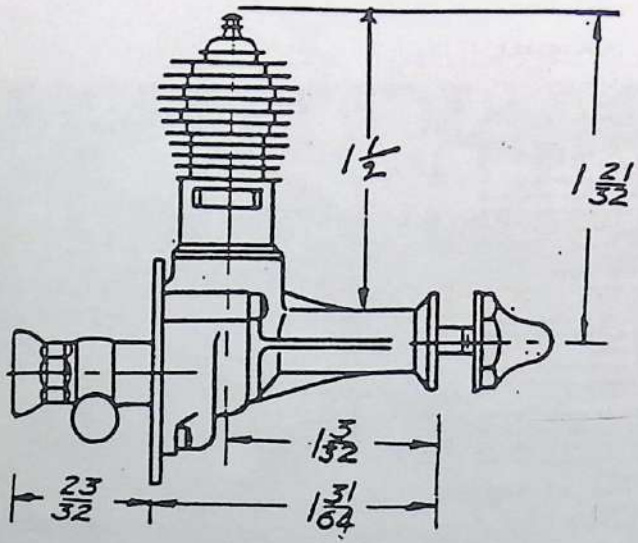
730 Poinsettia, P. O. Box 476, Santa Ana, Calif.



Thimble-Drome Thermal Hopper

• The excellent Thimble-Drome Space-Bug. .049, analyzed in February 1953 FLYING MODELS now has a free-flight counterpart of similar high performance: the Thermal-Hopper. This new engine by the L. M. Cox Manufacturing Co., Inc. has a large bore hopped-up carburetor as standard equipment. A high compression head with a racing plug element is available for extra power. Horsepower and propeller speeds are very close to those of the Space-Bug.

All Thermal-Hopper parts ahead of the crankcase are identical with the Space-Bug. The rear crankcase cover is turned from aluminum alloy. The reed assembly is mounted on the forward portion.

The intake tube is an integral part of the crankcase cover. It has a turned narrow groove through which three small holes are drilled. The aluminum needle-valve body fits over this groove to make up the multi-jet carburetor.

A bored aluminum nut having a fine mesh screen holds the needle-valve body in position. The needle valve can, of course, be placed in any position around the intake tube. A pressure ring is used on the fuel line. The needle is turned from steel alloy. A piano-wire circular spring maintains fuel adjustments.

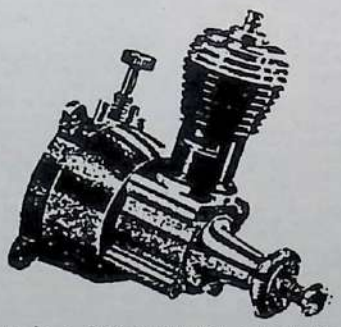
The Thermal-Hopper is mounted radially by using three holes. A 7/16" diameter hole through the firewall is necessary to clear the intake tube. A 13/16" diameter hole is necessary to clear the needle-valve body. No finger hole for choking is needed through the fuselage side since the Thermal-Hopper does not require choking for starting.

Starting and running abilities were as spectacular as those of the Space-Bug.

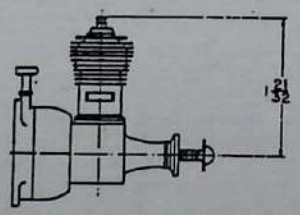
Price of the Thermal-Hopper is $6.95.

F.M. 08/1953

L. M. Cox Babe-Bee



• As a first engine for a would-be-modeler, the Cox Thimbledrome Babe-Bee should be truly welcome. It is simple in design, rugged in construction, and extremely easy to start and to operate. Best news of all, for most youngsters and fathers, is the low initial price of $3.95. A 1½ volt battery, a can of ½A glow fuel, a 5" to 6" prop, and some wire leads and the engine is ready to run.



The family background of the Babe-Bee includes the Thermal Hopper and the Space Bug—engines famous for their speed and cargo-lifting records. The Babe-Bee uses the same piston, so accurately ground that it can be interchanged with that of any other Cox .049 engine. It also has the reed-valve system of fuel transfer.

Performance-wise, the new engine develops its maximum horsepower in the 16,000. r.p.m. range. This can be obtained in flight with a 6" diameter very-low pitch prop, a 5½" diameter low-pitch prop, or a 5" diameter medium-pitch prop.

The fuel adjustment is fairly broad; starting position of the needle valve is somewhere close to two turns open, and starting can be accomplished by squirting a few drops of fuel into exhaust port and flipping the prop three or four times. For instant action, a gentle choking (placing your finger over the air intake) will give starts with one good prop flip.

If the engine runs backward (which the reed valve allows), either turn the needle closed to stop the engine, or use a spinner and stop the engine by finger pressure or the palm of your hand. Actually, the Cox people make an excellent spinner nut which can be used as an engine stopper, and the reversible feature can be used in pushers or twin-engine models to great advantage.

The special design-features that make this engine stand out are as follows: the crankcase is the strongest ½A part we have ever seen. It is an automatic-screw-machined part of high-strength, extruded aluminum. The fuel tank is also a screw-machined part of aluminum and is sandwiched between the die-cast back-plate and the engine. This back-plate includes the air intake, the needle valve body, and four engine mounting lugs. The location of the intake groove allows the engine to be mounted directly to the firewall. No bulkhead holes are needed for choking.

The vertical rear needle-valve is not very vulnerable to damage in crack-ups, and your fingers are kept well clear of the prop and hot exhaust gases when starting and adjusting. The reed valve is a four-petal .001" thick diaphragm, with a clip for a retainer and a stop to prevent excess travel. The reed shape permits very good fuel transfer and also very low stress values, so that the valve can be expected to operate the entire life of the engine. As in other Cox engines, the head and glow-plug are combined to give a very efficient dome-shaped combustion chamber, with minimum space taken by the glow element.

Mounting is by means of four #3 machine screws, or the equivalent wood screws if the bulkhead is ⅛" or greater in thickness. Prop-mounting is by means of a #5—40 machine screw, which means that a ⅛" diameter hole is required through the prop.

For best performance, the correct-size prop hole and a balanced prop are quite important, because of the Babe-Bee's high speed. No provision has been made for use of a timer for fuel cut-off. One solution would be to drill two holes in the top of the aluminum tank for fuel lines: one from the timer to the bottom of the tank, the other to the needle jet inside the tank. The fuel line to the jet should be neoprene for long life, since it is immersed in the fuel and is not easy to inspect.

At the time of engine testing the operating instructions by Cox were not at hand. But judging from the past, the Babe-Bee will come complete with a full-size mounting layout and the other information needed to operate and service the engine.

Bore is .406", stroke is .386"—to give an .049" cubic-inch displacement. Weight is 1⅝ ounces, complete with fuel tank.

After ten minutes running, the following speeds were obtained using Thimbledrome glow fuel:

7" diam./2" pitch Tornado Plasticote — 12,300 r.p.m.
6" diam./3" pitch Top Flite—14,200 r.p.m.
8½" diam./2½" pitch Kaysun plastic—15,000 r.p.m.
8½" diam./4" pitch Power Prop—12,700 r.p.m.
5" diam./5" pitch Tornado Plasticote — 12,800 r.p.m.
4½" diam./6" pitch Power Prop — 13,800 r.p.m.

Price of the Cox Babe-Bee, complete, is $3.95.

F.M. 07/1956

Cox Olympic

▷ Maybe the new AMA rules are not everybody's meat: rule changes never are, anywhere, but, in reducing the class A displacement limit to .1525 cu. in., the AMA has gone a long way towards raising the world status of American contest modeling.

The reason for this is easy to see. The .1525 cubic inch (2.5 cubic centimeters) displacement is the limit that is internationally recognized for world championship model flying. For several years now, the two FAI world championship events for gas-engined models, free-flight and speed, have been restricted to 2.5 c.c., and, in Europe, individual nations have adopted FAI rules for most, if not all, of their own internal contests. As a result, engine designers have been encouraged to concentrate their efforts on the development of high performance motors of this size, whereas American designers and manufacturers have, hitherto, devoted most of their resources to an entirely different set of requirements. Small wonder that no American modeler, or American engine, has won an FAI international contest for five years.

The U.S. can produce engines capable of winning such events and there is no doubt about this in the minds of contest men all over Europe. Ever since it was first known, two or three years ago, that the Cox company had a .15 on the way, engine enthusiasts in Britain and continental Europe have awaited its appearance with bated breath. They are not going to be disappointed. There is no shadow of doubt that the new Cox Olympic .15 can better the performance of any stock 2.5 c.c. engine made in Europe at the present time. There is little doubt, either, that Western Europe will use this engine wherever its potential can be exploited: the challenge of East European state-sponsored contest engines makes this inevitable.

The Olympic follows the usual Cox layout, of reed-valve induction and reverse-flow scavenged twin-opposed port cylinder. Such notable Thermal Hopper features as the multijet carburetor and clean, hemispherical cylinder head with built-in glow filament, are retained. The main visible changes are the beam mounting lugs (a recent departure and also seen on the new Space-Hopper .049) and the twin ball-bearing mounted crankshaft.

Constructionwise, the new Cox is typical of this manufacturer's products. No castings are used. Crankcases are turned on screw machines from extruded bar stock, afterwards pazing, in turn, through two other machines which do all the remaining operations—i.e. those non-concentric to the shaft. Pistons are machined from bar steel and are hardened on the wearing surface only, in order to leave the socket for the coared ball-joint sufficiently ductile for subsequent working. Connecting-rods, which are of steel, are assembled to the pistons by a special machine, built in the Cox company's tool shop. The operator merely places rods and pistons in two hoppers feeding the machine, which assembles them entirely automatically.

In the finishing of such items as cylinder bores, much emphasis is placed on temperature control, as an aid to accurate working. All grinding, cylinder boring, honing, etc., are therefore done in a temperature-controlled room, in which the temperature is maintained constantly within one degree, after being pre-set at a comfortable working level.

The Olympic uses a ball-bearing mounted crankshaft, because, all other things being equal, a ball-bearing engine must achieve higher mechanical efficiency than a plain bearing motor. Agreed some highly impressive performances have been put up by plain-bearing motors, but these have been in spite of, not because of, having plain bearings. Frictional losses in the Olympic are obviously very low indeed.

The crankshaft journal itself is of smaller diameter (⅜-in.) than is usually employed in .15's. This is practical because it does not have the stress-raising intake port of a shaft-valve, and, being supported in ball-bearings, does not need the added bearing area of a large diameter journal. The shaft has a chamfered circular web and a machined-in crescent counterbalance. The connecting-rod is rather longer than average and piston side thrust is thereby held to a minimum. The piston is flat crowned and uncovers the large exhaust ports at 70 degrees BBDC, a normal timing. Bypass timing, on the other hand, is very advanced, the tops of the two internal bypass flutes being almost flush with the upper edges of the exhaust ports. The cylinder, as in other Cox motors is machined in one piece, with integral cooling fins, and screws into the crankcase. The combined glow head unit screws into the top of the cylinder and seats on a soft copper gasket.

Cox reed valves have been simplified, compared with the assemblies used on the Space-Bug and Thermal Hopper. On the Olympic, a single copper reed, retained by a wire snap ring, is used. Reed valve housing, crankcase backplate and carburetor venturi are combined in a single machined unit. The familiar and highly effective Cox triple-jet carburetor is featured, whereby fuel is supplied, finely atomized, via three small jets bored equidistantly around the venturi. Actual metering takes place before the fuel reaches the jets, by means of a separate needle-valve. The complete needle-valve unit is secured to the venturi by means of a nut with a large screwed intake, and can be rotated through 360 degrees, for the most convenient location for individual installations.

Surprise item with the Olympic is the provision of a starter spring. Incongruous on an "expert's" engine? You will doubtless think so—until you have tried it a few times. There may be a few diehards who will insist on finger flipping rather than resort to such a "sissy" item as a spring starter. And they won't have any trouble because the Olympic is an easy-starting motor. But reed-valve motors have a tendency to occasionally start backwards, especially on small, light props. The starter definitely does a better job of starting: we were convinced of this after trying it against normal hand flipping. No reverse starts and the thing works like a charm, first time, every time. Starting from cold needs a cylinder prime, plus a couple of turns of the prop with the intake choked to draw fuel to the carburetor. The engine will then start within two or three attempts, provided it has been adequately primed. Restarts with a hot engine are instantaneous. If there is fuel in the delivery line, no priming, no choking and no needle readjustments are necessary: just wind the prop back one turn against the spring, energize the plug, release the prop and she's away.

As on other Cox engines, no lengthy break-in is needed and it is normally quite safe to let the motor have its head after a preliminary rich mixture break-in of only one minute. However, as a courtesy, our test engine was given 30 minutes running before any performance figures were taken. Tests were carried out with the aid of our reaction-dynamometer, on which, incidentally, some 40 different types of .15 engines, both diesel and glow, have been evaluated to date.

The first thing that became apparent with the Olympic, was its high torque. This reached a maximum of 23 oz. inches at between 11,000 and 12,000 rpm, which is equivalent to a brake mean effective pressure of 60 lb/sq. in., is better than any glow .15 previously tested and closely approaches the very high torque of top diesel 15's like the Oliver Tiger. As rpm are increased, however, the normal decline of the torque curve is less abrupt than with the diesels and, in consequence, the Olympic reaches a higher bhp peaking speed. Actual bhp figures, obtained with a fuel containing 30 percent nitromethane, were as follows:

At 10,000	rpm—	.218 bhp
11,000	" —	.245 "
12,000	" —	.270 "
13,000	" —	.288 "
14,000	" —	.300 "
15,000	" —	.310 "
16,000	" —	.318 "
17,000	" —	.318 "
18,000	" —	.317 "

Running qualities throughout the tests were excellent, the motor running smoothly and consistently, and the response to the needle-valve was just right. Suggested prop for achieving maximum free-flight performance would be around 8 x 4 or 8½ x 3½.

Summary of Data

Type: Reverse-flow scavenged two-cycle with reed-valve intake.
Weight: 4¼-oz including starter spring.
Displacement: 0.1495 cu. in. or 2.45 c.c.
Bore: 0.585 in. Stroke: 0.556 in.
Stroke/Bore Ratio: 0.95:1.
Specific Output: 2.13 bhp/cu. in.
Power/Weight Ratio: 1.34 bhp/1 lb.
Price: $12.98 including starter and special wrench.
Manufacturer: L. M. Cox Manufacturing Company Inc., 730 Poinsettia Street, Santa Ana, California.

by P.C.F. China

DATA:

L. M. COX RR-1

Bore: .404"
Stroke: .384"
Displacement: .049 cu. in.
Bore to stroke ratio: 1.05 to 1
Weight with tank: 1.8 ozs.
Max. torque: 5.96 in. oz.
Max. horsepower: .092
Power rating: 1.84 H.P. per cu. in.
Power to weight ratio: .82 H.P. per lb.
Cylinder head: Turned aluminum alloy finned, threaded and with integral glow element, hemispherical combustion chamber
Cylinder: Steel alloy, threads for head and crankcase, squared ports
Piston: Steel alloy flat top, socket for con rod.
Connecting rod: Hardened steel, ball for attachment to piston.
Crankshaft: Case hardened steel, balanced, with pin for rear rotary drive and internal threads for prop mounting screw.
Crankcase: Aluminum alloy threaded for cylinder, tapped for tank mounting, serves as crankshaft bearing.
Fuel tank and needle valve assembly: Aluminum alloy fuel tank and backplate includes air intake, fuel pick up engine mounting lugs tank filler and overflow with threaded needle valve with coil spring retention.
Prop mountings: ¼" diameter No. 5-40 machine screw.
Manufacturer: L. M. Cox Mfg. Co.
P. O. Box 476
Santa Ana, California
Price complete with wrench, prop, mounting screws and spinner is $5.95.

● This is not a new engine nor is it as well known as the world's champion weight lifter and world's speed record holder as are the Thermal Hopper and Space Bug and other popular ½A engines by L. M. Cox. The main virtue of the RR-1 and probaby the reason it exists is that it will run in one direction, only since it uses a rotary valve in place of the usual reed valve. The habits otherwise of the RR-1 are very much like those of the more familiar Cox engines—very high speed, tremendous power and ease of starting that 6-year olds can handle.

The needle valve adjustment, as with all Cox engines, is at the rear of the tank about 2" from the prop and is also above the level of the hot exhaust gases. No fuel lines are exposed. The fuel pick up tube is plastic with an internal spring to prevent tube collapse. The pick up point can be positioned in the tank to suit control-line or free-flight flying conditions and instructions are included for schemes for separate tanks or inclusion of timers and fuel cut-offs.

The fuel adjustment needle should be removed at least half way if the back cover is taken off, to prevent possible damage to the needle end. Due to the use of a rotary valve, the RR-1 Cox engine tank has to remain in the same position on the crankcase. The rear cover, however, may be placed in any four of the possible positions. A left-hand rotary valve is available for use where twin-engine or pusher engines, using right-hand props, are going to be used. The rotary valves, as well as cylinders and pistons, are interchangeable as in other Cox engines due to the extremely close manufacturing tolerances.

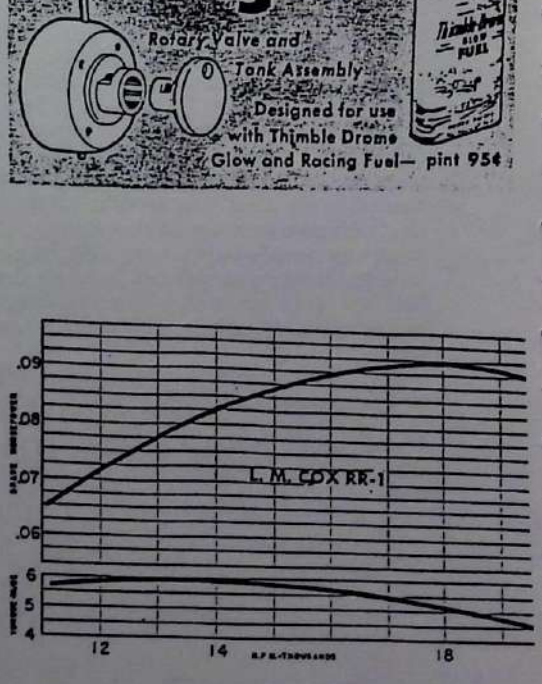
Due to the rear intake normally being inaccessable for choking purposes, a slight prime and several flicks are required for starting the RR-1. Some glow plug clips, not of the alligator or head clamp type, may not make proper electrical contact on the cylinder due to the protective cylinder coating. If this occurrs a few back and forth motions of the clip should be enough to break through this barrier. The needle adjustment for maximum rpm is fairly broad. The speed is above the capability of many rpm indicators but maximum rpm with any one prop can be determined by sound by most people. The balance of the prop, due to this high speed, is especially important. If the prop mounting screw is even slightly bent it might be wise to discard the neat aluminum spinner supplied and use a short screw and washer.

The plastic props, including nylon, in most cases allow a greater rpm than the wood props, perhaps due to their flexibility which allows them to flatten slightly under load. The RR-1 produced its maximum horsepower with medium pitch/3½" diam. props and low pitch/6" diam. props. The prop supplied, a 5" diam./4" pitch, appeared to allow maximum horsepower on the ground and therefore would be over the peak in flight, however it certainly makes a nice sound so why worry about a little power.

Using Thimble Drome racing fuel the following speeds were obtained:

7" diam./2" pitch Tornado—14,200 r.p.m.
6" diam./2" pitch Top Flite—17,400 r.p.m.
6" diam./3" pitch Tornado—16,800 r.p.m.
5¾" diam./3" pitch Tornado—17,800 r.p.m.
5½" diam./2" pitch Top Flite—19,600 r.p.m.
5" diam./4" pitch Thimble Drome—18,100 r.p.m.
4¾" diam./6" pitch Power Prop—16,900 r.p.m.

F.M. 12/1956



MAN. 08/1959


NOTICED THE DIFFERENCE?
Have you noticed the difference—the difference in performance—with today's Thimble-Drome Glow Fuel? Count the cans at any contest. Thimble-Drome Glow Fuel is made by the factory that knows engines, world's largest producer of model engines and powered models. It's different! Your engine will like it!
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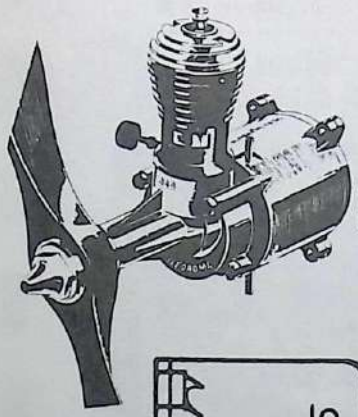
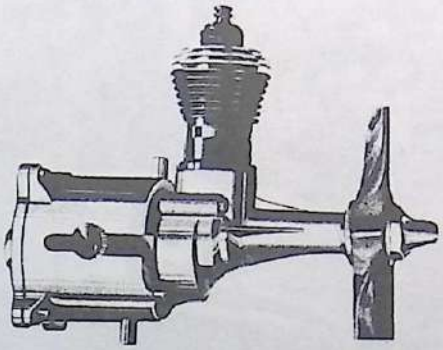
KIT
THERE'S NO FUEL LIKE Thimble Drome GLOW FUEL
FOR ALL GLOW ENGINES
pint 95¢
half pint 50¢

L. M. COX MANUFACTURING CO., INC.

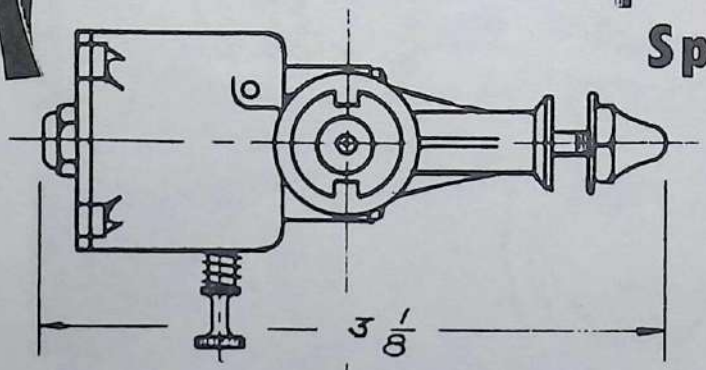


Cox Space Bug

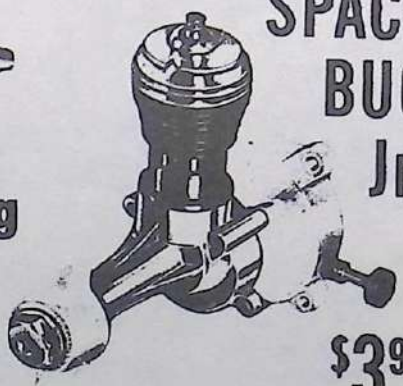


Space Bug .049

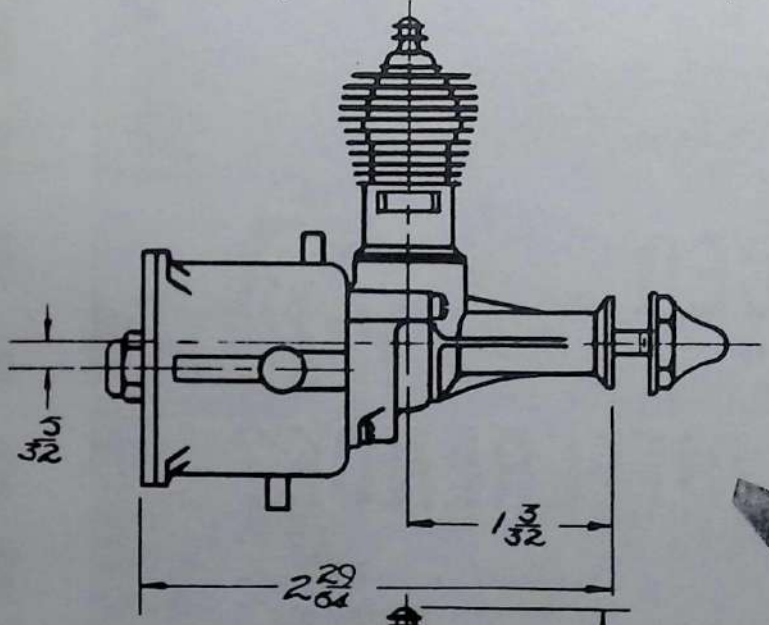
$6.95



THIMBLE-DROME SPACE BUG Jr.



$3.95



GLOW FUEL

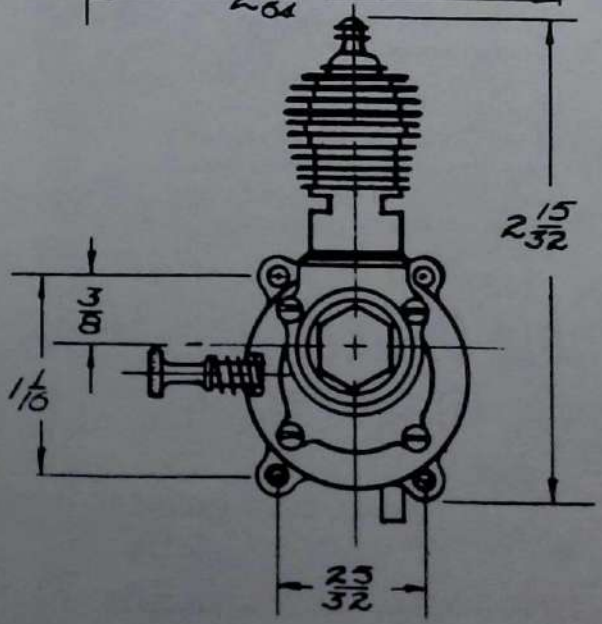
Outperforms many so-called "racing" fuels. Heat balanced to withstand high speeds.

pint **95c** half pint **50c**

RACING FUEL

Jet fast. Hottest fuel at ANY price.

pint **$1.10** half pint **60c**



Thermal Hopper

More ½A records than all other engines COMBINED

Cox multi-jet carburetor assures top performance and smoothness under varying flight conditions. Even bench mounted, Thermal Hopper attains 18,000 rpm with a 6-inch, 3-pitch prop, 22,000 with a 5-inch prop. Still faster in the air!

$6.95

THERMAL HOPPER MOUNTING

All aluminum. Very light. Quickly converts Thermal Hopper to flush mounting with no holes in firewall. Only 3 screws (no nuts) to install. **75c**

THERMAL HOPPER 2 SPEED CONTROL

Slips on in place of regular (single) needle valve unit. Just unscrew venturi nut and install. A must for ½A radio control.

$1.95

M.A.N. Feb. 1957

OFFICIAL RESULTS of the

1956 NATIONAL MODEL AIRPLANE COMPETITION in Dallas

Regardless of claims, no other engines can show these recognized official results!

EVENTS	1ST PLACE		2ND PLACE		3RD PLACE	
	ENGINE	FUEL	ENGINE	FUEL	ENGINE	FUEL
½ A Speed Junior	Thermal Hopper	TD racing	Thermal Hopper	TD racing	Thermal Hopper	TD racing
½ A Speed Senior	Thermal Hopper	TD racing	Thermal Hopper	TD racing	.....	TD racing
½ A Speed Open	.....	TD racing	Thermal Hopper	.....	Thermal Hopper	TD racing
½ A Free Flight Junior	Thermal Hopper	.....	Thermal Hopper	TD glow	.....	.....
½ A Free Fligth Senior	.....	.....	Thermal Hopper	TD glow	.....	.....
½ A Free Fligth Open	.....	.....	.....	.....	.....	.....
PAA Clipper Cargo	Thermal Hopper	TD racing	Space Bug	TD racing	Thermal Hopper	.....
American class PAA load—Junior, Senior	Thermal Hopper	.....	Thermal Hopper	TD racing	.....	.....
American class PAA load open	Thermal Hopper	TD racing	Thermal Hopper	TD racing	.....	.....
Free Flight ROW all classes, Senior	Thermal Hopper	TD racing				

Thimble Drome

Thimble Drome Engines also established 2 new speed records and a new Clipper Cargo record.

ENGINES	THIMBLE DROME	ALL OTHER MAKES
First places ½ A	6	3
Second places ½ A	8	1
First to Third ½ A	17	10
Total first places	7	

FUEL	THIMBLE DROME	ALL OTHER MAKES
First places in ½A	5	4
Second places in ½ A	7	2
First to Third in ½ A	15	12
Total first places	9	

Where stamina counted—Thimble Drome did best

EVENT	TD ENGINES	TD FUEL
1. Speed	7 out of 9 places	7 out of 9 places
2. Clipper Cargo	all 3 places	2 out of 3 places
3. American class PAA load Junior, Senior	1st and 2nd places	2nd place

L. M. COX Manufacturing Company, Inc., P. O. Box 476, Santa Ana, California

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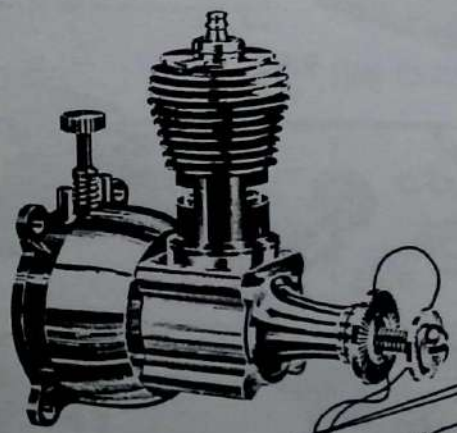
for CONSISTENT RESULTS *every day*

***in* SPEED OR SPORT . . . IN PLANES, BOATS OR CARS**

Be sure you're . . .



Powered by

Thimble Drome

You don't have to be told you've got the finest power plant when you're using a Thimble Drome. You can tell—by the way your engine starts, by the snarl of authority of a TD engine, by the way it mounts up to peak power without a stutter, and as time goes on, by the way it lasts. And because Tbimble Drome engines are the most popular half-A engines in the world, they give you more for your money—in features, design improvements, precision engineering, and highest quality, durable metals. In your own model and in any ready-powered model, make sure the power is a championship TD engine.

***Thimble Dome* FUEL**

TD fuel will give you superior performance in any engine. Always use it with a TD engine

L. M. COX MANUFACTURING COMPANY, INC.

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A READY-TO-FLY *Thimble-Drome* PLANE $7.95!

SUPER CUB 105

THE BEST KNOWN PLANE IN THE WORLD... THE PIPER CUB...

in an authentic prototype model, modified just enough to conform with the aerodynamics of models. Realism, ease of control, plus the smoothest flying dependability and easy starting TD power! Made of super-tough high impact plastic. A value you could expect only from Thimble Drome.

FULLY ASSEMBLED

17½" wing span—11⅝" length Ready to fly. Powered by TD Babe Bee engine with unbreakable spring starter. Attractive "view packaging."

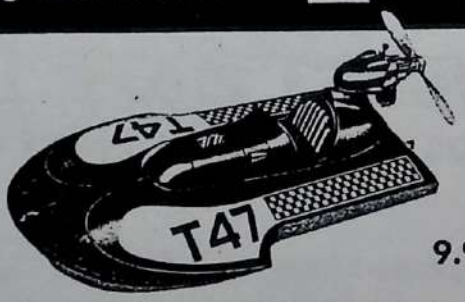
Powered by TD Thimble Drome

The tag that means the best in powered models!

TD-3

Smartest looking plane on the field. Exclusive air-cell wing, checkerboard design. Flies like a dream—stunts like a veteran.

9.95



WATER WIZARD

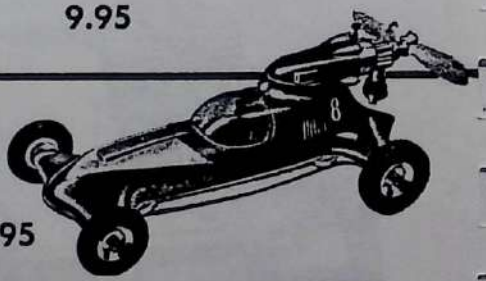
Step-Hydro that zoo-o-oms over the water with or without tether—fast, furious action! 15" long—8¼" beam. Easy starting TD Babe Bee Engine with unbreakable spring starter. Fully assembled—chock full of real "git up and go"!

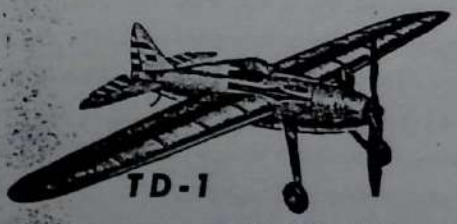
9.95

PROP ROD

Thrills and spills for speed-minded youngsters from 7 to 70! Streamlined 12" length. Aluminum frame, plastic body. Machined aluminum wheels, racing tires.

9.95

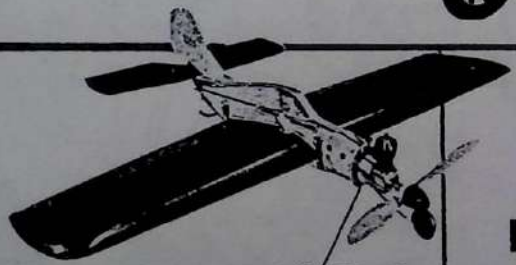




TD-1

Huge shimmering ALL-METAL 24½" wing. 18" gleaming white fuselage. Instant starting championship Space Bug Engine.

19.95



FLIGHT TRAINER TD-4

Adjustable engine mount changes thrust angle from *stability* for beginner to full *stunt sensitivity*. On rough landings, parts only *dis-assemble*—back together in seconds!

7.95

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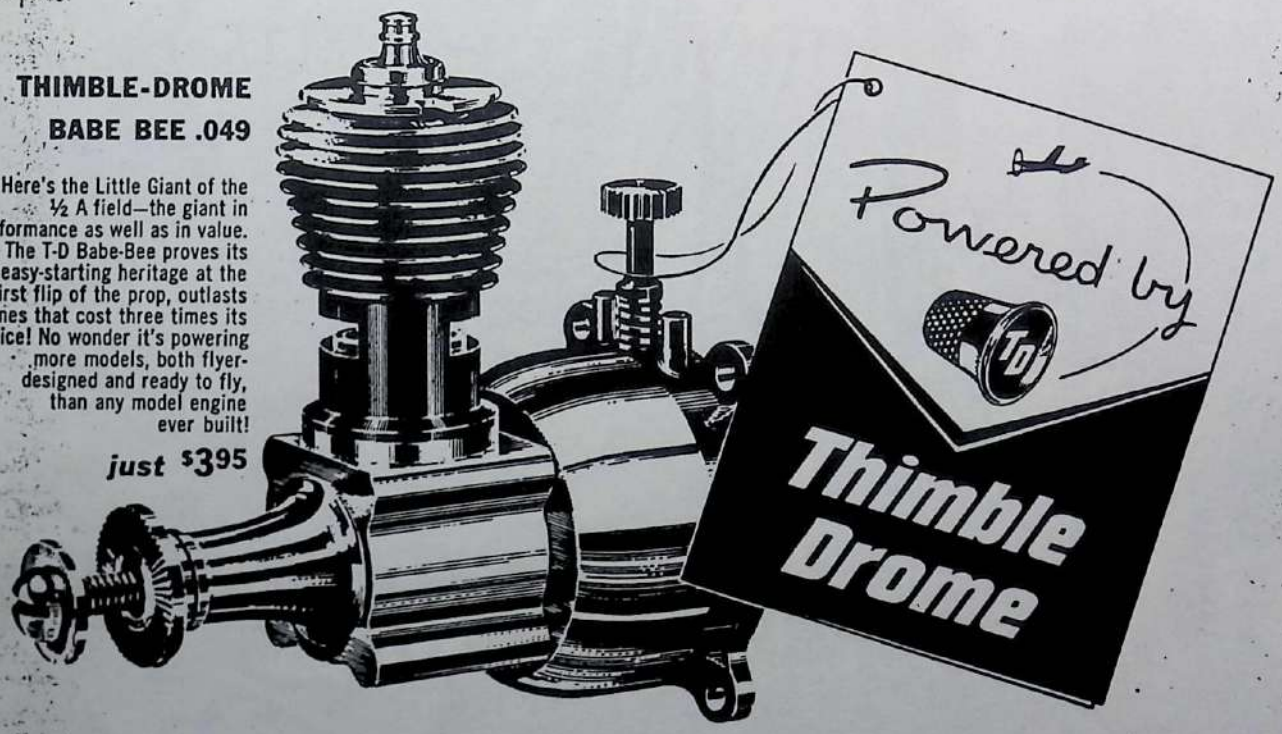
if you want THE BEST look for this tag



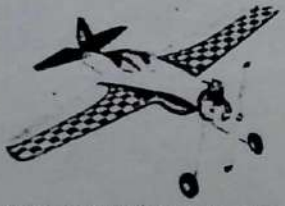
THIMBLE-DROME
BABE BEE .049

Here's the Little Giant of the ½ A field—the giant in performance as well as in value. The T-D Babe-Bee proves its easy-starting heritage at the first flip of the prop, outlasts engines that cost three times its price! No wonder it's powering more models, both flyer-designed and ready to fly, than any model engine ever built!

just $3.95

THIS CHRISTMAS GET THE BEST, GET THIMBLE-DROME!

SUPERCUB 105—Sweet-flying model of the most popular of all private planes. Only $7.95



TD-3—Thrilling aerobatic plane with Air Cell wing and checkerboard pattern. $9.95

TD-4 FLIGHT TRAINER — Features adjustable engine mount and quick rubber band re-assembly. $9.95

T-D GLOW FUEL—The fuel to use for everyday flying with TD or ANY engine. Pt. 95¢

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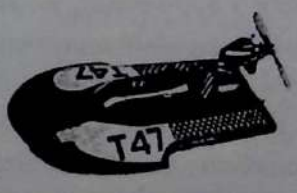
PROP ROD — Combination speed and stunt racer, full of spins, turns, thrills, and action. $9.95

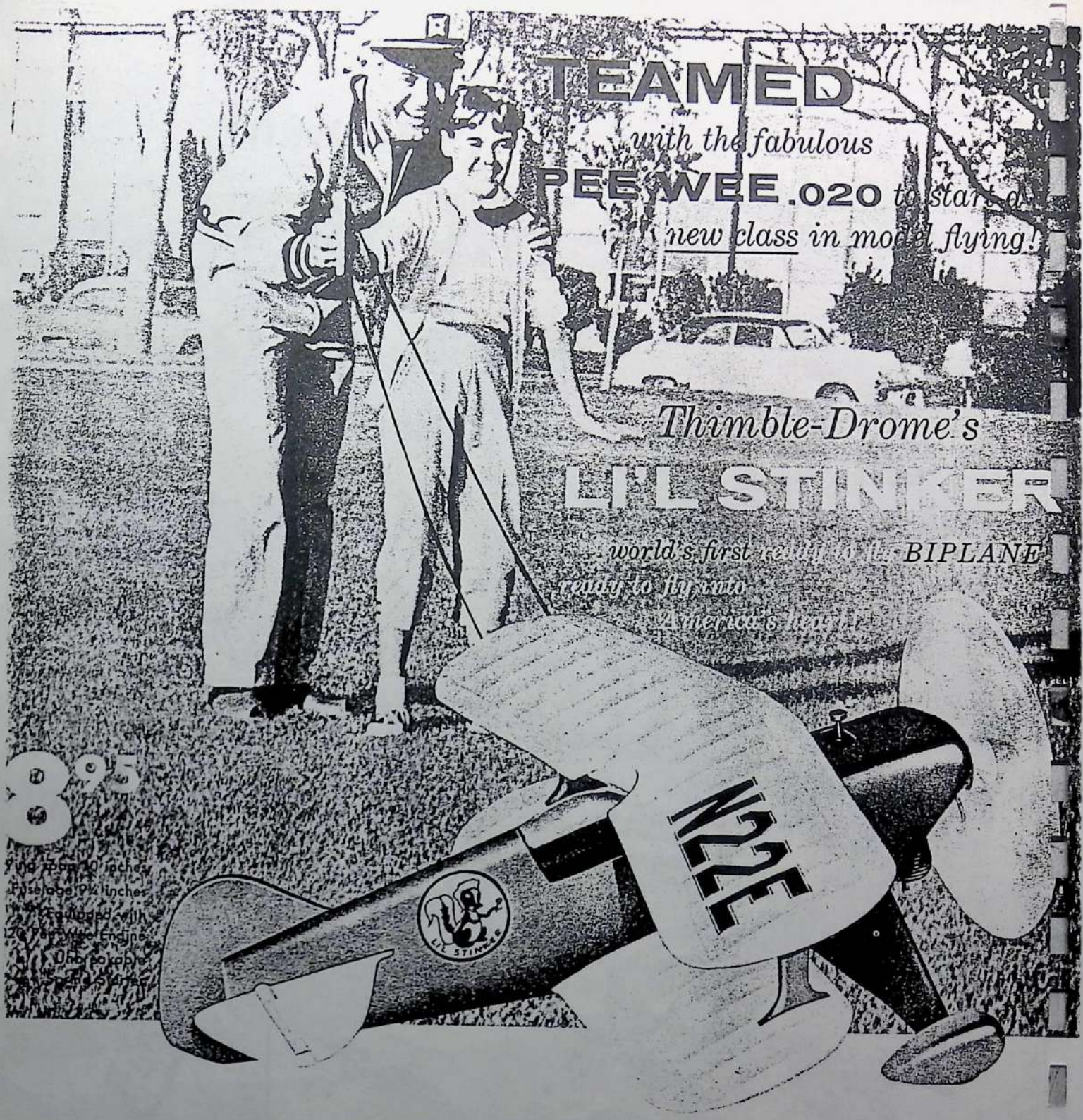


WATER WIZARD—All that its name implies in terrific power boating action. Just $9.95

T-D RACING FUEL—The finest. Jet fast. For all engines, every class. Pt. $1.10

For full color brochure on Thimble-Drome Products, send post card to

L. M. COX MFG. CO., INC. • P. O. Box 476, Santa Ana, California



Here's the most exciting power model ever built! A BIPLANE designed expressly for the amazing Thimble-Drome PEE WEE .020 engine that has taken the country by storm—LI'L STINKER is authentically modelled in high impact plastic from the famous Pitts Special. Its jewel-like authenticity—from wing struts to landing gear skirts—will excite everyone who *sees* it! And its superb Thimble-Drome flyability will THRILL everyone who *flies* it! Just as use of *micro* wave lengths opened unlimited potentials in radio transmission . . . this *brand new* "half ½A" team will bring new thrills, NEW EXCITEMENT to model flying! Your favorite dealer has this new "team" waiting for you at his shop now!

YOU KNOW
YOU'VE GOT THE BEST,
WHEN IT'S BY
THIMBLE-DROME

L. M. COX MFG. CO., INC. • *730 Pointsettia Street, Santa Ana, California*

Flying Models Aug. 952

everybody gets into the act when it's a

Thimble-Drome

SUPER CUB 105

Super-tough high-impact plastic throughout.
Authentic moulded-in details.
Modeled from Piper prototype... modified only to conform with model aerodynamics.

17½ inch wing span

Smooth-flying dependability and ease of control PLUS the *instant starting* of the Thimble-Drome Babe Bee .049 engine have all the family waiting to take the controls of their Super Cub 105. Tested for dependable flights *every time*, the Thimble-Drome Super Cub has everything you want in a ready-to-fly model—including the *easy-to-handle* price of just

7.95

TD .049 Babe Bee engine has unbreakable spring starter.

YOU KNOW YOU'VE GOT THE BEST, WHEN IT'S BY THIMBLE-DROME

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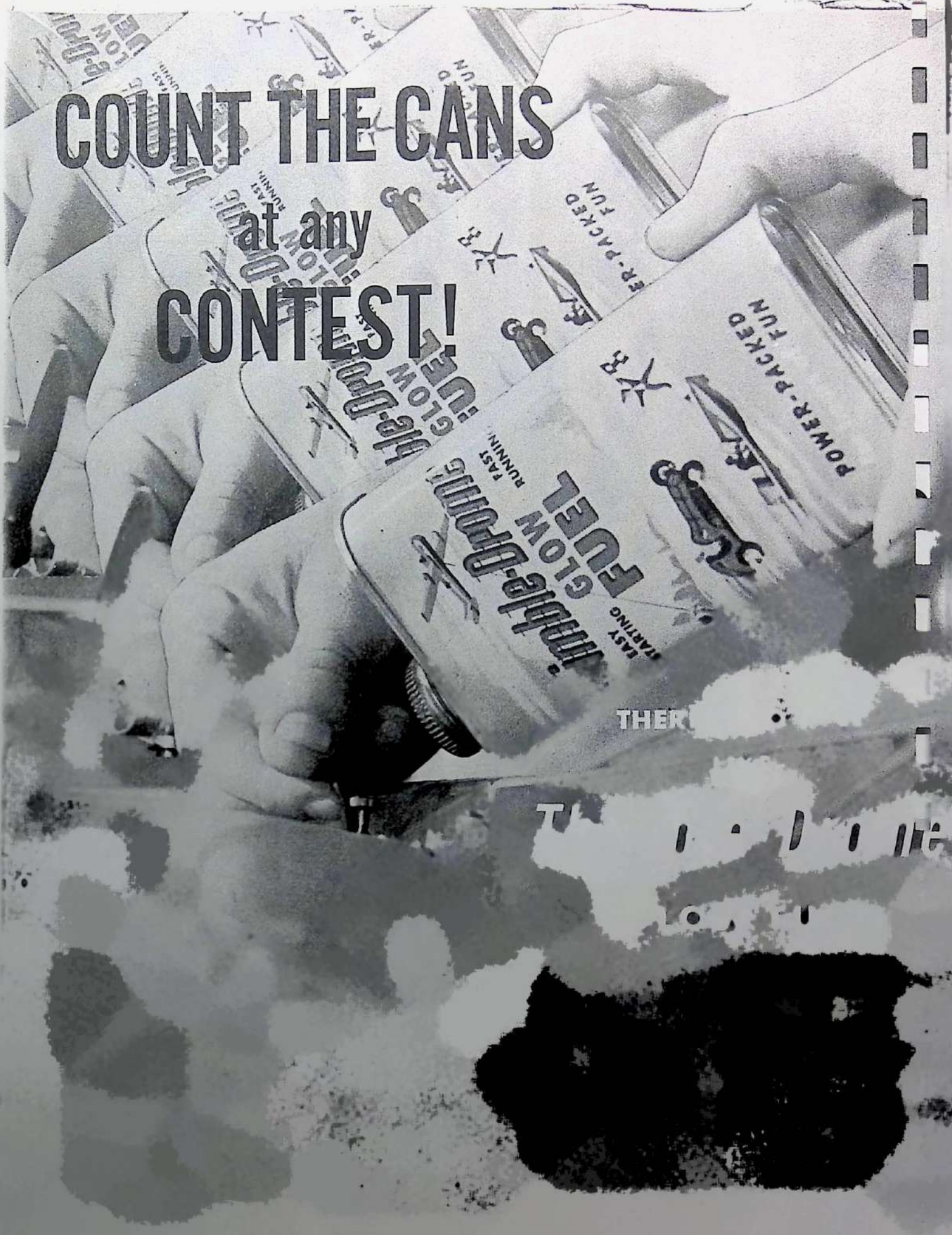
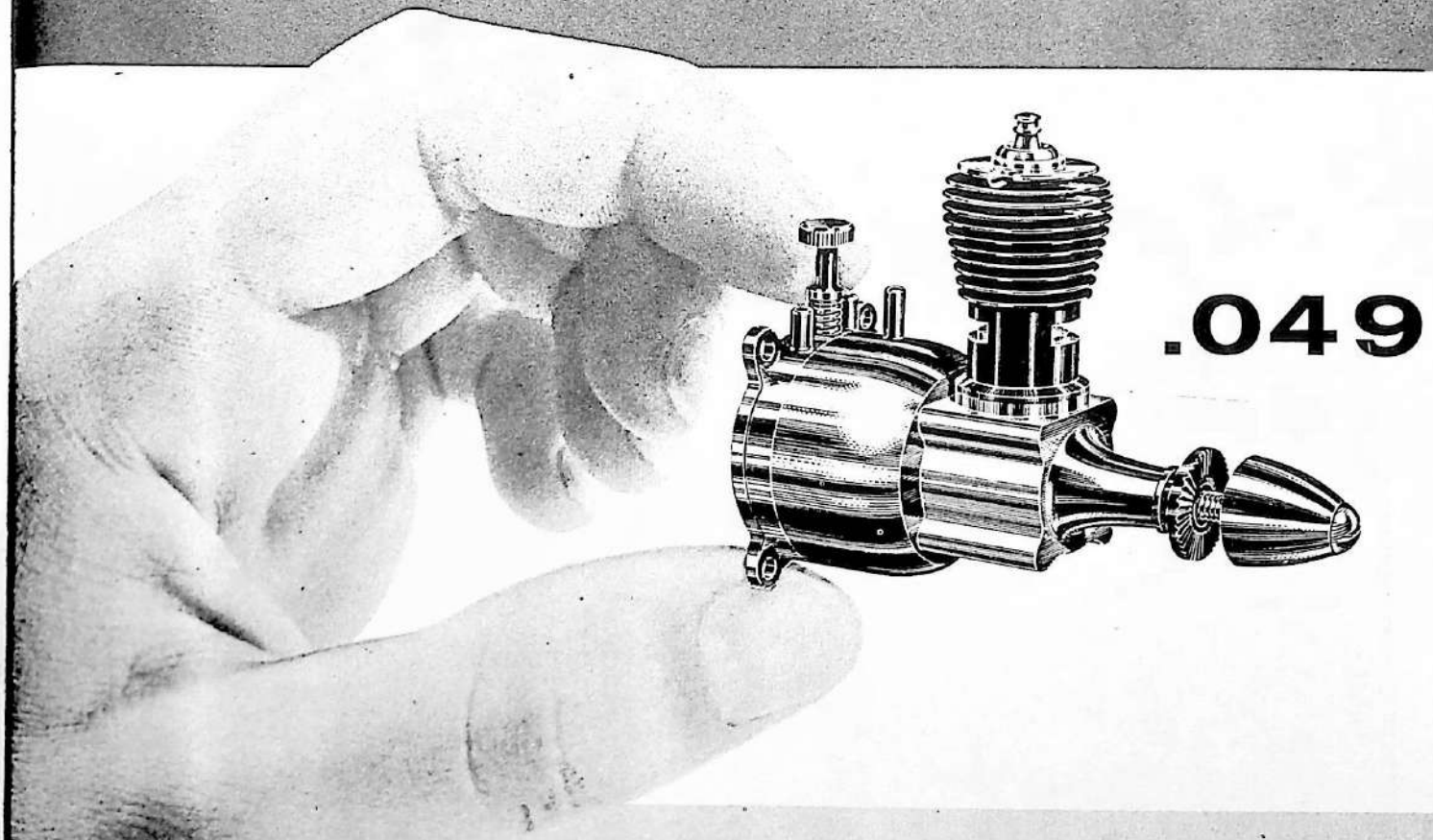

COUNT THE CANS
at any
CONTEST!
POWER-PACKED FUN
LOW GLOW FUEL
EASY STARTING
FAST RUNNING

THE NEW *Gold Standard* IN ½A ENGINES

Thimble-Drome GOLDEN BEE



$4.95

at dealers in Thimble-Drome clear-view dust-proof packaging

The minute they lay eyes on it, model builders will thrill to its gleaming golden color and economical price! Typical Thimble-Drome 24-carat quality and performance...better than average ½A power, with the quick-starting that is a "T-D Standard". PLUS all the famous features that have made "Powered by Thimble-Drome" the symbol of dependability and performance! All-metal tank-carburetor unit, no outside fuel lines, rear needle valve, etc. AND a large size stunt type tank for longer flights.

L. M. COX MFG. CO., INC. • *P. O. Box 476, Santa Ana, California*

Nat'l Sales: Milt Grey Sales • 9538 Brighton Way, Beverly Hills, California

M.A.N. Dec. 58

***ALL IN FAVOR** of a Bright*

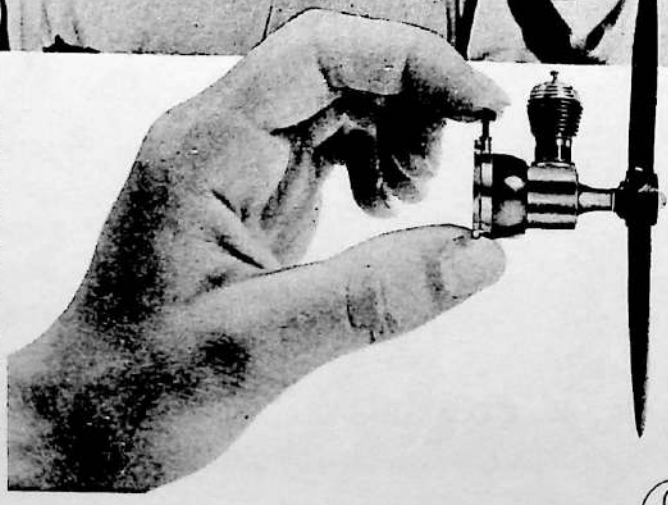
Idea for **CHRISTMAS** *say...*

Pee-Wee

by **Thimble-Drome**

"Most exciting new development since the glow plug..." with only 1/50th of a cubic inch displacement! Here's an engine HALF THE SIZE of .049s...yet with so much power and "go" that it flies most 1/2A planes.

Every day the Thimble-Drome PEE WEE is sending new hundreds of modelers to their drawing boards designing SMALLER THAN 1/2A planes, cars and boats that can easily be forerunnners of a brand new "1/4A CLASS" in the fascinating hobby of power modeling!



world's smallest glow engine!

1½ inches high!
1¾ inches from Backplate to Prop screw!
Weighs only 21 Grams!
Develops maximum power at 18,000 rpm—does practical work up to 20,000 rpm!

3.95

PEE WEE IN PRICE, TOO!

It's engineered by the world's largest maker of model engines!

L. M. COX MANUFACTURING CO., INC. • *730 Poinsettia Street, Santa Ana, California*

MAR 31 1959


FOR THE RIGHT START...
THERE'S NO FUEL LIKE
Thimble-Drome
GLOW FUEL
POWER-PACKED FUN
Thimble-Drome
GLOW
FUEL
EASY STARTING
RUNS
N5184K

Thimble-Drome

World's Foremost Name in Model Engines

ANNOUNCES

TWO TERRIFIC .15's

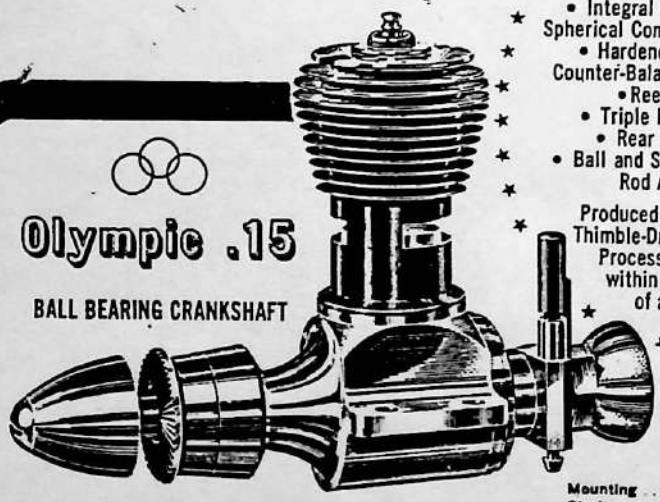
FOR ADVANCED SPORT AND CONTEST FLYING

.15 Series

FEATURES

- Integral Glow Head with Spherical Combustion Chamber
- Hardened and Ground Counter-Balanced Crankshaft
- Reed Valving
- Triple Periphery Jets
- Rear Carburetion
- Ball and Socket Piston and Rod Assembly

Produced by Exclusive Thimble-Drome TEM-ROL Process—Accuracy within Millionths of an Inch



Olympic .15

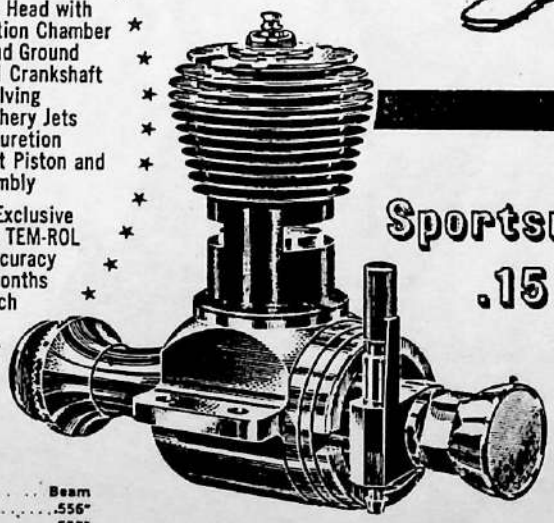
BALL BEARING CRANKSHAFT

A super hot contest engine, surpassing engines of much greater cu. in. displacement in power, performance, and endurance. Extra precise fitting of piston and cylinder to top contest requirements.

Recommended for F.A.I. free flight, and speed.

12.98

Mounting	Beam
Stroke	.556"
Bore	.585"



Sportsman .15

Just what the name implies. A dependable engine that delivers smooth performance in both 4-cycle or 2-cycle operation. Entire crankcase made of a super bearing-alloy which assures lasting bearing life.

Recommended for control line, radio control, and scale free flight

7.98

L. M. COX
MANUFACTURING CO., INC.
Santa Ana, California

Send for folder M, "How to Get the Best Performance from Your Engine." Informative, valuable.

OPERATING TIPS AND ENGINE CARE

The Glow plug is built right into the head in one unit. When the plug burns out just replace the entire head at the regular glow plug price.

After the last run, oil the engine with a light oil (SAE 10 is good) and wrap it with cloth or otherwise protect it from dust and dirt.

If the engine gets dirt on it through crack-up, or otherwise, do not run it until it is thoroughly cleaned. **Take it apart,** wash it, oil it, and reassemble.

4. If the engine gets tight it is not frozen up. Do not send to factory. A new engine will sometimes tighten up a few times, especially after slow runs. This is more likely to happen and will occur more often to an engine that is properly fitted and has properly smooth wearing surfaces. Do not run it tight. This is caused from a shellac like deposit on the cylinder wall. Screw the head off. **Remove the cylinder** and scour the inside wall very lightly with a bit of fine or medium steel wool. Wash, oil, and replace. The engine will then turn over freely and run good. **Never** use sandpaper, emery cloth, or abrasives of any kind, or scrapers. Such methods will ruin the cylinder. Steel wool will not harm the bore.
5. Certain kinds of weather, especially warm humid (sticky) weather will cause excessive shellacing in a new cylinder. There is no known way to eliminate this nuisance and the smoother the fit the more susceptable is the engine to this trouble.
6. Do not tighten the head too firmly. Set it up very lightly. Allow the engine to cool before removing head so it will loosen easier. Too much pressure against the exhaust ports to hold the cylinder from turning may force the cylinder out of round or even turn a burr into the bore. A new cylinder is usually required to remedy such damage.
7. To remove the glow plug from a hot engine—pour a little fuel slowly over the glow plug to reduce the plug temperature. Do not run it over the cylinder. The plug will then release easily. A hot plug will stick and forced removal may damage the cylinder.
8. Tampering with the reed valve can do no good unless it is necessary to remove dirt as per Sec. C Par. 7. The slightest bend or dent in the reed may prevent the engine from running at all.
9. If the reed is ever replaced, be sure and put in the reed made for this engine.

SPECIFICATIONS

Wt.—3.9 oz. Bore—.585". Stroke—.556". Displacement .1499 cu. in. Beam mount. Overall height 2 3/16". Height above rails 2 3/16". Overall length 3 15/16". Width center to center of rail screw holes 1 1/4". Piston—ground surface, no rings. Intake valve—reed. Rotation—right or left.

WARRANTY

This engine is guaranteed against defects in materials and workmanship for 30 days from date of purchase. Glow plugs are never guaranteed because of their delicate nature. No other guarantee is made or implied. If engine is returned to the factory within warranty, include 50c to cover cost of handling and return postage.

Do not take engine back to your dealer.

FACTORY REPAIR SERVICE

Minor repairs, examinations, or adjustments—$1.00 plus parts. Complete overhaul (guaranteed new engine performance)—$4.50, including parts. On all C.O.D. shipments, purchaser pays postage and C.O.D. fees.

PARTS ORDERS

Purchase parts from your dealer. If not available, order direct from factory. No C.O.D.'s please. Send remittance with your order. On orders less than $2.00 add 35c handling charge. In California add 4% sales tax.

Prices and design of parts subject to change without notice.

ENGINE PARTS LIST FOR THE SPORTSMAN ENGINE

Catalogue Number	Part	List Price
1101	Crankcase	2.00
1102	Glow Head	.75
1103	Piston and Rod	1.75
1104	Cylinder	1.75
1105	Crankshaft	2.25
1107	Reed Retainer Ring	.15
1108	Reed Valve	.25
1109	Needle Valve and Spring	.75
1110	Prop Drive Plate	.25
1116	Venturi Nut with Screen	.35
1119	Prop Screw and Washer	.20
1130	Wrench	.35
1124	Carburetor Body	2.00
1125	Carburetor Complete	3.25
1126	Needle Valve Body	.75

Order Parts by Catalogue Number

L. M. COX MANUFACTURING CO.

730 Poinsettia P.O. Box 476 Santa Ana, Calif.

Litho by Cox Mfg. — U.S.A. 4-59 1159

CARE AND OPERATION OF YOUR

THIMBLE-DROME

SPORTSMAN .15

ENGINE

This engine is outstanding for sport flying, both control line and free flight.

Keep this engine immaculately clean, use Thimble Drome Glow Fuel in the blue can and it will maintain its winning characteristics for a long period of time.

This engine is precisely fitted at the factory for immediate, easy starting and immediate flight. A break-in period in the ordinary sense is not necessary for flight, in fact, a slow easy break-in is not desirable. Most of these engines will develop full power within one minute of running time; but a few, those which are slightly on the tight side, may not develop full power under one hour. Even these will develop sufficient power for average flying almost immediately. The only break-in required is very rich (slow) running the first 60 seconds after starting the first time. After 60 seconds it should be ready to go.

Elimination of break-in is not attained through loose or sloppy fitting but through very precise fitting, together with super fine wearing surfaces.

Remember—the Sportsman .15 is much happier at high speeds. Let it wind up. Do not use oversize props.

(A) PREPARATION FOR RUNNING

1. Mount the engine in the plane or, if you want to give it some running first, mount it on a suitable mount. Do not hold the engine directly in a vise. Use as a template, A-Fig. 1, to drill mounting holes. The screened nut, B-Fig. 1, in the rear is the air intake hole and must be left open.
2. Place propeller on the shaft with the flat side of the blades toward engine and lock securely with the propeller screw.
3. Use a Thimble-Drome filler spout with stainless steel strainer in your fuel can. Your engine will thus be filled direct from the can and protected from dirt and foreign matter that would otherwise stop up the carburetor jet. The strainer keeps dirt out of the can and any particles that might already be in the can, from getting into the carburetor jet.
4. Procure a 1 1/2 volt dry cell battery, #6 or equivalent, and connect it with 2 flexible insulated wires to a glow plug clip as shown in the diagram A and B-Fig. 2. Do not use a stronger battery. If you do, the plug will burn out. The connections should be soldered to insure good contact and taped to prevent bare ends of wire from getting together and "shorting" the battery. Be sure the battery is a good one. Your dealer sells batteries and glow plug clips. The Thimble-Drome plastic mounted glow plug clip with wires already attached is recommended.
5. Balance and trim propeller. This is very essential for good performance. Sand off any bead of plastice along edges of blades. Fit a drill or shaft through the hole and rest the shaft on razor blades set in wooden blocks as shown in C-Fig. 2. Sand the heavy blade until the propeller will balance in a horizontal position. Care must be exercised to do the sanding without spoiling the airfoil characteristics.

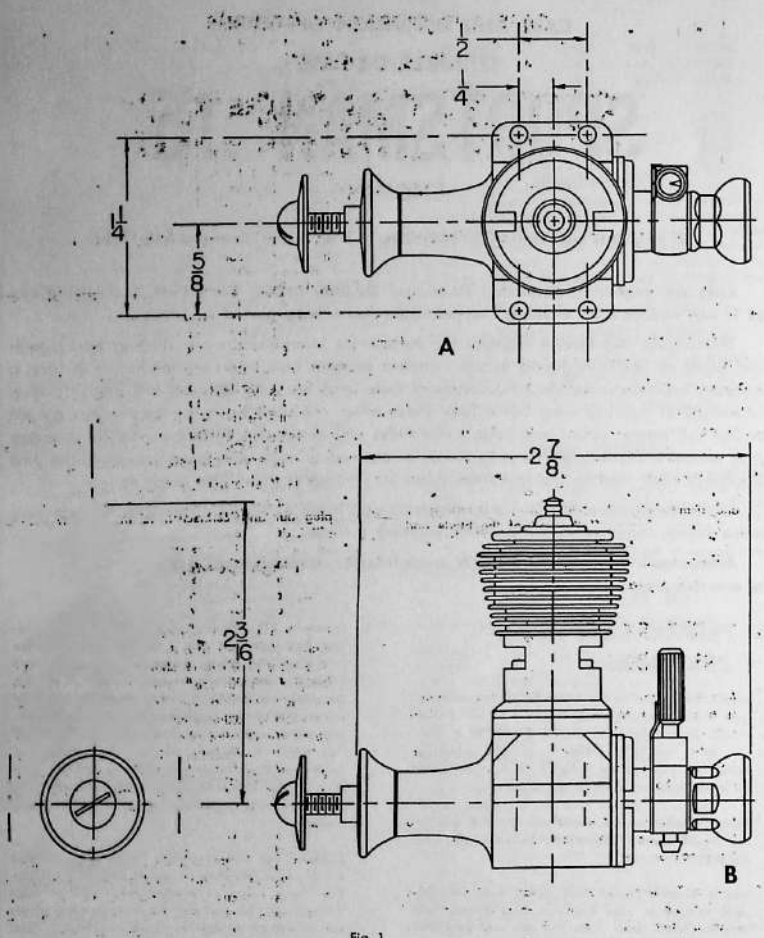


Fig. 1

FULL SCALE VIEWS OF THE SPORTSMAN FOR INSTALLATION INFORMATION

(B) STARTING THE SPORTSMAN

No matter how expert you are with small engines you will have better luck with this one if you follow directions exactly as listed and do each operation in the exact order given.

1. Close the carburetor needle valve, C-Fig. 1, by turning it clockwise till it stops. Do not force it.
2. Fill the fuel tank with Thimble-Drome racing fuel (in the red can).
3. Open the needle valve (counter clockwise) exactly 5½ full turns.
4. If the fuel level in the tank is lower than the carburetor venturi, put your finger over the air intake at the rear of the engine and pull the prop thru compression twice. No more, no less. If the fuel level is equal in height to the venturi or slightly higher do not do this operation.
5. Connect the battery by snapping the clip on the glow plug. B-Fig. 2.
6. Engage the spring starter and pull the prop around one turn only. Stop so that the exhaust ports are open.
7. Squirt a few drops of fuel into the exhaust port and immediately release the prop. Release it by sliding your finger off the end of the blade and away so your finger is instantly out of range of the spinning propeller as the engine will start instantly when released if primed with the right amount of fuel.
8. When the engine starts it will be running very rich and slow. The first time the engine is started let it continue to run rich for a period of 60 seconds. After approximately 60 seconds, slowly close the needle valve clockwise to the best running position and remove the battery connection. Subsequent starts may be adjusted to best running position immediately.

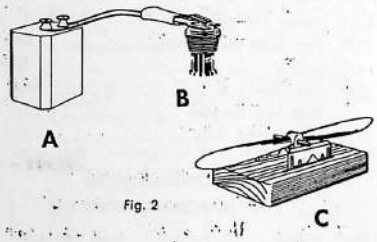


Fig. 2

9. If starting is delayed for any reason, close needle valve otherwise engine will become flooded.

(C) FAILURE TO START

1. If the engine coughs and spits a bit of fuel spray from the exhaust, it is too rich. Close the needle valve and continue cranking until the engine starts briefly. Open the needle valve again and crank it over. It should start immediately.
2. If it starts up with lots of power and dies immediately it is too lean. Open the needle valve a half turn, prime the engine, and crank it over again. If the trouble persists and the tank is lower than the carburetor try choking again as in Section B Par. 4. If the engine hasn't been run for some time it is also possible that thick castor oil is clogging the jets. Choking will clear this also.
3. If the engine still persists in above action it is possible the carburetor jets are stopped up. Remove the venturi nut and needle valve body. Three tiny jet holes will be found in the groove around the venturi tube. Clean these pet holes with a piece of fine wire. Reassemble and the engine should run.
4. If the engine refuses to fire at all screw the glow plug out and connect it to the clip. If the little coil inside does not get red hot, it is either burnt out or the battery is dead, of the connections are made incorrectly. Replace the battery or the plug, or correct the connections. Glow plugs are never guaranteed. Do not return the engine to the factory for a burnt out glow plug because the cost to you will be excessive. Buy one from your dealer.
5. If you are not using Thimble-Drome fuel, try it. **Never use gasoline or gasoline type fuels.**
6. Very heavy priming is often required for starting. These engines do not flood out as easily as most. Unless it is actually spitting out raw fuel it may need even more priming even though you have already primed it as much as most engines will stand.
7. If the plug, battery, and connections are known to be good, and if the jet has been checked for stoppage, and if the fuel is known to be the correct kind, yet the engine will not fire at all, it is possible there is dirt or a pice of foreign matter under the reed valve. This is very unlikely unless the venturi screen has been removed. If the venturi screen has been rmoved you may expect this trouble. The foreign matter can sometimes be removed without taking the valve assembly apart. If it is necessary to take it apart, be sure to replace the reed with the same side against the venturi.

wise protect it from dust and dirt.

3. If the engine gets dirt on it through crack-up, or otherwise, do not run it until it is thoroughly cleaned. Take it apart, wash it, oil it, and re-assemble.
4. If the engine gets tight it is not frozen up. Do not send to factory. A new engine will sometimes tighten up a few times, especially after slow runs. This is more likely to happen and will occur more often to an engine that is properly fitted and has properly smooth wearing surfaces. Do not run it tight. This is caused from a shellac like deposit on the cylinder wall. Screw the head off. Remove the cylinder and scour the inside wall very lightly with a bit of fine or medium steel wool. Wash, oil, and replace. The engine will then turn over freely and run good. Never use sandpaper, emery cloth, or abrasives of any kind, or scrapers. Such methods will ruin the cylinder. Steel wool will not harm the bore.
5. Certain kinds of weather, especially warm humid (sticky) weather will cause excessive shellacing in a new cylinder. There is no known way to eliminate this nuisance and the smoother the fit the more susceptable is the engine to this trouble.
6. Do not tighten the head too firmly. Set it up very lightly. Allow the engine to cool before removing head so it will loosen easier. Too much pressure against the exhaust ports to hold the cylinder from turning may force the cylinder out of round or even turn a burr into the bore. A new cylinder is usually required to remedy such damage.
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8. Tampering with the reed valve can do no good unless it is necessary to remove dirt as per Sec. C Par. 7. The slightest bend or dent in the reed may prevent the engine from running at all.
9. If the reed is ever replaced, be sure and put in the reed made for this engine.

SPECIFICATIONS

Wt.—4.1 oz. Bore—.585". Storke—.556". Displacement .1499 cu. in. Beam mount. Overall height 2 13/16". Height above rails 2 3/16". Overall length 3 15/16". Width 1 3/16". Width center to center of rail screw holes 1 1/4". Piston—ground surface, no rings. Intake valve—reed. Rotation—right or left.

RPM—subject to fuel and weather conditions. The following readings taken from Electronic Stroboscope manufactured by Communications Measurements Laboratory: Engine—picked at random—running time—20 minutes. Fuel—Thimble Drome racing. Weather—clear. Temperature—89° F. Humidity—21.1%. Barometric pressure—1016 milibars. Dew Point—44.5° F. Elevation—100 ft. above sea level. Test—Static.

Propeller	Length	Pitch	R.P.M.
Nylon	8"	4	15000
Power Prop	7"	6	16750
Plasticote	8"	6	13100
Plasticote	9"	3	13650
Plasticote	8"	3	16750
Top Flight	7"	4	18600

WARRANTY

This engine is guaranteed against defects in materials and workmanship for 30 days from date of purchase. Glow plugs are never guaranteed because of their delicate nature. No other guarantee is made or implied. If engine is returned to the factory within warranty, include 50c to cover cost of handling and return postage.

Do not take engine back to your dealer.

FACTORY REPAIR SERVICE

Minor repairs, examinations, or adjustments—$1.00 plus parts. Complete overhaul (guaranteed new engine performance—$7.50, including parts. On all C.O.D. shipments, purchaser pays postage and C.O.D. fees.

PARTS ORDERS

Purchase parts from your dealer. If not available, order direct from factory. No C.O.D.'s please. Send remittance with your order. On orders less than $2.00 add 35c handling charge. In California add 4% sales tax.

Prices and design of parts subject to change without notice.

ENGINE PARTS LIST FOR OLYMPIC ENGINE

Catalogue Number	Part	List Price
1401	Crankcase	2.00
1102	Glow head	.75
1403	Piston and Rod	1.75
1404	Cylinder	1.75
1405	Crankshaft	2.25
1406	Ball bearings, Ea.	2.00
1107	Reed Retainer ring	.15
1108	Reed Valve	.25
1109	Needle Valve and Spring	.75
1410	Prop Drive Plate	.25
1416	Venturi Nut with Screen	.40
1418	Prop Spinner and Screw	.40
1130	Wrench	.35
1424	Carburetor Body	2.20
1425	Carburetor Body	2.20
1426	Needle Valve Body	.85

Order Parts by Catalogue Number

L. M. COX MANUFACTURING CO.

730 Poinsettia P.O. Box 476 Santa Ana, Calif.

Litho by Cox Mfg. — U.S.A. 4-59 1459

CARE AND OPERATION OF YOUR

THIMBLE-DROME

OLYMPIC .15

ENGINE

THIS ENGINE IS A VERY HIGHLY PRECISE CONTEST TYPE ENGINE

Keep this engine immaculately clean, use Thimble Drome Racing Fuel in the red can and it will maintain its winning characteristics for a long period of time.

This engine is precisely fitted at the factory for immediate, easy starting and immediate flight. A break-in period in the ordinary sense is not necessary for flight, in fact, a slow easy break-in is not desirable. Most of these engines will develop full power within one minute of running time; but a few, those which are slightly on the tight side, may not develop full power under one hour. Even these will develop sufficient power for average flying almost immediately. The only break-in required is very rich (slow) running the first 60 seconds after starting the first time. After 60 seconds it should be ready to go.

Elimination of break-in is not attained through loose or sloppy fitting but through very precise fitting, together with super fine wearing surfaces.

Remember—the Olympic .15 is much happier at high speeds. Let it wind up. Do not use oversize props.

(A) PREPARATION FOR RUNNING

1. Mount the engine in the plane or, if you want to give it some running first, mount it on a suitable mount. Do not hold the engine directly in a vise. Use as a template, A-Fig. 1, to drill mounting holes. The screened nut, B-Fig. 1, in the rear is the air intake hole and must be left open.
2. Place propeller on the shaft with the flat side of the blades toward engine and lock securely with the propeller screw.
3. Use a Thimble-Drome filler spout with stainless steel strainer in your fuel can. Your engine will thus be filled direct from the can and protected from dirt and foreign matter that would otherwise stop up the carburetor jet. The strainer keeps dirt out of the can and any particles that might already be in the can, from getting into the carburetor jet.
4. Procure a 1 1/2 volt dry cell battery, #6 or equivalent, and connect it with 2 flexible insulated wires to a glow plug clip as shown in the diagram A and B-Fig. 2. Do not use a stronger battery. If you do, the plug will burn out. The connections should be soldered to insure good contact and taped to prevent bare ends of wire from getting together and "shorting" the battery. Be sure the battery is a good one. Your dealer sells batteries and glow plug clips. The Thimble-Drome plastic mounted glow plug clip with wires already attached is recommended.
5. Balance and trim propeller. This is very essential for good performance. Sand off any bead of plastice along edges of blades. Fit a drill or shaft through the hole and rest the shaft on razor blades set in wooden blocks as shown in C-Fig. 2. Sand the heavy blade until the propeller will balance in a horizontal position. Care must be exercised to do the sanding without spoiling the airfoil characteristics.

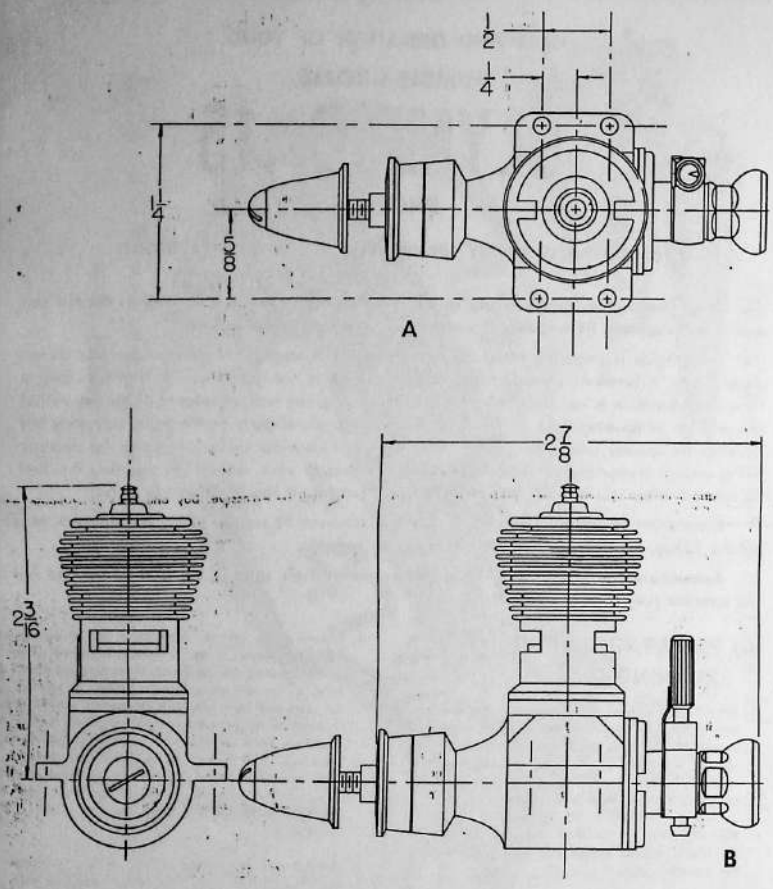


Fig. 1

FULL SCALE VIEWS OF THE OLYMPIC .15 FOR INSTALLATION INFORMATION

(B) STARTING THE OLYMPIC

No matter how expert you are with small engines you will have better luck with this one if you follow directions exactly as listed and do each operation in the exact order given.

1. Close the carburetor needle valve, C-Fig. 1, by turning it clockwise till it stops. Do not force it.
2. Fill the fuel tank with Thimble-Drome racing fuel (in the red can).
3. Open the needle valve (counter clockwise) exactly 5 ½ full turns.
4. If the fuel level in the tank is lower than the carburetor venturi, put your finger over the air intake at the rear of the engine and pull the prop thru compression twice. No more, no less. If the fuel level is equal in height to the venturi or slightly higher do not do this operation.
5. Connect the battery by snapping the clip on the glow plug. B-Fig. 2.
6. Engage the spring starter and pull the prop around one turn only. Stop so that the exhaust ports are open.
7. Squirt a few drops of fuel into the exhaust port and immediately release the prop. Release it by sliding your finger off the end of the blade and away so your finger is instantly out of range of the spinning propeller as the engine will start instantly when released if primed with the right amount of fuel.
8. When the engine starts it will be running very rich and slow. The first time the engine is started let it continue to run rich for a period of 60 seconds. After approximately 60 seconds, slowly close the needle valve clockwise to the best running position and remove the battery connection. Subsequent starts may be adjusted to best running position immediately.
9. If starting is delayed for any reason, close needle valve otherwise engine will become flooded.

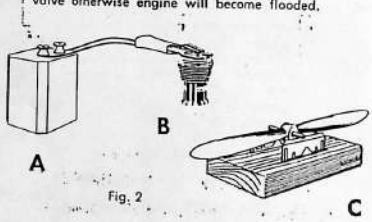


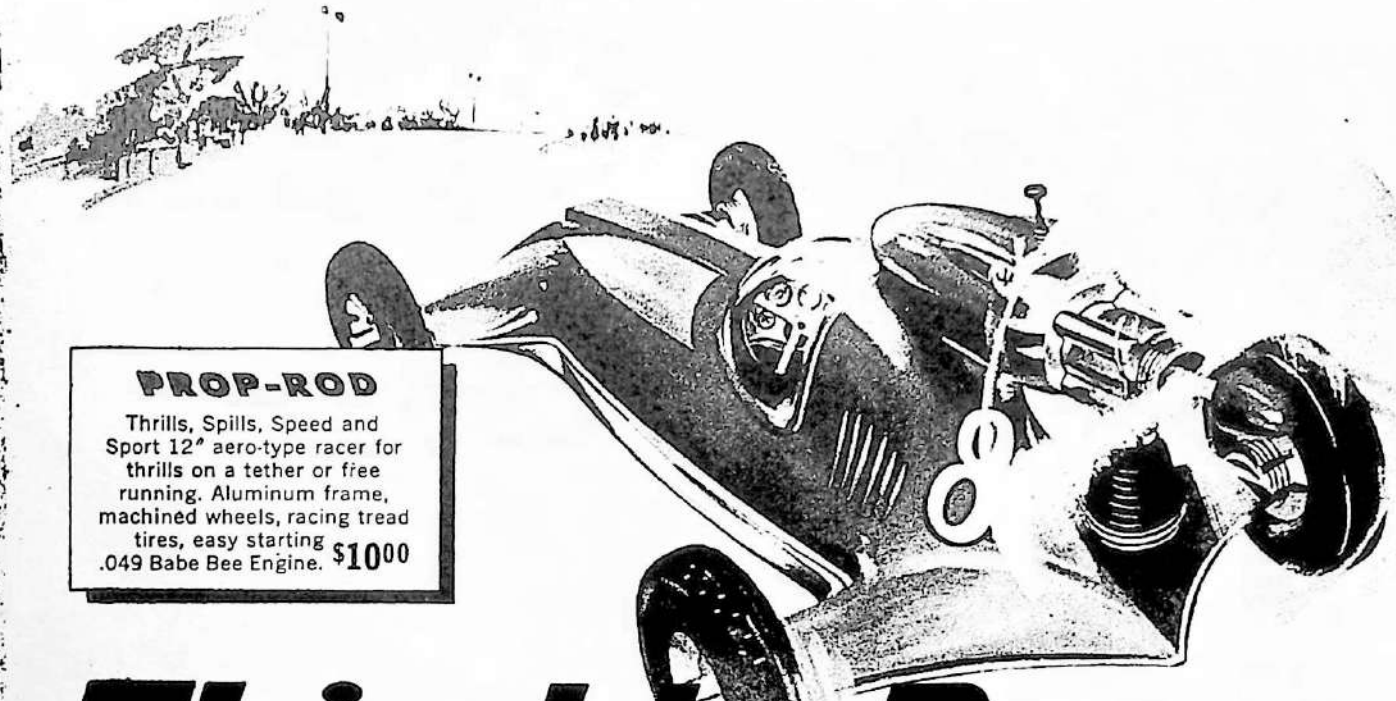
Fig. 2

(C) FAILURE TO START

1. If the engine coughs and spits a bit of fuel spray from the exhaust, it is too rich. Close the needle valve and continue cranking until the engine starts briefly. Open the needle valve again and crank it over. It should start immediately.
2. If it starts up with lots of power and dies immediately it is too lean. Open the needle valve a half turn, prime the engine, and crank it over again. If the trouble persists and the tank is lower than the carburetor try choking again as in Section B Par. 4. If the engine hasn't been run for some time it is also possible that thick castor oil is clogging the jets. Choking will clear this also.
3. If the engine still persists in above action it is possible the carburetor jets are stopped up. Remove the venturi nut and needle valve body. Three tiny jet holes will be found in the groove around the venturi tube. Clean these pet holes with a piece of fine wire. Reassemble and the engine should run.
4. If the engine refuses to fire at all screw the glow plug out and connect it to the clip. If the little coil inside does not get red hot, it is either burnt out or the battery is dead, or the connections are made incorrectly. Replace the battery or the plug, or correct the connections. Glow plugs are never guaranteed. Do not return the engine to the factory for a burnt out glow plug because the cost to you will be excessive. Buy one from your dealer.
5. If you are not using Thimble-Drome fuel, try it. **Never use gasoline or gasoline type fuels.**
6. Very heavy priming is often required for starting. These engines do not flood out as easily as most. Unless it is actually spitting out raw fuel it may need even more priming even though you have already primed it as much as most engines will stand.
7. If the plug, battery, and connections are known to be good, and if the jet has been checked for stoppage, and if the fuel is known to be the correct kind, yet the engine will not fire at all, it is possible there is dirt or a pice of foreign matter under the reed valve. This is very unlikely unless the venturi screen has been removed. If the venturi screen has been rmoved you may expect this trouble. The foreign matter can sometimes be removed without taking the valve assembly apart. If it is necessary to take it apart, be sure to replace the reed with the same side against the venturi.

(D) OPERATING TIPS AND ENGINE CARE

1. The Glow plug is built right into the head in one unit. When the plug burns out just replace the entire head at the regular glow plug price.
2. After the last run, oil the engine with a light oil (SAE 10 is good) and wrap it with cloth or other-



PROP-ROD

Thrills, Spills, Speed and Sport 12″ aero-type racer for thrills on a tether or free running. Aluminum frame, machined wheels, racing tread tires, easy starting .049 Babe Bee Engine. $10.00

Thimble-Drome

dependable

PERFORMANC

the key to more fun in every model sport!

Engines that start easily!

Models that run well!

WATER WIZARD

Exciting Step Hydro

Slam-bang hydro action at the beach, or in your swimming pool! 15″ overall — 8½″ beam. Easy-starting .049 Babe Bee Engine. Long life nylon prop. Spring Starter. $10.00

Send for Illustrated Folder M8

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World's Largest Manufacturers of Ready-to-Fly Planes, Engines, Fuel, and Accessories

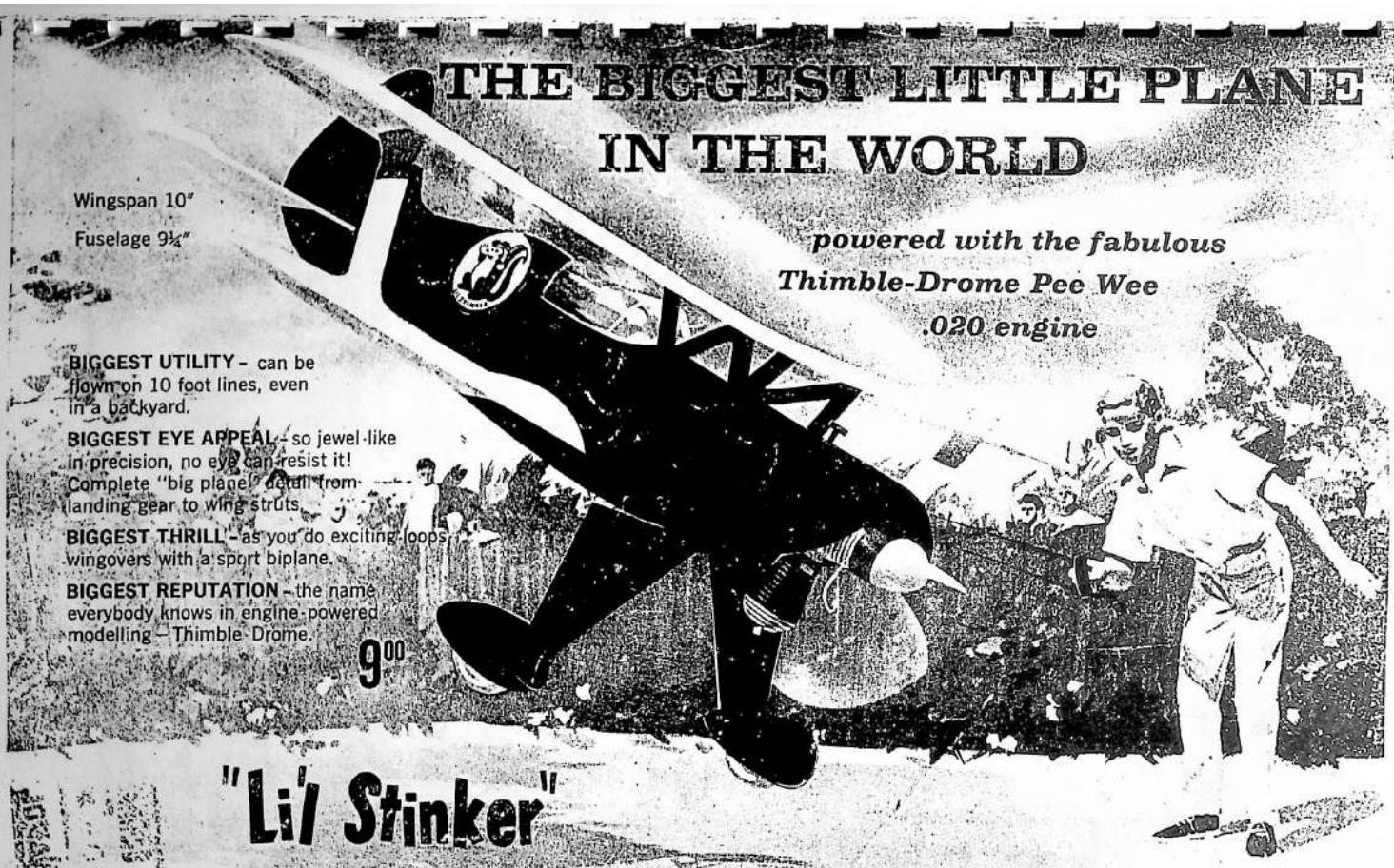
MAN Aug 59

THE BIGGEST LITTLE PLANE IN THE WORLD

Wingspan 10"

Fuselage 9¼"

powered with the fabulous Thimble-Drome Pee Wee .020 engine



BIGGEST UTILITY – can be flown on 10 foot lines, even in a backyard.

BIGGEST EYE APPEAL – so jewel-like in precision, no eye can resist it! Complete "big plane" detail from landing gear to wing struts.

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BIGGEST REPUTATION – the name everybody knows in engine-powered modelling – Thimble Drome.

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"Li'l Stinker"

Thimble-Drome

First Ready-to-Fly Biplane

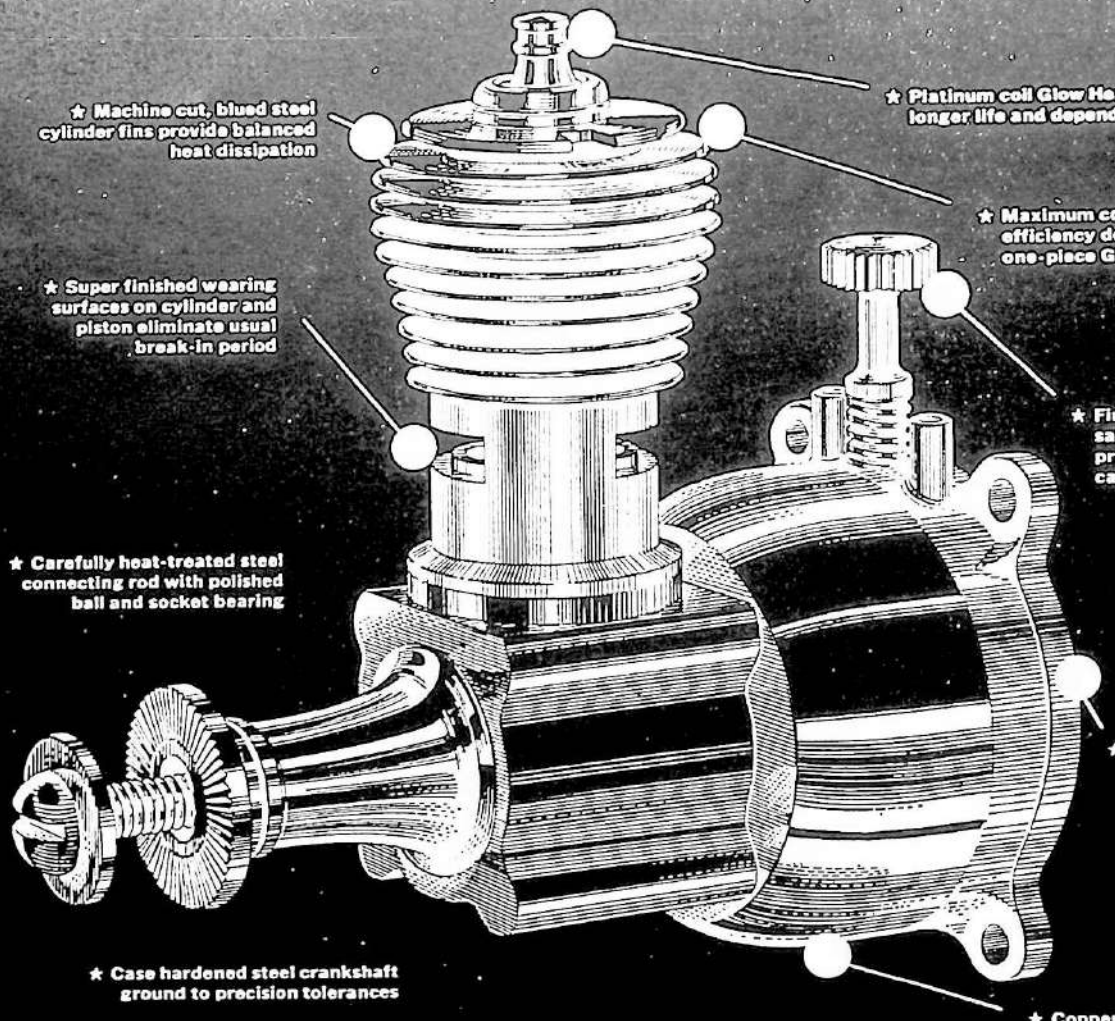
Fully Assembled — Flight Tested

L. M. COX MANUFACTURING CO., INC., P.O. Box 476A, Santa Ana, California

MAY 1959

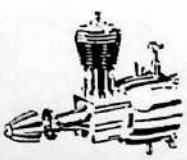
you know it's the best – it's by

Thimble-Drome



PLUS exclusive Thimble-Drome **TEM-TROL** *process which assures cylinder and piston accuracy within millionths of an inch—resulting in easier starting, smoother running, longer life!*

Golden Bee .049



Golden anodized 24 carat quality and performance! Stepped-up 1/2A power. Oversized stunt tank.

$4.98

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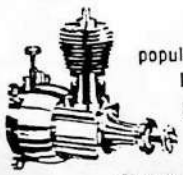

Worlds's most popular 1/2A engine. Instant starting, powerful action. For Free Flight or Control.

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Pee Wee .020

Weighs only 21 grams, yet more power per gram than any larger engine. Does practical work up to 22,000 RPM!

$3.98

Thimble-Drome Glow Fuel

Always use genuine T-D fuel, finest money can buy.

HALF PINT 50c
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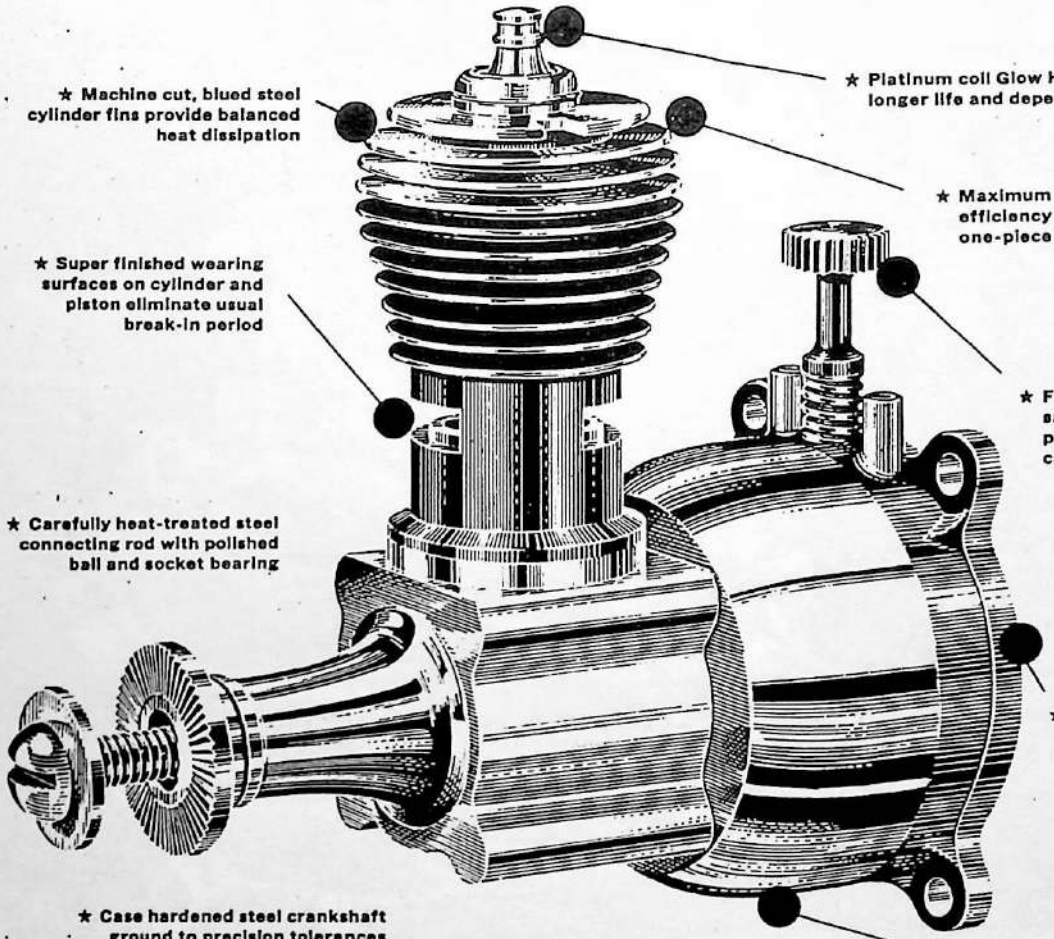
PRECISION STANDARDS — PERFORMANCE FEATURES

UNMATCHED BY ENGINES OF ANY CLASS OR PRICE

Thimble-Drome

UNDISPUTED LEADER OF ½A



★ Machine cut, blued steel cylinder fins provide balanced heat dissipation

★ Platinum coil Glow Head for longer life and dependability

★ Maximum combustion chamber efficiency derived from clean one-piece Glow Head assembly

★ Super finished wearing surfaces on cylinder and piston eliminate usual break-in period

★ Finely threaded needle valve safely located away from propeller assures precise carburetor adjustments

★ Carefully heat-treated steel connecting rod with polished ball and socket bearing

★ Carburetor integral with fuel tank. No outside fuel lines required.

★ Case hardened steel crankshaft ground to precision tolerances

★ Copper reed valve guarantees easy starting plus top RPM

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JET WINNER USES AMBROID

Planes Turn Speeds Up to 166.66 mph

Ambroid Liquid Cement has an enthusiastic booster in Harry Lotshaw, model plane champ from Plainfield, Ind., shown above with trophies he has won with his Ambroid-cemented jets.

"By using Ambroid," Harry says, "I have been able to turn out fast, rugged planes that win consistently in local contests. In addition, my planes have won several important victories in major competition: First in Jet Speed in the 1955 King Orange Internationals; Second in the same event in 1956. In the 1957 Nationals I placed Sixth in C Speed at 157 mph.

"One of my jets, made with Ambroid, of course, turned a top speed of 166.66 mph.

"I'm so enthusiastic about Ambroid myself that I always advise new modelers to use it, too."

Thousands of successful modelers prefer Ambroid because it is completely waterproof, hot fuel resistant, dries fast, and forms a bond so strong it often outlasts the materials it joins together.

Take Harry Lotshaw's advice and build *your* next plane with Ambroid—1¾-oz. tube, 30¢; 4-oz. tube, 60¢, at leading hobby shops.

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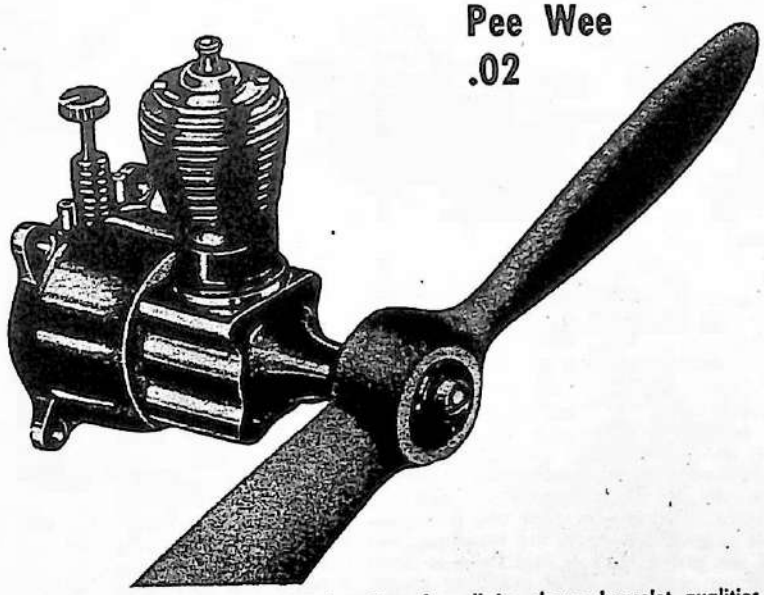

Hold any of the .049 Cox engines at arm length and you'll realize how small the .02 really is.

Yet, for all its charm bracelet qualities, performance is sensational. Spin the prop and see!

Engine Review

For Half A scale and free flight sport, tiny .02 is a life saver, could begin a new trend.

by E. C. MARTIN

► This new piece of magic from Thimbledrome is pure wizardry both to look at and operate. Its appearance is so similar to the larger Cox engines that for a moment you do not realize that you are not holding it at arm's length!

First thing we did was grip firmly between thumb and forefinger and fire it up while reclining in the armchair beside the family hearth. Of course, the palsy of the hand has cleared up now, but we still throw our hat in first when entering the house. Unfortunately, we have no range of test props to cover an .020 and no precedent for comparison but, if an impression is anything to go by, this little bundle has amazing power. Remarkably, starting and needle adjustment are on a par with the best, regardless of size.

There are no castings in the basic structure of this engine and, with the exception of the fuel tank backplate, which is a die casting, the entire job is machined from bar stock. The crankcase is turned from a dural type material which began either as an extrusion or was form milled in bar lengths before turning. After rough turning, the work is tumbled to a uniform finish and then receives its final machining operations to produce a really featherweight component of unusual strength. The 5/32 diameter crankshaft runs in a well fitting unbushed bearing and the middle third of its length is relieved. The counterbalanced crankpin is a mere 5/64 diameter and receives a sturdy little steel conrod whose ball end is swaged into the piston. The cylinder is a scale model of the larger Thimbledrome variety having twin opposed exhaust ports, bypass grooves, and integral fins. The top is tapped to receive the aluminum plug head combination, and the lower end is threaded to screw into the crankcase.

In very small engines, of about half inch bore and below, a hardened steel piston and cylinder maintain their shape and fit for very long periods and are easier in some ways to finish to the extreme accuracy necessary for reasonable compression sealing. Larger bores are prone to seizure when both components are glass hard, and a soft- or cast-iron piston in a hard cylinder seems to yield greater and more consistent performance. When both surfaces are hard and the cold clearance between piston skirt and cylinder wall is only a fortieth part of one thousandth of an inch, it will be evident that the most minute errors can cause performance variations among apparently similar engines that often never disappear with running before the rest of the engine is worn out. In these days of highly competitive enginesmiths a radical difference between the best and worst of a design is too great a risk, and consequently the hardening of both components is uncommon in America.

The basis of the trouble is that the very principle of the lapped piston and cylinder is a marginal proposition. It happens to just about work, like the full-sized poppet exhaust valve, but now it is taken for granted and roundly cursed when it won't play. Kept at a constant temperature the clearances will remain constant and as manufactured. Heat the piston and the clearance will diminish. Less clearance causes friction. Friction causes heat. Cylinder heat radiates from cooling fins, piston heat does not, so the clearance becomes less and less until it disappears and the

(*Continued on page* 43)

Engine Review

(*Continued from page* 30)

whole mess comes to a grinding halt. More commonly, however, this thermal instability manifests itself less obviously by simply limiting performance to a level where combustion temperature and friction have found a compromise. Upset the status quo by running a lean needle setting or hotter fuel and the machinery dies, as every speed flier knows.

The essence of breaking in an engine quickly is finding and never exceeding this point of compromise. As everything wears itself to the right fit, the point of compromise moves up the power scale until volumetric efficiency prevents any further improvement and the engine can be considered as broken in.

The obvious solution to all this is to manufacture the piston to be the correct size and shape at operating temperature. This is what is commonly done in other fields, and advantage is taken of the light weight and thermal conductivity of light alloys, despite their high co-efficient of expansion, to improve other characteristics of the engine. However, the resulting cold fit of the piston is such that there is practically no compression at cranking speed, and starting is unacceptably difficult. This problem is solved by providing a number of piston rings for sealing purposes which are, in fact, very shallow lapped pistons, but with one important difference. They are split, and spring outwards to maintain contact with the cylinder walls, and accommodate themselves to varying conditions of fit caused by temperature fluctuation. Alloy pistons and rings are undoubtedly the answer if one can afford them, and the fact that many records are currently held by lapped piston engines is simply due, in our view, to the absence of thorough development work on piston rings of suitable sizes, because of the current lack of demand for expensive high performance engines. Small piston ring design is based on large ring design parameters which, while satisfactory, are not by any means entirely suitable for our purposes, and we may yet see notable improvements if there is a revival of racing engine interest.

However, to get back to the point, the piston of our test engine is interesting because it is hardened and yet features a swaged in conrod ball joint. Swaging can only be carried out on malleable material, and hardening must take place before the conrod is fitted otherwise the rod will be too brittle. The solution in this case consists of copper plating the piston and either masking the skirt or removing the copper deposit from the skirt before carburizing the piston. This process consists of heating the work to cherry red heat in a material containing free carbon which penetrates the exposed surfaces to a depth determined by the duration of exposure. Quenching the work in water produces a glass hard case on the unplated skirt while leaving the plated surfaces in their original soft condition so that the conrod can be fitted. Finally the skirt is finished to size with the rod installed so that any distortion from swaging and hardening can be removed in the process. The most outstanding feature of the Thimbledrome range of engines is the system of carburetion and admission control, and much of their remarkable performance is due to the thorough and ingenious development work carried out in this field. The detail design in the fuel tank and rear cover of the .020 is especially noteworthy.

The main unit comprises a cup, turned from bar and anodized red, which has a hollow stem in the middle communicating with a boss on the undersurface of the cup which fits into and forms the rear cover of the crankcase. This boss is recessed on its face and the internal diameter has a snap-ring groove. Behind the snap ring goes a reed valve shaped like a plus sign, the center of which covers the end of the hollow stem or induction pipe. The reed is blanked from 1/1000 brass shim stock, and in operation moves to and fro, as well as flexing, so that the mixture can flow between the arms of the plus sign. To prevent overstress the reed is limited in its deflection by one end of the circlip passing across its center. The fact that the outside diameter of the boss is only ⅜" will give an idea of the fascinating neatness of the detail work in this engine.

At the upper rim of the cup where it joins the tank blackplate is a most unusual and accurate example of machining. It is necessary to have at this joint a fuel-tight seal which not only tightens down to a very precise dead length, but which also holds the backplate absolutely concentric with the tank. These requirements are dictated by the most ingenious system of carburetion we have seen on a model engine. In principle the induction pipe is in two pieces, one being the stem in the tank, and the other the hole in the center of the backplate. However these two pieces are prevented from touching by the joint at the rim of the cup, thus leaving in effect a crack around the induction pipe big enough to take a cigarette paper. This tiny annular crack is the jet, and its width is controlled by the tank to backplate joint. A gasket varies in thickness, and screws do not provide a precise concentric location, therefore, something crafty in the way of joints was called for, and accomplished by turning a vee groove in the face of the tank rim and a mating male vee on the face of the backplate. When the four retaining screws are tightened the vees insure that everything pulls up to the right relationship.

The admission of fuel to the annular jet is controlled by a positive shut-off needle valve which regulates flow to a chamber formed by a shoulder on the end of the induction pipe stem. Fuel gets to the needle valve through a small piece of plastic tubing, complete with anti-kink spring, inside the tank and extending to a suitable pick-up point.

The backplate unit is an intricate little diecasting incorporating filler and vent, four-point radial mounting lugs, and counterbored bosses for the tank to crankcase retaining screws. The needle valve body is a tiny steel insert pressed into a bore in this casting to provide long wearing very fine threads in order to give reasonable latitude in adjusting such microscopic quantities of fuel. The needle itself is of typical Thimbledrome pattern with a coil spring locking device.

Now those hardy souls, if any, who have been able to follow this marathon description, and understand the workings of this extremely clever fuel-air mixer are no doubt wondering how air gets to a hole in the middle of a radial mounting plate and probably visualize fuel under the tissue and internal model rot. This time we have a Thimbledrome which keeps the innards dry. The backplate has a passage, recessed in its face, connecting from the intake to the outside world, and it is chokeable. Finally, the whole unit can be rotated in increments of ninety degrees, but the vent positions dictate a top position for the needle knob.

In the absence of any useful figures for this engine we can only repeat that handling and starting is better than that of many good large engines, and the steam available will be a pleasant surprise. It could be the beginning of a new trend, but what a job for the manufacturers!

(*Continued on page* 46)

COX THIMBLE-DROME ENGINES

DISPLACEMENT CONVERSION CHART

Cu. In.	Cu. Cent.
.010	.163
.020	.327
.049	.810
.051	.835
.09	1.497
.15	2.490

REED VALVE ENGINES

Pee Wee .020

Less than half the size of .049 engines — yet so much power and "go" it flies most 1/2A planes! Exceptionally light weight—only 21 grams! Develops maximum power at 19,000 RPM . . . does practical work up to 22,000. Amazingly powerful!

Cat. No. 100

Golden Bee .049

Gold anodized 24-carat quality and performance in an engine that starts quick, gives better than average 1/2A power.

Cat. No. 120

Sportsman .15

Everything the name implies! A super-sturdy engine that performs smoothly in 4-cycle or 2-cycle operation. Entire crankcase of lasting bearing alloy.

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TEE DEE FRONT ROTARY

Tee Dee .010

Cat. No. 130

A sensational achievement in miniaturizing . . . with "big engine" features, and amazing weight-lifting power and go!

Tee Dee .049

Cat. No. 170

A super-hot Front Rotary 1/2A engine for free flight or control line contest flying. Has extra high power curve.

Tee Dee .09

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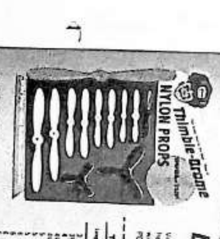
For top Class A contest work—with super power, stutter free performance! Precision features that have made TEE DEE engines the hottest in the model world!



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Choose the correct size and pitch propeller for your T-D model from this display at your Dealer.

T-D DUBL-TUF NYLON PROPS

Length	Pitch	Blades	Recommended for Cat. No.	Cat. No.	Price Each
3	1¼	2	.010 Engines	3318	
3½	2½	2	5430	5418	
4	2½	2	5330	5378	
4½	2	2	.020 Engines	1018	
4½	4	2	5200	5205	
5	3	2	1080	758	
5	3	3	5500	5567	
5	4	2		759	
6	3	2	5700 500	762	
6	3	3	5800	5843	
6	4	2		763	
6	6	2	5600	5617	
7	3½	2	.09 Engines	2318	
8	4	2		766	
8	5	2		850	
9	4	2		767	

BUY 1 OR 1 DOZEN! Individual polyethylene tear-off packages insure you of a fresh prop that is protected and dust-free until you use it.

Extra props are protected in your tool box, too.

Flight Engineer's Case COMPACT - TIME-SAVING - with INTEGRAL BATTERY

NOW — the world's finest case and the world's finest accessories!

A durable plastic hinged case with carrying handle and metal lid fastener—8½" L x 6" W x 3½" H—that contains EVERY ACCESSORY it takes to start and fly a model airplane, including the new midget super power STARTING BATTERY. Case has dividers and trays for tools and spare parts, as well as a battery compartment. Battery can be used without removing from case. Contents: Skylon Reel, Jumbo Glow Head Clip with wires attached, ½ Pint T-D Glow Fuel, Filter Cap with stainless steel strainer, Filler Hose, Line Snaps, 2 Glow Plug Wrenches, Dacron Lines, Wiping Cloth, Midget super power starting battery.

Cat. No. 770

Thimble-Drome Flywheel and Special Nut

Adapts Thimble-Drome .049 engines to inboard boat models. Deep drive splines engage plastic tubing used for universal joint.

Cat. No. 830

Thimble-Drome Handy Reel

A deluxe precision-built reel that takes any size flying wire, either stranded or solid. Holds up to 200 ft. for even more of smaller sizes on each of two spools, enclosed in handsome 2 color plastic control handle.

Cat. No. 780

Thimble-Drome Muffler Assembly

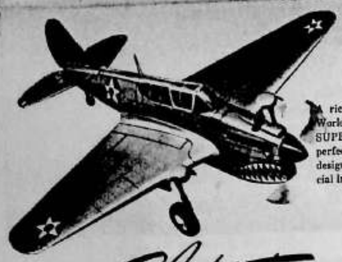
A long needed accessory that permits flying ANYWHERE! Cox engineered . . . reduces engine noise . . . prevents neighborhood complaints. Fits T-D reed valve engines.

Cat. No. 9066

Hot Spot Glow Plug

For use in 1/2A engines other than Thimble-Drome. Pure platinum filament . . . more glow per plug.

Cat. No. 881 Packed 6 on strip



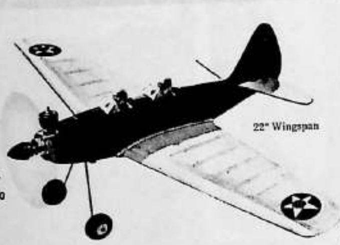
P-40 WAR HAWK

A richly detailed model of the P-40 WAR HAWK, World War II's most famous fighter, with special SUPER BEE engine for power dives, zooms, loops, and perfect 3-point stall landings. Accurate scale model design. Clear plastic cockpit canopy with gunsight. Official Insignia. 20" wingspan.

Cat. No. 5500

PT-19 *Flight Trainer*

Unsurpassed realism and performance! This famous T-D trainer provides progressive control from first flight through primary stunt. On rough impact, parts separate—to be re-assembled in seconds! Fully formed fuselage, student and instructor figures, dependable .049 engine.



22" Wingspan

Cat. No. 5700

WIN YOUR WINGS with COX Thimble-Drome

Now you can wear beautifully sculptured, heavy metal Junior Pilot's wings – exactly similar in design and quality to senior airline and service pilot's wings. And you'll receive a beautiful diploma for framing and handsome wallet card with your membership registration number in the Junior Pilots of the World. ***Ask your Dealer today*** *for a Cox Thimble-Drome Flight Check-Out Certificate and full details.*

32" Wingspan

Comanche

with performance that matches its beauty!

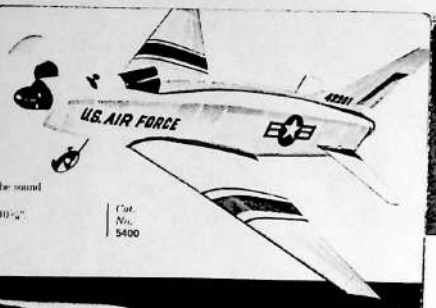
The FIRST plastic plane to be powered by a .15 Class engine. Not for young beginners, but the most exciting gift for an adult or experienced model flyer! Complete big plane detail, accessories, landing gear, insignia!

Cat. No. 5600

4 member Flying Family passenger kit included

Modern Jet Beauty powered with Fabulous Pee Wee .020 Engine

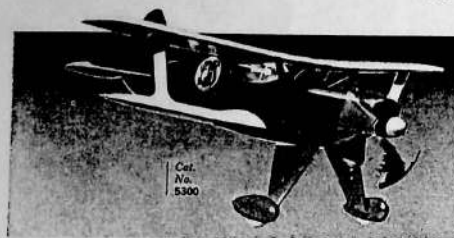
Super Sabre F-100



Sleek scale model of the first plane to break the sound barrier. Official Air Force markings. Top flying thrills at very low cost. Wingspan 10¾".

Cat. No. 5400

"Lil' Stinker"



World's Smallest Engine Powered Biplane! Actually fly it in your own backyard!

Powered with Pee Wee .020 engine for thrilling sport. Wingspan only 10"—but a rough tough flier. Designed from a famous stunt plane.

Cat. No. 5300

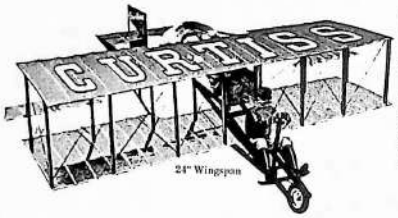
Super Sabre 150

NEW! FLYING CHARACTERISTICS

Newest version of one of the world's largest selling, best performing model planes. The Super Cub 150 has new simple reinforcement, new engine mounting, new color scheme with simulated wing flaps, but same low, low price. Recommended for beginner OR expert. .049 engine.

Wingspan 17¾"

Cat. No. 5200



24" Wingspan

CURTISS PUSHER

1911 VINTAGE

The toughness of this early day "flying machine" amazes the experts, just as its realistic old-time performance fascinates everyone who flies it. A ready-for-assembly all-plastic showcase model, molded in authentic colors, with pilot, powered with Thimble-Drome's easy-starting Babe Bee .049 engine.

Cat. No. 5800

PROP-ROD

THRILLS • SPINS

SPEED • SPORT

Circles at exciting speeds on a tether . . . or free running, it gives you dramatic zigs, zags, spins, spills. Bright red, high impact 12 inch body . . . shiny aluminum wheel discs . . . quick starting Babe Bee .049 engine . . . nylon prop. World's most popular race car!

Cat. No. 900

WATER

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Spray throwing thrills and speed on l beaches. Authentic step hydro desig "chrome" fittings! All plastic. Leng

Cat. No. 5000

LEAD THE WORLD IN PERFORMANCE

T-D CONTEST ENGINES

NEW! FRONT ROTARY ENGINES

... the ultimate in advanced sport performance and value

Tee Dee .020

Cat. No. 160

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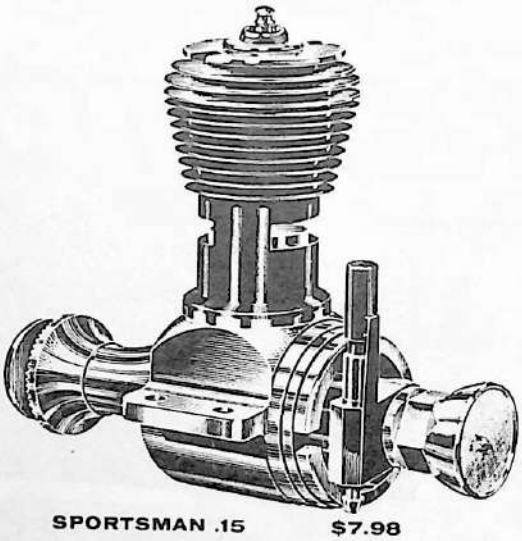

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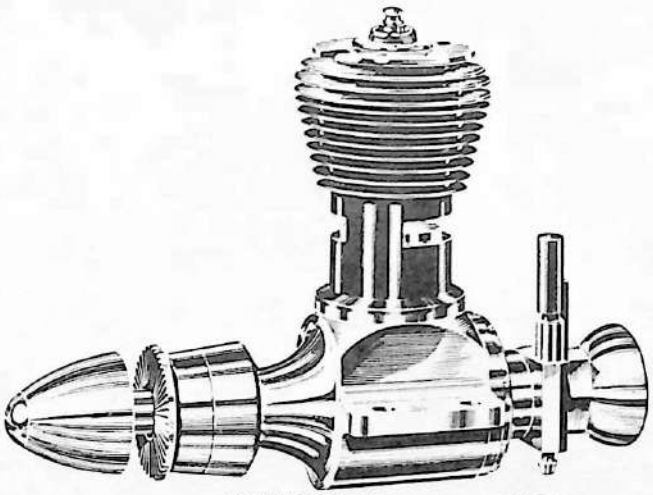

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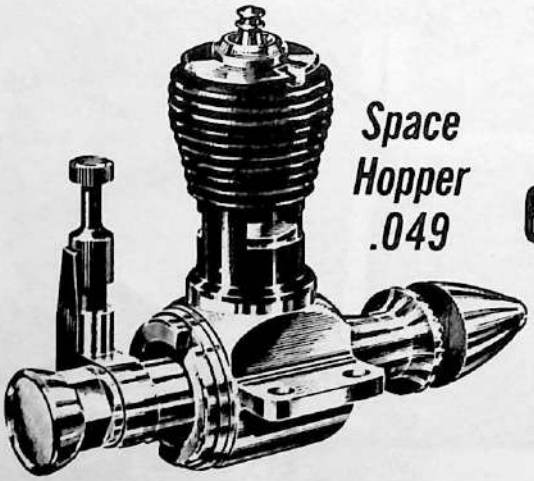

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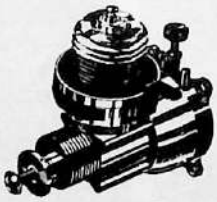

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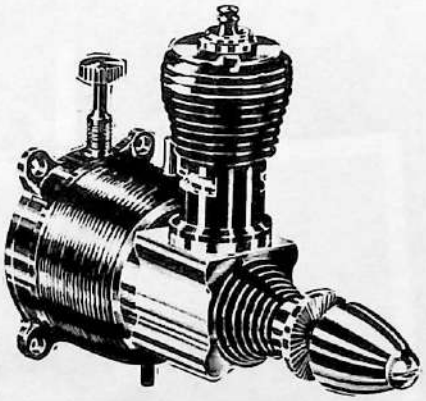

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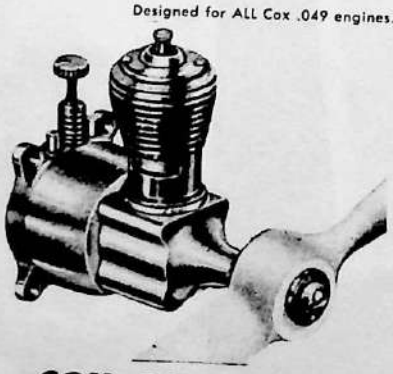
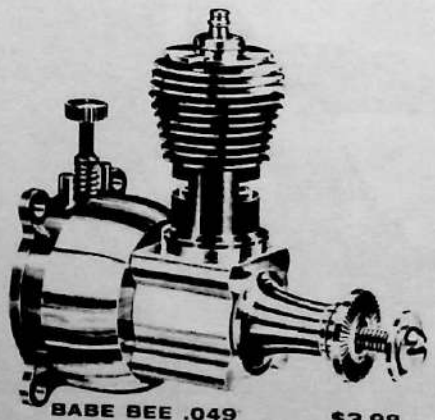
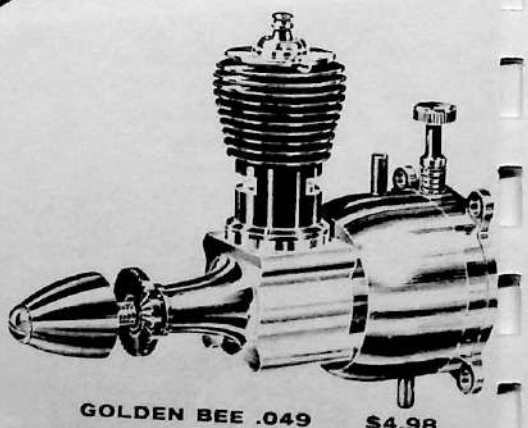


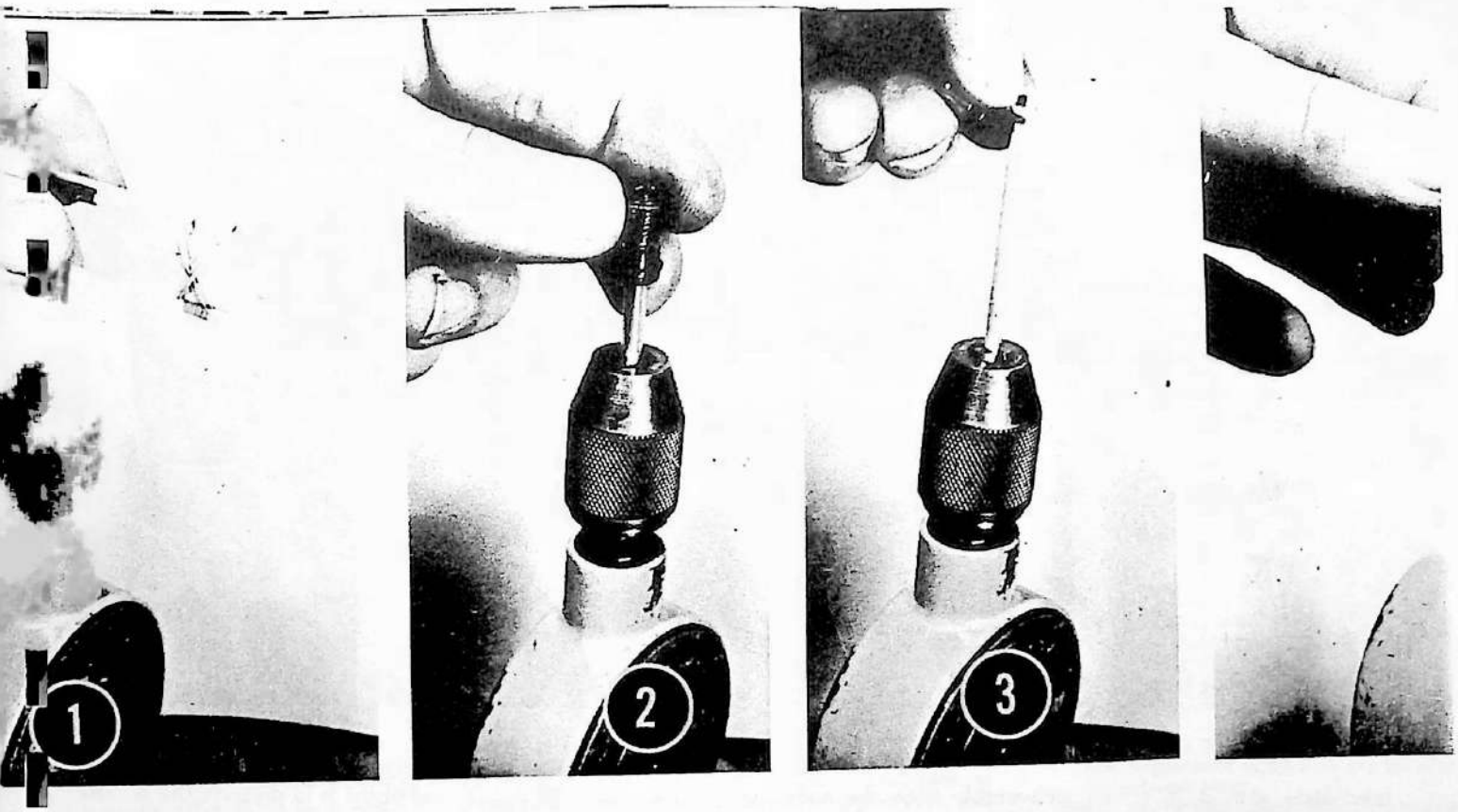
COX .020 cu. in. disp. PEE WEE



BABE BEE .049 $3.98



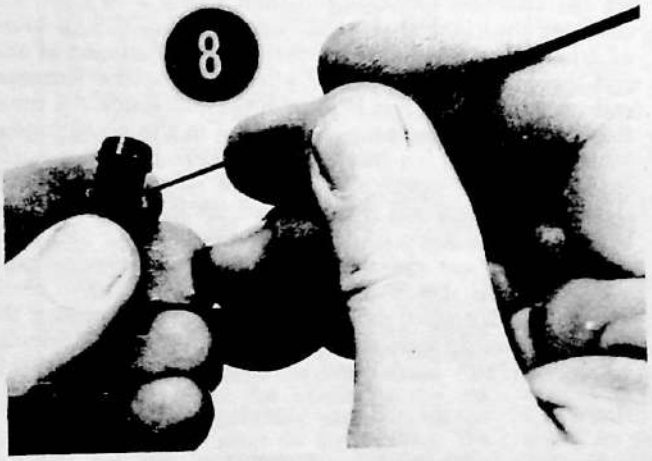
GOLDEN BEE .049 $4.98



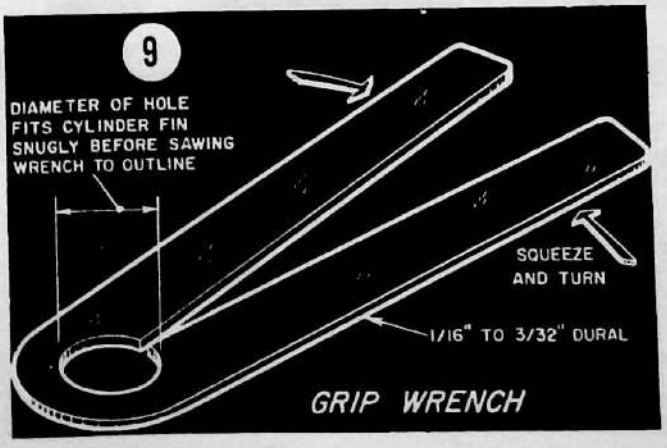
PEE WEE HOP-UP

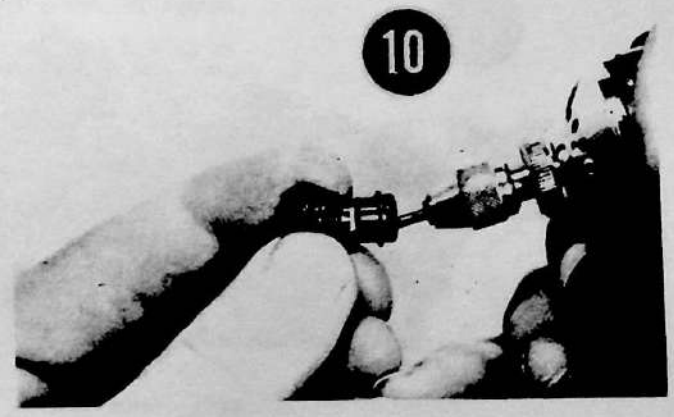
by WARREN H. CURTIS

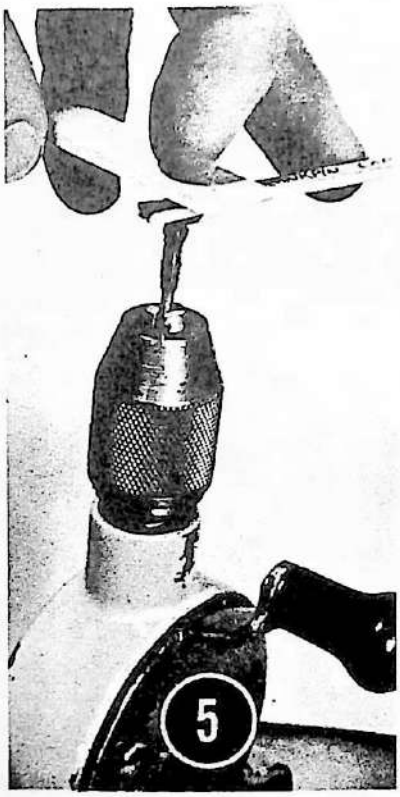
Imagine achieving perfection upon perfection. Manufacturer selected the hottest engine from line and still able to increase rpm with resultant power increase.

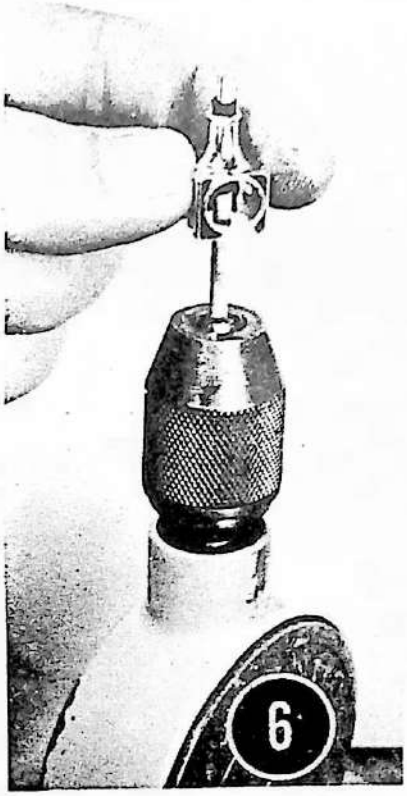


► Because of precision and quality which represent the best that modern methods can produce at a reasonable cost, the Cox .020 Pee Wee becomes an excellent subject for hand finishing and rework. As received, it has fits just tight enough to reach optimum speeds by pre-run lapping and polishing. Wear and friction are reduced to a stable minimum by a controlled process which allows selection of fits and produces bearing surface refinement unobtainable from mass production or from the usual break-in. The









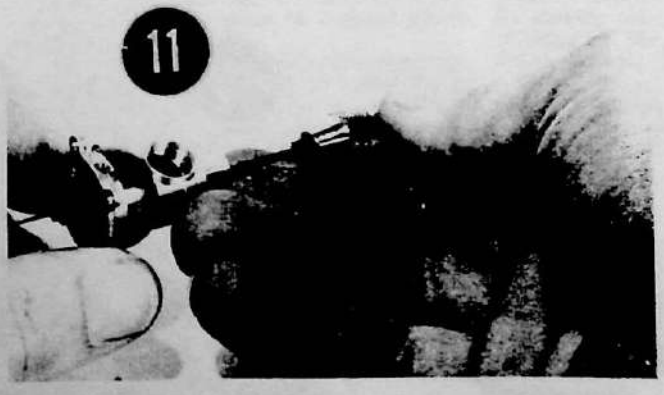
immediate gain is in power deliverable with the added benefits of running consistency and long engine life.

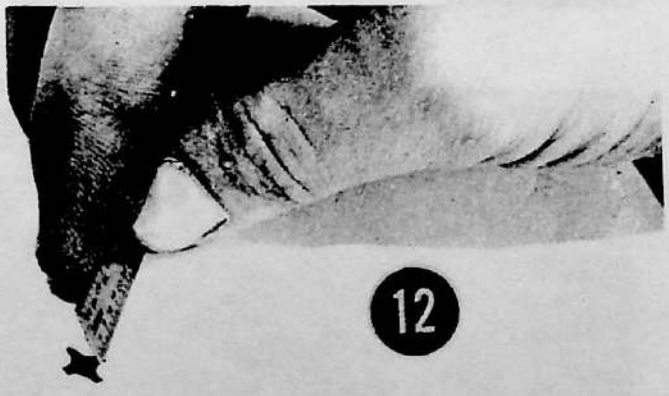
Advantage of power polishing is best utilized by two-bladed propellers of 3½″ to 4½″ dia. Hopped-up version requires smaller propellers, as its port timing and fuel induction are tuned for maximum rpm with a consequent loss of torque at low speeds.

In lieu of a new engine, one having high compression and an unworn main bearing will do nicely. Just be sure that varnish is not giving a false indication of piston/cylinder seal. To be sure, clean the upper bore with a rouge and oil paste on a soft balsa paddle. The paddle should be half the bore in thickness and wide enough to cause a force fit. Piston replacement will usually restore lost compression, for, although harder than the bore wall, it wears faster. This illogical wear, alone, justifies pre-run hand finishing.

The surface of a new piston is produced by very fine grinding. Under strong magnification, sharp peaks are observable. During the first moments of running a new, unpolished engine, these peaks break off and blend with oil. Many lodge in the cylinder wall. As diamond cuts diamond, they now cut the piston. Its diameter is reduced enough to make a potentially hot engine just ordinary. The scored skirt may be of even greater loss. Prime object of the work to be done to the piston is to preserve the dimension Cox has so accurately produced. As the polishing process greatly reduces wear, a long bench run-in may become necessary; on the order of half an hour. Should varnish form during run-in, use the rouge cleaning method. Squeaking of the paddle indicates the presence of varnish. Be sure to clean out all rouge before re-starting the engine.

Only a few simple tools are needed for the polishing. A hand drill in a bench vise is the "lathe." Its slow, gentle action equals that of a watchmakers lathe, if actual results are any criterion. Cut the head from a long 3-48 screw for chucking the crank shaft. A 2″ length of 5/32″ I.D. brass tube is used as a lapping mandrel, slightly flattened at one end the mandrel mounts the piston. Force the flattened end over the rod socket boss with the rod inside the tube. Balsa piston and shaft laps are shown in the photographs. Make a crankpin lap by drilling a 1/16″ hole in a hardwood strip and sawing ½″ past the hole. A ⅛″ dowel, slotted ¾″ at one end is to be used for finishing the main bearing. A fine Arkansas slipstone, crocus cloth, and powdered rouge, are the required abrasives. Make a "grip-wrench" to the sketch—fig. 9. This wrench will avoid much grief from damaged port edges. Use it for removing the cylinder from the case and the glowhead from the cylinder material—1/16″ hard dural (*Continued on page* 47)





Pee Wee Hop-Up

(*Continued from page 27*)

or brass.

POWER POLISHING:

Disassemble your engine completely except for the reed-valve. This will void the guarantee. Don't worry, Mr. Cox has observed the results of this rework favorably. Mix a thick paste of rouge powder and light oil. Mount the piston on the mandrel. Up-end the hand drill in a bench vise. While turning the chucked piston at about two handle rev's per sec., use Arkansas slip stone to work a slight radius on the crown and skirt lips. This is done to prevent bore wall scuffing, port hooking, and to improve wall oiling by creating wipe feed. The radius is not to exceed .055"—or ½ cyl. fin thickness. When radius are complete wipe piston free of stone residue and then polish the lips highly with rouge paste on a balsa scrap. Apply paste to twin-lap of fig. 1 and polish the side of the piston as illustrated. With the lap held motionless and squeezed firmly enough to collapse soft balsa slightly, give the drill handle ½ sec. turns for 45 to 60 sec. As the lap darkens polishing becomes finer, so make this a one-shot operation. The finished surface should show the grind pattern under a hazy polish.

Leaving the piston chucked, wash and dry the cylinder. White gas or cleaning solvent are good washes. Cut, don't sand, a slight bevel on the edges of ¼" sq. strip of soft balsa. Insert through bore and apply paste. Rest the lower fins of the cylinder on a piece of rubber light cord laid on a table. Working this setup like a rolling pin for ten 6 inch strokes will prepare the bore for lapping. Wash the cyl. well and wipe the bore clean with lintless

(*Continued on page 50*)

Pee-Wee Hop-up

(*Continued from page 47*)

tissue. Thin some rouge paste to a free flowing oil, apply generously to piston and bore, then put the cylinder on the piston as in fig. 2. Keep the piston 1/32" below its top stroke height. Rotary lap piston and cyl. for three minutes, working the piston between the 1/32" position and one which uncovers the exhaust ports.

Remove and clean the piston and chuck a pointed dowel in the drill. Referring to fig. 3, polish the rod bearing for three min. per side using paste. Place piston and cylinder in solvent to soak awhile.

Wash and wipe the crankshaft dry. If any roughness can be felt with a fingernail rubbed on the journals, a brief crocus banding is needed. Cut a ¼" strip and pull a loop of it against the shaft which has been chucked on the headless screw. As with the piston polishing, do not work the crocus. Let the shaft do the working. We do not wish to lose the shaft dimension. Wash the shaft and polish it with a new twin-lap and paste—fig. 4. Polish the shaft until only a bare trace of original grind remains.

The crank pin is usually the roughest part of the Pee Wee. For pre-polishing a rough pin, make a special lap with a 3/32" hole. Loop a ⅛" strip of crocus in this hole and out the saw slot. Wash well after this work is done and finish with a similar lap and paste—fig. 5. The final lap has a 1/16" hole. Hold the lap down with a wiping block while the lap strokes one finger freely.

Slit a ⅛" dowel ¾" into one end. Catch a ⅛" fold on a ¾" crocus band in the slot. Cut the band as it starts to lap itself when wrapped around the dowel. Chuck in drill after working into main bearing. Fig. 6. Polish out the bearing for two to three minutes. Lay a piece of 400 paper on a sheet of glass. Press the case back surface squarely on the paper and twist it three turns to remove burrs and tool marks. Do the same with the cylinder seat, but give only one turn. Wash the case well, scrubbing with a brush to remove all abrasive dust. Assemble case, piston, and cylinder, as in fig. 7. Apply oily polish to shaft, piston, bore, crankpin, and rod socket. Stroke-lap at fast speed for three minutes. Using a bulb syringe, wash rod socket thoroughly, and clean all engine parts, including tank, reed and tank backplate. Check fuel passages for clear openings. Oil all parts and assemble engine for running.

Obtain some Hoppe's #9 Nitro powder solvent from any gun shop. Add one to two capfulls to a pint of fuel. Run engine rich until it is hot. Then lean out to peak. If it fades, back out to rich setting and hold until engine starts to pick up speed. This cautious touching of the peak keeps varnish formation down and prevents overheating. Straight Hoppe's in the ports will free a seizure if one occurs from an extended peak run.

The effectiveness of a good polishing job will be noted by the absence of a dark cast of exhaust oil on the initial run. The work so far amounts to a mild hop-up. A "full house" job entails more work of a very exacting nature. If you would like to turn Coxes 3 blade nylon "Sabre" prop at 22,000 or better, the following rework will pay off.

High rpm Hop-up—supplements power polishing; includes all steps of polishing process.

Starting with the cylinder before any polishing is done, its port timing is to be advanced. Have a watchmaker get you a #6-cut pointed round file, and one half-round of the same cut. They are called escapement files. Bevel the top of the exhaust ports inward and upward to open 1/100" earlier. A cyl. fin is 1/100" thick. Use the round file for cutting and the half-round for finishing. Crocus band the filed edges without touching the bore. Fig. 8 shows the filing in progress.

Obtain a 3/32" dia. Mounted Dental Point from a dentist. Run it with a hand grinder which has a minimum of shaft end play. While preserving its form, grind the top of the bypass recesses a bit less than 1/100" higher, .077"-.008". An alternate advance is had by cutting .005" higher and levelling off the top. Guard the ridge between bypass ways and exhaust ports with extreme care. These four ridges are base pressure seals. Dull the newly cut bypass lips with crocus. Fig. 10 shows the bypass grinding. Find a spare piston that is a bit smaller in diameter than your good one. Using watchmakers oilstone powder (fine grade) in plenty of oil, lap the port area only, to remove any grinding or filing burrs. Wash the cylinder thoroughly and polish it and the piston as in figs. 1 & 2. Be sure to radius the piston lips. We are thinking of the good piston, of course. Polish rod hole (fig. 3.)

Polish shaft, pin, and case bearing as figs. 4, 5, 6. This time open the case bearing enough to give a .0015" to .002" play. A 1/16" strip of airmail paper is a good gage. The shaft should enter snugly without tearing the strip. Clean parts and assemble for stroke lapping of fig. 7.

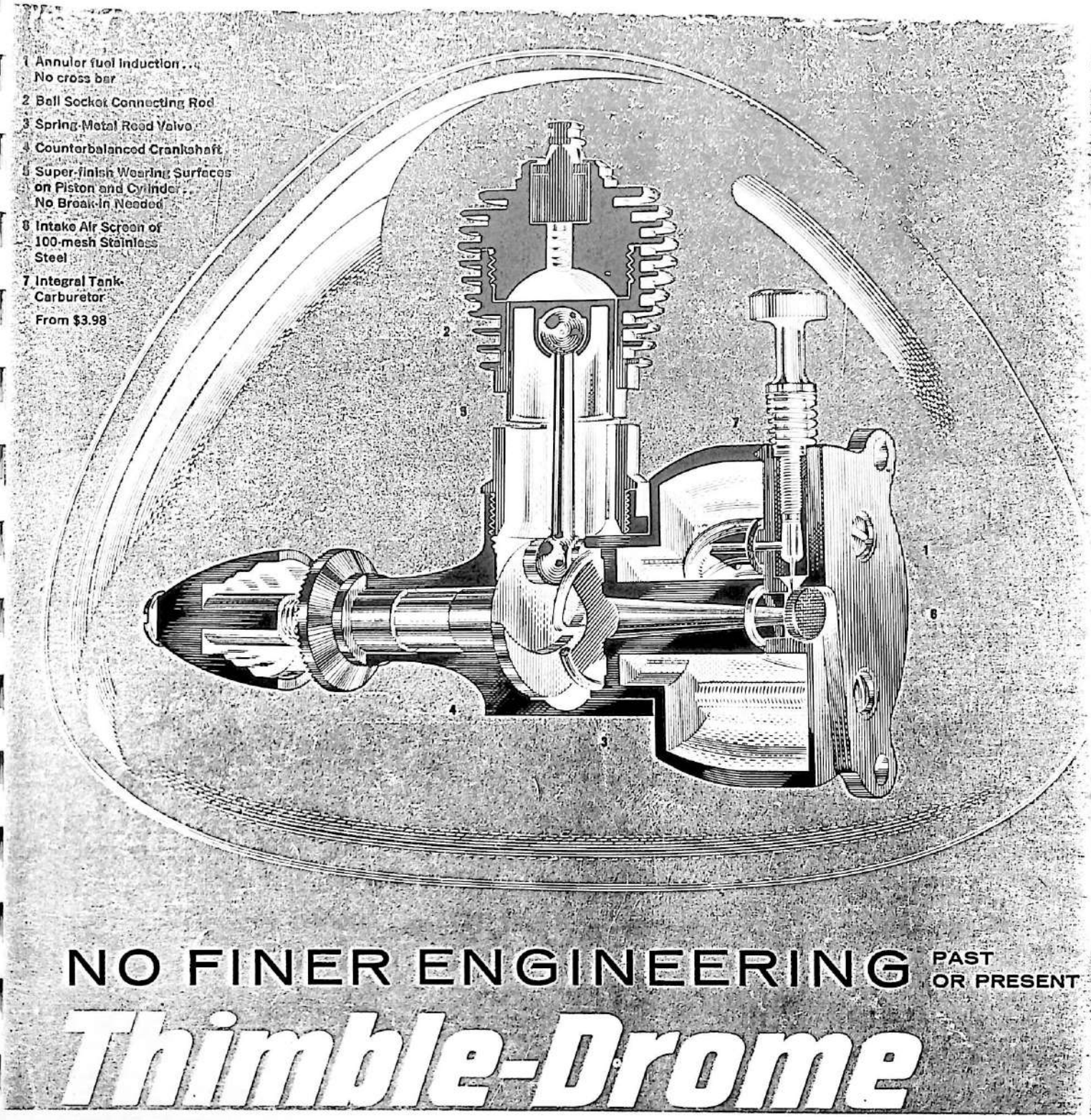
After stroke lapping, clean and assemble the case and tank without the reed. Run a tapered jewelers broach or a #55 drill through the venturi throat as in fig. 11. To open it to .052". If the drill is used, dull its flute corners so it will not run oversize. Otherwise, cut with the broach and use the drill as a gage. Fair the backplate air inlet into the throat, making a smooth bell-mouth that breaks right at the fuel orifice. Burr the edges of this orifice with crocus cloth. Separate tank and back to do this.

In fig. 12, ears are being bent forward at the corners of the reed petals; one ear to a petal. Bend up just enough to take up the play between the reed seat and the retaining ring. Press with scale or similar tool as reed is resting on paper cushion. This modification pitches the reed frequency to a higher level than will be realized during any high speed run. Early in our experimentation, surging was noted at high rpm. It was reasoned that a free reed pulsed as a function of piston stroking at low speeds. But at high speeds, rpm became a function of play-dampened reed pulsing. Changing to a sprung reed both stopped the surging and gave higher rpm. Opening of the venturi became necessary due to snappier reed action as well as to cylinder porting. A summary of the hop-up features might be helpful.

- General polishing to reduce friction.
- Precise lapping to obtain optimum fits.
- Free crankshaft clearance to reduce oil-shear drag.
- Radiussing of piston lips to promote wall oiling, reduce scuffing, prevent port hooking.
- Port advance to increase fuel induction and implement expanding gas velocity for exhaust assist.
- Reed conversion from free to spring closing.
- Enlarged venturi throat to support greater fuel volume.

As one added feature, oil grooving the piston at the socket boss height has been advantageous. While permitting a looser fit, it retains head sealing at high speeds. This is a lathe operation and so, is optional. Cut with a carbide dental burr used as a scraper, the groove must have polished edges that fair smoothly into the piston surface.

Run the hopped-up engine as advised for the simpler polished one. Give it sufficient bench time to work up to a stable peak, and then fly it with smaller than average propellers.



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Thimble-Drome

A cutaway illustration tells only half the story of Thimble-Drome engineering. The other half is written every year, as it was again this July, at the Nationals!

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Every part of your Thimble-Drome reflects the skill of a specialist... developed through years of experience. No other engine – full scale or model – is produced to such high standards of precision and quality control. No guild craftsman of the past ever worked to such painstaking accuracy!

Built for craftsmen of the model skies, Thimble-Drome engines are carrying the model sport to new heights – throughout the world. If it cost you a hundred dollars, you couldn't buy a finer engine!

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M.A.N. Nov. 60

Cox Tee-Dee

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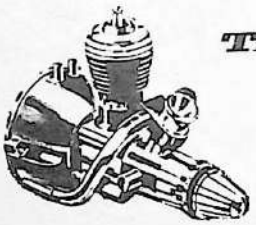
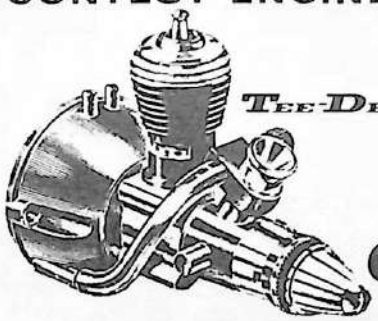
Box 476. Santa Ana. California

FRONT ROTARY VALVE CONTEST ENGINES



TEE-DEE .010

LIST 7.98



TEE-DEE .020

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TEE-DEE .049

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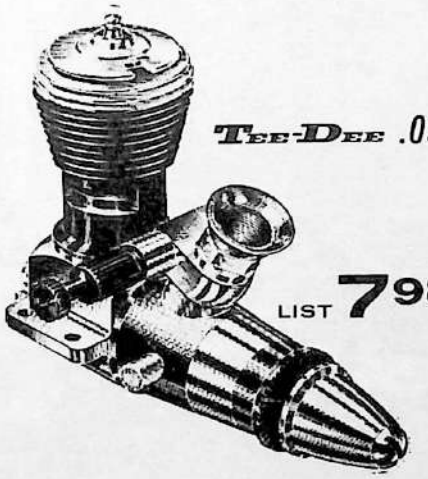

TEE-DEE .051

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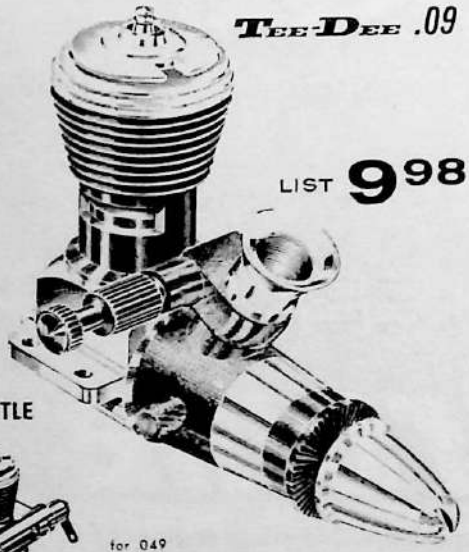

TEE-DEE .09

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COX SPECIAL .15

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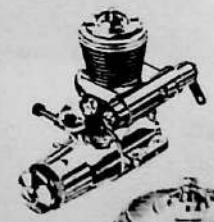
$2.50

THROTTLE

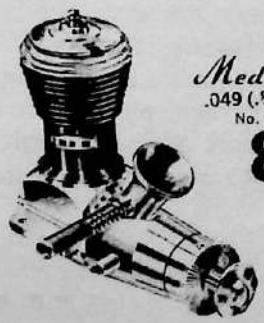


for .049
for .09
for .15

THE MEDALLIONS

Medallion
15 (2.499cc)
No. 220
12.98

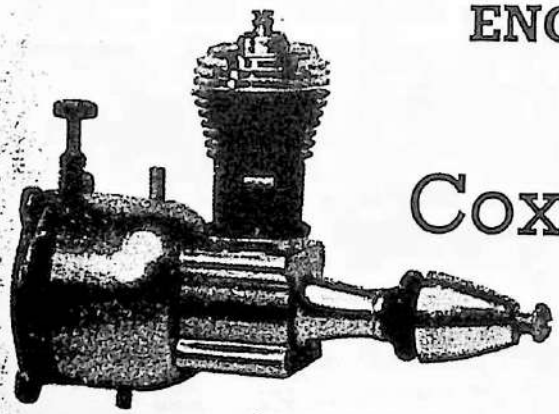
Medallion
.09 (1.497cc)
No. 230
10.98



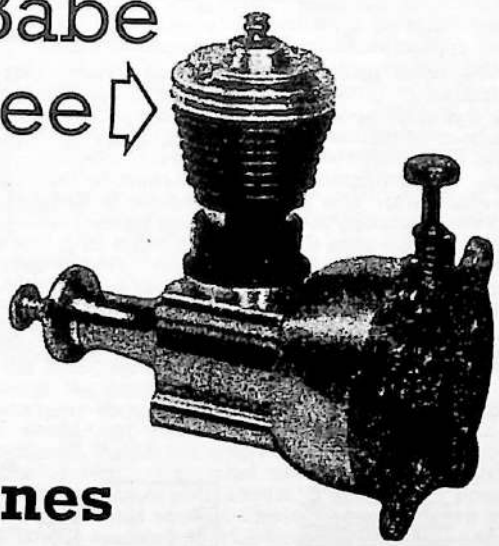
Medallion
.049 (.819cc)
No. 240
8.98

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 either 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 "unglamorised" 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 backplate 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 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 backplate. The crankcase is machined from extruded section light alloy, the cylinder

SPECIFICATION

Displacement: ·81 c.c. (·0494 cu. in.)
Bore: ·4057 in.
Stroke: ·382 in.
Bare weight:
Babe Bee—1¼ ounces
Golden Bee—1⅛ ounces
Max. Power:
Babe Bee—
·056 B.H.P. at 13,000 r.p.m.
Golden Bee—
·0625 B.H.P. at 14,000 r.p.m.
Power rating:
Babe Bee—·069 B.H.P. per c.c.
Golden Bee—·077 B.H.P. per c.c.
Power/Weight ratio:
Babe Bee—·032 B.H.P. per ounce
Golden Bee—·033 B.H.P. per ounce
Material specification
Crankcase: Machined from extruded section light alloy
Cylinder: Mild steel, black finish
Piston: Hardened steel
Connecting Rod: Hardened steel
Crankshaft: Hardened steel
Cylinder Head: Turned dural
Main Bearing: Plain
Induction: Reed valve
Tank: Turned dural
Tank Backplate: Light alloy pressure die casting
Finish:
Babe Bee—Bright (tumbled) crankcase, plain metal tank
Golden Bee—"Gold" anodised crankcase and tank
Manufacturers
L. M. Cox Manufacturing Co., Santa Ana, California, U.S.A.
British Agent
A. A. Hales, 26 Station Close, Potters Bar, Middlesex
Retail Prices in G.B.
Babe Bee 42/6 Golden Bee 73/3

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.

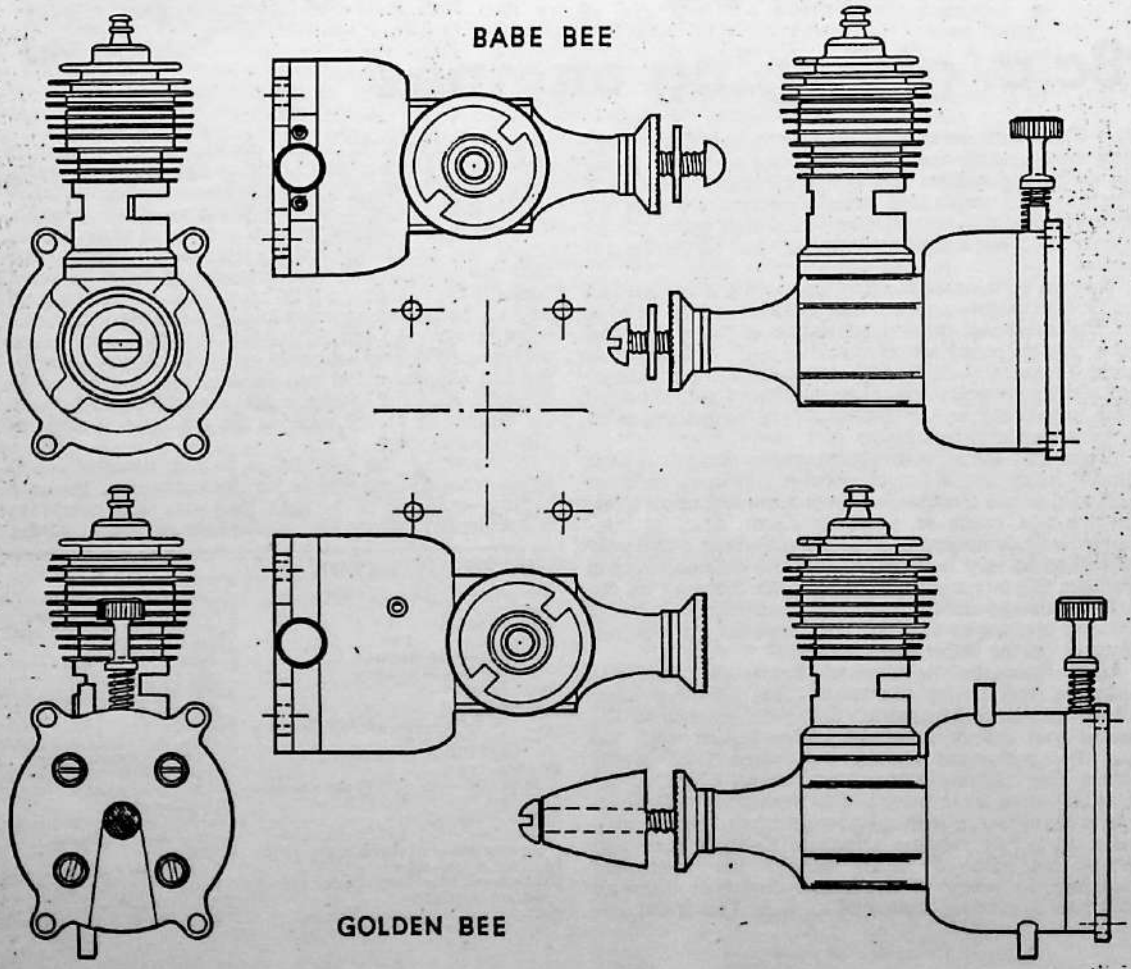
The head, incorporating an integral glow plug, is machined from light alloy and screws into the top of the cylinder, seating on a copper gasket, threaded diameter of the head being appreciably greater than the bore (hence the "step" in the cylinder side-view at the top). The combustion chamber formed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

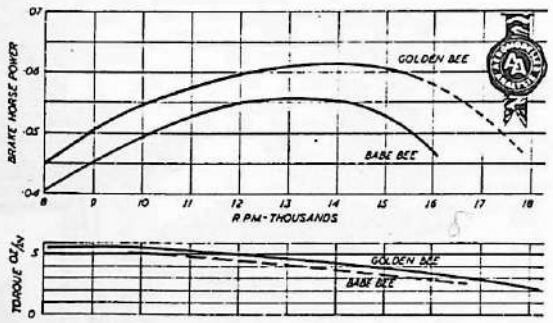
The piston is purely cylindrical in shape, thin walled and machined with a spigot to take the connecting rod

Propeller—R.P.M. Figures

Propeller	*dia. x pitch*	*r.p.m.*
COX GOLDEN BEE		
Keilkraft nylon	7 x 4	9,500
	7 x 6	7,600
	6 x 4	12,200
	6 x 3	14,300
	5½ x 4	14,300
	5 x 4	16,000
	5 x 3	17,500 - 18,000
Top Flite	6 x 4	13,400
	7 x 4	9,500
	6 x 3	15,200
	5½ x 4	15,200
	5½ x 3	16,200
Stant	6 x 4	11,000
	7 x 4	9,800
	8 x 4	8,000
Davies Charlton	5½ x 3½	17,600
	6 x 4	14,800
Frog nylon	6 x 4	14,000
	7 x 4	10,000
COX BABE BEE		
Keilkraft nylon	5 x 3	16,200
	5 x 4	14,800
Top Flite	7 x 4	9,000
	6 x 4	13,000
	6 x 3	14,400
	5½ x 4	14,500
	5½ x 3	15,700

Fuel used Keilkraft Record Nitrex.





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 either 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-fitted the light alloy propeller driver. The propeller shaft is formed by a ·120in. 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 backplate casting carries a down tube into which accommodates the needle valve, opening into a central hole. This mates with a tapered central passage in the tank itself, together forming the actual venturi. The front end of the tank is a plug fit 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 stub "tee" on the down tube, integral with the tank backplate, to which is fitted a length of plastic tube 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 tank 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 starting 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 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 flat 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 fit a spring starter, as is done on these engines when fitted 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.

Rubber Rules

DEAR SIR,

I read with interest John O'Donnell's article in the March issue and would like to add the following comments.

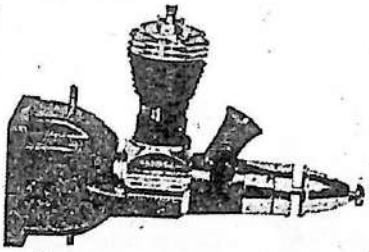
I am against all contests in any class being held to restricted rules, believing that the efforts put into the unrestricted model's development produce ideas of great value, but agree that a fairly large percentage of contests could well be restricted. It is not uncommon to find an "unrestricted" competition being held on a field far too small to accommodate it. At present the number of contests for restricted (i.e. Wakefield) rubber models is too small for the average modeller to be very interested and the answer is, I feel, to have a less rigidly restricted class with more contests using it (e.g. the Flight Cup). This brings me to the question of the restrictions themselves. The carrying of ballast equal to rubber weight is a sound suggestion and I believe an improvement can be made by further restricting the rubber weight to be not more than one-quarter of total weight. I think this scheme has the following points in its favour:

1. Processing is limited to 2 checks on balance with equal arms.
2. The smaller model will be able to hold its own, while not being especially favoured.
3. Structure weight will be sufficient to enable most contest modellers to build an efficient model in this class.
4. Structure weight will be low enough to allow scope for careful and ingenious building.
5. "Unrestricted" models can be used in this class by adding a small amount of "non-disposable" ballast, which should be stowed internally (external storage of "disposable" ballast being allowed).

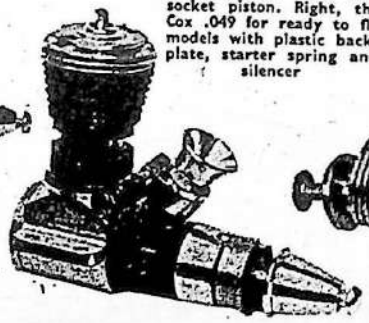
E. ECKFORD.

Nottingham,
Notts.

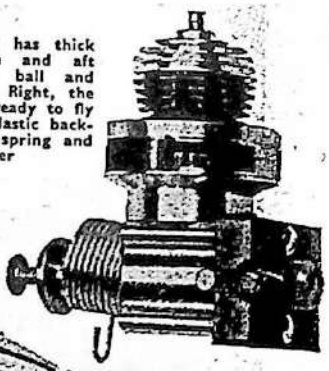
Left: Cox Special 15, on our tests, 700 r.p.m. faster than any other engine on straight fuel with 8 x 4 prop. Note sideways exhaust with new piston assy: using wrist pin



Above: New Cox tank mount in plastic with Medallion .049 showing spraybar in plastic moulded intake. Tank ideal for F/F, R/C or C/L



Left: Cox .09 has thick cylinder, fore and aft exhaust, and ball and socket piston. Right, the Cox .049 for ready to fly models with plastic back-plate, starter spring and silencer



Aeromodeller April 1962

(E) PRESSURIZING

Pressurizing is very critical when taken directly off the crankcase. On this engine pressurizing means have been provided and the rotary valve controls the pressure to normal operating limits. To rig up for pressure the crankshaft must be removed. The hose connector on the side of the carburetor body is located exactly over the spot where the pressure is taken off. The metal parts are not drilled however, and a drill of the correct size to fit the hose connector or slightly smaller must be used to continue this hole through the metal parts. The burr must then be carefully removed from the interior of the bearing and the engine reassembled. The hose connector is then connected to the tank with a piece of plastic fuel tubing.

With pressure, the venturi may be opened to 1/16" on the .010 or 3/32" on the .020 engine to attain maximum power although the gain is very little.

(F) TO REMOVE CARBURETOR BODY FROM AN ENGINE:

1. Remove backplate, cylinder, and piston-rod assembly.
2. Remove spinner and engage prop screw approximately 3 or 4 threads in crankshaft.
3. With rear of crankcase on a hard smooth surface, tap prop screw with hammer until thrust washer disengages from crankshaft.
4. Unscrew carburetor retaining nut and slip carburetor body off.
5. To re-assemble engine, reverse above procedure. To re-press thrust washer onto crankshaft, put thrust washer face down on a smooth flat surface. Obtain a short length of wood dowel of a size that will fit into the intake hole of crankshaft. Tap dowel with hammer until thrust washer is fully seated on crankshaft.

SPECIFICATIONS

	TEE DEE .010	TEE DEE .020
Weight	.49 oz.	.85 oz.
Bore	.237"	.300"
Stroke	.226"	.282"
Displacement	.00997 Cu. In. .163 cc	.0199 Cu. In. .3266 cc
Overall Height	1-17/32"	1-13/16"
Overall Length	1 ½"	1 ⅞"
Width	1-1/16"	1 ⅛"

SPEEDS

The following speeds are typical of engines selected at random and run under average conditions:

TEE DEE .010		TEE DEE .020	
Prop Size	RPM	Prop Size	RPM
3" Dia. x 1 ¼ P	27,500	3 ⅛" Dia. x 2 ½ P (3-blade)	22,750
		4" Dia. x 2 ½ P	19,500

WARRANTY

The engine is guaranteed against defects in materials and workmanship for 30 days from date of purchase. Glow plugs are never guaranteed because of their delicate nature. No other guarantee is made or implied. If engine is returned to the factory within warranty, include 50c to cover cost of handling and return postage.

Do not take engine back to your dealer.

FACTORY REPAIR SERVICE

Minor repairs, examinations, or adjustments — $2.50 plus parts. Complete overhaul (guaranteed new engine performance) — $8.00, including parts. On all C.O.D. shipments, purchaser pays postage and C.O.D. fees.

PARTS ORDERS

Purchase parts from your dealer. If not available, order direct from factory. No C.O.D.'s please. Send remittance with your order. On orders less than $2.00 add 35c handling charge. California residents, enclose applicable state sales tax.

Prices and design of parts subject to change without notice.

PARTS LIST

PART	TEE DEE .010 Cat. No.	TEE DEE .010 List Price	TEE DEE .020 Cat. No.	TEE DEE .020 List Price
Glow Head & Gasket	1302	1.40	1032	1.10
Needle Valve & Spring	1309	1.00	1609	1.00
Prop Spinner & Screw	1319	.90	1618	.75
Carburetor Body	1324	.75	1624	1.00
Cylinder, Piston & Rod	1375	4.75	1675	4.00
Crankcase, Crankshaft, Carburetor Body, Retainer Nut and Drive Plate	1379	5.50	1679	6.50
Needle Valve Body & Venturi	1389	2.75	1689	2.75
Fuel Tank, Engine Mount & Screw Set	1398	1.75	1698	1.75

Order Parts by Catalog Number

L. M. COX MANUFACTURING CO., INC.
a subsidiary of LEISURE DYNAMICS, INC.
1505 East Warner Avenue, Santa Ana, Calif. 92705
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CARE AND OPERATION OF YOUR

TEE DEE .020 & .010 ENGINES

THESE ENGINES ARE HIGHLY PRECISE CONTEST-TYPE ENGINES

Keep your engine immaculately clean, use Cox Racing Fuel or glow fuel and it will maintain its winning characteristics for a long period of time.

This engine is precisely fitted at the factory for immediate, easy starting and immediate flight. A break-in period in the ordinary sense is not necessary for flight, in fact, a slow, easy break-in is not desirable. Most of these engines will develop full power within one minute of running time; but a few, those which are slightly on the tight side, may not develop full power under one hour. Even these will develop sufficient power for average flying almost immediately. The only break-in required is very rich (slow) running the first 60 seconds after starting the first time. After 60 seconds it should be ready to go.

Elimination of break-in is not attained through loose or sloppy fitting, but through very precise fitting, together with super fine wearing surfaces.

Remember—your Tee Dee Engine is much happier at high speeds. Let it wind up. Do not use oversize props.

If a special tank is used, the tank which is mounted on the engine may be by-passed and used for mounting only; or it may be removed and the smaller, close-up mounting plate which is also furnished, may be used.

(A) PREPARATION FOR RUNNING

1. Mount the engine in the plane, or if you want to give it some running first, mount it on a suitable mount. Do not hold the engine directly in a vise. Use the appropriate template from either Fig. 2 or Fig. 3 to drill mounting holes.

2. Place propeller on the shaft with the flat side of the blades toward the engine, and lock securely with the propeller screw.

3. Procure a 1½ volt dry cell battery, #6 or equivalent, and connect it with 2 flexible insulated wires to the glow plug clip as shown in the diagram A and B—Fig. 1. Do not use a stronger battery. If you do, the plug will burn out. The connections should be soldered to insure good contact, and taped to prevent the bare ends of the wires from touching and "shorting" the battery. Be sure the battery is a good one. Your hobby dealer sells batteries and glow plug clips. The Cox plastic mounted glow plug clip (Cat. No. 755-6) with wires already attached is recommended, and requires no soldering.

4. Balance and trim the propeller. This is essential for contest performance. Sand off any bead of plastic along the edges of the blades. Fit a drill or shaft through the hole, and rest the shaft on razor blades set in a wooden block as shown in C—Fig. 1. Sand the heavy blade until the propeller will balance in a horizontal position. Care must be taken to do the sanding without spoiling the airfoil characteristics of the propeller blades.

(B) STARTING THE TEE DEE ENGINES

No matter how expert you are with small engines you will have better luck with these engines if you follow directions exactly as listed and do each operation in just the order given.

1. Close the carburetor needle valve B—Fig. 2 or 3, by turning it clockwise until it stops. Do not force it.

2. Fill the fuel tank with Cox fuel.

3. Open the needle valve (counter clockwise) exactly 5 full turns.

4. Put your finger over the air intake and pull the prop through compression until the fuel line is full. Use a clear plastic fuel line so this can be checked visually. If the tank is mounted so the fuel level is higher than the carburetor the hose will fill itself when the needle valve is opened.

5. Connect the battery by snapping the clip on the glow plug. B—Fig. 1.

6. Engage the spring starter and pull the prop around one turn only. Stop so that the exhaust ports are open for the .020 and closed for the .010

7. Squirt a few drops of fuel into the exhaust port and immediately release the prop. With the .010 close the exhaust ports to prime. The fuel that will gather at the port will run in as the port opens and is sufficient for priming. Release the prop by sliding your finger off the end of the blade and away so your finger is out of range of the spinning propeller as the engine will start instantly when released, if primed with the right amount of fuel.

8. When the engine starts it will be running very rich and slow. The first time the engine is started let it continue to run rich for a period of 60 seconds. After approximately 60 seconds, slowly close the needle valve clockwise to the best running position and remove the battery connection. Subsequent starts may be adjusted to best running position immediately.

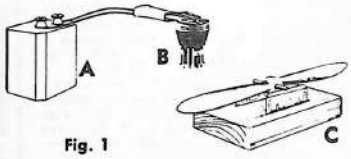


Fig. 1

FULL SCALE VIEWS OF THE TEE DEE .010
FOR INSTALLATION INFORMATION

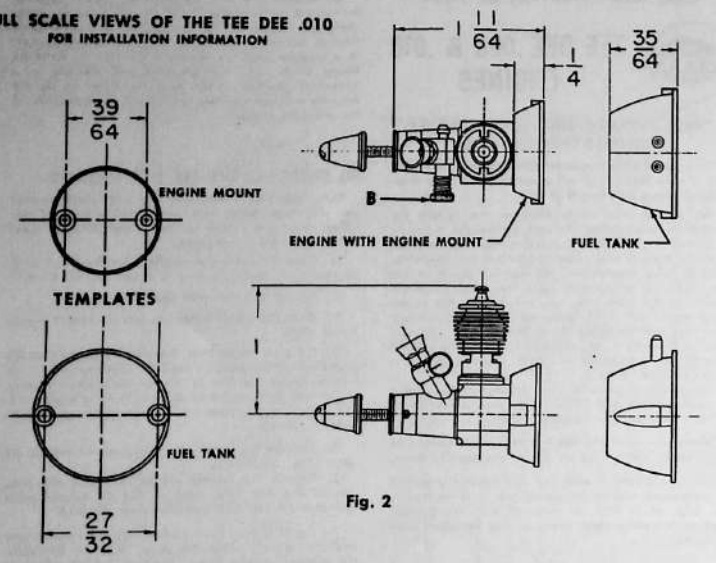


Fig. 2

FULL SCALE VIEWS OF THE TEE DEE .020
FOR INSTALLATION INFORMATION

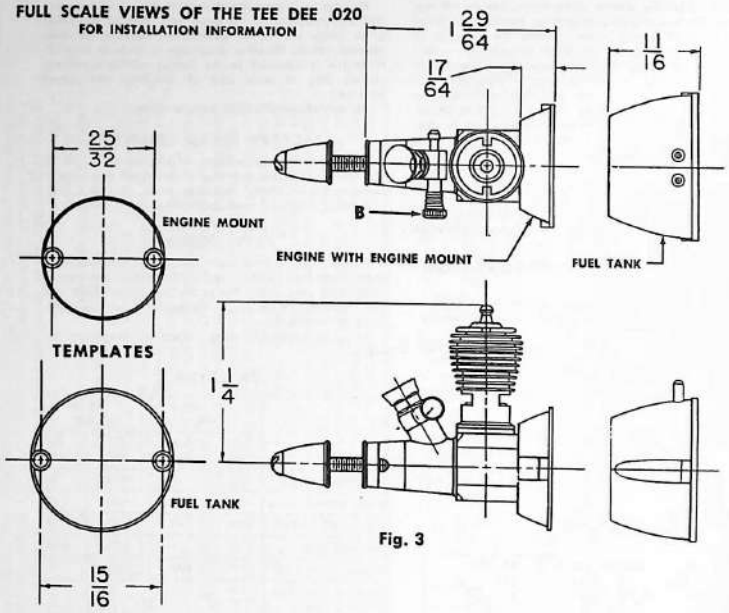


Fig. 3

9. If starting is delayed for any reason, close needle valve otherwise engine will become flooded.

(C) FAILURE TO START

1. If the engine coughs and spits a bit of fuel spray from the exhaust, it is too rich. Close the needle valve and continue cranking with the spring starter until the engine starts briefly. Open the needle valve again and engage the spring starter. The engine should start instantly.

2. If it starts up with lots of power and dies immediately it is too lean. Open the needle valve a half turn, prime the engine, and crank it over again. If the trouble persists and if the engine hasn't been run for some time it is also possible that thick castor oil is clogging the jets. Choking, as in Par. 4, Sect. B, will clear this.

3. If the engine still persists in the above action it is possible the carburetor jets are stopped up. Remove the venturi nut and needle valve body. Three tiny jet holes will be found in the groove around the venturi tube. Clean these jet holes with a piece of fine wire. Re-assemble and the engine should run.

4. If the engine refuses to fire at all, screw the glow head off and connect it to the clip. If the little coil inside does not get red hot, it is either burnt out or the battery is dead, or the connections are made incorrectly. Replace the battery or the head or correct the connection. Glow heads are **never** guaranteed. Do not return the engine to the factory for a burnt out glow head because the cost to you will be excessive. Buy one from your dealer.

5. If you are not using Thimble-Drome fuel, try it. **Never use gasoline or gasoline type fuels.**

(D) OPERATING TIPS AND ENGINE CARE

WARNING—If the engine is taken apart and then reassembled, be very careful not to overtighten the parts that screw together. This is particularly true in the case of the .010 engine. Overtightening the cylinder or head, will force the cylinder out of round, and cause the engine to bind. Clearances and tolerances are so fantastically small that the slightest distortion will render the engine inoperative. So remember—snug parts up very lightly!

1. The glow plug is built right into the head in one unit. When the plug burns out, just replace the entire head at the regular glow plug price.

2. After the last run, oil the engine with a light oil (SAE 10 is good) and wrap it with cloth, or otherwise protect it from dust and dirt.

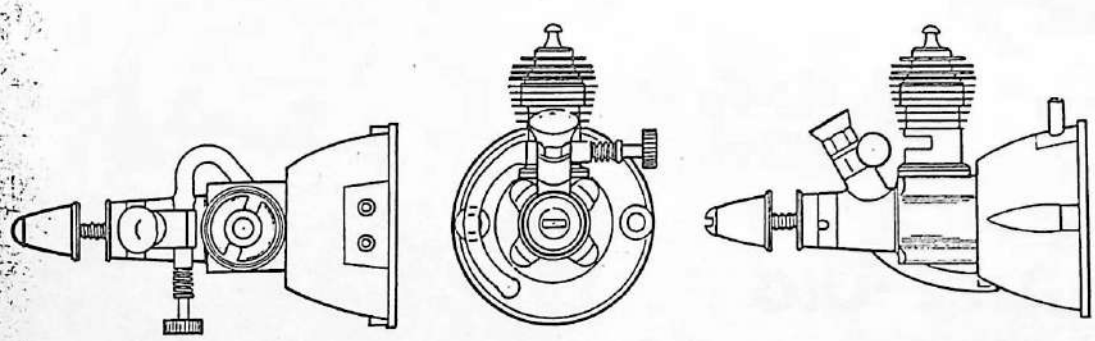
3. If the engine gets dirt on it through crack-up, or otherwise, do not run it until it is thoroughly cleaned. **Take it apart,** wash it, oil it, and reassemble.

4. If the engine gets tight it is not frozen up. Do not send to factory. A new engine will sometimes tighten up a few times, especially after slow runs. This is more likely to happen and will occur more often to an engine that is properly fitted and has properly smooth wearing surfaces. Do not run it tight. This is caused by a shellac-like deposit on the cylinder wall. Screw the head off. **Remove the cylinder** and scour the inside wall very lightly with a bit of fine or medium steel wool. Wash, oil, and replace. The engine will then turn over freely and run properly. **Never** use sand-paper, emery cloth, or abrasives of any kind, or scrapers. Such methods will ruin the cylinder. Steel wool will not harm the bore.

5. Certain kinds of weather, especially warm humid (sticky) weather will cause excessive shellacking in a new cylinder. There is no known way to eliminate this nuisance and the smoother the fit the more susceptible is the engine to this trouble.

6. Do not tighten the head too firmly. Set it up very lightly. Allow the engine to cool before removing head so it will loosen easier. Too much pressure against the exhaust ports to hold the cylinder from turning may force the cylinder out of round or even turn a burr into the bore. A new cylinder is usually required to remedy such damage.

7. To remove the glow head from a hot engine—pour a little fuel slowly over the glow head to reduce the head temperature. Do not run it over the cylinder. The head will then release easily. A hot head will stick, and forced removal may damage the cylinder.



THE TEE-DEE .01 was the first of the new Cox front rotary series which we have had the pleasure of handling and testing and without qualification we rate it as the finest example of precision-miniature production engineering we have seen. Pro-British as we may be, this is a job which only Cox could have done so well and we freely admit that no British manufacturer could begin to compete on such lines. Apart from the considerable difference in the commercial market—the Americans have about ten times the sales potential with their greater population and higher average income—we just have not got the equipment or "know how" in this country to tackle such a sub-miniaturised job so successfully.

The Tee-Dee .01 is worth the money just to look at and handle, outstandingly attractive in appearance and presentation and equally admirable as an example of engineering skill. The Tee-Dee design—and this will, no doubt, apply throughout the rest of the series—has the same impact on the model engine world as did the Arden when it first appeared—a design and production in a class apart.

The Tee-Dee .01 is, of course, really a "toy" with a primary appeal because of its novelty value in matching tiny model sizes. It is not the smallest commercial motor that has been produced, nor the lightest, but whereas its sub-miniature predecessors have been "marginal" in power output—and often tricky to start and handle—the Tee-Dee retains ample "full size" model engine characteristics and develops plenty of power in proportion to its size. It is the only *sub*-miniature motor which has yet been produced which will fly a stunt control line model, for example, and give a genuine aerobatic performance. Many motors four times the capacity of the Tee-Dee leave much to be desired in this respect.

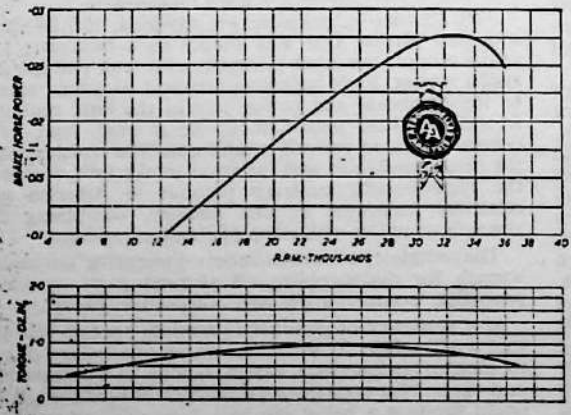
On the performance side the most outstanding characteristic of the Tee-Dee is its extremely high operating speed, and also the considerable range of speeds over which it can be run. The extremely efficient moulded plastic propeller supplied by the engine is 3 inches diameter by 1¼ inch pitch with wide blades, which it turns at 27,000 r.p.m. to develop a very appreciable thrust. It will also drive larger size propellers right up to 6 x 3 sizes, but not with the same verve. Starting remains easy, but the engine is definitely struggling on a 6 x 3 or 5 x 4 and revs quite obviously pulled right down. Thrust is also decreased, and in view of the characteristics of the torque curve there is no point in trying to operate the engine on larger propellers. It develops maximum *torque* somewhere around 24,000 r.p.m. and maximum power output at approximately 32,000 r.p.m.

Since the torque generated is only of the order of one ounce-inch, testing an engine of this size sets particular problems as conventional equipment is not sensitive enough or accurate enough to measure the small difference involved. Even speed measurement is difficult, without further special equipment, since the "normal" r.p.m. operating range for the Tee-Dee is well above the maximum available on the stroboscope. Nor can a reed tachometer be used to check the order of stroboscope readings. Apart from the fact that the reed tach. scale does not extend up to anything like the speed range covered, there is just not enough vibration most times to energise the reed in any case.

The majority of torque readings were, therefore, established using calibrated torque bars normally used for sub-miniature electric motor testing. These readings must still be regarded as somewhat tentative, largely because the calibration figures are not rated for such high speeds and true values may be modified by scale effect. Although shown to be free from scale effect, for the purpose for which they were originally intended, this did not visualise speeds greater than 10,000 r.p.m. and hence torque absorption figures have been extrapolated from the original calibrations.

In any case, the peak B.H.P. figure is largely of academic interest only. The real proof of performance is that there is a sub-miniature engine which will really fly a matched size of model, free flight or control line, with performance to spare, on the design propeller.

The peak B.H.P. figure arrived at, in fact, is quite fantastic—virtually the same order as that of 0·5 c.c. glow motors—but direct comparison is unrealistic because of the extremely high speed at which peak B.H.P. is given. Thus the useful load—in terms of propeller



SPECIFICATION

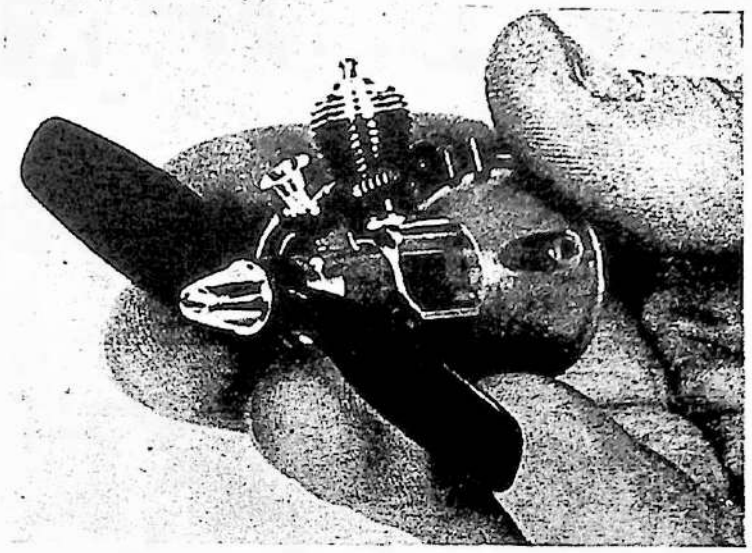
Displacement: .163 c.c. (.00997 cu. in.)
Bore: .237 in.
Stroke: .226 in.
Bore/stroke ratio: 1.05
Weight: ¼ ounce
Max. power (approximate): .028 B.H.P. at 32,000 r.p.m.
Max. torque: 1.0 ounce-inches at 24,000 r.p.m.
Power rating: .172 B.H.P. per c.c.
Power/weight ratio: .056 B.H.P. per ounce.
Material Specification:
Crankcase: machined from light alloy bar, "gold" finish overall
Crankshaft: hardened steel, 1/16 in. diameter steel screw propeller shaft
Piston: hardened steel
Cylinder: soft steel
Connecting rod: machined from dural (ball-and-socket little end)
Intake body: moulded plastic, located by screwed dural collar
Venturi: turned aluminium
Spraybar housing: steel
Cylinder head: turned dural, integral 1.5 volt glow element
Crankcase back cover: moulded plastic
Rear-cover tank: moulded plastic, with plastic end
Main bearing: plain
Manufacturers:
L. M. Cox Mfg. Co. Inc., Santa Ana, California, U.S.A.
British Importers:
A. A. Hales Ltd., 26 Station Close, Potters Bar, Middlesex.

October, 1961

ENGINE ANALYSIS 88

COX TEE-DEE ·010

By R. H. WARRING



Propeller—R.P.M. Figures	
3 x 1½ Cox plastic	27,000
5½ x 3½ D-C Nylon	7,800
6 x 3 Top Flite nylon	5,800
5½ x 3 Top Flite nylon	6,000
5½ x 4 Top Flite nylon	5,500
5 x 4 K-K nylon	6,000
5 x 3 K-K nylon	7,000

size—is directly restricted by the necessity of obtaining high speed operation so that a small diameter size and very small pitch is the only practical choice.

Starting characteristics are excellent, and perfectly straightforward. A coil spring starter is supplied, which can be slipped in place over the front of the engine and located by engaging the loop end over the stub pipe on the side of the intake moulding. The Tee-Dee likes a little prime through the exhaust with the port *closed* and needle valve opened to a slightly rich position (approx. five turns open).

The only thing that does upset the handling characteristics to any extent is gummyness resulting from residual fuel, causing excessive initial drag on the piston (and possibly a flooded cylinder by the time it has washed off), or even clogging the jets. It will not take kindly to being left after running on some of the fuels notorious for the gummy deposits they form on standing.

We did not find fuel mixture as such critical, but a high nitro content fuel is necessary for maximum performance and smoothest running. A nitromethane content of 10 per cent. seems a minimum requirement. All the test running was conducted on Record Super Nitrex which have perfectly smooth running and first-time starting and a r.p.m. figure for the standard propeller within 100 of the manufacturer's figure (the manufacturers specifically recommending Thimble Drome fuel for optimum performance.

Constructionally, the Tee-Dee features a number of original design features. The familiar Cox-type crankcase is retained, machined from solid bar, with a standard Cox-type mild steel cylinder screwing into position. Two transfer ports are formed on the inside of the cylinder, diametrically opposed, overlapping the exhaust by some 80 per cent. The turned aluminium head containing an integral glow element screws into the top of the cylinder and seals on a thin copper washer.

A front rotary port opening is machined in the top of the crankcase bearing length giving a rectangular opening approximately 3/16 in. long and just over 3/32 in. wide in a cut-out "flat". Onto this assembles a plastic moulding comprising a sleeve and angled stub intake tube. A ridge inside this moulding locates it accurately with respect to the "flat" so that the choke tube opens directly into the crankcase port. The moulding, which is an injection moulding, is retained in position by a threaded collar screwing onto the front of the crankcase.

To complete the intake assembly a venturi insert screws down into the plastic stub tube, carrying also the needle valve housing. The latter comprises a screwed housing for the needle valve itself to the rear of the main body which is drilled out to fit over the venturi stem. A small hole admits the fuel mixture into the body hole (and how this small hole is drilled, we do not know). From there passage into the venturi throat is around a narrow circular passage covered by the needle housing body and three tiny holes through the venturi stem. These four small holes are the ones which can readily be blocked with dirty or gummy fuel. The spraybar body, incidentally, can be locked in any position when tightening the venturi, so if desired it can be angled backwards slightly. Provision is also made for utilising the crankshaft port to provide tank pressurisation, if required. A pressure tapping point is given by a small tube projecting to the right on the plastic moulding. This is blanked off by the crankcase metal, as originally fitted, but can readily be drilled through (with shaft removed) to produce the necessary port opening.

The crankshaft is quite large for the size of engine—.162 in. diameter with 3/32 in. diameter hole down the centre. The port is rectangular, just under 3/16 in. long and 3/32 in. wide. The shaft terminates immediately in front of the bearing in a knurled length carrying the propeller driver and is drilled and tapped from the front to carry a screw to form the propeller shaft. The crank web is 5/16 in. diameter and counterbalanced, with a 1/16 in. diameter crankpin. The whole shaft is hardened and ground to finish, including the crankpin. The main bearing length appears to have been honed to finish.

The flat topped piston is machined with very thin walls, copper plated inside and the top and then hardened and ground to finish. The diminutive connecting rod actually tapers in diameter, terminating in a ball little end, spun over to lock into the top of the piston. Piston-cylinder fit is extremely good and undoubtedly truly concentric. Compression is quite outstanding.

Two alternative backplates are provided, both injection moulded plastic. One acts simply as a backplate and radial mount; the other incorporates a tank and integral radial mount. Each backplate attached with four screws to the crankcase and in the case of the tank mount a further moulded plastic backplate is used, held by a central screw, to provide a tank end. The material used for these mouldings and the front intake unit, is one of the high-strength materials peculiar to America and relatively unknown in this country, combining the strength of nylon with none of its disadvantages.

The complete pack also includes a diminutive "universal" wrench for disassembling all screwed parts, moulded propeller, starter spring and alternative backplate.

If a summary of qualities is needed, we can best say that the Tee-Dee .01 is way out ahead of anything else in its class in performance, design, quality of workmanship and value. Not even the most competent model engineer could produce a better job as a "one off" project.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F.M. 08/1957

Cox Tee-Dee .010

THE REPORT WE HAVE ALL BEEN WAITING FOR, THE SMALLEST PRODUCTION ENGINE—WILL IT MEET ITS CLAIMS—YES AND EVEN MORE IS REPORT FOR .010.

► A dozen years ago when .49's and .60's held sway and .19's and .09's were still "small", the first Half-A motors were announced. There wasn't even a separate class for them then (they were variously called AA, ½A and A/2) and there was talk of models that would be flown in the living room. This, needless to say, was unfounded optimism but, with the recent announcement of a .010 cu. in. engine by Cox, the would-be parlor-fliers may be forgiven for having had their hopes raised again.

Has indoor free-flight arrived with the Cox Tee-Dee .010? At the risk of disappointing some, we can only answer with an emphatic "no". Listen to this lusty infant's high-pitched yell and you'll be in no doubt that it belongs as much to the wide open spaces as its larger brothers. Despite its diminutive size and a weight of only one-half of an ounce, the Tee-Dee .010 puts out just about as much power as some of those early Half-A's while turning about 2-2½ times as fast.

Most manufacturers tackling the problem of designing and manufacturing a sub-miniature motor of this size, would be content to produce something that would just start and run with some degree of reliability. The L. M. Cox Company, however has succeeded in giving us one that delivers outstanding performance as well.

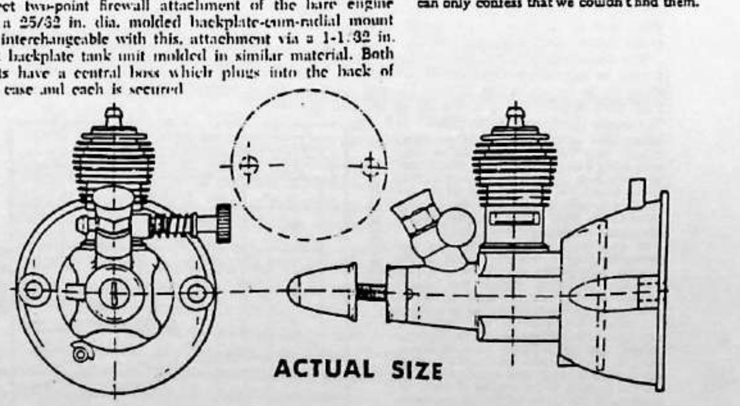
Actually, engines as small as .010 cu. in. are not completely new. Until recently, for example, the British Davies-Charlton company produced the Bambi .0094 cu. in. diesel. A custom made small diesel of similar displacement called the Dragonfly is also availabe in Engand at the present time. Just about the time he introduced the first commercial glowplug, some 14 years ago, Ray Arden built a number of one-off sub-miniatures that were even smaller, including one with the incredibly small displacement of only .0015 cu. in.

With the exception of the Bambi, however, all previous under .01 cu. in. motors have been largely one-off, or hand-made limited production, items and none of them has been at all comparable with the Cox as regards performance and consistency. As is well-known, Cox manufacturing methods are such as to permit appreciably closer tolerances than has hitherto been usual in quantity produced engines. Such techniques have especial value in the production of engines as small as this, where extreme accuracy in the finishing and fitting of working parts is essential to reliable starting and consistent performance.

In regard to operating speed, the Tee-Dee .010 sets something of a record. On the prop supplied, Cox claim a speed exceeding 27,000 rpm. This was, in fact, confirmed in our tests, which also indicated that such revolutions correspond approximately with the horsepower peaking speed of the .010 and that the engine, under reduced load, is capable of turning much faster still.

Interestingly, the .010 closely follows the design and construction of the other models in the new Tee-Dee range, the largest of which, the outstanding Tee-Dee .15 FAI class motor, was featured in our June review. Basically, the .010 is a scaled down Tee-Dee .15 and it is uncommon to find one basic design serving, so efficiently, two such widely different displacements—one fifteen times the swept volume of the other.

The main point of difference between the .15 and its baby brother, is in the latter's mounting details. The .15 is a beam-mount motor, whereas the .010 is for radial mounting only. The .010, however, provides for either direct two-point firewall attachment of the bare engine via a 25/32 in. dia. molded backplate-cum-radial mount or, interchangeable with this, attachment via a 1-1/32 in. dia. backplate tank unit molded in similar material. Both units have a central boss which plugs into the back of the case and each is secured



to the case with four screws. The tank unit has the addition of a flush-fitting rear cover retained by a single central screw, plus molded-in fuel feed, filler and vent pipes. It holds sufficient fuel for approximately 1½ minutes running at 27,000 rpm.

The crankcase and bearing unit is an all-machined component, produced from extruded bar stock and has a gold anodized finish. As on the .15, the bearing has a flat machined across it, to expose the required intake aperture width and is then encased by a molded sleeve or collar with angled threaded boss into which the carburetor is screwed. The internal shape of the molding is such that an accumulator chamber is formed between the carburetor and the rotary valve, exactly as on the .15. It even has provision for a rotary-valve timed pressurized fuel system via an integral nipple on the side of the molding. As supplied, however, this is simply used as an anchor point for the starter spring.

The hardened crankshaft is a reduced scale version of the .15 shaft, complete with crescent counter-balance, "massive" intake porting and a relieved section ahead of the valve port to reduce drag and make more effective use of the journal area. According to our measurements, the rotary valve opens approximately 5 deg. later and closes 5 deg. earlier than on the .15.

Despite its tiny size, the .010 carburetor retains the triple jet system that is found on the larger contest type Cox engines. The only concession to simplicity that has been made, is the substitution of an all-steel needle-valve block and collar for the alloy type with steel thread insert.

The cylinder components show no marked departure from normal Cox practice. The cylinder itself, has twin exhaust ports and twin opposed internal bypass grooves and screws into the crankcase. The piston assembly features the usual Cox lightweight flat topped piston with hardened skirt surface and ball and socket connection to a hardened steel conrod. The combustion chamber shape formed by the cylinder head, however, follows a middle course between the new type .15 head and the older hemispherical pattern and is, in fact, perfectly conical in shape.

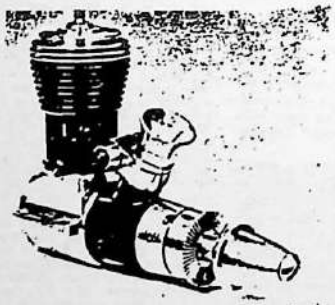
Starting the .010 is easy. We received the two test engines before instruction leaflets had been printed but soon got the hang of starting them quickly. On an engine of this size, trying to prime with fuel through the tiny ports can be likened to feeding treacle to a .15 with a soup ladle, and the drill, therefore, is to close the ports first and then to aim a few drops of fuel in the general direction of one of them. Just about the right amount of fuel will cling around the port and enter the cylinder when the piston is lowered. Use of the starter spring will then, usually, bring the .010 to life within the first couple of tries. Hot restarts were usually obtained instantaneously after re-filling the tank. Delayed restarts (i. e. with the engine just warm) required only choking the intake for a couple of preliminary flicks of the prop.

Our test engine had approximately 30 minutes running before performance tests were carried out. Other than the standard 3 x 1½ in. prop. supplied with the engine, there are practically no props commercially available that will suit the Tee-Dee .010. However, just for the record, on a Top Flite wood 4½ x 3 we obtained 10,800 rpm, and on a 4½ x 2½ T-D prop, 9,600 rpm. At the same time we obtained 27,200 on the standard prop, although, under most favorable climatic conditions, nearly 28,000 had been seen.

At over 27,000 rpm, the Tee-Dee .010 showed every indication of being far from fully extended and, purely for experiment, we then began pairing sixteenths off the prop blades: 27,500, 28,600, 29,800 and finally, at 2¼ in. dia. and with a special fuel mix using 50 percent nitro and Ucon polyoxide lubricant, a crisp 32,400 rpm! The .010 ran out a full tank at this speed and showed every sign of being able to go quite a bit faster. Even the head filament stood up to this treatment—the same head with which the engine had begun life and which by a rough calculation had initiated combustion no less than 1½ million times.

If the Tee-Dee .010 has any faults we can only confess that we couldn't find them.

M.AN. 08/1961



Externally similar to the Tee Dee .15 from which it was developed, Special has many internal modifications including revised valve timing

COX'S LATEST RACING ENGINE THE SPECIAL .15 REPLACES THE TEE DEE .15. 62'S TOP POWER PLANT IN FREE FLIGHT.

► A review of the Cox Special 15 is particularly appropriate at this time, since this engine is likely to be widely used at the forthcoming World Free-Flight Championships. Already well established as a top ranking Class A free-flight engine in the U.S., the Special and the Tee-Dee 15 from which it was derived, have also been widely accepted across the Atlantic. At the last World F/F Champs, held in 1961, when the Tee-Dee had been on the market for only a few months, only five of the sixty-three entrants used Tee-Dee 15's, but winner Fritz Schneeberger of Switzerland was one of them. Tee-Dee 15 powered models won the British Nationals unrestricted power event (any size engine allowed) in 1961 and again in 1962 and Tee-Dee's and Specials have also achieved many wins and places in continental European contests.

The decision to withdraw the Tee-Dee 15 after less than a year in production and replace it with an improved model to be known as the Special 15, was taken by the L.M. Cox Manufacturing Company at the end of 1961. The reason for this move was that, during 1961, several instances of structural failure were reported by modelers who were using Tee-Dee's in speed models and propping them for rpm in excess of 21,000. It was found that when stressed to this extent, the cylinder would sometimes fracture between the ports or the ball-joint piston/connecting-rod assembly would fail.

A completely redesigned cylinder and piston assembly is, therefore, used by the Special. Firstly, the cylinder wall is appreciably thickened. Below the bottom cooling fin, the external diameter of the cylinder is increased from .714 in. to .814 in., which, even allowing for the slightly enlarged bore dimension of the Special, means that the cylinder wall thickness, here, is now increased by over 70 percent from .0645 in. to a very substantial .1115 in. The increase in the amount of metal remaining in the region of the exhaust ports and bypass flutes (the former weak spot) is, however, proportionately greater. Further strength at these points is ensured by the fact that instead of the bypass flute outer wall being approximately concentric with the cylinder bore, the flutes are now crescent shaped in section. This does not result in any loss of bypass cross-sectional area, however, since the extra cylinder thickness has permitted the flutes to be increased in depth by approximately .020 in.

The ball-joint hardened steel piston and rod assembly, which has been a feature of every Cox engine since the original Space-Bug .049, has, in the Special, been replaced by a new cast-iron piston and light alloy conrod, coupled together by a normal wrist-pin. We say "normal", but the Cox habit of doing things differently obviously dies hard, because even here we find some departure from orthodox procedure. In most model engines using wrist-pins, the pin is either full-floating or is pressed into the piston. In the Special, the pin is free to rotate in both conrod eye and piston bosses, but end float is eliminated by steel spacers pressed on to the pin each side of the conrod. This locates the rod centrally within the piston and also eliminates the need for end-pads on the wristpin since it is prevented from reaching the cylinder wall. The wristpin is solid and is 5/32 in. dia. The connecting-rod is machined from high duty aluminum alloy and has lubrication holes at both ends. Compared with the Tee-Dee 15 piston and rod assembly, that of the Special is about 16 percent heavier.

A new cylinder head is also used by the Special. In contrast to the hemispherical heads used by the older Olympic and Sportsman and current Medallion 15, and the trumpet head used by the Tee-Dee 15, the Special has a cone-shaped head. This gives a slightly lower compression ratio than the Tee-Dee 15 trumpet head and, in conjunction with a new glow filament, offers substantially improved glowhead life. The filament wire is of heavier gauge than that used in earlier type heads and draws appreciably more current.

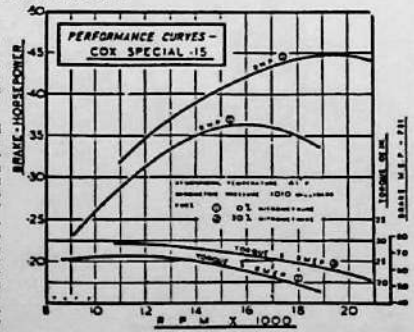
Structurally, the rest of the engine is indistinguishable from the Tee-Dee 15. There are, however, some less obvious detail changes. For example, the cylinder bore has been increased from .585 in. to .591 in., enlarging the piston displacement from .1494 cu. in. (2.499 c.c.) to .1525 cu. in. (2.499 c.c.), thereby taking full advantage of class limits. The rotary valve is now retimed to open approximately 20 degrees earlier for a total induction period of 190 degrees—by our measurement 35 deg. ABDC to 45 deg. ATDC. Cylinder port timing remains practically unaltered with a 140 degree exhaust duration and the bypass opening only about 6-7 degrees after the exhaust. The piston skirt clears the bottom edge of the exhaust port to open the crankcase to atmospheric pressure for approximately 24 degrees either side of TDC. The crankcase is slightly modified to accommodate the new cylinder; the new cylinder cannot, we might add, be fitted to the Tee-Dee model, although the new cylinder-head will fit the Tee-Dee cylinder. The only difference is in the pressure fitting which forms part of the molded front housing. This has been enlarged to make the fitting of a pressure line more secure. As on the Tee-Dee and Medallion engines, use of pressurized fuel feed is optional. To bring the pressure fitting into use, it is necessary to dismantle the engine and complete the pressure outlet by drilling through the bearing.

The remaining design features of the Special are as per the various Tee-Dee models which have been dealt with in these reviews many times before. Briefly, they include a highly developed shaft rotary-valve intake system, an efficient multi-jet carburetor and many interesting structural refinements, plus very high standards of fitting and finishing throughout.

Our test Special proved to be easy starting and much the same as the Tee-Dee 15 in general handling qualities. A characteristic of these engines is that there is a slight time lag between the moment of making an adjustment to the needle-valve and the moment when this takes effect in increased or decreased rpm. This was especially noticeable when the engine was loaded down to 12,000 rpm or less.

Tests on two Tee-Dee 15's were previously carried out in this series. The first of them was on a pilot-run preproduction engine and was published in our June 1961 issue. This engine delivered just on .40 bhp at close to 18,000 rpm on 30 percent nitro fuel. In due course, however, we were advised by Leroy Cox that production Tee-Dee 15's were, on average, 300-500 rpm better, on an 8x4 prop, than the preproduction samples and a production motor was therefore submitted for further test. This proved to be even better than Mr. Cox's claim and on 8x4's was as much as 900 rpm up on the earlier engine. A supplementary report published in our February 1962 issue showed this engine as delivering .47 bhp on the same fuel.

Compared with the later model Tee-Dee, our Special, it will be noted, reached a higher peaking speed (19,000 plus) but recorded slightly less power (.45 bhp) on the same fuel, while maximum torque was down from 31 to 29 oz. in. There is not a great deal of difference between the respective average levels of performance of the Tee-Dee and Special, but on balance the edge is definitely in favor of the Special and some explanation of our test results is, therefore, called for.



Firstly, the production Tee-Dee test samples was, as subsequent experience with other examples confirmed, a trifle above-average and a figure of around .45 bhp would probably be a good average for the Tee-Dee. Secondly, our dynamometer tests on the Special were carried out during a spell of rather cold weather, when intake air reaching the engine was little more than 40 deg.F. Normally, the cooler and denser the air reaching an engine, the greater the power output, but in a glow engine, a reduction in power output can occur with over-cooling due to the ignition point being thereby retarded and, in the Special, this condition is likely to be aggravated by the lower compression ratio of the new cone head. (No checks could be made on the Special with the earlier type high-compression trumpet head, for the simple reason that our small stock of these had all been consumed by our own Tee-Dee's). It seems clear, in fact, that, under normal summer contest conditions, with air temperature 20-30 degrees higher, the Special is operating in conditions best suited to it and we feel justified in suggesting that, under ideal conditions, a peak output closely approaching .50 bhp would not be an unduly optimistic estimate of its potential performance using 30-50 percent nitro fuel.

Performance was also checked on a straight "FAI" mixture of 3-1 methanol and castor-oil. On this, the peak output recorded was .365 bhp at 16,000 rpm's, compared with nearly .39 for the Tee-Dee on the same fuel. This increased discrepancy can be attributed to the lower compression ratio which, of course, does not favor a "cold" fuel.

The new glowhead, incidentally, survived the full tests without burnout or deterioration. This included sustained rpm of over 20,000 (7x4 Power-Prop).

To sum up, the Special perfects what was, in the Tee-Dee, an already outstanding engine.

Summary of Data

Type: Two-part, two-cycle with opposed exhaust ports and twin bypass flutes. Shaft type rotary-valve intake.
Weight: 4.4 oz.
Displacement: 0.1525 cu.in. or 2.499 c.c.
Bore: 0.591 in. Stroke: 0.556 in.
Stroke/Bore Ratio: 0.941 : 1
Specific Output (as tested): 2.95 bhp/cu.in.
Power/Weight Ratio (as tested): 1.64 bhp/lb.
Price: $14.98.
Manufacturer: L. M. Cox Manufacturing Co. Inc., 730 Poinsettia Street, Santa Ana, California.

M.A.N. 05/1963

WORLD'S FINEST CONTEST ENGINE!

*** PROVEN AT U.S. and FOREIGN NATS ***

COX SPECIAL .15

* 1961 *

WINNER — International FAI Power — (Germany)
WINNER — Swedish Nationals in FAI Power
WINNER — British Nationals in FAI Power
WINNER — US Nationals — Junior FAI Power
WINNER — US Nationals — Senior FAI Power
WINNER — US Nationals — Open FAI Power

* 1962 *

WINNER — British Nationals — FAI Power
2nd PLACE — British Nationals — Class A Free Flight
WINNER — US Nationals — Junior Class A Free Flight
2nd PLACE — US Nationals — Junior Class A Free Flight
WINNER — US Nationals — Senior Class A Free Flight
2nd PLACE — US Nationals — Senior Class A Free Flight
WINNER — US Nationals — Open Class A Free Flight
2nd PLACE — US Nationals — Open Class A Free Flight
WINNER — US Nationals — Senior FAI Power
2nd PLACE — US Nationals — Senior FAI Power
WINNER — US Nationals — Open FAI Power

Watch for sweeping victories in speed during 1963
(Tip—Use bigger props and more pitch!)

No other engine near its cu. in. displacement has ever compiled such a commanding record of international wins as the new Cox Special .15! Wherever speed and power count, where dependability and the "guts" for grueling contest work are paramount, you can count on the high precision rugged features of the Cox Special .15: NEW LONG LIFE GLOW HEAD (integral with combustion chamber.) . . . MICROMATIC CYLINDER . . . SPECIAL ALLOY PISTON . . . HARDENED STEEL WRIST PIN! Recommended for Speed, FAI Power, Free Flight, R/C, Pylon, etc.

NEW LONG LIFE GLOW HEAD

A long life glow head for the Cox special contest engine. Run after run even in the most grueling of all contest work — Speed as well as FAI Power and Free Flight. Also fits other Cox .15 engines. Price 90c

NEW HI-THRUST PROPS WINNERS AT NATS

With new swirl . . . new blade form . . . high-efficiency square tip! Gleaming Black Nylon.

3" —1¼ Pitch # 1318 .25 6"—3 Pitch # 862 .25
4½"—3½ Pitch # 856 .25 7"—3½ Pitch # 2118 .50
8"—4 Pitch # 864 .60

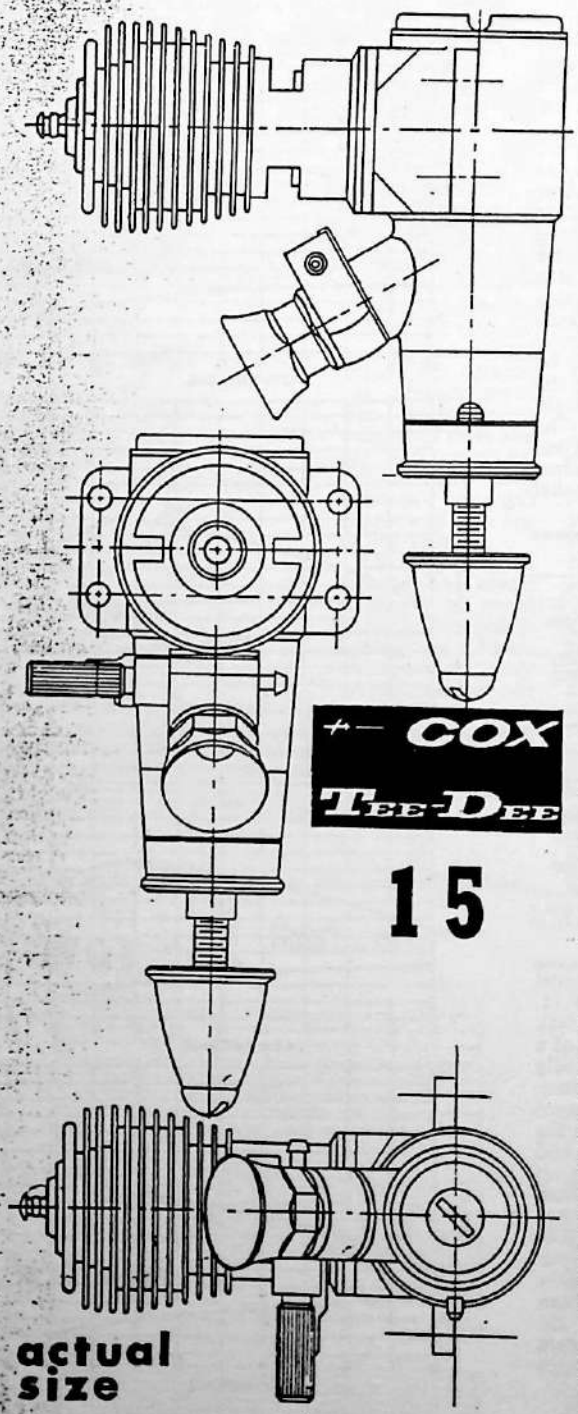
L. M. COX Manufacturing Co., Inc. • Cox Center Santa Ana, California • World Leader in Model Aviation

MAN 05/1963

ENGINE ANALYSIS

No 91

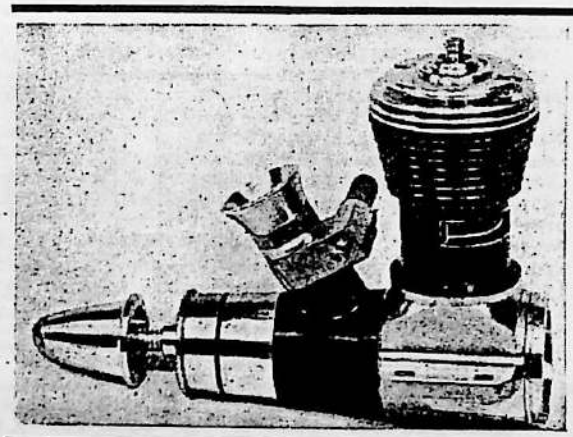
by R. Warring



BASICALLY SIMILAR IN geometry throughout to the Cox .010 described in October, 1961 report—all the Cox Tee-Dee series are virtually scaled to an identical design—the Tee-Dee 15 gives a truly remarkable performance which quite outstrips that of any other plain bearing engine, diesel or glow, of similar size. In many respects the Tee Dee 15—and thus the whole Tee Dee range—is a development of the original Cox "Olympic".

The bottom end is, of course, entirely re-designed around the Cox version of conventional shaft induction instead of reed valve. The bearing is plain, honed to finish, and carries a very hard, very large diameter shaft ($\frac{7}{16}$in. o/d). The shaft is stepped to give a long rear journal and a short front journal, ground to finish over the journals and the crankpin. A rectangular port .290in. wide and $\frac{7}{16}$in. long is cut in the shaft (finished with perfectly vertical edges, not just milled in by one operation) and exactly matches a corresponding port in the crankcase unit. The crankcase is then surmounted by a hard nylon type plastic injection moulding, which seats on a taper and also locates positively radially. A screwed-on collar then holds this moulding in place and the intake tube and carburettor assembly screws into the moulding to complete the induction system in most efficient manner.

The shaft itself steps down to a stub $\frac{1}{4}$in. diameter length immediately in front of the bearing, which is splined to carry the propeller driver (machined from light alloy and anodised gold). The propeller shaft consists of a .161in. diameter steel screw, screwing into the shaft, carrying on the front a turned dural spinner in lieu of a washer.



As with all Cox engines, virtually all parts are turned from solid bar stock (with the exception of the plastic moulding) on automatic machines capable of working to very high accuracy, high surface finish, and with piston and cylinder units produced under controlled conditions for absolute accuracy of the order of millionths of an inch. As a consequence, there is no case of "selective fitting" when assembling. Tolerances held are such that all parts fit and the order of fits obtained is probably considerably higher than those developed manually. For the same reason, Cox engines need little or no running-in and although the test Tee-Dee 15 was given about an hour's running before taking any final readings, there was no change in performance.

The Tee-Dee 15 is essentially high revving, demanding a relatively small size of propeller. Peak r.p.m. on static test we found to be between 17,000 and 18,000 r.p.m., depending on fuel used. Running was consistent and strong at even higher speeds, indicative of more than

adequate porting and correct timing. Induction is between approximately 55 degrees after b.d.c. to a little over 40 degrees after t.d.c. and gas flow is no doubt assisted by the "reservoir" space formed by the plastic housing, leaving a sort of accumulator chamber above the actual port. With pressure feed, fuel can literally pour into the intake throat at high speed running so that virtually liquid fuel is sucked in when the port opens. The needle valve control under such conditions becomes extremely non-sensitive and needs a considerable amount of adjustment to arrive at optimum settings. One gets the impression that the more fuel that is poured in, the higher the speed for a given load, but such speeds are not held consistently without careful adjustment.

Although we found the Tee-Dee 15 very easy to handle, starting characteristics on smaller propellers are definitely not as good as in the case of other Tee-Dee engines. The compression ratio is so high that it is rather like starting an over-compressed diesel. A good strong flick is required and then more often than not, the engine starts backwards and continues to run backwards at a moderate speed. As a point of interest, when running backwards it is often possible to be leaning out the needle to produce a backfire, when the engine immediately runs in the *right* direction—and provided the needle can be opened again quickly enough, will continue to run the right way. We also found it possible to produce "right way" starts by flicking gently *backwards* initially. The best answer with 7in. diameter propellers or smaller, seems to be finger choke until the fuel line is full, prime through the exhaust and then flick smartly. Exhaust priming is also most effective for starting.

Propeller R.P.M. Figures

Nitro Methane Content		0 Frog Redglow*	15% Record Nitrex	20% Castor 25% Methanol 55%	50% Castor 25% Methanol 50%
Top Flite	7 x 6	15,100	15,200	15,400	17,000
	8 x 4	15,000	15,000	15,200	16,800
	8 x 6	12,000	12,000	12,500	—
	9 x 4	12,000	12,000	12,400	—
	10 x 3½	10,200	10,200	10,200	—
K-K (nylon)	7 x 4	17,000	17,000	17,800	18,800
	7 x 6	14,300	14,400	14,500	15,700
	8 x 4	15,000	15,000	15,200	16,300
Frog (nylon)	7 x 4	16,500	16,600	17,000	18,400
	8 x 4	14,500	14,800	15,000	15,800
Trucut	7 x 4	17,800	17,800	18,000	18,900
	8 x 4	15,500	16,000	16,000	—

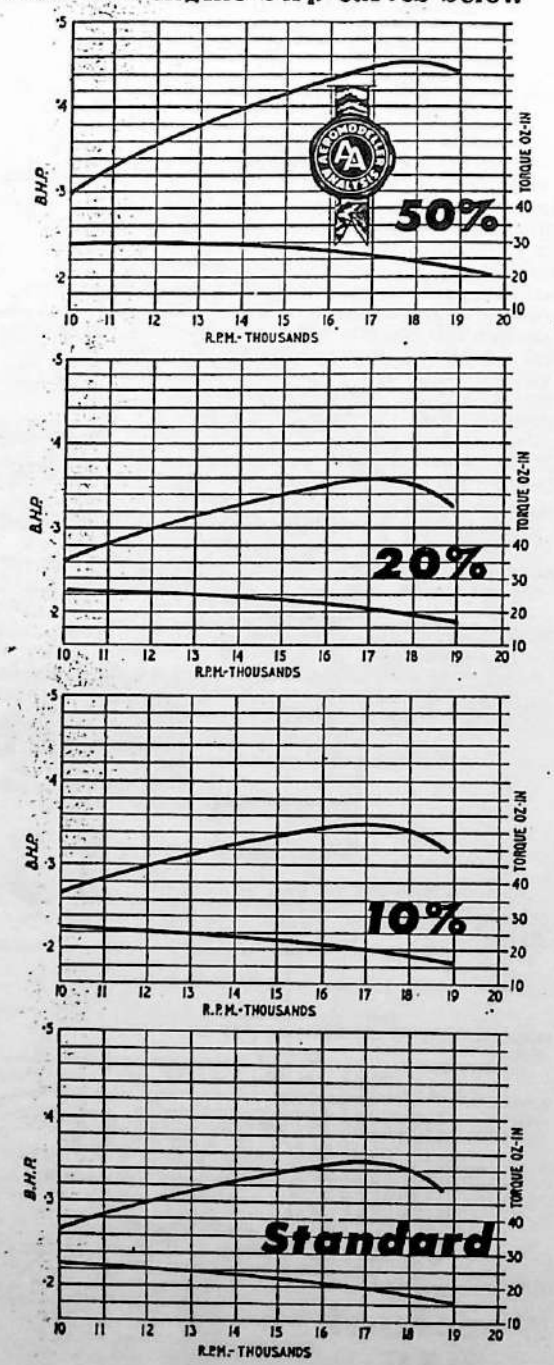
* Although Frog Redglow contains no nitro methane, it is not a true "straight" fuel since it contains a small proportion of other ignition additives.

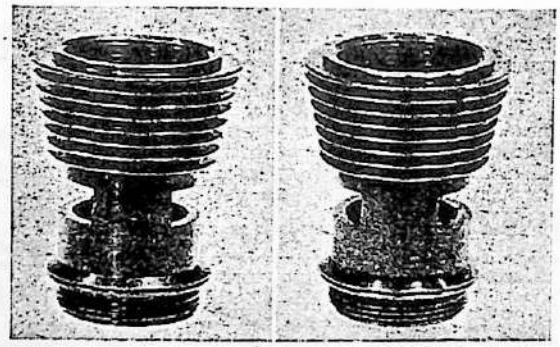
Performance we found to be excellent on straight fuel (with non-nitro additives—*see* PROPELLER—R.P.M. figures), yielding a peak B.H.P. of around .35 at 17,000. We could not improve on this figure over a period of a number of runs on different days, although undoubtedly higher figures have been obtained with individual engines. Nor did we find any appreciable difference in performance using 10 per cent. and 20 per cent. nitro methane in the basic fuel—only a very slight gain in the latter case and virtually no difference with 10 per cent. On stepping up the nitro methane content to 50 per cent., however, there was a very appreciable gain throughout the whole power range explored, realising a peak B.H.P. of .455 at 18,000.

The particular difficulty using a high-nitro fuel (50 per cent.) is that it is extremely destructive to the glow element. We burnt out six heads, making some ten separate runs on 50 per cent. nitro fuel. Further, the original cylinder was not strong enough to take these fuels. The problem of whether or not to continue "high nitro" testing was finally solved, when the cylinder cracked at the bottom of the exhaust ports on a 20,000 r.p.m. run (with destruction of yet another element).

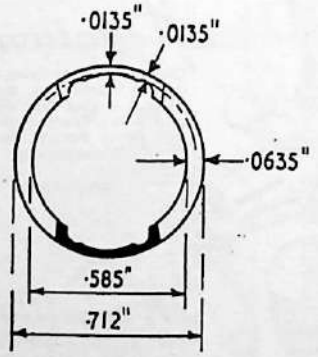
This was a pure structural fault—just not enough metal holding the cylinder on, subsequently rectified by the manufacturers. The cylinder is of soft steel with diametrically opposed rectangular exhaust ports milled through the walls. Two transfer passages are milled

First test engine b h p curves below





Crack on first test engine, and new type thick cylinder, at left. All Cox TD's will have thicker barrels in future.



upwards on the inside of the cylinder, passing between the pillars left between the exhaust ports. The actual section consists of three arcs *see drawing at left* leaving very little column strength supporting the top of the cylinder.

On the original cylinder the actual thickness of metal at the critical points holding the cylinder together was only .0135in. — just not man enough for the job, as the manufacturers have since confirmed. Breakage, when it occurred, was always in line with the bottom of the port and the stress raiser in the form of a sharp square corner here has been relieved by putting in a radius (nominally .025in.). At the same time, wall thickness of the cylinder has been *increased* by .010in., making the thin part measure .0235in. instead of .0135in., after the cylinder has been bored and honed. *Having received a new cylinder for examination, we are convinced that no further breakage of this type should occur.*

The use of nitro methane in the fuel is definitely beneficial. Although we found little or no improvement in power performance, using up to 10 per cent. nitro, and only a small gain with 15 per cent. nitro, adjustment is less critical. With 20 per cent. nitro and higher nitro mixtures, there is a definite gain, almost directly proportional to nitro content. Unfortunately, the original engine was wrecked before intermediate fuels between 20 and 50 per cent. could be investigated. A subsequent replacement again employed the original thin cylinder which, not being the current standard, we did not feel justified in exposing to similar "high nitro" strains. Propeller r.p.m. figures were virtually identical to our original test data on low nitro fuels, but definitely "up" on 30 per cent. nitro used as a practical maximum and with castor content reduced to 20 per cent. No 30 per cent. nitro figures were available on the original engine for the direct comparison and so a separate B.H.P. graph is shown *below left* for the second engine.

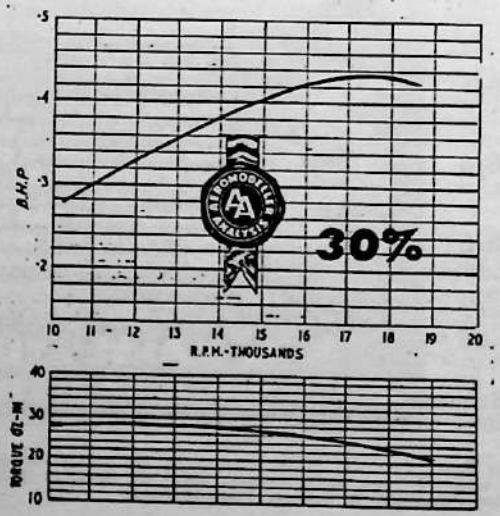
We rate the Cox Tee-Dee .15 as an outstanding production which should achieve considerable prominence in the contest field—as well as making an equally good sports motor, for it was quite happy turning at 10in. x 3½in. propeller at 10,000 rp.m. plus. Pressurisation is not necessary but may be advisable for contest work where the engine is being operated at peak r.p.m. and tends to require a more critical needle setting for consistent performance. A pressure tap point is provided on the plastic housing (intake moulding)

Propeller—R.P.M. Figures

Second test engine on 30% nitro methane, 20% castor, 50% methanol:

K-K nylon	7 x 4	... 18,300
	8 x 4	... 16,000
Frog nylon	7 x 4	... 18,000
Top Flite	8 x 4	... 16,200
	7 x 6	... 16,400
	9 x 4	... 12,900

Production engine test on advised fuel, below:



Specification

Displacement: 2.449 c.c. (.1494 cu. in.)
Bore: .58465in.
Stroke: .556in.
Bore/Stroke ratio: 1.05.
Bare weight: 4 ounces.
Max. power: .35 B.H.P. at 17,200 r.p.m. on straight fuel
.455 B.H.P. at 18,000 r.p.m. on 50% nitro methane } *Original test engine*
.44 B.H.P. at 17,000 r.p.m. on 30% nitro methane—*production model.*
Max. torque: 27 ounce-inches at 10,000 r.p.m. on straight fuel
30 ounce-inches at 10-12,000 r.p.m. on 50% nitro methane } *Original test engine*
Power rating: .143 B.H.P. per c.c. on straight fuel.
.18 B.H.P. per c.c. on 30% nitro methane *(original production model).*
.186 B.H.P. per c.c. on 50% nitro methane *(production model).*
Power/weight ratio: .088 B.H.P. per ounce on straight fuel.
.11 B.H.P. per ounce on 30% nitro methane *(original production model).*
.114 B.H.P. per ounce on 50% nitro methane *(production model).*

Material Specifications:

Crankcase: machine from light alloy bar stock.
Intake housing: injection moulded plastic.
Cylinder: mild steel (integral fins).
Cylinder head: turned from light alloy (integral glow element).
Back cover: machined from solid.
Crankshaft: hardened steel ¼in. diameter.
Connecting rods: hardened steel (machined). Ball and socket little end.
Piston: hardened steel (hardened on walls only), flat top.
Propeller shaft: .161in. N.S.F. steel screw and spinner (turned from light alloy).
Venturi intake: machined from light alloy.
Carburettor collar: light alloy (anodised gold).
Needle: steel (spring ratchet).
Propeller driver: machined from light alloy (anodised gold).
Manufacturers: L. M. Cox Manufacturing Co., Box 476, Santa Ana, California, U.S.A.
U.S. Retail Price: $12.98. Price in G.B. 124s. 0d.
British importers: A. A. Hales Ltd., Potters Bar, Middlesex.

Aero Modeller March 1963

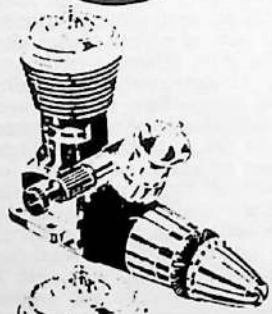
COX Thimble-Drome ENGINES

LEAD THE WORLD!

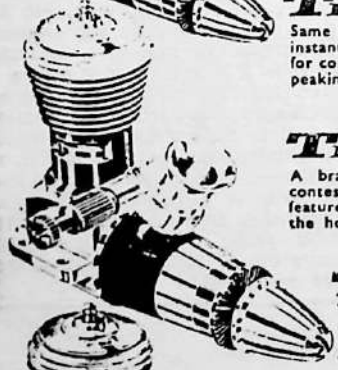
TEE-DEE FRONT ROTARY VALVE CONTEST ENGINES

TEE-DEE .010
So small you almost have to look twice to see it! Only .16 c.c. but packed with "Big engine" features—sensational in its weight lifting power! **77/6**

TEE-DEE .020
Plenty of power to fly ¼A models—an achievement in miniaturizing you would expect to see only in hand-made "one off" engines. Fast starting, fast revving. Ideal for PAA-load or baby R/C **67/10**



TEE-DEE .049
Super-hot ¼A power for free flight or control line contest work. Front rotary induction for stutter-free performance . . . extra high power curve. The best engine money can buy! **77/6**



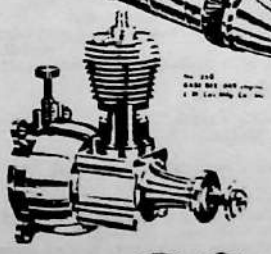
TEE-DEE .051
Same overall dimensions as the .049 to give instant interchangeability from ¼A to Class A for contest work. Similar high peaking power. **77/6**

TEE-DEE .09
A brand new front rotary super-power contest motor. All the precision engineering features that make TEE-DEE engines the hottest in the model world! **97/-**

TEE-DEE .15
Top size engine in the TEE-DEE range—top power for that EXTRA performance that counts with larger models **122/-**

NEW

COX SPECIAL .15
Specially developed for the ultimate in contest performance—speed—F.A.I. power—Free Flight—R/C—wherever SPEED and POWER count. Special alloy piston, hardened steel gudgeon pin, new robust cylinder. Built to take gruelling contest punishment. **146/-**



PEE WEE . . 38/6
.020 (.33 c.c.)—less than half the size of .049 engines yet with power a'plenty.

BABE BEE . . . 38/6
.049 (.8 c.c.) for free flight or control line.

GOLDEN BEE . 47/3
.049 (.8 c.c.) with better-than-average ¼A power, over-size stunt tank for longer runs.

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NEW! FRONT ROTARY VALVE ENGINES

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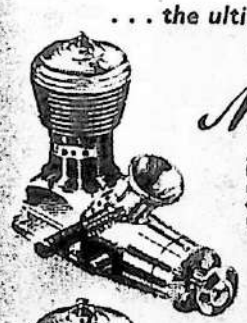
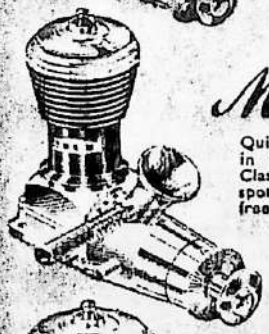
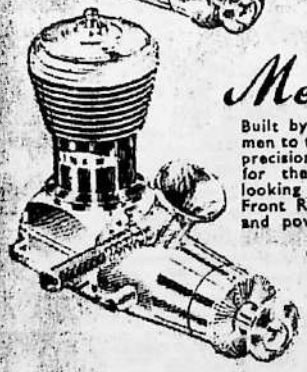


Medallion .049
A top quality beam-mount engine for smooth operation over a wide range of speed, under ALL load conditions. Specially recommended for stunt, sport, flying scale . . . anywhere top performance and dependable operation is required. **67/10**



Medallion .09
Quick starts, top flying efficiency in the smoothest performing Class A engine ever offered the sport-stunt flyer! With stutter-free Front Rotary Valving for dependability through every manoeuvre. **87/-**



Medallion .15
Built by Thimble-Drome craftsmen to the highest standards of precision, and designed especially for the model flyer who is looking for the tops in Class A Front Rotary Valve smoothness and power for F.A.I. sport or stunt flying, day after day. **107/-**

COX GLOW FUEL
Thimble-Drome Fuel is made from the finest ingredients, burns CLEAN and leaves no slowing down 'varnish' or clogging 'sludge'. STANDARD FUEL (8 Ounce can) contains 18% NITROMETHANE. Price 4/6. RACING FUEL ('NITRO 30') contains 30%

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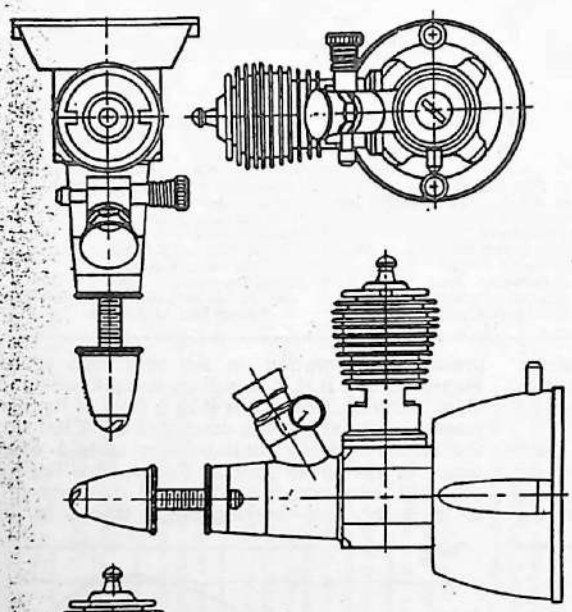
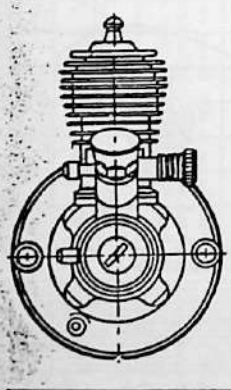
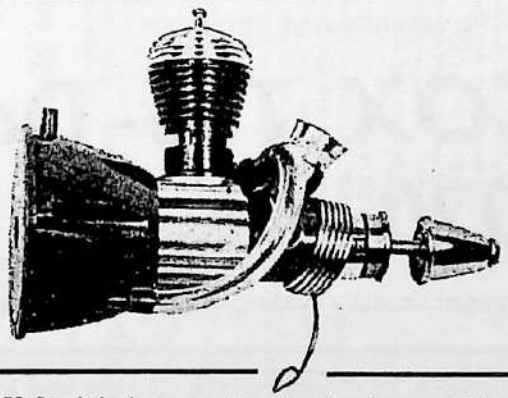




Engine Analysis

Number 97

by R. H. Warring



BASICALLY THE COX TEE-DEE .020 (.327c.c.) glow motor is geometrically scaled from the T-D .01 (see AEROMODELLER, October 1961) and is thus identical in general description. It is again a high-revving motor—but not to the same fantastic speeds achieved with its smaller brother—and requiring special sizes of propellers to operate at peak r.p.m.

If the instructions are followed explicitly, starting is perfectly straightforward and easy—needle 5 turns open, choke, prime through the exhaust with the port fully open, then flip or use the spring starter (the latter is recommended with the small sizes of propeller used). We did not find it fussy on nitromethane content of fuel either as regards starting or running, but a fuel with a fairly high nitro content is best for easy adjustment and smooth running.

Fuel residue

One possible trouble with different fuels, applicable to all very small motors in general (and the Cox Tee-Dee in particular, it seems) is gumminess or stickyness caused by residual fuel remaining in the engine after use. When it comes to starting the engine again after a few days idleness it feels "horrible" and reluctant to flip over—a condition which is not immediately relieved by flooding with fresh fuel.

Another thing these very small glow motors seem to develop is a lacquer-like coating over the inside of the cylinder after some running time, again imparting drag and detracting from performance. The recommended procedure for cleaning this is to "scour" the bore *lightly* with fine steel wool after about an hour's running time, which can remarkably improve performance on a subsequent run.

Cause of non-starting is usually simply—either the engine flooded or low battery for the glow plug (or both, the low battery not getting the element hot enough to fire the mixture anyway). The Cox element is defintely for 1.5 volts only and the life of even large 1.5 volt dry batteries can be unexpectedly low, especially under flying field conditions. Perhaps we do not make such good dry batteries in this country as America.

Starting tip

Even partial flooding *will* cool the element to the point where the mixture will not fire on a fresh 1.5 volt battery—and further flicking of the propeller from then on only makes things go from bad to worse. We found a "workbench" solution which worked very well. Using a 2 volt *accumulator* and a standard 2 volt glow plug *in series* in one lead to the Cox head, the element temperature was just right for normal starting. If flooded, (we were investigating how quickly these small engines flood and how they behaved as a consequence), temporarily shorting out the "resistance" glow plug produced enough heat to dry the engine element rapidly.

The main *causes* of flooding we found were (i) weak batteries (by far the most common cause); (ii) excessive finger choking instead of choking to fill the fuel line and then priming through the exhaust with the port *open;* (iii) trying to start the engine in an inverted position as fitted in a model (the remedy here being to turn the engine to an upright or horizontal position for starting).

For smoothest running we would prefer a fuel with a minimum 10 per cent. nitromethane content, although performance was comparable on Frog "Redglow". Cox's own fuel—now available in this country—seems excellent for the Tee-Dee engines and has a 15 per cent. nitromethane content. It seems a far "cleaner" fuel than many, with less tendency to "gum" or shellac formation. With no fuels tried, however, was needle valve adjustment critical, nor could consistency of running be faulted.

The only criticism we have with regard to the Tee-Dee .020 is in the manner of mounting via a moulded hard nylon tank. Designed for radial mounting the engine attaches to the tank moulding with four screws through the front of the tank, and the tank secures to the firewall of the model via two diametrically opposed mounting bolts. Possibly due to the fact that plastic is not a

DATA

PROPELLER—R.P.M. FIGURES

Propeller		*R.P.M.*
3½ x 2½	Cox three-blade plastic	21,000 plus
5½ x 3	TopFlite	11,200
5½ x 4	TopFlite	9,500
5 x 4	Keilkraft nylon	10,200

Fuel used: nominal 20 per cent. nitromethane, 25 per cent. castor, 55 per cent. Methanol.

NOTE: These propeller-r.p.m. figures are largely of academic interest. No standard commercial propellers available in this country are a "match" for the .020 other than the Cox 3½in. dia. three-blade and Cox 4 x 2½ plastic (two-blade).

Displacement: .3266 c.c. (.0199 cu. in.)
Bore: .300in.
Stroke: .282in.
Bore/stroke ratio: 1.16
Bare weight: .85 ounces
Max. power: .0304 B.H.P. at 20,500 r.p.m.
Max. torque: 1.6 ounce-inches at 15-16,000 r.p.m.
Power rating: .093 B.H.P. per c.c.
Power/weight ratio: .036 B.H.P. per ounce
Material Specification:
Crankcase: machined from light alloy bar, "gold" finish overall
Crankshaft: hardened steel, 1/16 in. diameter steel screw propeller shaft
Piston: hardened steel Cylinder: soft steel
Connecting rod: machined from dural (ball-and-socket little end)
Intake body: moulded plastic, located by screwed dural collar
Venturi: turned aluminium
Spraybar housing: steel
Cylinder head: turned dural, integral 1.5 volt glow element.
Crankcase back cover: moulded plastic
Rear-cover tank: moulded plastic, with plastic end
Main bearing: plain
Manufacturers:
L. M. Cox Mfg. Co. Inc., Santa Ana, California, U.S.A.
British Importers:
A. A. Hales Ltd., 26 Station Close, Potters Bar, Middlesex.

completely rigid material this does seem to give undue flexibility to the mount. As a result the propeller must be *meticulously* balanced if excessive engine vibration is to be avoided.

The standard Cox 3½ in. diameter by 2½ in. pitch three bladed propeller particularly recommended for this engine is way out of balance, as moulded and, being three-bladed, is difficult to rework to exact dynamic balance. Two-bladed propeller are better since they can be balanced closely without much trouble. But without a properly balanced propeller on the .020 you can lose an awful lot of power. First figures on the 3½ in. diameter propeller (unbalanced) were, for example, 15,000 r.p.m., as against the 22,750 r.p.m. figure quoted by the manufacturers. This we improved to 21,000 plus on reworking the propeller, during which the length of one blade, at least, was appreciably reduced.

In fairness to Cox, we must point out that they specifically state on their instruction sheet that the propeller to be used should first be trimmed and balanced.

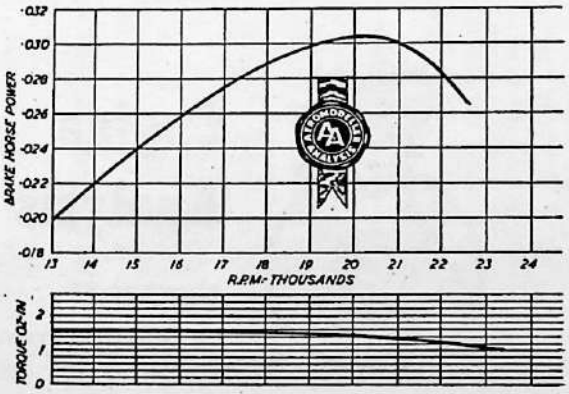
Our test figures, we feel, may be a little unflattering to the true capabilities of the Tee-Dee .020 because of the presence of vibration on the very high speed runs. However, .031 B.H.P. is still an exceptional figure for a .33 c.c. engine, which puts it in a class of its own. Peak power, as measured, was developed at 20,500 r.p.m. but the torque is fairly constant over quite a wide range down to the lower speeds. To use the Tee-Dee .020 properly, however, it needs small diameter propellers to let it rev. fast—nothing bigger than 4 in. diameter preferably. The engine gave consistent running on larger propeller sizes, but at such speeds was not doing a lot of work. It was, however, easier to *hand* start on larger propellers.

The tremendously popular

COX Tee-Dee

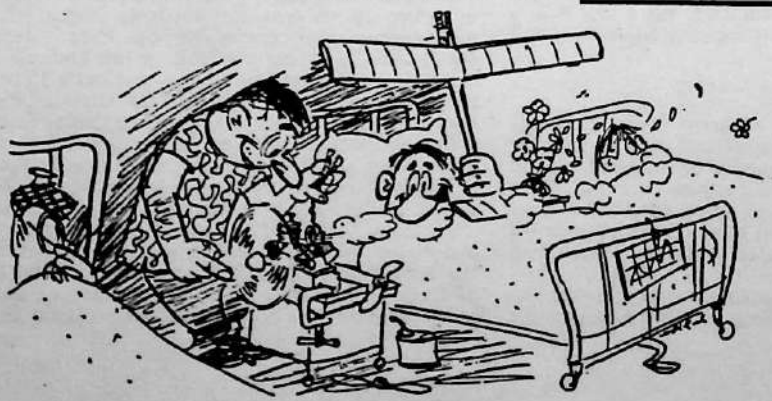
·020 (·327c.c.)

Front rotary valve, glowplug engine



Workmanship

On the workmanship side we can only say that Cox engineering represents the highest standard in the model world today; and they combine this with first class styling and presentation. Their advertisement agent responsible for publicising Cox Tee-Dee must have an easy time of it. Merely to see one is to want to own it—and there is nothing to criticise on power performance either!



" Ed, you're wonderful! most visitors only bring flowers"

to hold cylinder as damage could result from burrs being forced into the cylinder.

7. To remove the glow head from a hot engine —pour a little fuel slowly over the glow head to reduce the head temperature. Do not run it over the cylinder. The head will then release easily. A hot head will stick and forced removal may damage the cylinder.

8. Do not tighten the carburetor retainer nut more than enough to hold the carburetor from rattling. Overtightening will distort the front bearing and cause power drop and inconsistent running.

9. Tighten venturi nut only enough to hold needle valve body in position. Overtightening may strip the thread from the plastic carburetor body.

10. The needle valve body may be removed and replaced in the opposite position if desired.

E) PRESSURIZATION

Pressurizing is very critical when taken directly off the crankcase. On this engine pressurizing means have been provided and the rotary valve controls the pressure to normal operating limits. The hole in the pressure fitting on this engine is already started, but the hole will have to be drilled through the crankcase at this point before you can run on pressure. To rig for pressure observe the following steps:

1. Remove the back cover, cylinder, piston and rod assembly, venturi and needle valve assembly.

2. Rotate crankshaft until the port opening in the shaft points towards the pressure fitting on the right side of the black plastic carburetor body.

3. Continue drilling the hole already started in the pressure fitting through the crankcase. Use a #60 drill (.040 diameter).

4. Rotate crankshaft to deburr the drilled hole.

5. Flush crankcase and shaft thoroughly with methanol to remove all metal particles.

6. Lubricate shaft with light weight oil and reassemble engine.

The fuel tank **must** be air tight in order for the engine to operate properly on pressure. Be sure the tubing that connects the pressure fitting on the engine to the tank is also air tight. If the engine does not run smoothly air is getting into the pressure system. Check it thoroughly.

With pressure, the venturi may be opened to 5/32" on the 049 and .051 or 7/32" on the .09 engine to attain maximum power although the gain is very little.

(F) TO REMOVE CARBURETOR BODY FROM AN ENGINE:

1. Remove backplate, cylinder, and piston-rod assembly.
2. Remove spinner and engage prop screw approximately 3 or 4 threads in crankshaft.
3. With rear of crankcase on a hard smooth surface, tap prop screw with hammer until thrust washer disengages from crankshaft.
4. Unscrew carburetor retaining nut and slip carburetor body off.
5. To re-assemble engine, reverse above procedure. To re-press thrust washer onto crankshaft, put thrust washer face down on a smooth flat surface. Obtain a short length of wood dowel of a size that will fit into the intake hole of crankshaft. Tap dowel with hammer until thrust washer is fully seated on crankshaft.

WARRANTY

This engine is guaranteed against defects in materials and workmanship for 30 days from date of purchase. Glow heads are never guaranteed because of their delicate nature. No other guarantee is made or implied. If engine is returned to the factory within warranty, include 50c to cover cost of handling and return postage.

Do not take engine back to your dealer.

FACTORY REPAIR SERVICE

Minor repairs, examinations, or adjustments — $2.50 plus parts. Complete overhaul (guaranteed new engine performance) .049 & .051 — $8.00; .09 — $9.50, including parts. On all C.O.D. shipments, purchaser pays postage and C.O.D. fees.

ENGINE SPEEDS (RPM)

The following speeds are typical of engines selected at random and run with Cox Competition Propellers (Metallic grey). Cox Racing Fuel was used for all tests. Temperature: 75°, Humidity: 46%, Altitude: 90 ft. above sea level.

PROP SIZE	TEE DEE .049	TEE DEE .051	TEE DEE .09
5" Dia. x 3 P	21,000	21,000	
5½" Dia. x 4 P	17,000	17,000	
6" Dia. x 3 P	18,500	18,500	
6" Dia. x 4 P	13,500	13,500	
7" Dia. x 3½ P			17,750

PARTS ORDER

Purchase parts from your dealer. If not available, order direct from factory. No C.O.D.'s please. Send remittance with your order. On orders less than $2.00 add 35¢ handling charge. California residents, enclose applicable state sales tax.

Prices and design of parts subject to change without notice.

PARTS LIST PART	TEE DEE .049 Cat. No.	List Price	TEE DEE .051 Cat. No.	List Price	TEE DEE .09 Cat. No.	List Price
Glow Head & Gasket	1702	1.25	1702	1.25	2102	1.25
Needle Valve & Spring	1709	1.20	1709	1.20	2109	1.20
Prop Spinner & Screw	1718	.90	1718	.90	2119	1.20
Carburetor Body Only	1724	1.20	2024	1.20	2124	1.20
Cylinder, Piston & Rod	1775	4.75	2045	4.75	2175	5.75
Needle Valve Body & Venturi	1789	3.00	1789	3.00	2189	4.25
Crankcase, Crankshaft, Carburetor Body, Retainer Nut, Drive Plate, Crankcase Cover & Thrust Washer	1779	8.50	2049	8.50	2179	11.95

Order Parts by Catalog Number

Prices subject to change without notice.

L. M. COX MANUFACTURING CO., INC.
a subsidiary of LEISURE DYNAMICS, INC.
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CARE AND OPERATION OF YOUR

TEE DEE .049,.051, & .09 ENGINES

THIS ENGINE IS A VERY HIGHLY PRECISE CONTEST-TYPE ENGINE

Keep it immaculately clean, use Cox glow fuel or racing fuel and it will maintain its winning characteristics for a long period of time.

These engines will develop almost full power within one minute of running time; but a few, those which are slightly on the tight side, may not develop full power under one hour. Even these will develop sufficient power for average flying almost immediately. The only break-in required is a rich (slow) running with a recommended pitch propeller for the first few minutes. Gradually close the needle valve to peak operating RPM's for a short period, then run rich for a few minutes. Repeat this procedure for 5 to 15 minutes or until engine will hold top RPM.

NOTE: Your Tee Dee .049 engine develops its maximum H.P. at approximately 22,500 RPM. Use propellers that keep the RPM's below 24,000. Damage could result if engine is allowed to run above this figure.

(A) PREPARATION FOR RUNNING

1. Mount the engine in the plane, or if you want to give it some running first, mount it on a suitable mount. Do not hold the engine directly in a vise. Use A-Fig. 2, or A-Fig. 3 as a template to drill mounting holes.

2. Place propeller on the shaft with the flat side of the blades toward engine and lock securely with the propeller screw.

3. Procure a fuel tank from your local hobby dealer and connect the tank outlet to the carburetor fuel inlet nozzle. Best results will be obtained by mounting the tank close to the engine and with the average fuel level at the same height as the carburetor venturi.

4. Procure a 1½ volt Cox dry cell battery, or equivalent, and connect it with 2 flexible insulated wires to the glow plug clip as shown in the diagram A and B — Fig. 1. Do not use a stronger battery. If you do, the plug will burn out. The connections should be soldered to insure good contact, and taped to prevent bare ends of wire from getting together and "shorting" the battery. Be sure the battery is a good one. Your dealer sells batteries and glow plug clips. The Cox plastic mounted glow plug clip (Cat. No. 755-6) with wires already attached is recommended and requires no soldering.

5. Balance and trim propeller. This is very essential for good performance. Sand off any bead of plastic along the edges of the blades. Fit a drill or shaft through the hole and rest the shaft on razor blades set in wooden blocks as shown in C-Fig. 1. Sand the heavy blade until the propeller will balance in a horizontal position. Care must be taken to do the sanding without spoiling the airfoil characteristics of the propeller blades. Caution: Use only nylon or wooden props. Styrene props are extremely dangerous on these engines.

(B) STARTING THE TEE DEE ENGINES

No matter how expert you are with small engines you will have better luck with these engines if you follow directions exactly as listed and do each operation in the exact order given.

1. Close the carburetor needle valve, B-Fig. 2, or B-Fig. 3, by turning it clockwise until it stops. Do not force it.

2. Fill the tank with Cox fuel.

3. Open the needle valve (counter clockwise) exactly 4½ turns for the .049 and .051 or 3½ turns for the .09 engine.

4. If the fuel level in the tank is lower than the carburetor venturi, put your finger over the air intake of the engine and pull the prop through compression until the fuel hose is full. Use a clear plastic fuel line so this can be checked visually. If the tank is mounted so the fuel level is higher than the carburetor the hose will fill itself when the needle valve is opened.

5. Connect the battery by snapping the clip on the glow head B-Fig. 1.

6. Squirt a few drops of fuel into the exhaust ports and immediately flip the propeller over counter clockwise. For quick starting the propeller must be flipped quite vigorously. The engine should start instantly if it has been primed with the correct amount of fuel in the exhaust port.

7. When the engine starts it will be running very rich and slow. The first time the engine is started let it continue to run rich for a period of 60 seconds. After approximately 60 seconds, slowly close the needle valve clockwise to the best running position and remove the battery connection. Subsequent starts may be adjusted to best running position immediately.

8. If starting is delayed for any reason, close needle valve, otherwise engine will become flooded. This precaution is only necessary if the tank is mounted so the fuel level is higher than the carburetor.

(C) FAILURE TO START

1. If the engine coughs and spits a bit of fuel spray from the exhaust, it is too rich. Close the needle valve and continue cranking until engine starts briefly. Open the needle valve again and

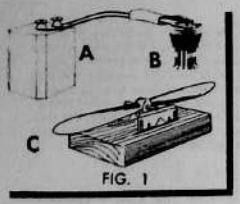
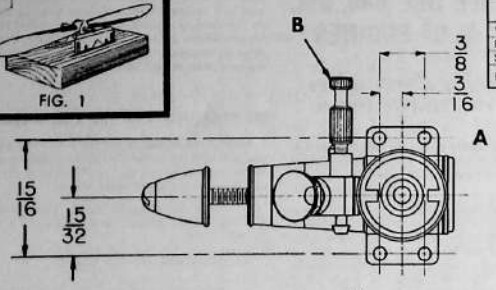


FIG. 1

FULL SCALE VIEWS OF THE TEE DEE .049 AND .051
FOR INSTALLATION INFORMATION



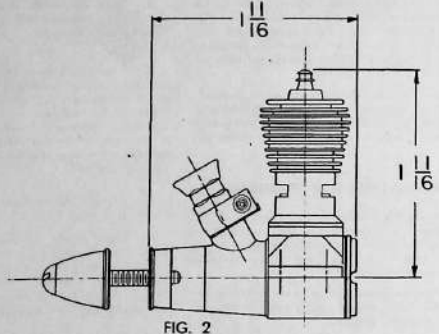
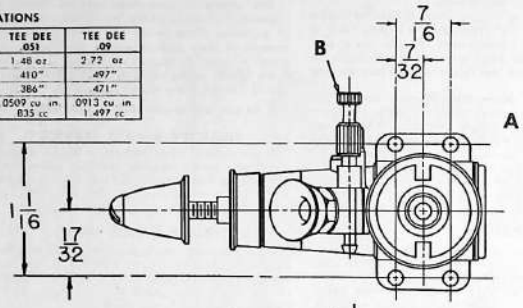


FIG. 2

SPECIFICATIONS

	TEE DEE .049	TEE DEE .051	TEE DEE .09
Weight	1.48 oz.	1.48 oz.	2.72 oz.
Bore	.406"	.410"	.497"
Stroke	.386"	.386"	.471"
Displacement	.0499 cu. in. 819 cc	.0509 cu. in. .835 cc	.0913 cu. in. 1.497 cc

FULL SCALE VIEWS OF THE TEE DEE .09
FOR INSTALLATION INFORMATION



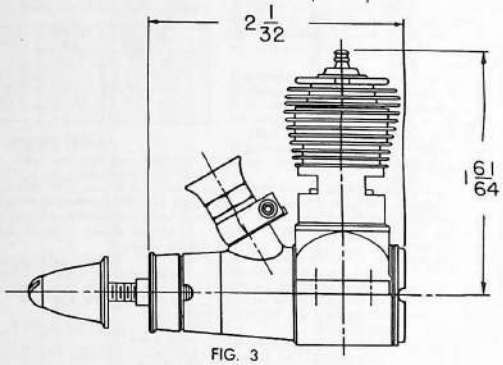


FIG. 3

crank it over. It should start immediately. Blowing into the exhaust ports between flips will help clear the excess fuel out of the glow plug.

2. If it starts up with lots of power and dies immediately it is too lean. Open the needle valve a half turn, prime the engine, and crank it over again. If the trouble persists and the tank is lower than the carburetor try choking again as in Section B Par. 4. If the engine hasn't been run for some time it is possible that thick castor oil is clogging the jets. Choking will clear this out.

3. If the engine still persists in above action it is possible the carburetor jets are stopped up. Remove the venturi nut and needle valve body. Three tiny jet holes will be found in the groove around the venturi tube. Clean these jet holes with a piece of fine wire. Reassemble and the engine should run.

4. If the engine refuses to fire at all, screw the glow plug out and connect it to the clip. If the little coil inside does not get red hot, it is either burnt out or the battery is dead or the connections are made incorrectly. Replace the battery or the plug, or correct the connections. Glow plugs are **never** guaranteed. Do not return the engine to the factory for a burnt out glow plug because the cost to you will be excessive. Buy one from your dealer.

5. If you are not using Cox fuel, try it. **Never use gasoline or gasoline type fuels.**

(D) OPERATING TIPS AND ENGINE CARE

1. The glow plug is built right into the head in one unit. When the plug burns out just replace the entire head at the regular glow plug price.

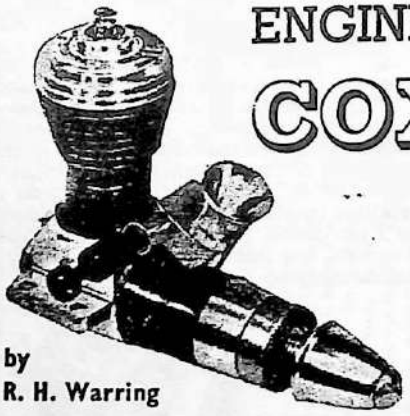
2. After the last run, oil the engine with a light oil (SAE 10 is good) and wrap it with cloth or otherwise protect it from dust and dirt.

3. If the engine gets dirt in it through crack-up or otherwise, do not run it until it is thoroughly cleaned. **Take it apart,** wash it, oil it, and reassemble.

4. If the engine gets tight it is not frozen up. Do not send to factory. A new engine will sometimes tighten up a few times, especially after slow runs. This is more likely to happen, and will occur more often to an engine that is properly fitted, and has properly smooth wearing surfaces. Do not run it tight. The tightness is caused by a shellac-like deposit on the cylinder wall. Screw the head off. **Remove the cylinder** and scour the inside wall very lightly with a bit of fine or medium steel wool. Wash, oil, and replace. The engine will then turn over freely and run properly. **Never** use sandpaper, emery cloth, or abrasives of any kind, or scrapers. Such methods will ruin the cylinder. Steel wool will not harm the bore.

5. Certain kinds of weather, especially warm humid (sticky) weather will cause excessive shellacking in a new cylinder. There is no known way to eliminate this nuisance and the smoother the fit the more susceptible is the engine to this trouble.

6. Do not tighten the head too firmly. Set it up just snug. Before removing head allow it to cool so it will loosen more easily. Use both wrenches when removing glow head. The top fin has flats for this purpose. Exhaust port should not be used



ENGINE ANALYSIS No. 101

COX TEE DEE ·049

High performance glow plug engine for contest flying in the ½A F/F class

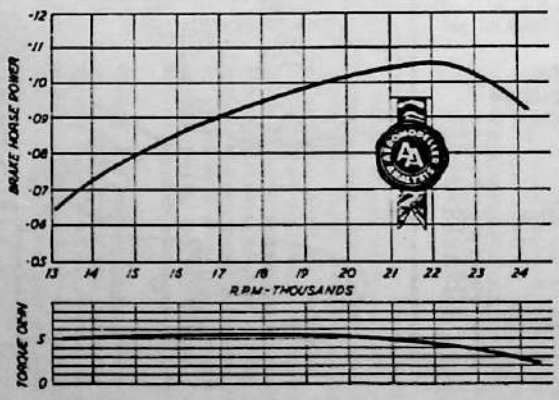
by
R. H. Warring

THE TEE-DEE IS an exactly scaled down version of the T-D .15 in the ratio 1:1.44, reducing the bore from .585 in. to .406 in. and the swept volume from .1494 cu. in. to .0499 cu. in. (.819 c.c.) or the upper limit of the American ½A contest size. Like its larger counterpart it is essentially an engine with a contest performance which gives it certain characteristics not normally associated with sports motors for "Sunday flying." Nevertheless it is still an easy motor to handle, particularly using spring start, and can be "tamed" by using larger propeller sizes, if necessary.

Hot fuel advised

For absolute maximum performance very high nitro-content fuels can be used, provided one accepts the fact that above 40 per cent. nitromethane content glow element life will be drastically reduced. Also the compression ratio is extremely high to start with. For all practical purposes a 30 per cent. nitromethane fuel is about the hottest fully compatible with the design layout. The test figures were obtained on a nominal 25 per cent. nitromethane mixture (nominal because the original mixture was re-made around a commercial nitro fuel, the actual nitro percentage of which was suspect on comparing running figures). These showed a peak B.H.P. figure of .105 at 22,000 r.p.m., equivalent to nearly .13 B.H.P. per c.c., which is really top performance for a glow motor of *any* size.

The .049 is adaptable to pressurisation via the tapping point on the crankcase plastic moulding, drilling through the basic crankcase bearing length to match and open up a port "timed" by the crankshaft induction port. It is very difficult to assess the merits of pressurisation on bench-run tests. Certainly it did not make any measurable difference on propeller-r.p.m. figures. Under flight conditions, however, pressurisation might make all the difference between a good consistent run and one plagued by varying feed due to tank position, inertia forces, etc.



Pressure feed not essential

If flight performance is consistent without pressurisation, it would seem best to forget it. If flight running is inconsistent, we would still prefer to try altering tank position, shape, etc., first before resorting to pressurisation. One thing about tapping the pressure point off the crankshaft, though, is that it does make it non-critical and with no adverse effect on starting characteristics.

The .049 ran consistently at all propeller-speeds tried, which ranged from about 12,000 r.p.m. up to beyond 21,000 r.p.m. on 5 in. diameter propellers. It is obviously happiest running at the higher speeds—as well as peaking very high in the speed range—so that a 6 x 3 propeller would appear a logical free flight choice, with a 5½ x 4 or 5 x 4 for control line. Hand starting is still readily possible with 5 in. diameter propellers although because of the high compression timing is very "advanced" and there is a considerable kick-back. Propellers must be flipped *really* smartly. Using the spring starter gives far less trouble, safer to the fingers, and pretty foolproof unless the engine is flooded.

Strong props wanted

Nylon or wooden propellers are virtually essential for safety—with the .049 seeming to prefer the additional "flywheel" effect of the heavier plastic product. Brittle plastic propellers (e.g. styrene) could well burst or shed a blade at these speeds. Because running speeds are high, too, propellers require careful balancing to minimise vibration—and a final adjustment of position on the shaft to give smoothest possible running. The beam mounting lugs give a more solid fixing than the plastic mounts used on the two smaller engines—and also represents a change in appearance on the two larger Tee-Dee engines (.049 and .15).

In layout and construction the .049 follows that of the .15 (see AEROMODELLER January 1962), with all components proportionately reduced in size. Crankshaft diameter is a generous .280 in. with bearing surface relieved to provide two main journals (one long and one short). The crank web is counterbalanced to a fair degree. The whole shaft is quite hard and finished by

grinding over the journals and .109 in. diameter crankpin.

The cylinder is of unhardened steel with the same fluted diametrically opposed transfer passages as on all the Tee-Dee series. The piston is hardened, with ball-and-socket little end joint for the slightly tapered hardened steel connecting rod of .087 in. mean diameter. The light alloy crankcase unit is machined from bar stock tapped to take a front collar locating the plastic moulding comprising centre section and venturi base. The venturi then screws into the plastic housing through the carburettor fitting (comprising needle housing and main jet feeding the groove in the venturi body opening into the throat via four peripheral jets. These jet holes are small and readily clogged—hence the advisability of using clean, preferably filtered fuel. Cox do, in fact, make a filter-spout to fit standard fuel cans and for the protection it gives this simple device is an excellent fitting for *any* fuel can.

Needle adjustment tended to be a little bit critical on straight fuel, although starting was still straightforward and running consistent. For consistent contest performance it will probably be necessary to formulate an "optimum" mixture to suit average conditions and then be prepared to adjust the fuel proportions, as necessary, to meeting changing climatic conditions. With a head element there is no chance to change the glow plug for a "hotter" or "cooler" type.

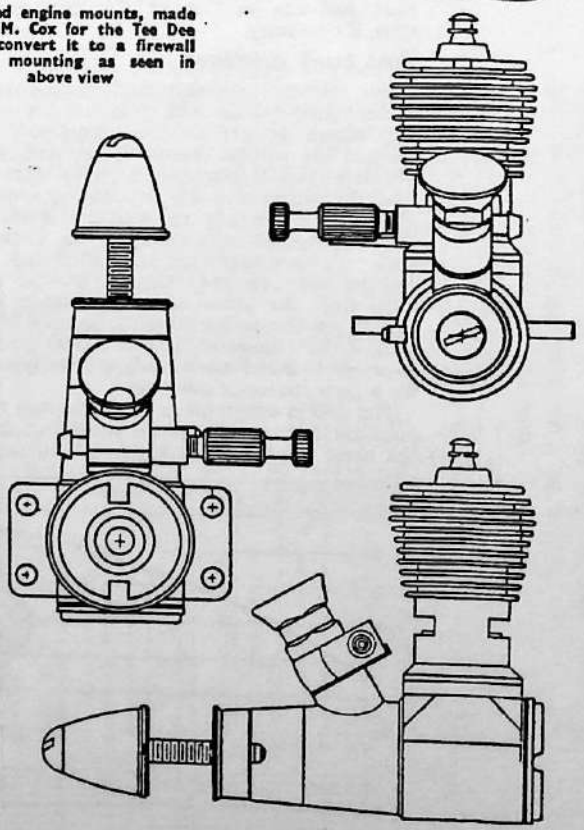
Ready for use

With the Cox standard of manufacturing accuracy, surface finish and fits, no running-in is necessary with the .049 although the initial run should be made on a rich mixture just as a precaution. As with the two smaller engines, "lacquering" may develop later to retard performance and require removing (on LeRoy Cox's advice) by scouring the cylinder bore with fine steel wool. There is little or no chance of reworking the engine to get any little extra performance, nor is this necessary (no modification is likely to improve performance in this highly developed design).

Maximum performance with a new engine will be developed after only a few minutes running time—say 30 minutes at the most—and the possibility of variation between different engines is remote. Any marked differences in the performance of two new engines can be put down to fuel differences. Some loss of performance after about an hour's running may be noticed, recoverable by "de-lacquering". Unlike some glow motors, too, performance should be held for quite a long useful life.

Although a perfectly normal production engine—every one the same and produced in thousands—the .049 is up to top contest standard in ½A class—better than most of its contemporaries and comparable with most "tuned" specials (and without being as tricky or sensitive to fuel mixture as some). It looks right, sounds right on "matching" propeller sizes, and backs up that promise with a peak B.H.P. figure comparable with that of many 1 c.c. diesels. It is not the easiest of .049 glow motors to start, but that is a small price to pay for the performance achieved.

Moulded engine mounts, made by L. M. Cox for the Tee Dee .049 convert it to a firewall radial mounting as seen in above view



Material Specifications:

Crankcase: machine from light alloy bar stock
Intake housing: injection moulded plastic
Cylinder: mild steel (integral fins)
Cylinder head: turned from light alloy (integral glow element)
Back cover: machined from solid.
Crankshaft: hardened steel
Connecting rods: hardened steel (machined). Ball and socket little end
Piston: hardened steel (hardened on walls only), flat top
Propeller shaft: steel screw and spinner (turned from light alloy)
Venturi intake: machined from light alloy
Carburettor collar: light alloy (anodised gold).
Needle: steel (spring ratchet)
Propeller driver: machined from light alloy (anodised gold).
Manufacturers: L. M. Cox Manufacturing Co., Box 476 Santa Ana, California, U.S.A.
U.S. Retail Price: $7.98. Price in G.B. 71s. 6d.
British importers: A. A. Hales Ltd., Potters Bar, Middlesex.

Specification

Displacement: .819 c.c. (.0499 cu. in.)
Bore: .406 in.
Stroke: .386 in.
Bore/stroke ratio: 1.05
Bare weight: 1¼ ounces
Max power: .105 B.H.P. at 22,000 r.p.m.
Max. torque: 5.5 ounce-inches at 18,000 r.p.m.
Power rating: .128 B.H.P. per c.c.
Power/weight ratio: .07 B.H.P. per ounce

Propeller R.P.M. Figures

Propeller	*R.P.M.*
6 x 4 Top Flite nylon	14,500
5½ x 3 Top Flite nylon	21,000
6 x 3 Top Flite nylon	18,400
5½ x 4 Top Flite nylon	18,200
6 x 4 Davies-Charlton nylon	17,000
5½ x 3½ Davies-Charlton nylon	24,000
6 x 4 Frog nylon	15,400
6 x 4 Stant	12,200
6 x 3 Stant	14,400
5 x 3 Keilkraft nylon	21,000
5 x 4 Keilkraft nylon	19,800

Fuel: 25 per cent. nitromethane, 20 per cent castor; 55 per cent. methanol.

lacking in a new cylinder. There is no known way to eliminate this nuisance and the smoother the fit the more susceptible is the engine to this trouble.

6. Do not tighten the head too firmly. Set it up very lightly. Allow the engine to cool before removing head so it will loosen more easily. Too much pressure against the exhaust ports to hold the cylinder from turning may force the cylinder out of round or even turn a burr into the bore. A new cylinder is usually required to remedy such damage.

7. To remove the glow head from a hot engine —pour a little fuel slowly over the glow head to reduce the head temperature. Do not run it over the cylinder. The head will then release easily. A hot head will stick and forced removal may damage the cylinder.

8. If desired, the Carburetor Spray Bar may be removed and repositioned so that the Needle Valve is on the opposite side of the engine. To remove the Spray Bar first remove the Needle Valve and Needle Valve Spring. Remove the small Retainer Ring which locks the Spray Bar into the plastic Carburetor Body. Carefully press the brass Spray Bar out of the Carburetor Body. Reposition the Spray Bar from the opposite side and replace Retainer Ring, Needle Valve Spring and Needle Valve. When replacing the Spray Bar, make certain the fuel jet hole points downward (towards the Crankshaft) in the venturi.

(E) PRESSURIZING

Pressurizing is very critical when taken directly off the crankcase. On this engine pressurizing means have been provided and the rotary valve controls the pressure to normal operating limits. The hole in the pressure fitting on this engine is already started, but the hole will have to be drilled through the crankcase at this point before you can run on pressure. To rig for pressure observe the following steps:

1. Remove the back cover, cylinder, piston and rod assembly, venturi and needle valve assembly.

2. Rotate crankshaft until the port opening in the shaft points towards the pressure fitting on the right side of the red plastic carburetor body.

3. Continue drilling the hole already started in the pressure fitting through the crankcase. Use a #60 drill (.040 diameter).

4. Rotate crankshaft to deburr the drilled hole.

5. Flush crankcase and shaft thoroughly with methanol to remove all metal particles.

6. Lubricate shaft with light weight oil and reassemble engine.

*The fuel tank must be air tight in order for the engine to operate properly on pressure. Be sure the tubing that connects the pressure fitting on the engine to the tank is also air tight. If the engine does not run smoothly air is getting into the pressure system. Check it thoroughly.

With pressure, the venturi may be opened to 7/32" diameter to attain maximum power.

WARRANTY

This engine is guaranteed against defects in materials and workmanship for 30 days from date of purchase. Glow heads are never guaranteed because of their delicate nature. No other guarantee is made or implied. If engine is returned to the factory within warranty, include 50c to cover cost of handling and return postage.

Do not take engine back to your dealer.

FACTORY REPAIR SERVICE

Minor repairs, examinations, or adjustments — $1.50 plus parts. Complete overhaul (guaranteed new engine performance) $7.50, including parts. On all C.O.D. shipments, purchaser pays postage and C.O.D. fees.

SPEEDS

The following speeds are typical of engines selected at random and run under average conditions.

	MEDALLION .049 RPM	MEDALLION .09 RPM	MEDALLION .15 RPM
5" Dia. x 3P	18,700		
5" Dia. x 4P	16,000		
5½" Dia. x 4P	15,200		
6" Dia. x 3P	15,000		
6" Dia. x 4P	12,600	16,000	
6" Dia. x 5P		15,250	
7" Dia. x 3P		15,250	
7" Dia. x 3½P		15,000	
8" Dia. x 3P		11,400	14,800
8" Dia. x 4P		10,800	13,800
7" Dia. x 6P			13,500
9" Dia. x 3P			13,200

PARTS ORDER

Purchase parts from your dealer. If not available, order direct from factory. No C.O.D.'s please. Send remittance with your order. On orders less than $2.00 add 35c handling charge. In California add 4% sales tax.

Prices and design of parts subject to change without notice.

PARTS LIST PART	MEDALLION .049 Cat. No.	List Price	MEDALLION .09 Cat. No.	List Price	MEDALLION .15 Cat. No.	List Price
Crankcase	1701	2.00	2101	3.00	2601	4.00
Glow Head	302-1	.65	2302	.75	1102	.75
Piston & Rod Assy.	303	1.50	2303	1.75	2203	2.00
Cylinder	304-2	1.50	2304	2.50	2204	2.75
Crankshaft	2405	2.15	2305	2.75	2205	2.85
Needle Valve & Spring Assy.	2309	.60	2309	.60	2209	.75
Prop Drive Plate	2410	.35	2310	.50	2210	.50
Prop Screw & Washer			2319	.35	1119	.35
Prop Spinner & Screw	1718	.35				
Retainer Nut	1721	.40	2121	.45	1821	.50
Crankcase Rear Cover	1722	.50	2122	.50	1822	.60
Carburetor Body	2424	.60	2324	.70	2224	.85
Carburetor Complete	2425	2.00	2325	3.00	2225	3.25
Spray Bar & Retainer	2328	.75	2328	.75	2228	.85
Wrench	1530	.60 Pr	2130	.65 Pr	1130	.70 Pr

Order Parts by Catalogue Number

L. M. COX MANUFACTURING CO., INC.
P. O. Box 476 • Santa Ana, California

Printed in U.S.A. 1-65 2259

CARE AND OPERATION OF YOUR COX

MEDALLION .049, .09 & .15

ENGINES

THESE ENGINES ARE OUTSTANDING FOR SPORT FLYING, BOTH CONTROL LINE AND FREE FLIGHT

Keep it immaculately clean, use Thimble Drome glow fuel in the blue can and it will maintain its winning characteristics for a long period of time.

This engine is precisely fitted at the factory for immediate easy starting and immediate flight. A break-in period in the ordinary sense is not necessary for flight, in fact, a slow, easy break-in is not desirable. Most of these engines will develop almost full power within one minute of running time; but a few, those which are slightly on the tight side, may not develop full power under one hour. Even these will develop sufficient power for average flying almost immediately. The only break-in required is very rich (slow) running for the first 60 seconds after starting the first time. After 60 seconds it should be ready to go. 30 minutes running time will add a few RPM for peak contest operation.

Elimination of break-in is not attained through loose or sloppy fitting, but through very precise fitting, together with super fine wearing surfaces.

Remember — your Medallion engine is much happier at high speeds. Let it wind up. Do not use over-size props.

(A) PREPARATION FOR RUNNING

1. Mount the engine in the plane, or if you want to give it some running first, mount it on a suitable mount. Do not hold the engine directly in a vise. Use A-Fig. 2, A-Fig. 3 or A-Fig. 4 as a template to drill mounting holes.

2. Place propeller on the shaft with the flat side of the blades toward engine and lock securely with the propeller screw.

3. Procure a fuel tank from your local hobby dealer and connect the tank outlet to the carburetor fuel inlet nozzle. Best results will be obtained by mounting the tank close to the engine and with the average fuel level at the same height as the carburetor venturi. Use a Thimble Drome filler spout with stainless steel strainer in your fuel can. Your tank will thus be filled direct from the can and protected from dirt and foreign matter that would otherwise stop up the carburetor jet. The strainer keeps dirt out of the can, and any particles that might already be in the can, from getting into the carburetor jet.

4. Procure a 1½ volt Cox dry cell battery, or equivalent, and connect it with 2 flexible insulated wires to the glow plug clip as shown in A and B-Fig. 1. Do not use a stronger battery. If you do, the plug will burn out. The connections should be soldered to insure good contact, and taped to prevent bare ends of wire from getting together and "shorting" the battery. Be sure the battery is a good one. Your dealer sells batteries and glow plug clips. The Thimble-Drome plastic mounted glow plug clip with wires already attached is recommended, and requires no soldering. (Cat. #755—35c).

5. Balance and trim propeller. This is very essential for good performance. Sand off any bead of plastic along the edges of the blades. Fit a drill or shaft through the hole and rest the shaft on razor blades set in wooden blocks as shown in C-Fig. 1. Sand the heavy blade until the propeller will balance in a horizontal position. Care must be taken to do the sanding without spoiling the airfoil characteristics of the propeller blades. Caution: Use only nylon or wooden props. Styrene props are extremely dangerous on these engines.

(B) STARTING THE MEDALLION ENGINE

No matter how expert you are with small engines you will have better luck with these engines if you follow directions exactly as listed and do each operation in the exact order given.

1. Close the carburetor needle valve, B-Fig. 2, B-Fig. 3, or B-Fig. 4, by turning it clockwise until it stops. Do not force it.

2. Fill the fuel tank with Thimble-Drome glow fuel (in the blue can).

3. Open the needle valve (counter clockwise) exactly 5 turns for the .049 and .09, and 6 turns for the .15 engine.

4. If the fuel level in the tank is lower than the carburetor venturi, put your finger over the air intake of the engine and pull the prop thru compression until the fuel hose is full. Use a clear plastic fuel line so this can be checked visually. If the tank is mounted so the fuel level is higher than the carburetor the hose will fill itself when the needle valve is opened.

5. Connect the battery by snapping the clip on the glow head, B-Fig. 1.

6. Squirt a few drops of fuel into the exhaust ports and immediately flip the propeller over counter clockwise. For quick starting, the propeller must be flipped vigorously. The engine should start instantly if it has been primed with the correct amount of fuel in the exhaust port.

7. When the engine starts it will be running very rich and slow. The first time the engine is started let it continue to run rich for a period of 60 seconds. After approximately 60 seconds, slowly close the needle valve clockwise to the best running position and remove the battery connection. Subsequent starts may be adjusted to best running position immediately.

8. If starting is delayed for any reason, close needle valve, otherwise engine will become flooded. This precaution is only necessary if the tank is mounted so the fuel level is higher than the carburetor.

(C) FAILURE TO START

1. If the engine coughs and spits a bit of fuel spray from the exhaust, it is too rich. Close the needle valve and continue cranking until engine starts briefly. Open the needle valve again and crank it over. It should start immedi-

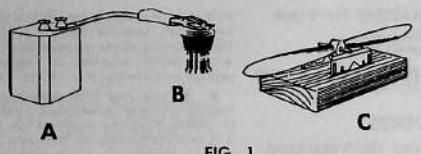


FIG. 1

FULL SCALE VIEWS OF THE MEDALLION .049

FOR INSTALLATION INFORMATION

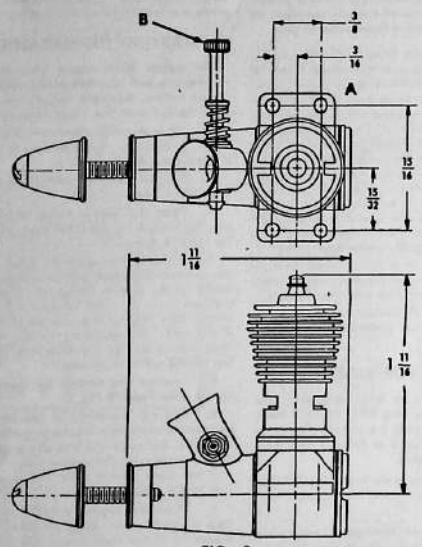


FIG. 2

FULL SCALE VIEWS OF THE MEDALLION .09

FOR INSTALLATION INFORMATION

SPECIFICATIONS

	MEDALLION .049	MEDALLION .09	MEDALLION .15
Weight	1.499 oz.	2.72 oz.	4.243 oz.
Bore	.406"	.497"	.591"
Stroke	.386"	.471"	.556"
Displacement	.049 cu. in. .818 cc	.091 cu. in. 1.497 cc	.152cu. in 2.499 cc

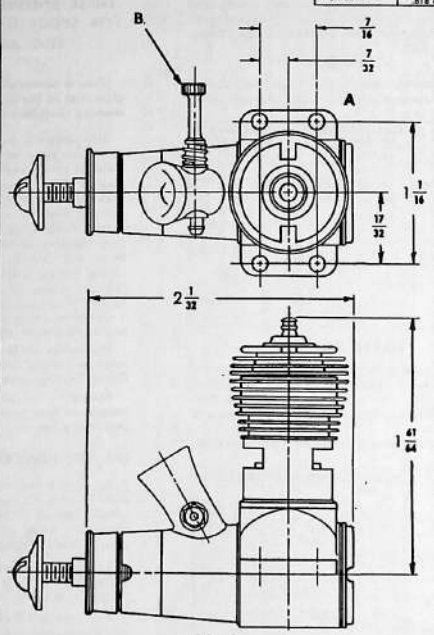


FIG. 3

FULL SCALE VIEWS OF THE MEDALLION .15

FOR INSTALLATION INFORMATION

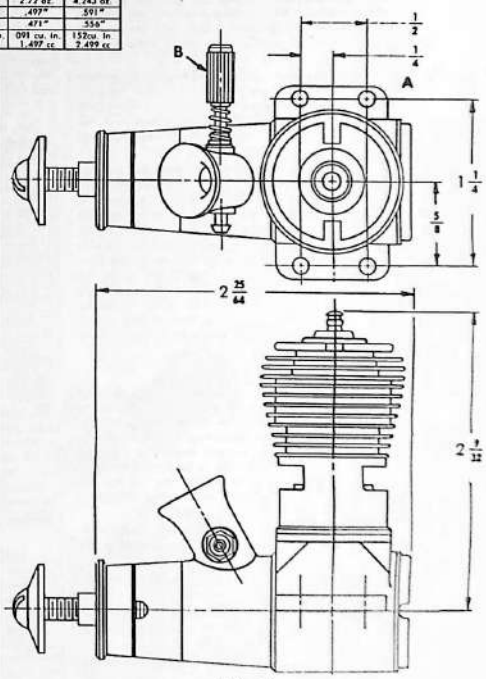


FIG. 4

ately. Blowing into the exhaust ports between flips will help clear the excess fuel out of the glow plug.

2. If it starts up with lots of power and dies immediately it is too lean. Open the needle valve a half turn, prime the engine, and crank it over again. If the trouble persists and the tank is lower than the carburetor try choking again as in Section B Par. 4. If the engine hasn't been run for some time it is possible that thick castor oil is clogging the jets. Choking will clear this out.

3. If the engine still persists in above action it is possible that the Spray jet is stopped up. If this condition exists it will be necessary to remove the Spray Bar and clean the jet with a fine wire. Instructions for removing the Spray Bar are covered in Section D, paragraph 9.

4. If the engine refuses to fire at all screw plug out and connect it to the clip. If the little coil inside does not get red hot, it is either burnt out or the battery is dead, or the connections are made incorrectly. Replace the battery or the plug, or, correct the connections. Glow plugs are **never** guaranteed. Do not return the engine to the factory for a burnt out glow plug because the cost to you will be excessive. Buy one from your dealer.

5. If you are not using Thimble-Drome fuel, try it. **Never use gasoline or gasoline type fuels.**

(D) OPERATING TIPS AND ENGINE CARE

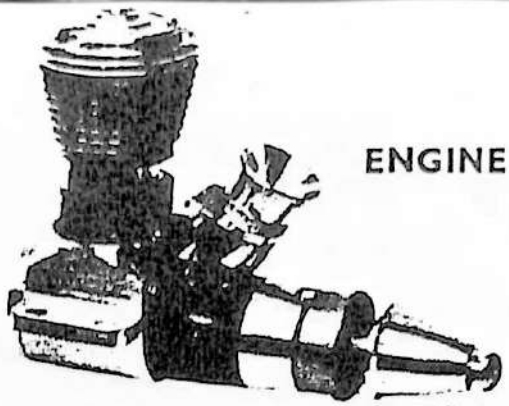
1. The glow plug is built right into the head in one unit. When the plug burns out just replace the entire head at the regular glow plug price.

2. After the last run, oil the engine with a light oil (SAE 10 is good) and wrap it with cloth or otherwise protect it from dust and dirt.

3. If the engine gets dirt in it through crack-up or otherwise, do not run it until it is thoroughly cleaned. **Take it apart,** wash it, oil it, and reassemble.

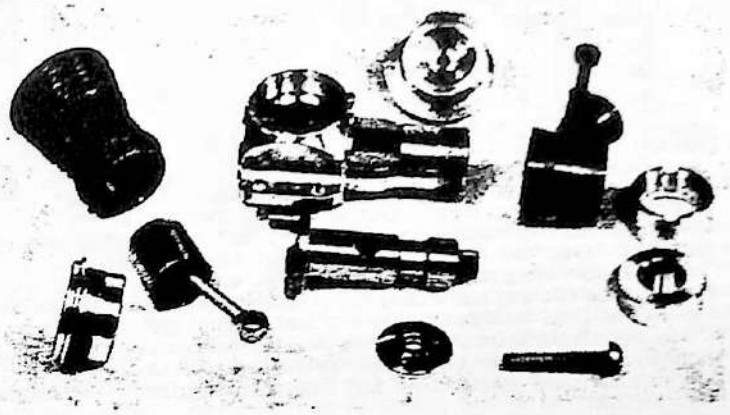
4. If the engine gets tight it is not frozen up. Do not send to factory. A new engine will sometimes tighten up a few times, especially after slow runs. This is more likely to happen, and will occur more often to an engine that is properly fitted, and has properly smooth wearing surfaces. Do not run it tight. The tightness is caused by a shellac-like deposit on the cylinder wall. Screw the head off. **Remove the cylinder** and scour the inside wall very lightly with a bit of fine or medium steel wool. Wash, oil, and replace. The engine will then turn over freely and run properly. **Never** use sandpaper, emery cloth, or abrasives of any kind, or scrapers. Such methods will ruin the cylinder. Steel wool will not harm the bore.

5. Certain kinds of weather, especially warm humid (sticky) weather will cause excessive shel-



ENGINE ANALYSIS No. 109 by R. H. Warring

COX TEE-DEE ·09 and MEDALLION ·09

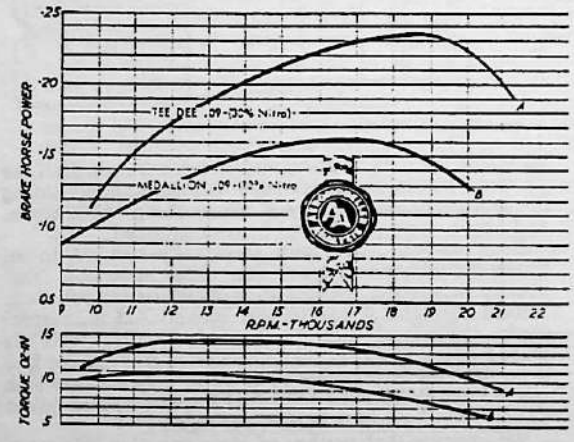


THESE TWO ENGINES, virtually identical except for the carburettion, represent a typical example of "Cox" standards—and still leaves us puzzled as to how they do it! The "Medallion" is rated as a sports engine with a typical (but very good) 1.5 c.c. sports performance. The Tee Dee is so close geometrically that you can swop over virtually any part with the Medallion—cylinder, piston, shaft all interchange if you care to try it—but its performance is quite exceptional for an engine of this size. The only *apparent* difference is that the Medallion employs conventional spraybar carburettion and the Tee-Dee the Cox-originated annular mixing chamber with three small holes opening into the venturi throat—plus two transfer ports instead of one. With perfect logic, you pay more for the performance of the Tee-Dee—which is not just the difference in carburettor cost—although we suspect there is a little more to it than that. Although all Cox engine parts are made to very close tolerances we suspect that Tee-Dee production takes the best and closest match and the Medallions the general production run. Suffice it to say that the fits and tolerances on the latter are quite exceptional by any standards.

Both engines represent excellent value for money, with a "de luxe" appearance and workmanship and performance to match. To the British modeller used to diesels they are a little "soft" and need that much more care in handling, particularly if disassembled. The prop. shaft screw is soft steel and readily bent, for example (but just as easily replaced). The cylinder is soft and readily burred or even distorted unless the proper tool is used to unscrew it. Yet it is more than tough enough for the job for which it is designed and very much thicker walled than the original Cox cylinders produced for their first crankcase rotary series. Crankshaft diameter is also very generous at ⅜ in. for a glow motor of this size, although the beam strength is somewhat reduced by the large central hole (17/64 in.) and the massive rectangular port opening measuring approximately ⅜ in. by ¼ in. The shaft is hardened, as is the piston and connecting rod with the characteristic ball-and-socket little end introduced on the original models (but subsequently abandoned in favour of a conventional gudgeon pin on the 2.5 c.c. Cox Special).

A hardened steel con. rod running on a hardened steel crankpin is not, theoretically at least, a good wearing combination but presumably is dictated by the con-rod requirements and we hesitate to advance the remark more than as comment, rather than criticism. The big end fit in any case is beautifully accurate, with provision for adequate oil lubrication via drilled hole in the end of the con. rod.

The crankcase unit is machined from solid bar stock in the characteristic Cox manner of production and seemingly electro-polished after finishing. Over this fits the plastic moulding carrying the intake tube and carburettor assembly, held in place by a threaded collar screwing onto the front. The intake port on the crankcase



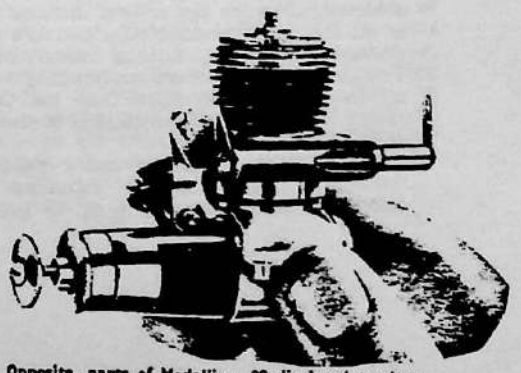
Propeller r.p.m. figures

	Tee Dee 09	Medallion 09
6 x 4 Top Flite	19,500	17,200
7 x 4 Top Flite	15,500	12,900
8 x 4 Top Flite	13,200	11,300
9 x 4 Top Flite	8,700	7,700
6 x 4 K-K nylon	19,000	17,100
6 x 3 K-K nylon	20,800	19,200
7 x 4 K-K nylon	15,400	13,300
8 x 4 K-K nylon	12,200	10,300
6 x 4 D-C nylon	20,000 plus	—
7 x 4 D-C nylon	15,900	14,200
Fuel used:	*Cox Nitro 30 Racing fuel*	*Cox Thimbledrome glow fuel*

DATA

Displacement: 1.497 c.c. (.0914 cu. in.
Bore: .497 in.
Stroke: .471 in.
Weight: Medallion 09—2⅞ ounces
Tee Dee 09—2¼ ounces
Max. power: Medallion 09—.162 B.H.P. at 16,500 r.p.m.
Tee Dee 09—.235 B.H.P. at 19,000 r.p.m.
Max. torque: Medallion 09—11 ounce-inches at 12,000 r.p.m.
Tee Dee 09—14.7 ounce-inches at 14,000 r.p.m.
Power rating: Medallion 09—.108 B.H.P. per c.c.
Tee Dee 09—.1575 B.H.P. per c.c.
Power/weight ratio: Medallion 09—.059 B.H.P. per ounce
Tee Dee 09—.086 B.H.P. per ounce.

Material specification:
Crankcase: light alloy, machined from bar stock
Cylinder: mild steel
Piston: steel with hardened walls
Crankshaft: hardened steel
Connecting rod: hardened steel (ball and socket little end)
Cylinder head: light alloy
Crankcase back cover: light alloy
Carburettor: plastic housing with pressure tap (blind as supplied)
Medallion 09—brass spraybar and steel needle valve carburettion
Tee Dee 09—light alloy intake tube (venturi) with peripheral jets; needle valve in separate housing feeding into annular passage connecting jets
Prop. driver: light alloy (anodised gold on *Tee Dee* 09)
Propeller shaft: diameter mild steel screw cadmium plated)
Aluminium spinner with *Tee Dee* 09



Opposite, parts of Medallion .09 displayed to show one piece carburettor moulding, only external distinction. Above is precision throttle control, to sell in U.S.A. at $4.50 for .09, providing low idling speed and no reduction in top r.p.m.

unit is cut right across so that when the plastic moulding is fitted a sort of expansion chamber is formed immediately above the port opening. In the case of the Medallion a conventional venturi-shaped intake tube is formed integral with the moulding with a circular opening at the bottom of modest diameter. The Tee-Dee moulding carries a short stub intake only, into which a machined dural venturi tube screws, this being of true venturi shape with the bore diverging after the throat. A collar attachment encircles the dural venturi, carrying the needle valve metering the fuel via a single hole into a grooved passage around the outside of the venturi throat. Three very tiny holes circumferentially disposed then open from this annular passage into the venturi throat. Both mouldings have a side pipe for drilling through to provide tank pressurisation if required, timed by the shaft rotation.

Cylinders are machined from mild steel, and quite heavyweight in construction by Cox standards. Diametrically opposed exhaust ports of generous area are cut in the cylinder walls and in the "pillar" space between them a scalloped transfer passage is cut on the inside walls. The top of the transfer passage is arced, giving virtually 100 per cent. overlap at first opening. The Tee Dee has two such transfer passages (one in each "pillar" space, and the Medallion only one, this—apart from the carburettion—being the only real geometric difference between the two engines. Fitting the Medallion cylinder to the Tee Dee, incidentally, more or less reduces it to "Medallion" performance, showing that the difference in performance between the two relies mainly on improved carburettion and getting more fuel through the engine more quickly.

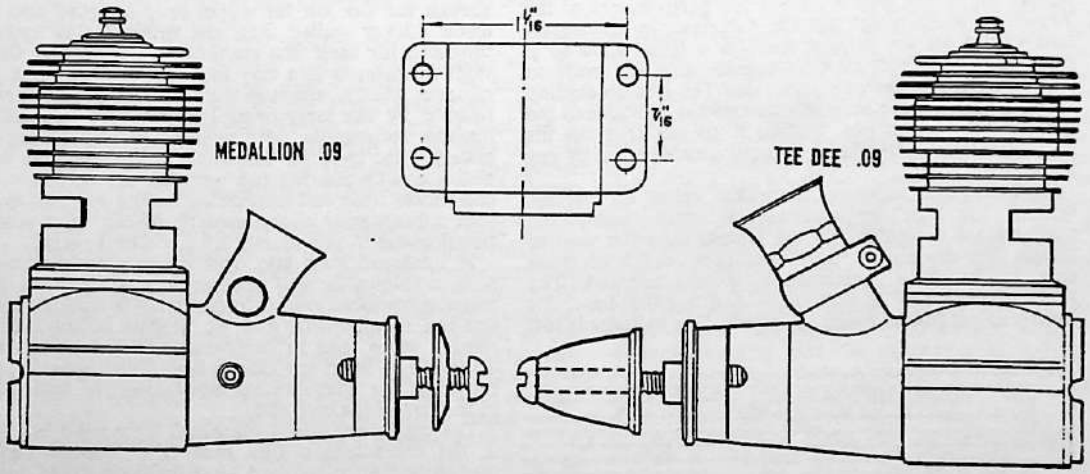
The pistons are of lightweight construction with extremely thin walls. Only the outside walls are hardened, the inside and top being copper plated to retain them in soft condition and make it possible to peen over the ball-end joint. The piston top is flat with only a slight edge radius. Cylinder head is a dural turning with integral glow element, screwing into the top of the cylinder and seating on a copper gasket. This is the only gasket used in the whole assembly, although the Tee Dee does carry a very thin laminated plastic spacer behind the propeller driver which also acts as an oil seal.

The crankcase back cover is a straightforward light alloy turning which screws directly into the crankcase unit. Distinguishing features between the two engines, apart from the appearance of the intake, are that the plastic intake moulding is red in the case of the Medallion and black in the case of the Tee Dee, whilst the Tee Dee prop. driver and carburettor collar are anodised gold. A chemically-treated (blacked) cylinder is common to both engines. The Tee Dee is supplied with a longer propeller screw and spinner in place of the short screw and washer on the Medallion, but these two fittings are interchangeable, if desired.

Despite the light weight of the reciprocating parts, and the counterbalance crankshaft, both engines are fairly susceptible to vibration and for best performance careful attention is necessary to propeller balance. This is largely due to the fact that both are high-revving engines. Whilst the "09" may appear to run quite well on an unbalanced load, a considerable loss of r.p.m. can result, as well as a considerable amount of engine vibration.

Starting and handling characteristics on both engines

Continued on page 235



ENGINE ANALYSIS

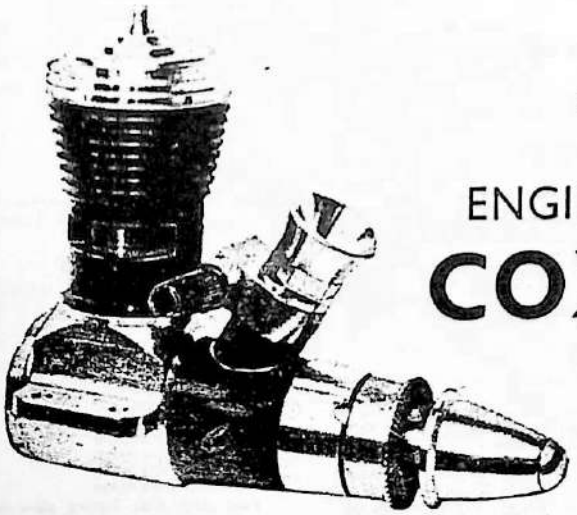
COX '09's continued from p.233

are good—the Medallion being somewhat easier for starting, perhaps, but despite its outstanding high speed performance the Tee Dee remains a remarkably good mannered engine—provided you flip it over fast on the smaller propeller sizes. Both engines like running fast and the Tee Dee, in particular, proved a bit rough and uneven at lower speeds, with a noticeable fall off in torque below 12,000 r.p.m. On the other hand it ran most smoothly and consistently at higher speeds, even when taken up well beyond the peak. We feel that the performance could be still further improved on the test figure achieved, although any further increase in nitro content of the fuel would undoubtedly lead to a much shortened element life. For all normal contest requirements the Tee Dee should give an outstanding account of itself on 25—30 per cent. nitro fuel, the Cox "Nitro 30" racing fuel now readily available in this country being an ideal match.

The Medallion, on the other hand, will run on "straight" fuels, although handling characteristics deteriorate somewhat and 5 or 10 per cent. nitro is advisable for easy starting and consistent running. Like its more powerful counterpart it is smoothest running in the high speed range—e.g. approaching 15,000 r.p.m. and above—and should not be over-propped.

Both models have been specifically reduced to an International contest size. The usual American "09" usually runs nearer .099 cu. in. in displacement, or 1.6 c.c. With a bore and stroke of .497 in. and .471 in., respectively, the actual displacement of the Cox "09's" is .0914 cu. in. or 1.497 c.c. As a contest engine the Tee Dee is particularly remarkable both for its exceptionally high specific power output (.1575 B.H.P. per c.c.) and power weight ratio (nearly .1 B.H.P. per ounce).

We imagine that neither of these two Cox 09's needs any specific recommendations from us as their performances on the flying field will undoubtedly speak for themselves in the coming months. The Medallion is an exciting and extremely powerful 1.5 c.c. sports engine with a performance not far removed from contest standards. Shortly, too, it will also be available with a throttle, when it will probably become a good choice for medium sized radio control models. The Tee Dee 09 has a performance potential better than that of any other 1.5 c.c. production engine that we know—diesel or glow—and this is one that could rule the 1.5 c.c. class.



ENGINE ANALYSIS No. 105

COX *Special* 15

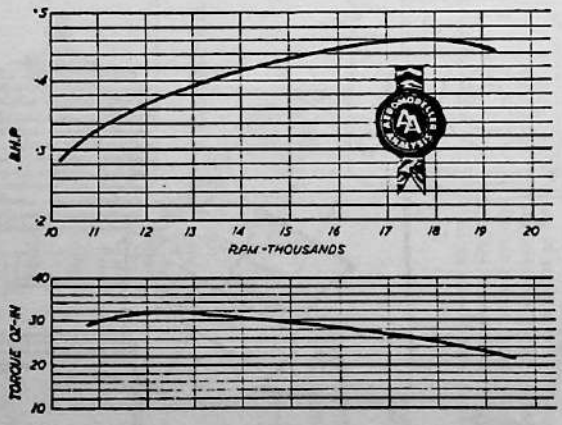
by R. H. Warring

THE COX IS a remarkable species of engine. Having arrived at a design layout which lends itself to exact scaling up or down to produce a whole family of sizes, each specific size then seems to lend itself to further minor variations, reflected in an appreciable difference in performance. Virtually, in fact, you get what you pay for. The more expensive the model in any particular size, the more powerful it is. Just where the extra comes from is difficult to detect, for workmanship throughout the range is outstanding.

The Cox Special 15 replaces the Tee Dee 15 (see AEROMODELLER, January 1962), which itself was an engine of outstanding performance for its size and weight, but suffered on the initial production run, at least, in having a cylinder with too thin a wall. As a result the cylinder was prone to crack between the exhaust ports, in line with the bottom of the ports. This was rectified by increasing the cylinder wall thickness quite substantially.

Despite its high speed performance, and a peak B.H.P. figure well in excess of 0.4 on heavily nitrated fuels, the Tee Dee 15 did not receive the contest honours one could have anticipated (particularly in the free flight field), which position the Special 15 looks like rectifying. It has already proved itself an outstanding unit at the U.S.A. 1963 F.A.I. power team eliminations. Although basically the same as the original Tee Dee it does give the impression of being a more rugged and contest-worthy engine, to say nothing of having found some additional power. The only major change, in fact, is the abandonment of a ball-and-socket con rod/piston assembly in favour of a more conventional gudgeon pin fitting. In other details, the comments of our January 1962 report generally apply.

The Cox Special is an out-and-out high speed engine. It is not happy on the larger propeller sizes, and even at 12,000 r.p.m. load-speed displays a certain reluctance to settle down. Starting characteristics, too, deteriorate at these lower speeds. But let it wind up to 17-20,000 r.p.m. with an 8- or 7-inch low pitch propeller and it becomes one of the sweetest running engines you could wish for, not particularly critical on settings and almost instant flick-starting, following a prime. About the only critical feature as regards handling is the fuel tank level for starting. Suction lift is relatively low when flicking over and the best tank position is just below the level of the spraybar. Gravity feed is not to be recommended as it makes it all too easy to flood the engine, especially if the battery is not right up to scratch.



Performance is noticeably improved running on high-nitro fuels and 30 per cent. nitro seems about the best selection for normal free flight contest work. Although shortage of nitromethane in this country has led to the virtual disappearance of commercial high-nitro fuels, Cox racing glow fuel (30 per cent. nitro) is now available in Britain—and at quite a reasonable price for this type of fuel, too—and is an ideal match. Performance is still good on standard Cox fuel (15 per cent. nitro), but definitely down (and high speed running less consistent) on straight fuels. Starting characteristics also deteriorate on straight fuels, although the compression ratio is high enough for running on non-nitrated fuels.

A 30 per cent. nitro fuel also gives a reasonable element life with the standard glow head. A new "*long life*" head has recently been introduced to fit the "15" (and also in other sizes for the 09 and 049), the only differences being that the element wire appears to be slightly thicker, and the actual machined surface of the combustion chamber slightly rougher (i.e. not polished as in the standard Special head). We noticed no difference in performance at all at low to moderate load-speeds (which in the case of the Special ranges up to some 15,000 r.p.m.!) but at higher speeds the normal head was worth several hundred extra r.p.m. Whether this was a characteristic of just the samples tried or not we cannot judge. Certainly, however, the "long life" element is much more robust and will stand up to a 2 volt accumulator for starting—provided the leads are not left on too long and the ac. is of reasonably small size so that the terminal voltage is pulled down a bit under load.

Performance we found to be quite markedly affected by weather. Initial runs in very cold conditions were somewhat disappointing, but subsequent runs in a higher ambient temperature produced outstanding results. By this time, too, the engine had received some 1½ hours running and although Cox engines are noted for their accuracy and are never "tight" even when brand new, performance does improve with about an hour's running time. The manufacturer's also make a special mention of "shellacing" or the formation of varnish-like deposits which can build up on the walls of the cylinder and contribute high frictional drag, although there was no evidence of this in our handling time, using Cox fuel throughout. The only time we experienced marked loss of power was in very cold weather, or when the cylinder has become accidentally unscrewed. It is relatively easy to loosen the cylinder

Specification

Displacement 2.449 c.c. (.1494 cu. in.)
Bore: .511 in.
Stroke: .556 in.
Weight: 4½ ounces
Max. power: .45 B.H.P. at 18,000 r.p.m.
Max. torque: 32 ounce-inches at 12,000 r.p.m.
Power rating: .185 B.H.P. per c.c.
Power/weight ratio: .102 B.H.P. per ounce
Material specification
Crankcase: machine from light alloy bar stock
Intake housing: injection moulded plastic
Cylinder: mild steel (integral fins)
Cylinder head: turned from light alloy (integral glow element)
Back cover: machined from solid
Crankshaft: hardened steel ⅛in. diameter
Connecting rod: machined from light alloy (plain big- and little-ends)
Piston: cast iron special alloy
Propeller shaft: .161in. N.S.F. steel screw and spinner (turned from light alloy)
Venturi intake: machined from light alloy
Carburettor collar: light alloy (anodised gold)
Needle: steel (spring ratchet)
Propeller driver: machined from light alloy (anodised gold)
Manufacturers: L. M. Cox Manufacturing Co., Box 476, Santa Ana, California, U.S.A.
U.S. Retail Price: $14.98. Price in G.B. 146s. 0d.
British importers: A. A. Hales Ltd., Potters Bar, Middlesex.

Propeller—R.P.M. Figures

Propeller	*R.P.M.*
8 x 4 Trucut	17,500
9 x 4 Trucut	13,800
9 x 6 K-K nylon	11,800
9 x 4 K-K nylon	14,200
8 x 4 K-K nylon	16,300
7 x 4 K-K nylon	19,200
9 x 4 Top Flite nylon	13,600
9 x 3 Top Flite nylon	15,800
8 x 4 Top Flite nylon	16,700
7 x 6 Top Flite nylon	16,600
7 x 4 Top Flite nylon	20,000

Fuel used: Cox Racing glow fuel (30 per cent. nitromethane).

when removing the head soon after a run for instance, as the head-cylinder fit is very tight, due to the greater expansion of the aluminium head when hot.

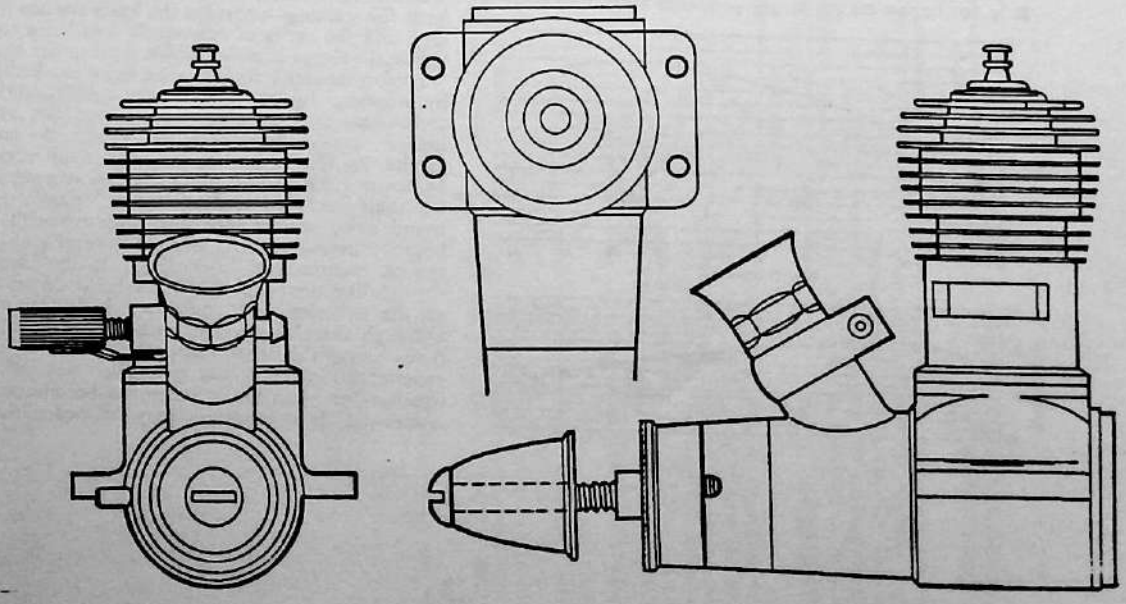
Test figures showed the remarkably high r.p.m. of 16,700 to 17,500 on 8 x 4 propellers, which appears a logical free flight size. A typical 9 x 4 pulls the revs. down quite a bit, but a 9 x 3 would also seem a good choice. Peak power, as determined from the dynamometer test, was developed at 18,000 r.p.m. although with smaller loads speeds well over 20,000 r.p.m. could be attained and held with remarkable steadiness. For a plain bearing engine this is a most remarkable performance. The only "fussy" characteristics we found, apart from fuel tank level for easy starting, was that the Special, like all Cox engines, readily suffers a blocked jet if the fuel is at all dirty. Clean fuel—and preferably filtered fuel—seems a "must" to be sure of avoiding this trouble.

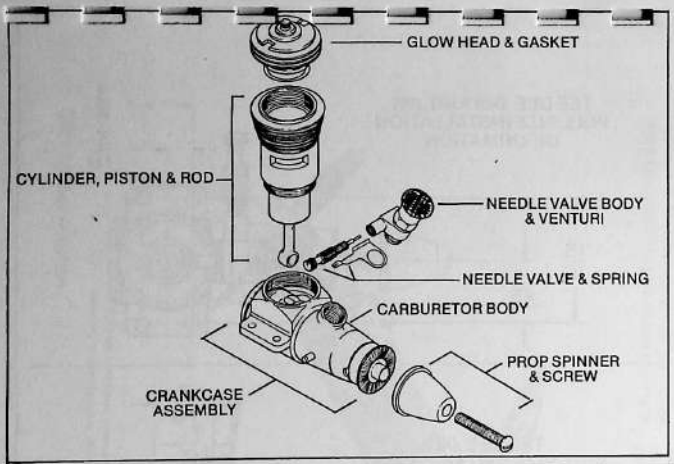
Constructionally the Special features the now familiar Cox layout, with virtually all metal parts turned from bar stock on automatic machines and produced to very close tolerances. The same 7/16 in. o/d crankshaft as on the Tee Dee 15 is retained with the large 7/16 in. by .290 in. port opening, although the edges are flat. The plastic housing surrounding the crankcase unit forms, in effect, an induction chamber above the port, as well as taking the screwed-in intake venturi and carburettor assembly. The plastic moulding also incorporates a stub tube for pressure feed, if desired.

To make use of this facility the underlying metal must be drilled through to open up a hole which is then "timed" by the crankshaft port. We have heard of people doing this with the shaft *in situ* (rotating the shaft into a position where the drill enters the port), but this is hardly to be recommended in view of the burr which could be produced on the inside, leaving this to be "smoothed" by the shaft! To drill for pressurisation demands a complete disassembly job.

This also raises another important point. Modellers used to rugged diesels and apt to use more than a reasonable amount of brute force on disassembling motors. Although the Cox is not a weak engine by any counts, it must be handled with extreme care when taking apart and putting together, and *only* using the combination tool provided in the proper manner. The cylinder is quite soft and readily damaged if mishandled. The piston on the Special, incidentally, is also unhardened and incorporates a floating gudgeon pin on which are located two tightly fitting spacers to position the con. rod centrally. Another detail feature is that the top edge of the piston is quite generously radiused off. The Tee Dee 15 had a hardened piston and ball and socket little end.

Summarising, we can only again rate the Cox Special as an outstanding example of precision production engineering with an exceptional performance, rendered even more remarkable in terms of power/weight ratio. It is not everybody's engine in that it is essentially intended as a high speed unit and it will give a disappointing performance if used with large props. It is also not as easy to start as a sports type glow motor, and is vicious on mistakes or carelessness flicking over with a 7-inch prop. Compared with a diesel, too, it will undoubtedly have a more limited life—but prop. for prop. it will out-rev any other engine of its size we know over its optimum speed range. It would appear to have outstanding potential as a contest engine.





WARRANTY

Your Cox engine is fully warranteed against factory defect for 90 days from the date of purchase. GLOW HEADS are NOT WARRANTED since they normally require periodic replacement. Should your engine require warranty service, you may contact Cox at the address given below.

FACTORY REPAIR SERVICE

Minor repairs and complete engine overhauls are available at the factory. Send the entire engine to the factory for evaluation. Give complete explanation of problem(s). Please tag the engine with your complete name and address. After factory examination you will be contacted as to repairs required and charges.

REPLACEMENT PARTS

To save time, we suggest that you contact your nearest hobby dealer if you need assistance or repair parts. If not available order direct from factory. No C.O.D.'s accepted. Use the printed order envelope and enclose a check or money order for full amount.

We have listed those parts which are most likely to require replacement during the life of your engine in the chart.

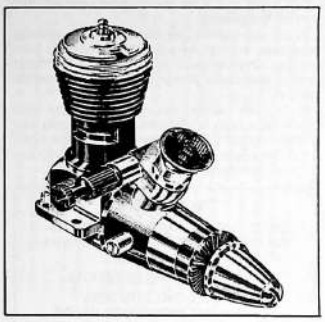
PARTS LIST PART	TEE DEE .049 Cat. No.	TEE DEE .051 Cat. No.	TEE DEE .09 Cat. No.
Glow Head and Gasket	1702	1702	2101
Needle Valve and Spring	1709	1709	2109
Prop Spinner and Screw	1718	1718	2119
Carburetor Body Only	1724	2024	2124
Cylinder, Piston and Rod	1775	2045	2175
Needle Valve Body and Venturi	1789	1789	2189
Crankcase assembly: Crankcase, Crankshaft, Carburetor Body, Retainer Nut, Drive Plate, Crankcase Cover and Thrust Washer	1779	2049	2179

COX HOBBIES INC., CUSTOMER SERVICE
4400 West 78th St., Minneapolis, MN 55435
a subsidiary of LEISURE DYNAMICS, INC.

Litho in U.S.A. R5/2-82

TEE DEE ENGINES .049, .051, & .09

CARE AND OPERATION



SPECIFICATIONS

	TEE DEE .049	TEE DEE .051	TEE DEE .09
Weight	1.48 oz.	1.48 oz.	2.72 oz.
Bore	.406"	.410"	.497"
Stroke	.386"	.386"	.471"
Displacement	.0499 cu. in. .819 cc	.0509 cu. in. .835 cc	.0913 cu. in. 1.497 cc

THIS ENGINE IS A VERY HIGHLY PRECISE CONTEST-TYPE ENGINE

Keep it immaculately clean, use Cox glow fuel or racing fuel and it will maintain its winning characteristics for a long period of time.

These engines will develop almost full power within one minute of running time; but a few, those which are slightly on the tight side, may not develop full power under one hour. Even these will develop sufficient power for average flying almost immediately. The only break-in required is a rich (slow) running with a recommended pitch propeller for the first few minutes. Gradually close the needle valve to peak operating RPM's for a short period, then run rich for a few minutes. Repeat this procedure for 5 to 15 minutes or until engine will hold top RPM.

NOTE: Your Tee Dee .049 engine develops its maximum H.P. at approximately 22,500 RPM. Use propellers that keep the RPM's below 24,000. Damage could result if engine is allowed to run above this figure.

(A) PREPARATION FOR RUNNING

1. Mount the engine in the plane, or if you want to give it some running first, mount it on a suitable mount. Do not hold the engine directly in a vise.

2. Plane propeller on the shaft with the flat side of the blades toward the engine and lock securely with the propeller screw.

3. Procure a fuel tank from your local hobby dealer and connect the tank outlet to the carburetor fuel inlet nozzle. Best results will be obtained by mounting the tank close to the engine and with the average fuel level at the same height as the carburetor venturi.

4. Procure a 1½ volt Cox dry cell battery, or equivalent, and connect it with 2 flexible insulated wires to the glow plug clip. Do not use a stronger battery. If you do, the plug will burn out. Be sure the battery is a good one. Your dealer sells batteries and glow plug clips. The Cox plastic mounted glow plug clip (Cat. No. 7556) with wires already attached is recommended.

5. Balance and trim propeller. This is very essential for good performance. Sand off any bead of plastic along the edges of the blades. Fit a drill or shaft through the hole and rest the shaft on razor blades set in wooden blocks. Sand the heavy blade until the propeller will balance in a horizontal position. Care must be taken to do the sanding without spoiling the airfoil characteristics of the propeller blades. Caution: Use only nylon or wooden props.

(B) STARTING THE TEE DEE ENGINES

No matter how expert you are with small engines you will have better luck with these engines if you follow directions exactly as listed and do each operation in the exact order given.

1. Close the carburetor needle valve, by turning it clockwise until it stops. Do not force it.

2. Fill the tank with Cox fuel.

3. Open the needle valve (counter clockwise) exactly 4½ turns for the .049 and .051 or 3½ turns for the .09 engine.

4. If the fuel level in the tank is lower than the carburetor venturi, put your finger over the air intake of the engine and pull the prop through compression until the fuel hose is full. Use a clear plastic fuel line so this can be checked visually. If the tank is mounted so the fuel level is higher than the carburetor the hose will fill itself when the needle valve is opened.

5. Connect the battery by connecting the clip on the glow head.

6. Squirt a few drops of fuel into the exhaust ports and immediately flip the propeller over counter clockwise. For quick starting the propeller must be flipped quite vigorously. The engine should start instantly if it has been primed with the correct amount of fuel in the exhaust port.

7. When the engine starts it will be running very rich and slow. The first time the engine is started let it continue to run rich for a period of 60 seconds. After approximately 60 seconds, slowly close the needle valve clockwise to the best running position and remove the battery connection. Subsequent starts may be adjusted to best running position immediately.

8. If starting is delayed for any reason, close needle valve, otherwise engine will become flooded. This precaution is only necessary if the tank is mounted so the fuel level is higher than the carburetor.

(C) TROUBLE CHART

1. If the engine coughs and spits a bit of fuel spray from the exhaust, it is too rich. Close the needle valve and continue cranking until engine starts briefly. Open the needle valve again and crank it over. It should start immediately. Blowing into the exhaust ports between flips will help clear the excess fuel out of the glow plug.

2. If it starts up with lots of power and dies immediately it is too lean. Open the needle valve a half turn, prime the engine, and crank it over again. If the trouble persists and the tank is lower than the carburetor try choking again as in Section B Par. 4. If the engine hasn't been run for some time it is possible that thick castor oil is clogging the jets. Choking will clear this out.

3. If the engine still persists in above action it is possible the carburetor jets are stopped up. Remove the venturi and needle valve body. Three tiny jet holes will be found in the groove around the venturi tube. Clean these jet holes with a piece of fine wire. Reassemble and the engine should run.

4. If the engine refuses to fire at all, screw the glow plug out and connect it to the clip. If the little coil inside does not get red hot, it is either burnt out or the battery is dead or the connections are made incorrectly. Replace the battery or the plug, or correct the connections. Glow plugs are **never** guaranteed. Do not return the engine to the factory for a burnt out glow plug because the cost to you will be excessive. Buy one from your dealer.

5. If you are not using Cox fuel, try it. **Never use gasoline or gasoline type fuels.**

(D) OPERATING TIPS AND ENGINE CARE

1. The glow plug is built right into the head in one unit. When the plug burns out just replace the entire head at the regular glow plug price.

2. After the last run, oil the engine with a light oil (SAE 10 is good) and wrap it with cloth or otherwise protect it from dust and dirt.

3. If the engine gets dirt in it through crack-up or otherwise, do not run it until it is thoroughly cleaned. **Take it apart,** wash it, oil it, and reassemble.

4. If the engine gets tight it is not frozen up. Do not send to factory. A new engine will sometimes tighten up a few times, especially after slow runs. This is more likely to happen, and will occur more often to an engine that is properly fitted, and has properly smooth wearing surfaces. Do not run it tight. The tightness is caused by a shellac-like deposit on the cylinder wall. Screw the head off. **Remove the cylinder** and scour the inside wall very lightly with a bit of fine or medium steel wool. Wash, oil, and replace. The engine will then turn over freely and run properly. **Never** use sandpaper, emery cloth, or abrasives of any kind, or scrapers. Such methods will ruin the cylinder. Steel wool will not harm the bore.

5. Certain kinds of weather, especially warm, humid (sticky) weather will cause excessive shellacking in a new cylinder. The smoother the fit the more susceptible is the engine to this trouble.

6. Do not tighten the head too firmly. Set it up just snug. Before removing head allow it to cool so it will loosen more easily. Use both wrenches when [illegible] ng gl[illegible]ad. Th[illegible]fin h[illegible] for this purpose. Exhaust port should not be used to hold cylinder as damage could result from burrs being forced into the cylinder.

7. To remove the glow head from a hot engine — pour a little fuel slowly over the glow head to reduce the head temperature. Do not run it over the cylinder. The head will then release easily. A hot head will stick and forced removal may damage the cylinder.

8. Do not tighten the carburetor retainer nut more than enough to hold the carburetor from rattling. Overtightening will distort the front bearing and cause power drop and inconsistent running.

9. Tighten venturi nut only enough to hold needle valve body in position. Overtightening may strip the thread from the plastic carburetor body.

10. The needle valve body may be removed and replaced in the opposite position if desired.

WARNING

USE OF THE FOLLOWING EQUIPMENT CAN DAMAGE YOUR ENGINE AND WILL VOID YOUR WARRANTY!

- DIESEL CONVERSION KITS
- SHAVED OR EXTREMELY HIGH COMPRESSION HEADS
- FUELS CONTAINING 100 PERCENT SYNTHETIC OIL FOR LUBRICATION

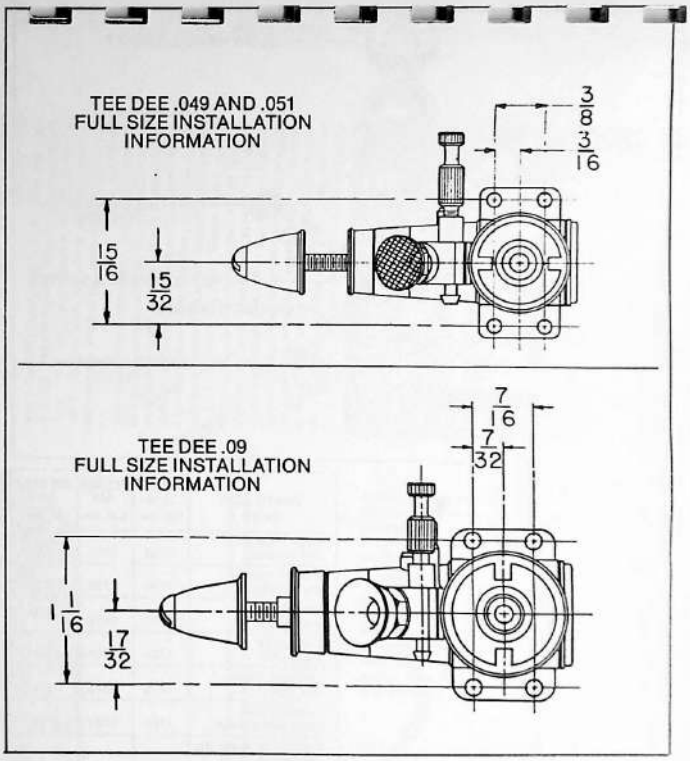
(E) PRESSURIZATION

Pressurizing is very critical when taken directly off the crankcase. On this engine pressurizing means have been provided and the rotary valve controls the pressure to normal operating limits. The hole in the pressure fitting on this engine is already started, but the hole will have to be drilled through the crankcase at this point before you can run on pressure. To rig for pressure observe the following steps:

1. Remove the back cover, cylinder, piston and rod assembly, venturi and needle valve assembly.
2. Rotate crankshaft until the port opening in the shaft points towards the pressure fitting on the right side of the black plastic carburetor body.
3. Continue drilling the hole already started in the pressure fitting through the crankcase. Use a #60 drill (.040 diameter).
4. Rotate crankshaft to deburr the drilled hole.
5. Flush crankcase and shaft thoroughly with methanol to remove all metal particles.
6. Lubricate shaft with light weight oil and reassemble engine.

The fuel tank must be air tight in order for the engine to operate properly on pressure. Be sure the tubing that connects the pressure fitting on the engine to the tank is also air tight. If the engine does not run smoothly air is getting into the pressure system. Check it thoroughly.

With pressure, the venturi may be opened to 7/32" on the .049 and .051 or 7/32" on the .09 engine to attain maximum power although the gain is very little.



(F) TO REMOVE CARBURETOR BODY FROM AN ENGINE:

1. Remove backplate, cylinder, and piston-rod assembly.
2. Remove spinner and engage prop screw approximately 3 or 4 threads in crankshaft.
3. With rear of crankcase on a hard smooth surface, tap prop screw with hammer until prop drive plate disengages from crankshaft.
4. Unscrew carburetor retaining nut and slip carburetor body off.
5. To re-assemble engine, reverse above procedure. To re-press drive plate onto crankshaft, put drive plate face down on a smooth flat surface. Obtain a short length of wood dowel of a size that will fit into the intake hole of crankshaft. Tap dowel with hammer until drive plate is fully seated on crankshaft.

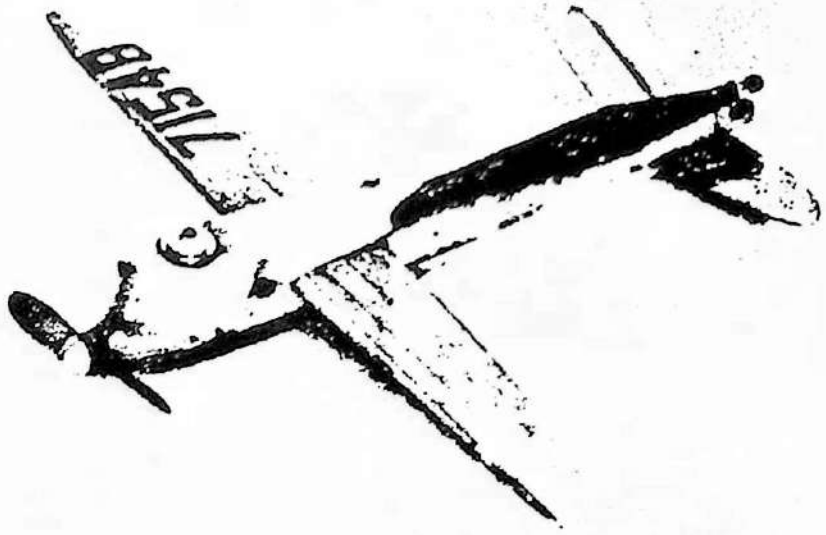
ENGINE SPEEDS (RPM)

The following speeds are typical of engines selected at random and run with Cox Competition Propellers (Metallic grey). Cox Racing Fuel was used for all tests. Temperature: 75°, Humidity: 46%, Altitude: 90 ft. above sea level.

PROP SIZE	TEE DEE .049	TEE DEE .051	TEE DEE .09
5" Dia. x 3 P	21,000	21,000	
5½" Dia. x 4	17,000	17,000	
6" Dia. x 3 P	18,500	18,500	
6" Dia. x 4 P	13,500	13,500	
7" Dia. x 3½			17,750

CONTROL LINE CL Speed

Gene Hempel

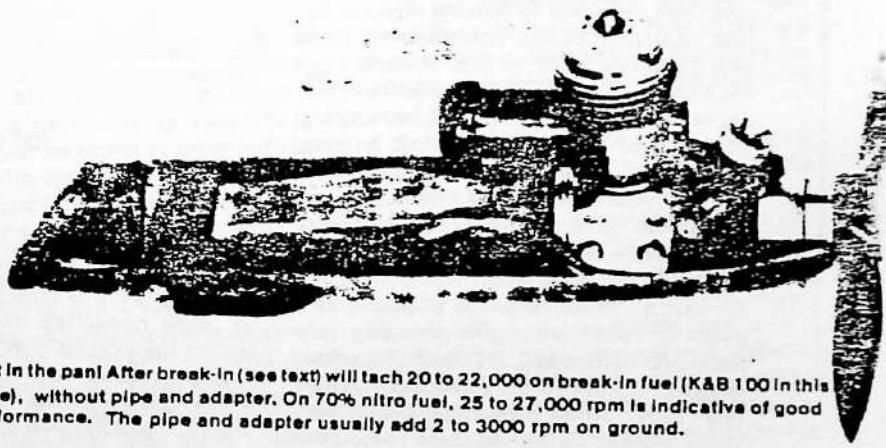


Remember when 100 mph for a 1/2A was sensational? Using a Schnuerle, piped Cox engine and single-blade propeller (two-blades in pic), Nick Sher turned 127.43 mph, tells how he did it.

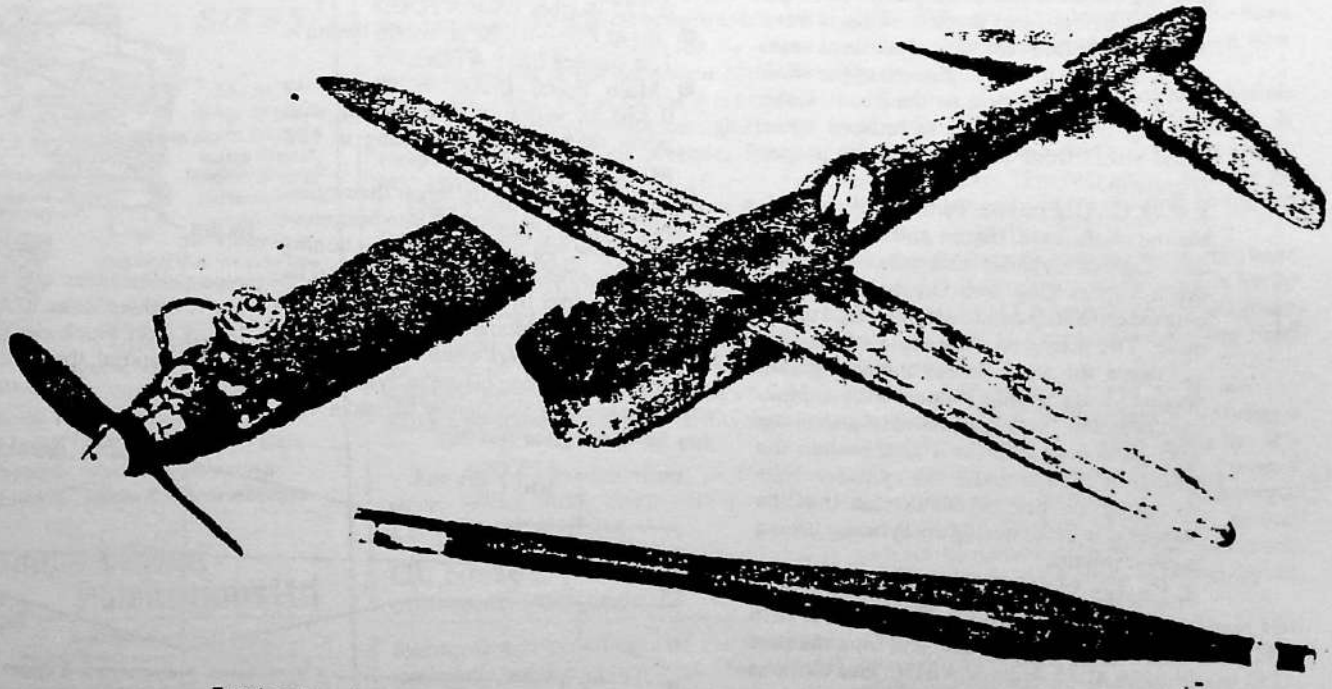
BEFORE starting into this month's column, let me mention that I was delighted to hear from some inquisitive readers. I was beginning to wonder if anyone ever read this column. It is difficult to write about something if you have no feedback from the readers. I appeal to you—keep those cards and letters coming—even if it's just to say, "hi." If there is something you would like to share, send it on, especially if it pertains to engine work. It may seem unimportant to you, but there are many modelers who are just starting and are interested in all sorts of "good poop." There are many boaters that read this column for engine information. Hope you boaters write about your engine problems and solutions!

I finally "blackmailed" Nick Sher into writing an article on 1/2 A speed. Nick has done an outstanding job making the COX T.D. .049 perform extremely well. He has agreed to share "all" his secrets in this month's column. His copy follows:

GENE HEMPEL has requested that I write an article about 1/2 A speed, specifically engine modifications. The information supplied is an accumulation of knowledge and experience from such engine experts as



Hot in the pan! After break-in (see text) will tach 20 to 22,000 on break-in fuel (K&B 100 in this case), without pipe and adapter. On 70% nitro fuel, 25 to 27,000 rpm is indicative of good performance. The pipe and adapter usually add 2 to 3000 rpm on ground.



Fuselage inverted, showing power pod and pipe. While the pictures tell a clear story of installation details, considerable rework is done internally on the engine—as the text relates.

Frank Garzon, Dub Jett, John Shannon, Mike Langlois, and the like. It has been fun to implement these ideas, plus a few of my own.

At my last speed meet of the season in Flushing, New York, using a Schnuerle, piped Cox and a single bladed prop (my first) and Frank Garzon on the needle, I turned a slightly lean 7.06 sec. (127.43 mph). The top shell of the ship was rubbing against the prop driver, so I did it again. Here are some of the techniques used to achieve that speed.

All of the numbers in the article were measured directly from the engine used in that Flushing meet. I have gone to great lengths to make these measurements accurately. I have too much respect for the hobby and the people that may read this to do otherwise.

Tips on ½A Speed

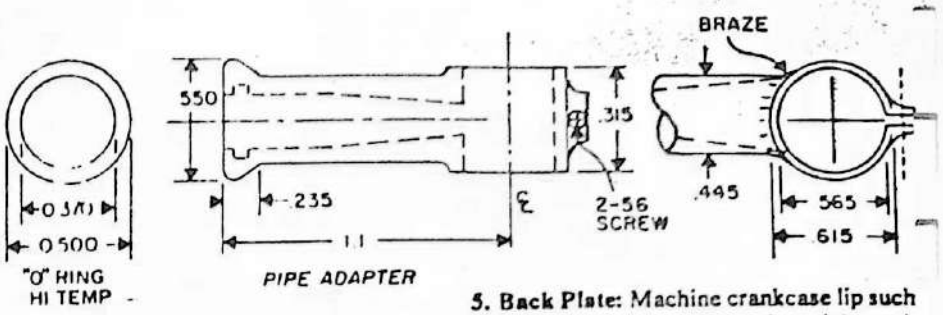
1. Crankcase Selection: Place case in Cox speed pan and check for flatness of mounting lugs with pan versus centerline of shaft bearing to centerline of pan. If inspection tools are available, check for shaft to cylinder centerline alignments and mounting lug flatness and parallelism to shaft bearing centerline.

2. Shaft Selection: Locate or obtain several shafts that have the thick counterweight web (latest series). Using a depth micrometer, select a shaft that has the longest stroke, i.e., measure stroke of piston in a partially assembled engine changing only the shaft. Remember, 1/2 A displacement can go to 0.0504 cu. in., according to AMA rule book. After measuring the stroke, check and be sure that the crank rod journal is in the center when looking down into the cylinder barrel from the top. This is very important. Before removing shaft from case, check the front to rear alignment of the shaft intake port in relation to the case intake opening. You may have to remove some metal either from case or shaft for proper alignment.

3. T.D.C. Alignment: Temporarily assemble the shaft, case, piston and blank cylinder. Tighten cylinder and measure piston depth versus plug step depth in cylinder with piston at top dead center, using a depth mike. The piston is generally .005 to .007 in. above the step. Select a metal gasket washer (I use stainless steel) with a thickness that will cause alignment of piston top with glow plug step (at T.D.C) when the washer is placed under the *cylinder base mounting surface.* Make certain that the washer is in place during the cylinder timing measurements.

4. Engine Timing:

a) *Shaft*—Grind open the transfer hole in the shaft to 0.200 in. dia. and time the port to open at 35 degrees ABDC and close at 65 degrees ATDC. I then have the shaft flash chromed, polished and fitted to the case by honing the case bearing hole. The timing modification of the crankshaft is accomplished by the following method: 1) Paint some lay-out blue around the port opening of the shaft. 2) Insert shaft into case and mount a degree wheel to shaft of the assembled engine. 3) Scribe the opening and closure lines on the shaft using a sharp needle. 4) After removing shaft from case, you are ready to remove material from the shaft with a Dremel type tool and carbide cutters.

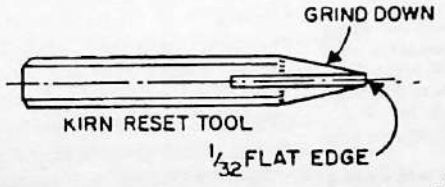


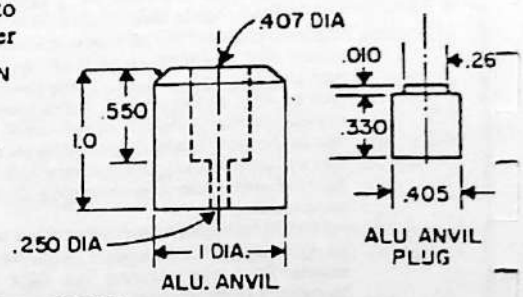
PIPE ADAPTER

b) *Blank Cylinder*—Screw cylinder into case (be sure not to forget metal washer under cylinder base) until it is tight. Place a mark where the exhaust port outlet should be. Now comes the hard part. Start by cutting the exhaust port opening first and then proceed to port the cylinder to the following dimensions:

- Exhaust Port—0.355 in. width, 0.140 in. height with radiused corners. Timing is 172 degrees open ATDC.
- Boost Port—0.200 in. width, timing is 126 degrees open ATDC.
- Main Ports—0.300 in. at base to 0.230 in. width at port opening with ports raked forward. Timing is 128 degrees open ATDC.

Locate a piston slightly larger than cylinder, such that it will just start into bottom of cylinder. Now you are ready to start honing and lapping cylinder to match piston. The piston to cylinder fit is such that the piston falls through the cylinder of its own weight from *Top Dead Center* when both are clean and dry. When fitting piston to cylinder it is wise to check fit frequently to make sure you have not gone too far.





RESET FIXTURES

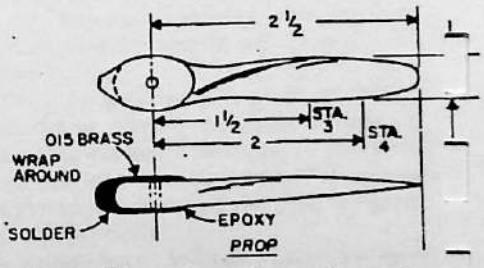
5. Back Plate: Machine crankcase lip such that the backplate cover, when tightened, comes within 0.015 in. of the shaft rod journal. File a slight flat on top of back plate cover to prevent piston skirt interference. Check that seated cover does not leak.

6. Remaining Parts: With the exception of the prop nut, the remaining parts are stock, including the venturi. When using a suction tank, which I do, any venturi larger than stock (approximately 0.116 in. dia.) will cause erratic running and loss of rpm. The needle valve assembly is the standard Kirn variety.

The prop nut is machined from ½ in. he aluminum stock, drilled and tapped for a 5–40 stud. This arrangement was necessary to properly retain the single bladed prop.

7. Pipe Adapter: This part is key to prop pipe performance and must be made correctly with *no* leaks. The material should be ledloy steel which closely matches the cylinder material thermally, thus preventi

Continued on page 1



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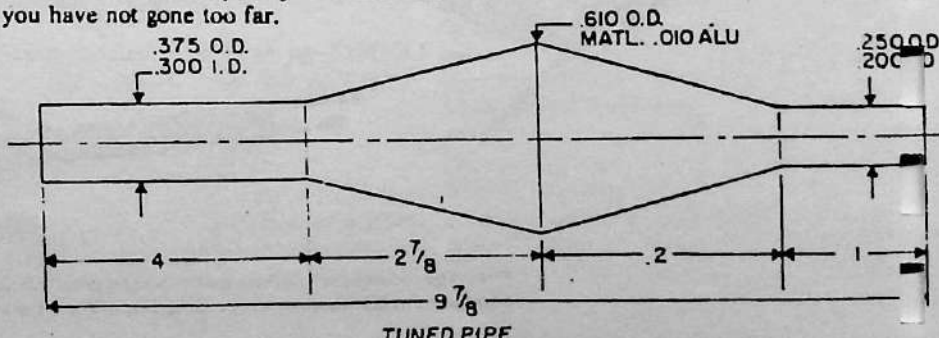

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(runners), sanitary engineers (clean up at end of the day), Half-A judges, and test pilots (for judging practice on Monday, July 30). Contact Lanny at 661 Louie Avenue, Lodi, CA 95240; tel.: (209) 368-9492.

A request has been made for information on the Cobra originally designed by Steve Wooley. This was a .35-size ship of the "classic style" with a turtle deck and long slim fuselage similar to the Ares. Steve built the Cobra sometime in 1969 or '70 but the magazine article did not appear in the now defunct *American Aircraft Modeler* until February, 1971. Steve built few airplanes, preferring to race sports cars which, unfortunately, was the cause of his death in a racing accident in 1970. He was a talented flier who professed dislike for practicing; however, he managed to finish fourth in the World Championships in 1960, '66, and '68. He had a third place in the 1962 Nats in open and a second in the '58 Nats in senior division.

The Cobra was a modernization of Wooley's Argus which he used in the 1960 World Champs. The Cobra had approximately 580 sq. in. of wing with a 10.375 in. root chord. The front moment arm was 9.35 in. and the rear moment arm was 13.75. The stab was approximately 25 in. in span. Steve stated in the Cobra article that the plane was slightly larger in wing area and flap area than the earlier Argus and that the stab was also larger.

The Argus which was built in the late '50s is very similar to Bill Werwage's Ares, but this is not surprising since Bill and Steve were close friends. The Argus and Cobra built by Steve had I-beam wings, large wheel pants, and the slim fuselages characteristic of the "Detroiter" style of stunt ships of the '50s and early '60s.

Plans for the Cobra are probably nonexistant since *AAM* went out of business; you could obtain an old copy of the magazine article for the plans that appeared with the article. The same applies for the Argus which appeared in the *American Modeler* in August, 1961. Plans for the Ares of Bill Werwage are still available through Hobby Helpers, 1543 Stillwell Avenue, Bronx, NY 10461, plan Group 560.

Mike Ditrich, 2402 Penna Avenue, Erie, PA 16503, has built a succession of .46 size Cobras with I-beam wings which are very good airplanes and will fly with anything. They turn very well, an improvement over the original Cobra. You might contact Mike for some of the basic dimensions. Unfortunately, I could not find a picture of one of Mike's airplanes at the time of this writing.

For information on stunt or PAMPA write: Wynn Paul, 1640 Maywick Dr., Lexington, KY 40504.

CL Speed/Hempel

continued from page 37

leakage due to loosening. This part becomes extremely hot during pipe runs. Dimensions are as shown on Pipe Adapter drawing.

It is important that the clamp I.D. and the cylinder O.D. are exactly the same dimension to prevent distortion when tightening. Further, contour the exhaust opening in the clamp for a good match to the cylinder exhaust. There is added rpm here.

8. Pipe: The pipe was purchased from Dub Jett. Dimensions are as shown on drawing of Tuned Pipe.

The pipe is made of aluminum and it has been aluminum soldered. Make sure there are no leaks, check after every flight. I use "Epoxy-Patch 11C" (black), made by Hysol Div. of Dexter Corp., to seal small leaks.

With the pipe adapter mounted on the engine and pipe in place the distance from the plug center to the end of pipe is 10¼ in. Plug center to pipe maximum diameter is 7 7/16 in.

9. Plug: Although the Glo-Bee plug yields higher non-piped rpm on the ground, in air performance with pipe has been disappointing. For best performance, I use a stock Cox plug, machine the O.D. into a Glo-Bee button configuration and hold it down with the Glow-Bee clamp. I generally use one gasket.

The plug blows on every "on pipe" flight with a Russian Roulette chance of taking a plug element in the ports and damaging the cylinder and piston. This is the nature of speed.

If the score marks are not too deep, the cylinder can be lightly polished using the following technique:

Make a small aluminum expandable mandrel so that it fits into the cylinder. Mount mandrel into drill press or lathe. Place cylinder onto mandrel with plenty of Marvel Mystery Oil and expand mandrel until it just starts to make contact with cylinder walls. Hold cylinder while mandrel rotates, stroking cylinder gently. If you observe that you can not get rid of the score marks by this method, you will usually need to replace piston. When you replace piston you need to start over by honing and lapping new piston to fit.

The plug must be extremely tight before each run to prevent loosening in flight. A loose plug will immediately cause the engine to go overlean. Use two wrenches, one on the cylinder and one on the plug to tighten the plug properly.

10. Prop: I have tried many props, but have learned that the single blade prop is by far the fastest in 1/2 A speed. The single blade used to date is dimensioned on the Prop drawing.

It is a Rev-Up 5-5 cut as shown. At station 3 and 4 of the Prather Pitch Gauge it reads 5 pitch and 4 ¼ pitch at the tip. It's balanced similarly to any standard prop. I have more experimenting to do with props.

11. Ball and Socket: At high rpm, sooner or later the rod to piston ball and socket will loosen. I try to judge when to tighten by the amount and sound of the play.

When using the normal Kim reset tool and a flat aluminum plate, I was losing 50% of the pistons due to distortion of the O.D.

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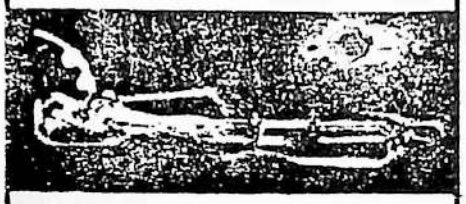

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However, when I use the fixtures shown in the Reset Fixtures drawing, which were designed by Frank Garzon, I seldom lose a piston.

Place the aluminum anvil plug into the 1 × 1" anvil with step facing upward. With the assembly placed on a rigid flat surface, insert piston face down against plug. Place the modified Kirn tool against the ball socket maintaining even pressure. As you start to hammer, rotate tool frequently checking often so that you do not bind the rod in the piston socket.

Burrs will be raised on the socket by the Kirn tool. Use a Dremel tool for deburring then clean piston thoroughly with soap and water. I have lost a cylinder to one of these hard burrs when it broke free.

12. Running: If you're still reading and not exhausted (as I am) we'll conclude with this paragraph.

High-nitro fuels should not be used on a new Cox engine. I use K&B 100 and a Cox Gray 6/3 prop, cut flat across tips to a 5 in. dia. for break-in.

A good engine, after 1/2 hour of running, should tach 20 to 22,000 rpm on this prop and fuel, open face (without pipe and adapter). Some fuel should be in evidence around the first end during running signifying a good shaft to case fit and adequate lubrication. At pipe speeds this lubrication is critical.

On 70% nitro fuels, 25 to 27,000 rpm on this prop is indicative of good performance. The pipe and adapter usually add 2 to 3,000 rpm on the ground.

Do not rush the break-in stage.

I have seen tach changes of 1 to 2,000 rpm as time is accumulated on an engine. Try different pistons, particularly worn ones, against the tach for improved results, if the aforementioned rpm have not been initially attained.

SERVICES/MATERIALS

1) Cox Blank Cylinder Barrels: Jack Fraher, 3980 Greystone Ave., Riverdale, NY 10463 (Tel. 212-549-1743)

2) Schnuerle Porting Service, Pipe Adapter: Mike Langlois, 2408 West Cornwallis Dr., Greensboro, NC 27408. (Tel. 919-288-5980)

3) Pipe and Adapters: Dub Jett, 4720 Ashbrook, Dallas, TX 75227.

4) Shaft Chrome, Cylinder/Case Honing: Machine Work: Gene Hempel, 302 North Yale Dr., Garland, TX 75042. (Tel. 214-272-5210)

5) For information: Nick Sher, 815 Beech Rd., Langhorne, PA 19047 (Tel. 215-757-5171)

6) 1/2 A Parts: Kustom Kraftsmanship, P.O. Box 2699, Laguna Hills, CA 92653.

Gene Hempel, 302 North Yale Dr., Garland, TX 75042.

CL Scale/Gretz

continued from page 38

"dirty" profile model, with pushrods, engine, tank, etc. hanging out all over the place, would have as much or more drag than a scale model. Just remember that the increased scale cross-section (frontal area) won't affect your model's performance to any great extent, *unless* it is accompanied by an increase in weight. Look at the full-scale Gee Bee racers; they relied on smooth contours to overcome their huge frontal area. The Wing Loading (meaning weight to wing area ratio) and the Power Loading (weight to thrust ratio) are the keys to good flight performance. Wing Loading in particular is the real difference between a CL stunt and a CL scale model; much more so than drag or frontal area. Al Rabe's well known stunt models are a good recent example. So keep your Focke-Wulf as light and aero-dynamically "clean" as possible, and be sure to use braided steel control lines, as opposed to ½A dacron lines, for minimum drag.

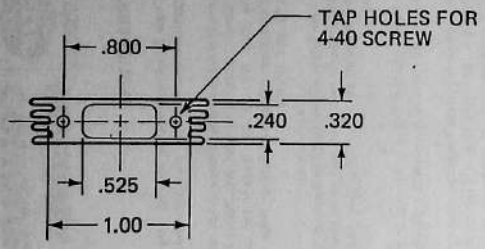
(Back to Chris.) "Would it be desirable from a stunting point of view to eliminate some or all of the three inches of dihedral the plans call for? I know it would remove a lot of the scale appearance, but might a flatter wing improve control line flying by a beginner? . . . Could or should the RC ailerons be completed as CL flaps?"

(Reply.) I would check some photos and a three-view drawing and use the scale amount of dihedral; House of Balsa may have increased the dihedral for RC flight. Again, you can look at some of Al Rabe's stunt models as recent proof that dihedral in itself doesn't hinder stunting ability. Is the wing removable on this model, Chris? If so, I wouldn't make mine that way. Building the wing into the model could save a little weight and access to the inside of the fuse isn't as important as it is for the RC version. Likewise, if there are any removable hatches other than the engine cowl, I would build them in too. Remember, lightweight is *mo* important if you hope to stunt your sca model!

The only problem with using the RC ailerons as CL stunt type flaps is the fac that most of their area is near the wing tips. which could cause a rocking motion if their range of movement is too extreme. Nevertheless, I would definitely try using the ailerons as stunt flaps on a model of this type and purpose, but I would limit their travel to about ¼ to ⅓ of the elevator travel for starters. In other words, at maximum elevator (45°) have about 15° of flaps. This slight flap movement shouldn't cause any trouble and may be the extra edge you need to enable your model to do some basic aerobatics.

Chris' question about dihedral brings up something that I didn't have room to talk about in that January column. Most everyone can grasp that an aircraft has a fore and aft "balance point," and this is often mistakenly referred to as the Center of Gravity or C.G. Actually Center of Gravity refers to more than that! (See Drawing No. 1.) There is *one* point in an airplane, regardless of the airplane's attitude, about which it can be perfectly balanced, and this point is the center of the aircraft's total weight or the Center of Gravity. It includes the fore and aft balance point as well as the balance points along the aircraft's other axes. All

NO. 2810 RADIO CONTROL ENGINE



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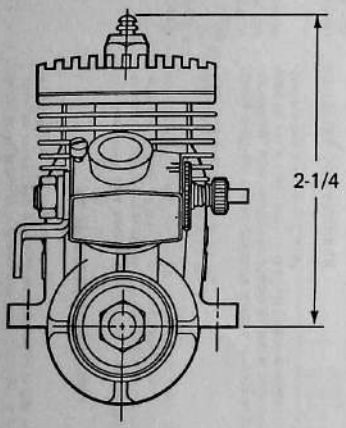

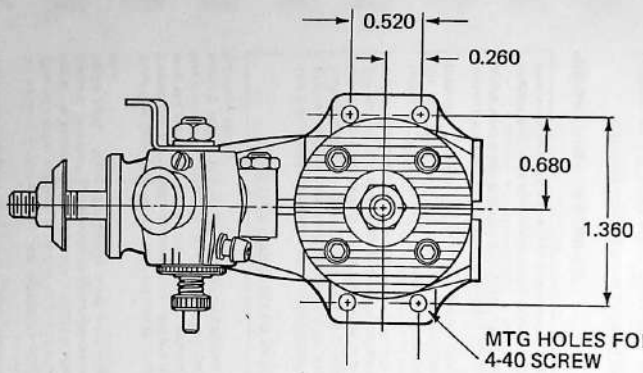

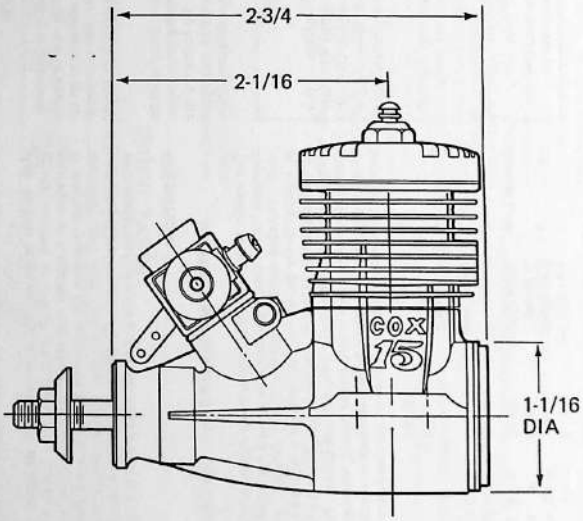

CARE AND OPERATION OF YOUR

COX HOBBIES CONQUEST .15 ENGINES

INTRODUCTION

The new Cox Conquest .15 engines were developed specifically for competition use; however, they also make excellent sport engines.

The engines are available in two configurations — one for Free Flight and Control Line flying (Cat. No. 2800) and one for Radio Control flying (Cat. No. 2810). Except for carburetors and heads, the engines appear identical, however there are internal differences in porting and timing.

The Free Flight engine features a special tuned length intake venturi which serves to reduce needle valve sensitivity. The engine is also equipped with an insert-type glow head with a trumpet-shaped chamber.

The Radio Control engine is fitted with a Perry carburetor and utilizes a finned head which accepts a standard long-reach glow plug.

Both engines feature a hardened steel cylinder liner and a sintered iron piston. Both the liner and piston are precision machined to a specific contour to yield maximum speed and power and to facilitate easy restarts at operating temperatures.

A modified Schneurle porting system is employed to achieve optimum fresh charge induction and exhaust scavenging.

An exhaust extractor (Cat. No. 2890) is available as an accessory. This will allow exhaust to be ducted out of cowling at a 15 degree angle. A special muffler (Cat. No. 2861) is also available as an accessory. The muffler has a die cast aluminum body with an internal baffle tube. Noise attenuation is achieved with minimum power loss.

Your Cox Conquest .15 is precision built throughout and should be treated like a fine piece of machinery. Before running your engine read the remainder of the instructions carefully. By following the few precautions stated in these instructions you can be assured of keeping your Conquest .15 in top competition running condition for many hours.

CAUTION — PROPELLER SAFETY

Use only balanced hardwood or epoxy-fiber propellers on this engine. Never use nylon propellers or propellers of other materials (including Cox black or gray propellers) as the high speed of this engine may cause the blades to part. Never rework the hub of a propeller as this may weaken the propeller and cause failure.

Install the propeller with the nut and washer supplied. Tighten the nut firmly but not to the point of breaking the propeller material. Recheck tightness after each engine run.

Always keep your face and body away from plane of rotating propellers. Keep spectators at least 10 feet away.

Inspect propeller after each flight. Discard any propeller that shows nicks, scratches, splits, cracks or any sign of wear.

PREPARATION FOR RUNNING

No. 2800 Free Flight and Control Line Engine

To obtain peak RPM this engine must operate on a pressurized fuel system. Use either crankcase pressure or one of the inflatable type tanks. To use crankcase pressure, drill a 1/64 (.0156) inch diameter hole through the pressure fitting boss in the backplate.

For events requiring more frequent glow head changes because of higher nitromethane content fuel such as Free Flight A Gas, Control Line Scale Racing, A Speed and FAI Combat, it is recommended that the insert head supplied be replaced with Cat. No. 28067 head and Cat. No. 28124 glow plug.

No. 2810 Radio Control Engine

For very slow idle speeds this engine must be equipped with an exhaust extractor or muffler. However, initial operation should be without muffler or extractor, as the extra heat generated by either can damage a new engine until internal parts are properly seated.

MOUNTING

Using 4-40 (or 3mm) machine screws, mount engine securely to hardwood, glass-reinforced plastic or metal mounting surface. Be sure to use a fuel filter in the fuel line and make sure the pressure fuel system is airtight, if used.

STARTING AND BREAK-IN

Fill the fuel tank with Cox Glow Fuel, or another good low nitromethane content fuel, and install an 8 X 4 propeller. Open the needle valve 3½ turns for the engine set up to run with crankcase pressure, or 5 turns for the engine equipped with the Perry carburetor. Prime both venturi opening and exhaust port, connect a fully-charged 1½ volt battery with a good quality clip (Cox Glow Plug Clip, Cat. No. 755-6, is ideal) and start engine. The engine should start running quite rich (four cycling). Run at this setting for the first minute of operation. Gradually lean the engine until the mixture is only slightly rich and continue running for a minimum of 15 minutes total time at this setting. The engine should now hold a lean setting — if not, continue break-in until it will.

Any further break-in should be with the propeller intended for flying trimmed to 7/8 of original diameter and fuel intended for operation at a slightly rich setting for a minimum of 15 minutes. If the fuel intended for operation contains more than 50% nitromethane, start with Cox Racing Fuel or similar medium nitromethane content fuel and run as above, then repeat procedure with operating fuel until engine will hold a lean setting.

OPERATION

No. 2800 Free Flight and Control Line Engine

The engine as set up at the factory has a minimum piston to head clearance for maximum performance on low nitromethane content fuels. The clearance can decrease during extended operation due to seating of the parts. If this happens a head gasket (Cat. No. 28180) should be added so the piston just clears the head at operating temperature. If higher nitromethane content fuels are to be used and/or the weather is very hot or humid, increase the number of head gaskets until optimum performance is reached. Recommended fuels and propellers for the various classes are:

CATEGORY	EVENT	FUEL (% NITRO-METHANE)	PROPELLER
Free Flight	FAI Power	0	7 x 3¼, 7½ x 3½
	A Gas	30-70	7 x 4, 8 x 3½, 8 x 4
Control Line	Scale Racing	30-70	7 x 5, 7 x 6
	A Speed	50-70	6 x 7, 6 x 7½
	FAI Speed	0	6 x 7, 6 x 7½
	FAI Combat	30-50	7 x 5

No. 2810 Radio Control Engine

See the Perry instruction sheet for adjustment of the Perry carburetor. To obtain a reliable, low idle, either a muffler (Cat. No. 2861) or exhaust extractor (Cat. No. 2890) should be fitted to provide adequate exhaust back pressure. Recommended fuels and props for these classes are:

CATEGORY	EVENT	FUEL (% NITRO-METHANE)	PROPELLER
Radio Control	Sport R/C	5-15	8 x 3½, 8 x 4
	Quarter Midget	10-15	7 x 5

MAINTENANCE

If dirt or foreign matter enters the engine, carefully disassemble, using the wrenches supplied. Note the position of piston and rod assembly in relation to cylinder, and replace them in same position during reassembly. Immerse the parts in solvent (kerosene or alcohol is recommended) and brush to remove grit. Make certain bearings are clean and free-spinning when dry. If there is any noticeable bearing roughness when clean, the bearing should be replaced. To remove the rear bearing, heat the case until the bearing falls out when the case is rapped sharply on a hard surface. The front bearing can be removed by inserting a wood or soft metal drift through crankshaft bore and tapping out the bearing. Use the crankshaft as a guide when reinstalling the bearings. Bearings must be oiled with light machine oil before reassembling. Be sure to reinstall the same cylinder base gasket as was removed, or replace gaskets (Cat. No. 28180) with same thickness as originally installed. Be sure to cross-tighten cylinder head screws during reassembly and make certain engine is free when turned over by hand.

LIMITED WARRANTY

Your Cox Engine (except glow head) is guaranteed against defects in material and workmanship for a period of ninety (90) days from date of purchase. Glow heads are not guaranteed because of their delicate nature. This warranty is in lieu of all other warranties express or implied, including warranties of merchantability or fitness.

The entire engine must be returned to factory for replacement or service under this guarantee. Include $1.00 to cover cost of handling and return postage.

In requesting warranty service the date of purchase and dealer's name and address must be included with your request.

FACTORY REPAIR SERVICE

Minor repairs, examinations, or adjustments — $2.50 plus parts. Complete overhaul (guaranteed new engine performance)

Conquest .15 F.F. & C.L.	Cat. No. 2800	$28.00
Conquest .15 R/C	Cat. No. 2810	$30.00

including parts. On all C.O.D. shipments, purchaser pays postage and C.O.D. fees.

REPLACEMENT PARTS

Purchase parts from your hobby dealer. If not available, order direct from the factory. No C.O.D.'s please. Send remittance with your order. On orders less than $3.00 add $.50 handling charge. California residents enclose applicable state sales tax.

Price and design of parts subject to change without notice.

ENGINE PARTS
CONQUEST .15 CAT. NO. 2800 (F.F.) & 2810 (R/C)

DESCRIPTION	CAT. NO.	LIST PRICE EACH	DESCRIPTION	CAT. NO.	LIST PRICE EACH
For 2800 & 2810:			For 2800 ONLY:		
Crankcase	28013	7.95	Needle Valve Ass'y.	28178	2.50
Rear Bearing	28014	4.50	Venturi	28021	1.50
Front Bearing	28016	3.50	Glow Head & Gasket .	28181	1.75
Prop Washer & Nut	28177	.75	Head	28032	1.50
Backplate	28029	1.00	For 2810 ONLY:		
Gasket & Screw Set	28180	.75	Piston, Sleeve & Rod	28056	19.95
Cylinder Casing	28182	3.00	Crankshaft & Spacer	28093	12.95
For 2800 ONLY:			Carburetor Retainer & Nut	28179	.75
Piston, Sleeve & Rod	28001	19.95	Glow Head & Gasket	28191	1.25
Crankshaft & Spacer	28017	12.95	Head	28067	2.00
Spinner Ass'y.	28166	2.95	Drive Washer & Sleeve	28183	1.00

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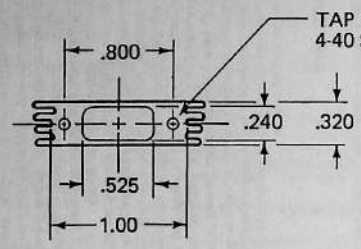
NO. 2800 FREE FLIGHT & CONTROL LINE ENGINE



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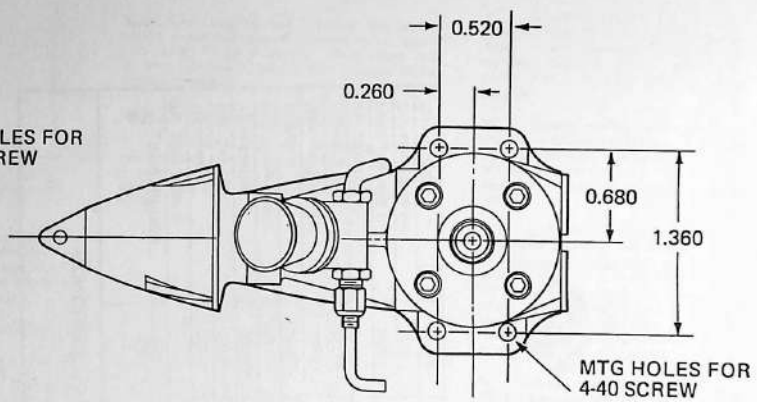

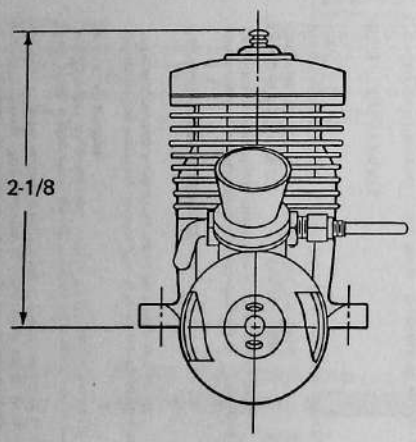

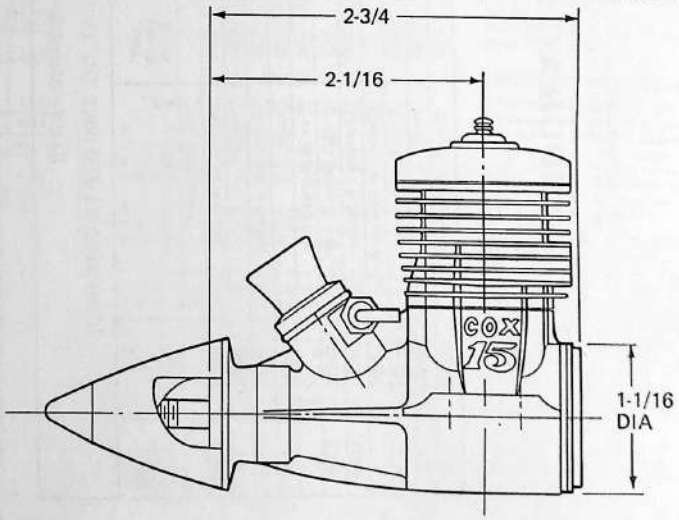

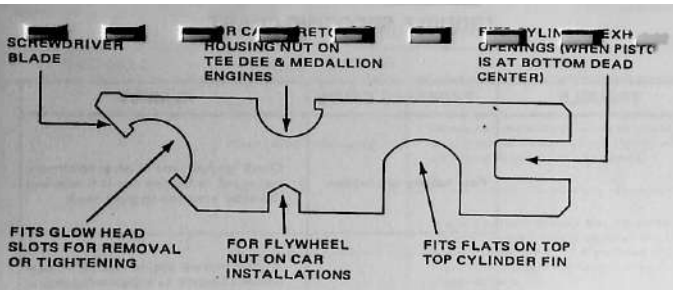

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PARTS ORDERS

Purchase parts from your dealer. If not available order direct from factory. No C.O.D.'s please. Send remittance with your order. On orders less than $2.00 add 50¢ handling charge. California residents, enclose applicable state sales tax.

Price and design of parts subject to change without notice.

CAT. NO.	DESCRIPTION	LIST PRICE EACH
309	Needle valve & spring	1.29
379	Crankcase, crankshaft & drive plate	3.20
1299	Overhaul kit (reed, retainer, gasket, screw set, prop screw & venturi gasket)	1.60
1465	Cylinder, piston & rod	4.99
1702	Glow head & gasket (6/cd.)	1.93
1764	Tank front & back, tube spring & venturi gasket	5.34
1774	Spinner set (spinner prop screw)	1.25

COX HOBBIES INC., 1505 East Warner Avenue, Santa Ana, California 92705
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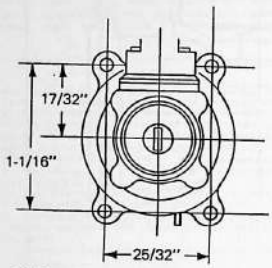
Litho in U.S.A. 2-77/R2 © COX HOBBIES INC., 1977

QRC ENGINE

Most QRC engines will develop full power within a few minutes of running time. Some may take 10-15 minutes. Even those will develop sufficient power for average flying almost immediately.

PREPARATION FOR RUNNING

1. Mount the engine in the plane, or if you want to give it some running first, mount it on a suitable mount. Do not hold the engine directly in a vise. Use template to drill mounting holes.



TEMPLATE FOR MOUNTING ENGINE

2. For best results use a Cox 6" diameter x 3" pitch propeller (Cat. No. 244). If you prefer a wood propeller it must be balanced. This is very essential for good performance.

3. Place propeller on the shaft with the flat side of the blades toward engine and lock securely with the propeller screw.

4. Procure a 1½ volt Cox dry cell battery, or equivalent, and connect it with 2 flexible insulated wires to the glow plug clip as shown in the diagram A and B — Fig. 1. Do not use a battery with higher voltage. If you do, the plug will burn out. Be sure the battery is a good one. Your hobby dealer sells batteries and glow plug clips. The Cox glow plug clip (Cat. No. 755-6) with plastic grip and wires attached is recommended and requires no soldering.

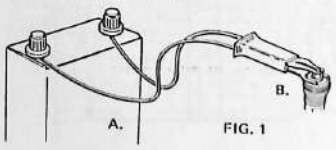


FIG. 1

ING AND RUNNING YOUR

St[illegible]nstru[illegible] then [illegible]y thr[illegible] without delay to avoid flooding. A flooded engine will not start easily.

2. Close needle valve (don't force or tighten) then open 2½ turns.

3. Use Cox Glow Fuel. Fill through filler tube on top of tank till fuel overflows other tube. Use neoprene or plastic hose and attach to filler spout in top of Cox Glow Fuel can. Never use a squeeze bulb or other pressure source.

4. Rotate muffler spring until opening on muffler housing is exposed. Rotate prop until piston closes off exhaust ports. Hold airplane VERTICALLY and place 4 or 5 drops of fuel at cylinder exhaust ports. Flip prop over 3 or 4 times.

5. Connect 1½ volt battery to glow head. Place end of spring starter over prop. Hold prop tip with thumb and first finger. Wind prop backwards ONE turn — then release. If engine runs for a short time and stops remove battery clip, prime it again as per Section No. 4, and re-attach battery clip. When engine starts it will be running quite slowly. Screw needle valve clockwise to lean mixture and increase RPM.

6. After engine is running and will hold top RPM, rotate muffler spring to completely cover exhaust opening. Disconnect glow head clip and make final adjustment on needle valve for maximum RPM.

TIPS ON RUNNING YOUR QRC .049 ENGINE

The QRC engine, when new, runs somewhat hotter than a non-muffled engine. To help compensate for this, all QRC engines are shipped with three head gaskets in order to lower the compression ratio during break-in runs. After your engine is broken in and will hold peak R.P.M. for a full tank full, without sagging, these may be removed one at a time until just one remains.

In cool weather additional power can be obtained by using Cox Racing Fuel (red can). But when the temperature is above 60 degrees best performance will be achieved with regular Cox Glow Fuel (blue can).

It is possible to start the QRC .049 with the muffler spring completely covering the exhaust area. However, you will have to open it to prime the engine. After priming, close it and start in the normal manner. When engine is hot, it will start with muffler spring in closed position WITHOUT priming.

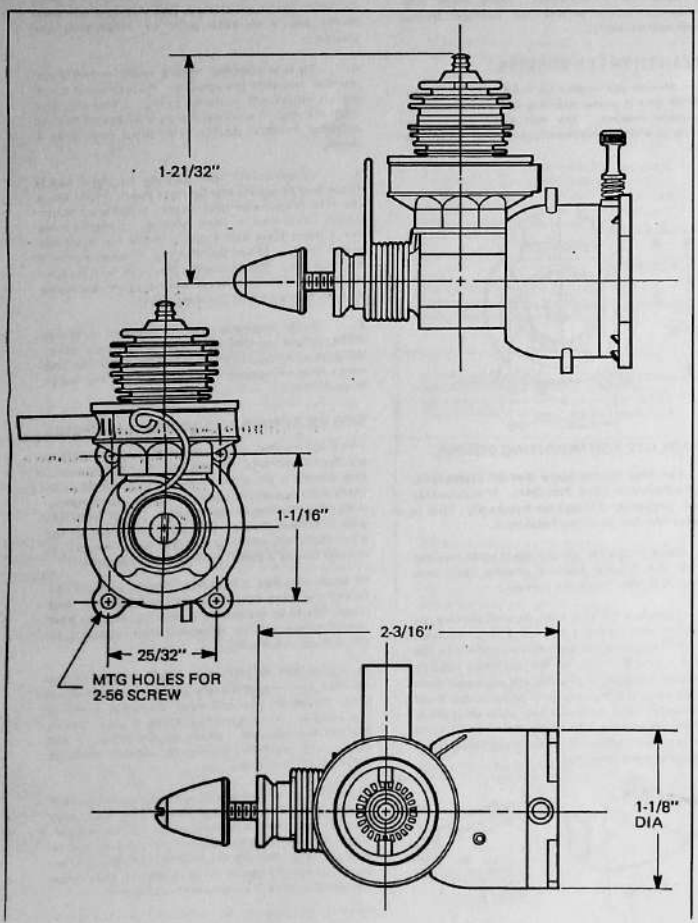
The QRC .049 engine will run backwards as well as forward. This is characteristic of a reed valve engine and does not denote a faulty engine. Reed valving is used because it contributes to easy starting. Should the engine start backwards, simply close the needle valve to stop it, then open the needle valve 2½ turns and restart.

Never put plane away with fuel in tank [illegible]

engine until tank is empty). Fuel left in tank w[illegible]ome [illegible]and c[illegible]gine, [illegible]ne, o[illegible] tank. If engine is clogged, priming and starting may be required as many as ten times before fuel will flow properly. If fuel will not flow, remove needle valve. Using a pressure nozzle or a piece of small hose, blow into the needle valve hole to force out congealed castor oil left from previous running. If engine remains clogged and will not run, either disassemble and clean or return it for factory repair (see back page).

Never leave fuel continuously exposed to air or sun as it will evaporate and thicken and cannot be used

The [illegible]f the fuel pick-up hose that is inside the fuel tank should be positioned to the bottom of the tank. If the hose is not in this position, it cannot pick up all the fuel in the tank and the engine will stop prematurely.



TROUBLE SHOOTING CHART

TROUBLE	PROBABLE CAUSE	REMEDY
WILL NOT START – ACTS LIKE BATTERY WASN'T ATTACHED TO GLOW HEAD.	Poor battery connection	Check connections of wires to battery and check to be sure clip is firmly and correctly attached to glow head.
	Weak or dead battery	A good battery should test 1½ volts or connect battery to a glow head that is known to be good. If glow head filament does not glow bright oranga - replace battery.
	Burned out glow head	With a battery that tests 1½ volts connected to glow head, check for bright orange reflection on top of piston seen through exhaust port. If no glow appears, replace glow head.
	Engine wasn't primed	Squirt a few drops of fuel through exhaust port and onto side of piston then continue with starting procedure.
	Engine flooded, too much fuel in cylinder	Close needle valve 1 full turn and start again (without priming). 4 or 5 starts may be required to clear engine.
ENGINE POPS AND/OR "KICKS" – WON'T START.	Loose propeller screw	Tighten propeller screw.
ENGINE STIFF, PROPELLER TURNS HARD OR "KICKS"	Engine flooded, too much fuel in cylinder	Close needle-valve completely. Leave battery attached and turn propeller (without priming) until short starting "burst" occurs. Then open needle-valve 2½ turns, prime and start again.
SHORT RUNNING "BURST"(BRIEF START, THEN STOP).	Engine not getting enough fuel (mixture too lean or tank empty)	Check tank fuel level – refill if necessary; or, open needle-valve another ½ turn, prime and start again. It may be necessary to repeat this procedure 3 or 4 times, opening the needle-valve ½ turn each time.
ROUGH SOUNDING ENGINE, SLUGGISH, WEAK POWER	Loose Glow Head	Tighten Glow Head with wrench supplied.

TROUBLE SHOOTING CHART

TROUBLE	PROBABLE CAUSE	REMEDY
WILL NOT START — ACTS LIKE BATTERY WASN'T ATTACHED TO GLOW HEAD.	Poor battery connection	Check connections of wires to battery and check to be sure clip is firmly and correctly attached to glow head.
	Weak or dead battery	A good battery should test 1½ volts or connect battery to a glow head that is known to be good. If glow head filament does not glow bright orange - replace battery.
	Burned out glow head	With a battery that tests 1½ volts connected to glow head, check for bright orange reflection on top of piston seen through exhaust port. If no glow appears, replace glow head.
	Engine wasn't primed	Squirt a few drops of fuel through exhaust port and onto side of piston then continue with starting procedure.
	Engine flooded, too much fuel in cylinder	Close needle valve 1 full turn and start again (without priming). 4 or 5 starts may be required to clear engine. (Cox Sure Starter will clear engine quickly).
ENGINE POPS AND/OR "KICKS" — WON'T START.	Loose propeller screw	Tighten propeller screw.
ENGINE STIFF, PROPELLER TURNS HARD OR "KICKS"	Engine flooded, too much fuel in cylinder	Close needle valve completely. Leave battery attached and turn propeller (without priming) until short starting "burst" occurs. Then open needle valve 5½ turns, and start again.
SHORT RUNNING "BURST" (BRIEF START, THEN STOP).	Engine not getting enough fuel (mixture too lean or tank empty)	Check tank fuel level — refill if necessary; or, open needle valve another ½ turn, prime and start again. It may be necessary to repeat this procedure 3 or 4 times, opening the needle valve ½ turn each time.
	Clunk jammed forward from hard landing	Point nose straight up and tap side of engine. If "clunk" is still jammed, disassemble engine tank and free it.
ROUGH SOUNDING ENGINE, SLUGGISH, WEAK POWER	Loose Glow Head	Tighten Glow Head with wrench supplied.

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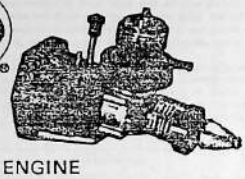
CARE AND OPERATION OF YOUR



R/C BEE ENGINE

INTRODUCTION

Your Cox R/C BEE engine incorporates many of the features most wanted by serious modelers like yourself. The crankcase is cast for light-weight strength. The fuel tank is extra-large and includes a 'clunk' fuel pickup for extended flying time and easy inverted flight. The mylar reed fuel induction system assures easy starting while the new Snap Starter eliminates the problem of having the engine start backwards.

NOTES

A. To prevent fuel leakage from the rear of the tank, the engine must always be mounted so that the back plate of the fuel tank is pressed firmly against the firewall or mounting support.
B. A "clunking" sound in your fuel tank is normal and is caused by the weighted pickup on the fuel intake hose.
C. Use only Cox Flight Power Fuel (blue can) during break-in.
D. For starting, and during break-in, leave the throttle in the 'fast' or 'high' position.
E. To simplify priming and help the engine run cooler, remove the flexible muffler during break-in.

BREAK-IN

As with any precision-built product, a little care and preparation will help your R/C BEE to give you top performance. While most R/C BEE engines can be flown without break-in, a little time spent breaking the engine in properly will pay many dividends in good flying later.

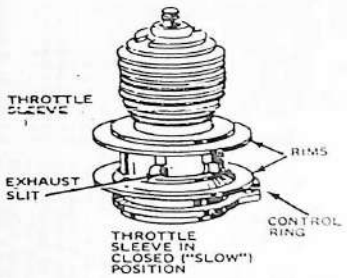
1. Mount the engine in a break-in/test mount or in the model. The back plate of the fuel tank is held in place against the sealing gasket by the pressure of the engine against the firewall or mount. To prevent fuel leakage from the rear of the tank, make sure that there is sufficient pressure applied to the back plate to hold it firmly in place. Do not hold the engine in your hand or directly in the jaws of a vise. The mounting hole location of the R/C BEE is the same as for Cox's other reed-valve engines.
2. Install a Cox 5"Dia. X 3" Pitch propeller (Cat. no. 858). The flat side of the propeller goes toward the engine. Tighten the propeller screw securely. Remove the flexible muffler from the throttle sleeve and lay aside.
3. Start the engine as described in the "Starting The Engine" section. When the engine is running, close the needle valve (clockwise) slowly until the engine runs smoothly (a shrill, high-pitched sound should not be heard, nor should the engine slow down). Remove the glow head clip. Let the tank run dry.
4. Refill the tank and restart the engine. Repeat step 3 until 4 tanks of fuel have been burned. Remove the 5"Dia. X 3" Pitch propeller and replace with a Cox 6"Dia. X 3" Pitch propeller (Cat. no. 862). Open the needle valve one additional turn
5. Refill the tank and restart the engine. Repeat st[illegible] until [illegible]tiona[illegible] of f[illegible]ve be[illegible] burned.
6. The engine is now ready to fly. When the engine is mounted on the model, refill and restart the engine. Adjust the needle valve until the engine reaches top speed (a shrill, high-pitched whine), then open the needle valve an additional ½ turn. Remove the glow head clip and tip the nose of the model so that it is pointed upward at an angle of about 45°. Readjust the needle valve if necessary.
7. For the first few flights it is recommended that the flexible muffler be left off. This will allow the engine to run at a cooler temperature while completing its break-in. After a total of 10 to 12 tanks of fuel have been burned (break-in and flight combined) the flexible muffler may be reinstalled.

STARTING THE ENGINE

We recommend the use of a Cox 6"Dia.X3" Pitch Propeller (Cat.no.862) after break-in. If you prefer to use a wooden propeller, it should be balanced to assure good performance with little vibration.

1. Connect the glow head clip to a 1½ volt battery or Cox Sure Starter (Cat. no. 760). Attach the fuel filler hose to a can of Cox Flight Power fuel.
2. Pull the flexible muffler away from the rim of the throttle sleeve far enough to verify that the throttle is in the 'fast' or 'high' position.

NOTE: The flexible muffler has been removed for clarity.



THROTTLE SLEEVE IN CLOSED ("SLOW") POSITION

3. Close the needle valve (clockwise) but DO NOT FORCE or overtighten. Open the needle valve 5½ turns.
4. Push the end of the fuel filler hose onto the fuel tank filler tube. Fill the tank slowly to avoid flooding the engine. Fill until fuel spurts out of the overflow. Remove the fuel filler hose. Wipe any excess fuel off the engine and tank.
5. Prime the engine by pulling the flexible muffler away from the rim of the throttle sleeve far enough to allow the end of the fuel filler hose to be inserted. Squirt several drops of fuel into the engine exhaust slits but be careful not to flood it. Remove the fuel filler hose and flip the propeller several times to work the fuel into the engine. Snap the flexible muffler (if used) back into place.
6. Connect the glow head clip to the glow head. Turn the propeller ONE full turn backwards (clockwise) after the starter cam engages and release. MORE THAN ONE TURN WILL DAMAGE THE STARTER SPRING!
7. If the engine does not start, repeat step 6 three more times. If the engine will still not start and run, remove the glow head clip and repeat steps 5 and 6.
8. If engine refuses to st[illegible]t, open the needle valve

[illegible] starter to [illegible] speed.

3. When the engine starts, adjust the needle valve for the desired speed (either for break-in or for flight), and remove the glow head clip. When adjusting the needle valve, allow a short amount of time between valve adjustment and engine response to avoid "overshooting" the desired setting. This engine has been especially designed to be less critical in adjustment than most engines of this size. For this reason there is a short delay between a movement of the needle valve and a change in the engine speed.

THE FUEL PICKUP

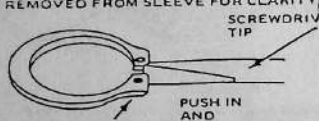
Tubing used inside the tank is a super-flexible silicone-based material that will stay flexible through long immersion in fuel. If for some reason the tubing should have to be replaced, you may obtain a new one from Cox. See the parts list for directions on how to obtain the tubing. The weight and the inlet tube to the engine have openings of only .062 inch diameter. Dirt in the fuel may cause these openings to become plugged. If this happens, they may be cleaned by blowing the dirt out or by inserting a thin piece of wire into the openings.

Access to the inside of the tank can be gained by snapping the rear plate and gasket off the back of the tank. In use, this plate is held in place by the pressure of the engine being held against the firewall.

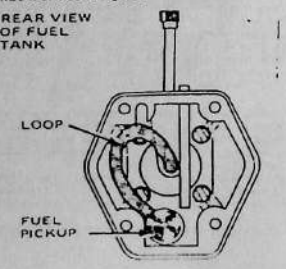
OPERATING TIPS

If it should be necessary to adjust the throttle control ring, in order to make the throttle operate correctly, it can be easily moved by slipping the end of a screwdriver in between the ears of the control ring and then turning the sleeve as required. Do not use force to turn the ring. If the sleeve does not move easily, spread the ears on the control ring slightly by prying gently with the screwdriver. Take care not to bend the control ring.

THROTTLE CONTROL RING (SHOWN REMOVED FROM SLEEVE FOR CLARITY)



If the fuel tank back plate is removed and the fuel intake hose removed or extended from the tank, remember to put a loop in the tubing when putting it back into place, otherwise the fuel pickup will not work as designed.



Never [illegible] the engine [illegible] away [illegible] fuel in the tank, but instead run the engine until the tank is dry. The lubricant in the fuel will thicken after exposure to air and may clog the fuel intake. If the intake does become plugged, disassemble the engine and wash all parts in alcohol or fresh fuel.

When storing the engine, oil it lightly with a good quality light oil (3-in-1, sewing machine oil etc.) and wrap in a plastic bag or a clean cloth. In cold weather, or for more power, you may wish to substitute Cox Racing Fuel.

WARNING

USE OF THE FOLLOWING EQUIPMENT CAN DAMAGE YOUR ENGINE AND WILL VOID YOUR WARRANTY!

- ELECTRIC STARTERS
- DIESEL CONVERSION KITS
- SHAVED OR EXTREMELY HIGH COMPRESSION HEADS

WARRANTY

Your Cox engine is fully warranteed against factory defects for 90 days from the date of purchase. GLOW HEADS are NOT WARRANTED since they normally require periodic replacement. Should your engine require warranty service, you may contact Cox at the address given in the "Replacement Parts" section.

FACTORY REPAIR SERVICE

Minor repairs, examinations, or adjustments $2.50 plus parts. Complete overhaul (new engine performance guaranteed) $10.00. Including parts. On all C.O.D. fees. (Prices subject to change without notice).

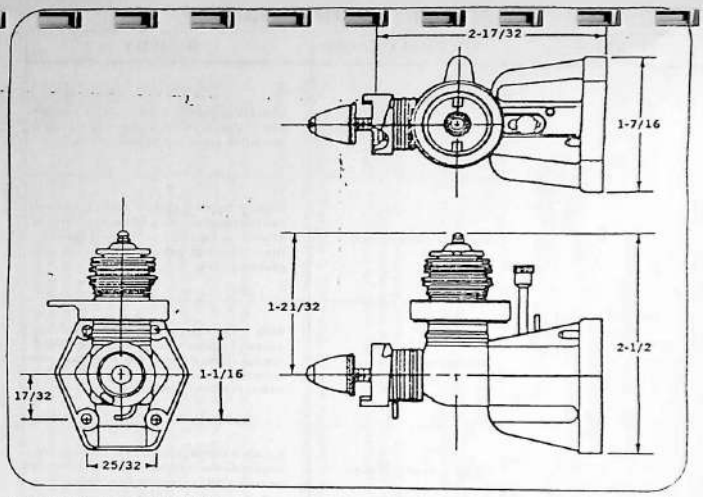
REPLACEMENT PARTS

Cox offers a replacement part and repair service for this engine through our Authorized Factory Service Centers. To save time, we suggest that you contact your nearest Service Center if you need assistance or repair parts. We have listed those parts which are most apt to require replacement during the life of your engine in the chart below.

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	PRICE EACH
1	20460	Crankcase and Shaft Assembly	$5.00
2	325	Glow Head and Gasket Assembly	1.75
3	1718	Prop Spinner and Screw	1.25
4	3615	Throttle/Muffler Assembly	5.00
5	333	Snap Starter Assy.	1.00
6	20461	Piston/Cylinder Assembly	5.00
7	20462	Fuel Intake Hose and Weight	1.25
8	1968	Needle Valve and Extension	1.00
9	20463	Carburetor and Tank Assembly with Back, Gasket and Screws	5.00
10	364	Reed	.25

Prices subject to change without notice.

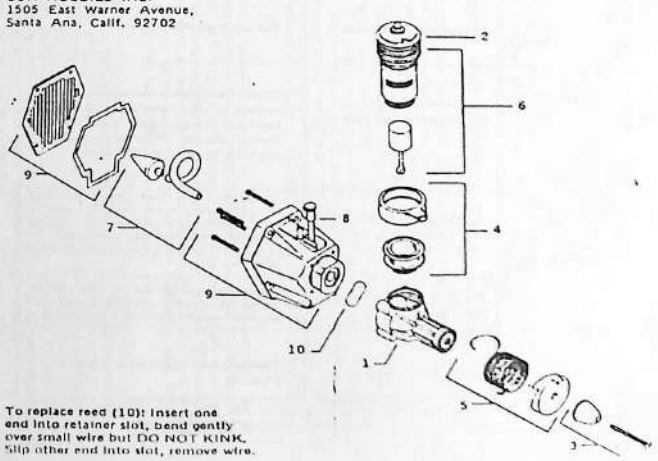


ORDERING INSTRUCTIONS:

When ordering from Cox please enclose your check or money order for the full amount (include a $1.00 handling charge). California residents only add State Sales Tax. C.O.D. or telephone orders will not be accepted.

Send your order to:

Customer Service Department
COX HOBBIES INC.
1505 East Warner Avenue,
Santa Ana, Calif. 92702



To replace reed (10): Insert one end into retainer slot, bend gently over small wire but DO NOT KINK. Slip other end into slot, remove wire.

CARE AND OPERATION OF YOUR

CONQUEST .15 ENGINES

INTRODUCTION

The new K&B Cox Conquest .15 engines were developed specifically for competition use; however, they also make excellent sport engines.

The Free Flight engine features a special tuned length intake venturi which serves to reduce needle valve sensitivity. The engine is also equipped with an insert-type glow head with a trumpet-shaped chamber.

The Radio Control engine is fitted with a Perry carburetor and utilizes a finned head which accepts a standard long-reach glow plug.

MAINTENANCE

If dirt or foreign matter enters the engine, carefully disassemble, using the wrenches supplied. Note the position of piston and rod assembly in relation to cylinder, and replace them in same position during reassembly. Immerse the parts in solvent (kerosene or alcohol is recommended) and brush to remove grit. Make certain bearings are clean and free-spinning when dry. If there is any noticeable bearing roughness when clean, the bearing should be replaced. To remove the rear bearing, heat the case until the bearing falls out when the case is rapped sharply on a hard surface. The front bearing can be removed by inserting a wood or soft metal drift through crankshaft bore and tapping out the bearing. Use the crankshaft as a guide when reinstalling the bearings. Bearings must be oiled with light machine oil before reassembling. Be sure to reinstall the same cylinder base gasket as was removed, or replace gaskets with same thickness as originally installed. Be sure to cross-tighten cylinder head screws during reassembly and make certain engine is free when turned over by hand.

LIMITED WARRANTY

Your K&B Cox Engine (except glow head) is guaranteed against defects in material and workmanship for a period of ninety (90) days from date of purchase. Glow heads are not guaranteed because of their delicate nature. **This warranty is in lieu of all other warranties of merchantability or fitness.**

The entire engine must be returned to factory for replacement or service under this guarantee. Include $3.00 to cover cost of handling and return postage.

In requesting warranty service the date of purchase and dealer's name, address and serial number must be included with your request.

Your K&B Cox Conquest .15 is precision built throughout and should be treated like a fine piece of machinery. Before running your engine read the remainder of the instructions carefully. By following the few precautions stated in these instructions you can be assured of keeping your Conquest .15 in top competition running condition for many hours.

CAUTION – PROPELLER SAFETY

Use only balance hardwood or epoxy-fiber propellers on this engine. Never use nylon propellers or propellers of other materials (including Cox black or gray propellers) as the high speed of this engine may cause the blades to part. Never rework the hub of a propeller as this may weaken the propeller and cause failure.

Install the propeller with the nut and washer supplied. Tighten the nut firmly but not to the point of breaking the propeller material. Recheck tightness after each engine run.

Always keep your face and body away from plane of rotating propellers. Keep spectators at least 10 feet away.

Inspect propeller after each flight. Discard any propeller that shows nicks, scratches, splits, cracks or any sign of wear.

MOUNTING

Using 4-40 (or 3mm) machine screws, mount engine securely to hardwood, glass-reinforced plastic or metal mounting surface. Be sure to us a fuel filter in the fuel line and make suire the pressure fuel system is airtight, if used.

STARTING AND BREAK-IN

Fill the fuel tank with K&B 500 Fuel, or another good low nitromethane content fuel, and install an 8 x 4 propeller. Open the needle valve 3½ turns for the entine set up to run with crankcase pressure, or 5 turns for the engine euipped with the Perry carbutretor. Prime both venturi opening and exhaust port, connect a fully-charged 1½ volt battery with a good quality clip and start engine. The engine should start running quite rich (four cycling). Run at this setting for the first minute of operation. Gradually lean the engine until the mixture is only slightly rich and continue running for a minimum of 15 minutes total time at this setting. The engine should now hold a lean setting – if not, continue break-in until it will.

Any further break-in should be with the propeller intended for flying trimmed to 7/8 or original diameter and fuel intended for operation at a slightly rich setting for a minimum of 15 minutes. If the fuel intended for operation contains more than 50% nitromethane, start with similar medium nitromethane content fuel and fun as above, then repeat procedure with operating fuel until engine will hold a lean setting.

The engine as set up at the factory has a minumu piston to head clearance for maximum performance on low nitromethane content fuels. The clearance can decrease during extended operation due to seating of the parts. If this happens a head gasket should be added so the piston just clears the head at operating temperature. If higher nitromethane content fuels are to be used and/or the weather is very hot or humid, increase the number of head gaskets until optimum performance is reached. Recommended fuels and propellers for the various classes are:

CATEGORY	EVENT	FUEL (% NITRO-METHANE)	PROPELLER
Free Flight	FAI Power	0	7 x 3½, 7½ x 3½
	A Gas	30-70	7 x 4, 8 x 3½, 8 x 4
Control Line	Scale Racing	30-70	7 x 5, 7 x 6
	A Speed	50-70	6 x 7, 6 x 7½
	FAI Speed	0	6 x 7, 6 x 7½
	FAI Combat	30-50	7 x 5

Radio Control Engine

See the Perry instruction sheet for adjustment of the Perry carbuextractor should be fitted to provide adequate exhaust back pressure. Recommended fuels and props for these classes are:
retor. To obtain a reliable, low idle, either a muffler or exhaust

CATEGORY	EVENT	FUEL (% NITRO-METHANE)	PROPELLER
Radio Control	Sport R/C	5-15	8 x 3½, 8 x 4
	Quarter Midget	10-15	7 x 5

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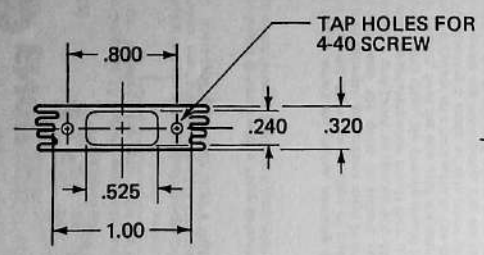
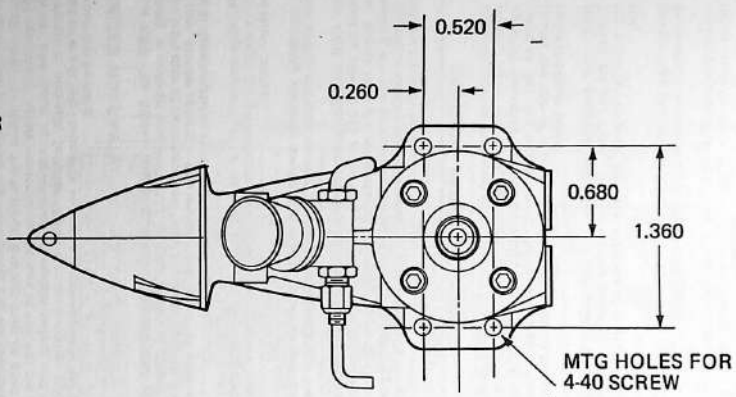
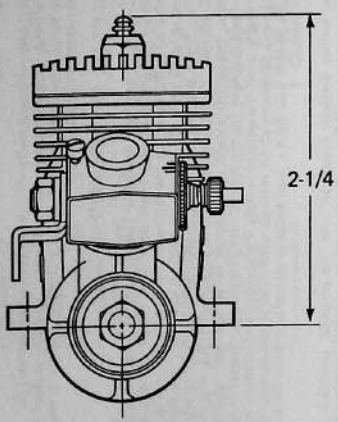
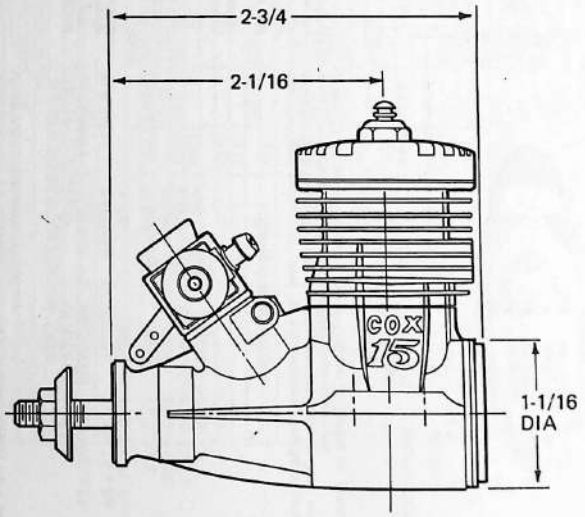
DOWNEY, CA 90241



REAR EXHAUST DETAIL







K & B Cox Conquest .15 R/C Sport - .15 F/F & U/C - .15 ¼ Midget

Order by this Number

QTY.	DESCRIPTION	7900	Price	7901	Price	7902	Price	TOTAL
	Crankcase	7904	$ 11.00	7904	$ 11.00	7904	$ 11.00	
	Ball Bearing (Rear)	7905	6.00	7905	6.00	7905	10.00	
	Ball Bearing (Front)	7906	4.75	7906	4.75	7906	4.75	
	Spacer - Crankshaft	7908	1.00	7908	1.00	7908	1.00	
	Crankshaft and Spacer	7989	14.00	7989	14.00	7989	14.00	
	Piston and Sleeve	7990	18.00	7990	18.00	7990	18.00	
	Wrist pin w/Keepers (2)	7991	2.50	7991	2.50	7991	2.50	
	Connecting Rod	7914	8.00	7914	8.00	7914	8.00	
	Cylinder Casing	7915	6.00	7915	6.00	7915	6.00	
	Indexing Pin (3)	7992	1.00	7992	1.00	7992	1.00	
	Head (w/o Fins)			7920	3.50	7920	3.50	
	Head	7968	5.50					
	Muffler Screws & Lockwasher (2 ea.)	7993	1.00					
	Lock. Shaft & Nut (Carb. & Venturi)	7994	2.25	7994	2.25	7994	2.25	
	Rear Cover w/O'Ring	7995	3.50	7995	3.50	7995	3.50	
	Collet	7926	1.25	7926	1.25	7926	1.25	
	Drive Washer	7927	2.25			7927	2.25	
	Prop Washer	7928	1.00	7928	1.00	7928	1.00	
	Prop Nut	7929	1.25	7929	1.25	7929	1.25	
	Pipe Adapter w/2 Screws			7954	3.00	7954	3.00	
	Exhaust Extractor			7955	3.00	7955	3.00	
	O'Ring For Exh. Adapter (2)			7969	1.00	7969	1.00	
	Spinner Assembly			7996	6.50			
	Glow Plug w/Idle Bar	4520	2.10					
	Needle Valve Assembly			7884	5.00	7884	5.00	
	Perry Carburetor	7930	21.25					
	Wrench	7941	1.00	7941	1.00	7941	1.00	
	Gaskets - Cyl. Base-Copper	7889	3.00	7889	3.00	7889	3.00	
	Needle Valve Body &Nut	7890	3.00	7890	3.00			
	Needle Valve & Locknut- Collet Type			7891	2.00	7891	2.00	
	Needle Valve w/Spring (Perry)	724C	1.20					
	Glow Head and Gasket			7892	3.50	7892	3.50	
	Venturi			7962	4.00			
	Venturi w/.240 Choke Dia.					7988	4.00	
	O'Ring for Venturi (3)			7893	1.25	7893	1.25	
	Maintintenance Kit	7894	4.00	7894	4.00	7894	4.00	
	Muffler Assembly Complete	7948	10.00					
	Perry Carb. for ¼ Mid. .240 Choke Dia.	7899	21.25					
	Needle Valve w/O'Ring	724BS						
	Repair Service Chg. (If Req.)		5.00		5.00		5.00	
	Chg. For Max. Repair (If Req.)		48.00		43.50		43.50	

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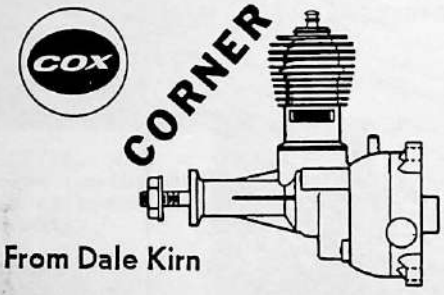
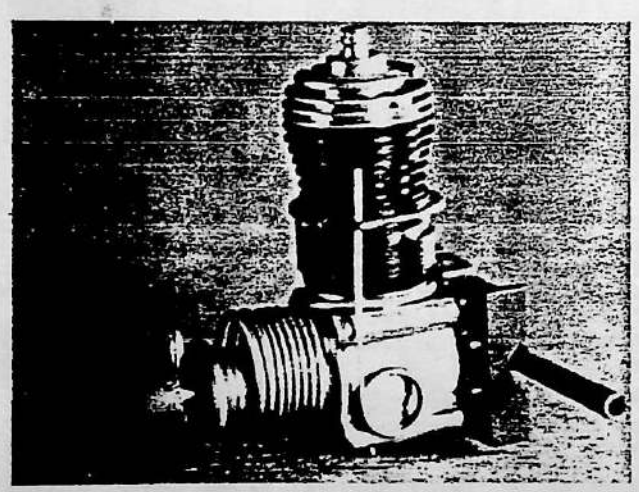


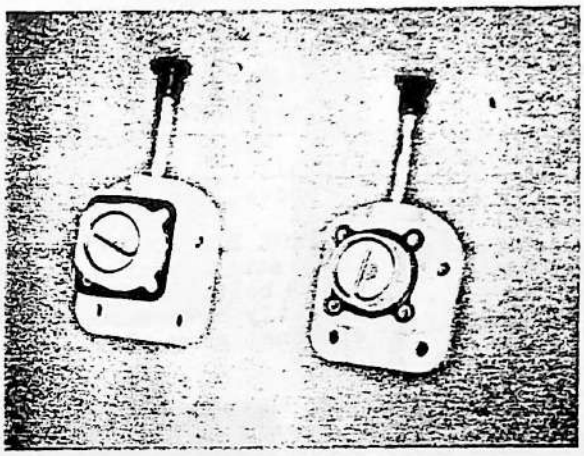
From Dale Kirn



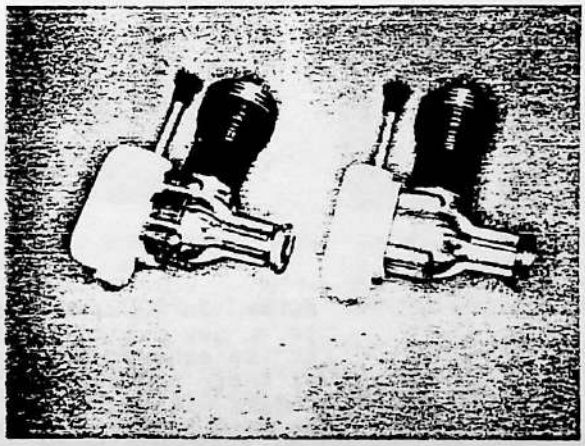
(Figure 1)

At the end of the index listing for L. M. Cox, we pictured an engine listed as a 290-?. We couldn't even guess the right series. This engine (Figure 1) is a 190-7. There is another of the same style, but with a fuel tank that is a 350-2. In other words, put a Babe Bee tank on the engine in Figure 1 and you would have 350-2. The 190-7 was used in the Thompson Racer w/speed control and the 350-2 in the P-40 w/speed control.

Two different styles of the 1977 R/C Bee are now out. The 21924 engines use an entirely different backplate (no tank) from the R/C Bee. Brought out in 1978 for use in the Wings model, it has also undergone a couple of changes in the early part of 1979. Figure 2 shows the differences between the "standard" backplate as used on earlier extruded engines (photo on right), and the new backplate for the die cast crankcase. Note the gasket and shape of reed boss. Figure 3 shows two of the 21924 engines. The one on the left is the 1978 model with aluminum drive washer and on the right is the 1979 model with a brass drive washer.



(Figure 2)



(Figure 3)

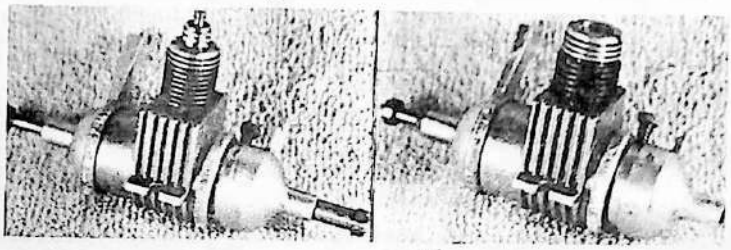
As of 1980, Cox uses only one cylinder on all of its product engines. This cylinder is also used on 3 of the hobby engines; Babe Bee, Black Widow and R/C Bee. It has two thin exhaust slits on 2 sides, no free port and is double bypass. The current Tee Dee .049 & .051 engines have the same style porting as before.

(Editor's comment; There is a rumor that Cox is going to re-introduce the Conquest .15 in a somewhat modified style. Any comment, Dale, or am I behind the times?)

L. M. Cox Mfg. Co., Los Angeles, California

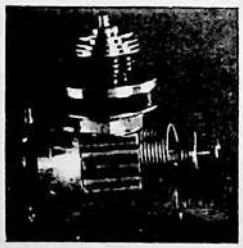
NOTE: Originally, Roy Cox only built die cast cars and bought his engines from first Cameron, and then from Mel Anderson. The Cameron engines are identical to those used in Cameron cars, so there are no identifying features to separate them. The Mel Anderson built car units are unique to the Cox cars, so the listing will begin with them. All models are glow.

O-FORTY-FIVE .045 - 1949. Baby Spitfire cylinder and piston unit, die cast case incorporates fuel tank, muffler, exhaust and shafts for axles, 4 to 1 gear reduction on driven axle, reed valve induction.



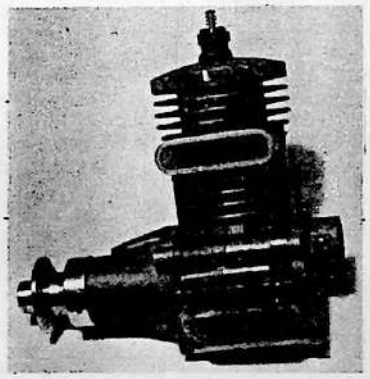
O-SIXTY .060 - 1950. Basically identical unit to above, but with larger cylinder and different head.

SPACE BUG .049 - 1952. First Cox built engine. Long stunt vented, die cast tank held to case with 4 bolts thru from front of case, head screws directly into bore. Very first engines used conventional glow plug.



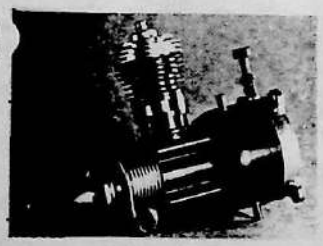
QZ .049

CONCEPT II →



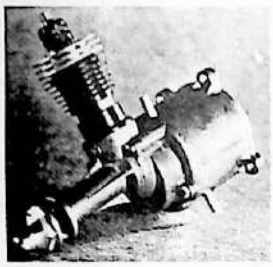
NOTE: In 1972, the entire Cox line changed over to a new design cylinder having a heavy "boss" in the exhaust area. This was to facilitate use of their new style mufflers, but was on all cylinders with or w/out mufflers. No attempt will be made to relist all engines still in production that received this change.

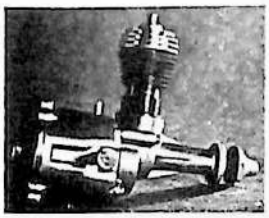
BLACK WIDOW .049 - 1973. Crankcase and long stunt vented tank anodized black, red rubber spinner. Sold in plastic box.



QRC .049 - 1976. Babe Bee crankcase, red anodized stunt vented tank, blue spinner, throttle muffler unit has exhaust stack extension.

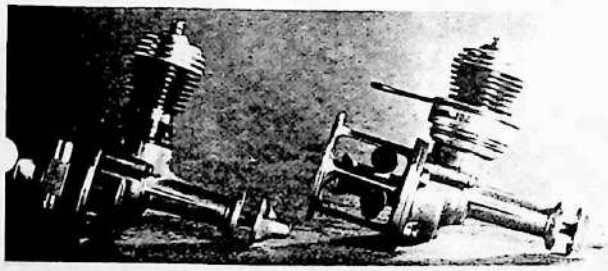
CONQUEST 15 .1509 - 1976. All new engine, diecast case/cylinder, rear exhaust, front rotary valve, finless head w/insert plug, spinner.



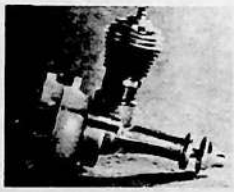


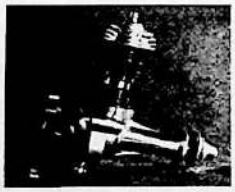
SPACE BUG .049 - 1952. As above, but with glow head. Offered as a "Special Hop Up Kit" for earlier engines!

THERMAL HOPPER .049 - 1953. Same crankcase as above, but with no tank, exposed venturi. A number of accessories were offered for this engine as shown in the photo of these two engines. These included an extension mount, dual needle valves, and a muffler/throttle unit.



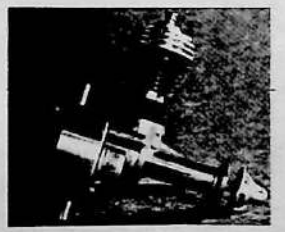
SPACE BUG JR. .049 - 1953. Same crankcase as above except two top mounting holes plugged, single bypass cylinder, white nylon tank, bolts to case thru tank.





SPACE BUG JR. (Variants) - 1954. As above but with red tank (used on TD-3), blue tank or yellow tank (Stanzel's Ready-to-fly).

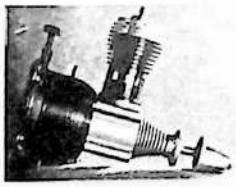
STRATO-BUG .049 - 1955. Similar to Space Bug Jr. above, but with spun aluminum, stunt vented tank, red nylon tank back, dual bypass cylinder.

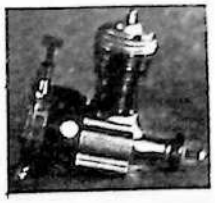


BABE BEE .049 - 1956. Case machined from extruded bar stock, new larger diameter glow head threads and new cylinder, single bypass, spun tank w/die cast tank back, no name on tank, no screen in intake.

RR-1 .049 - 1956. Similar to Babe Bee, but w fins around front of shaft housing, blue anodized, stunt vented tank w/fins around tank, dual bypass cylinder, rotary valve intake, silver case.

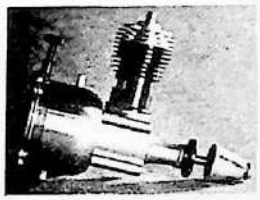
RR-1 .049 - 1957. Identical to above, but case anodized gold. NOTE: Rotary valves available for either left or right hand rotation. Black rotors left hand, silver rotors right hand.

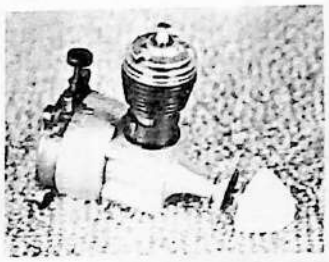




PEE WEE .020 - 1957. Miniature version of Babe Bee, tank and drive washer anodized red.

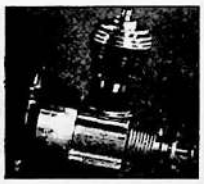
GOLDEN BEE .049 - 1958. Gold anodized Babe Bee case, longer, stunt vented gold anodized tank, black drive washer, screen in intake, dual bypass cylinder.

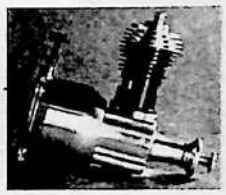




PEE WEE "LIL STINKER" .020 - 1958. Like Pee Wee above, but no colored parts, screen in intake, "Thimble-Drome" around tank, white rubber spinner.

BABE BEE .049 - 1959. Similar to Babe Bee above, but w/screen in intake, name around tank.

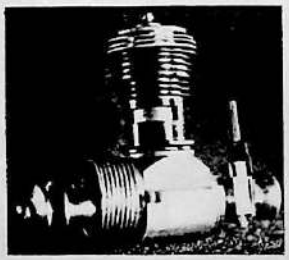


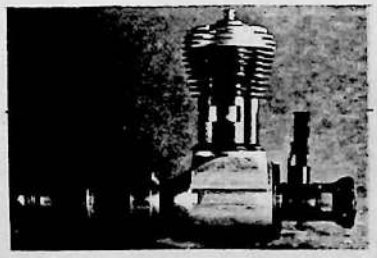


SILVER BEE .049 - 1959. As above, but longer tank, no name on tank.

SUPER BEE .049 - 1959. Similar to Babe Bee, but w/dual port cylinder, "P-40" stamped on cylinder.

SPORTSMAN 15 .142 - 1959. New large engine. Case machined from extruded bar includes beam mounts, plain bearing, no colored parts.

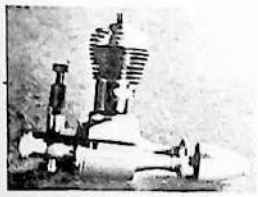


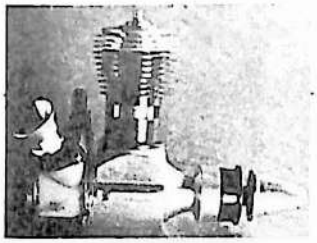


OLYMPIC 15 .142 - 1959. Similar to above, but w/dual ball bearing shaft, blue drive washer, red backplate, venturi & needle body, has spinner.

SPACE HOPPER .049 - 1959. Smaller version of Sportsman above, beam mounts, no color, spinner has no rim at rear.

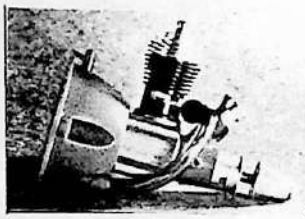
OLYMPIC 15 DRUM VALVE .142 - 1960. A number of these were special built at the factory by Bill Atwood for use by the speed fliers. Standard

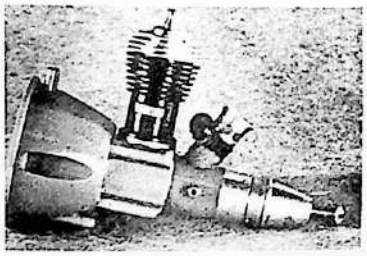




Olympic 15 engine fitted with special backplate, intake and rotary valve. Several styles of venturi castings were used.

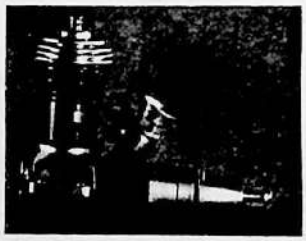
TEE DEE 010 .0099 - 1961. Totally new front rotary design, gold anodized case, red plastic intake casting, red tank, radial mount only.

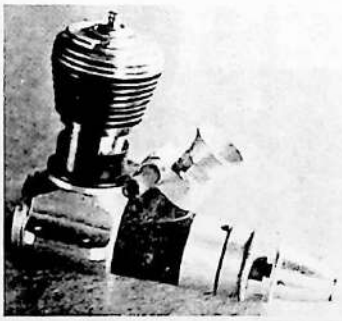




TEE DEE 020 .0199 - 1961. Larger version of above.

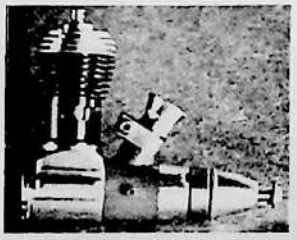
TEE DEE .049 - 1961. Front rotary, beam mount, no tank, silver case, gold drive washer, black intake casting.

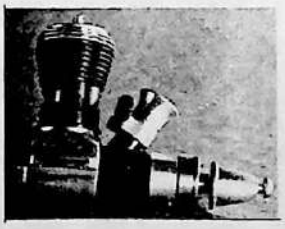




TEE DEE 15 .1494 - 1961. Larger version of above.

TEE DEE .051 - 1961. Similar to Tee Dee .049, but larger bore, red intake casting.



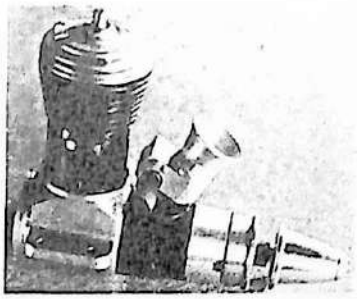


TEE DEE 09 .0913 - 1962. Smaller version of Tee Dee 15, black intake casting.

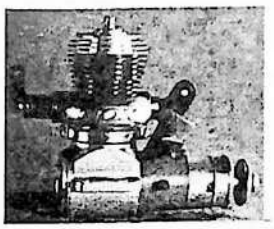
COX SPECIAL 15 .1525 - 1962. Similar to Tee Dee 15, but w/heavier cylinder, larger cylinder base will not screw into Tee Dee case, piston uses wrist pin rather than ball/socket used on all previous Cox engines.

MEDALLION .049 - 1962. Similar to Tee Dee .049, but red intake casting includes venturi, single port cylinder. Engine pictured includes accessory radial tank mount and muffler.

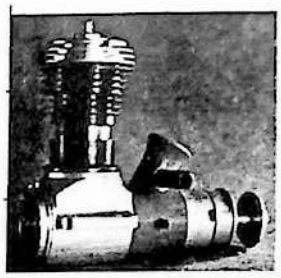
MEDALLION 09 .0914 - 1962. Larger version of above. Engine pictured includes accessory throttle unit.



MEDALLION .049
Cox SPECIAL 15



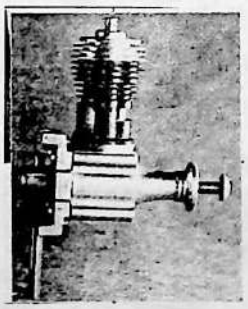
MEDALLION .09

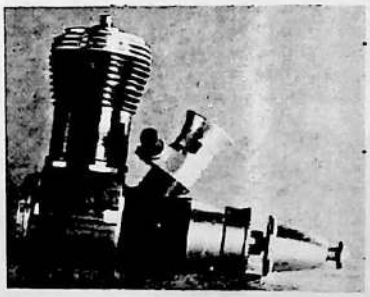


MEDALLION 15 .1494 - 1962. Larger version of Medallion .09.

NOTE: In 1962, Cox went real heavy into ready-to-fly models and began making modifications to the #350 Babe Bee to suit these models. Each of these variant engines was assigned a model number such as 350-3 (Mercedes-Benz), 350-4 (Buick Riveria), etc. 190 and 290 series engines were also introduced with tankless backplates in a variety of different styles. We have engines we can not find numbers for, numbers we can't find engines for and some numbers with more than one engine style. As a result, and until we can round up some Cox collectors to help with sorting all of this out, we will skip all of these variants in this index and just concentrate on those engines that were generally sold over the counter as an individual engine for general use.

SPOOK .049 - 1963. 290 series engine sold in bubble pack. Babe Bee crankcase, cast aluminum backplate, brass needle valve, exhaust deflector trapped between case and backplate.





COX MARK II SPECIAL 15 .1525 - 1965. Similar to Special 15, but with gold anodized crankcase, single exhaust cylinder w/boost port.

QZ .049 - 1966. Sold in bubble pack, standard #350 Babe Bee with standard muffler.

NOTE: In 1969 Cox advertized and built a few prototypes of the Concept II engines. These are: .35 FR Sport; .35 RR R/C; .40 FR R/C and .40 RR R/C. These were never released for general distribution, but some castings were "let out". The photo shows the basic design of this engine. It shows both the front rotary and rear rotary case covers (unfinished) on the same engine. It is shown only for reference and is not a production engine.

Mighty Mites
Caught by Dan Sitter

History of the Cox Engines – Part IIa

The .020 and .045 Product Engines

Forward

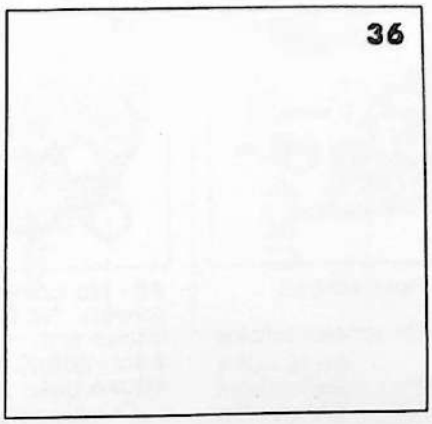
In October, 1989, when I began research on the History of the Cox Engines, I immediately became stymied in my research. After throwing up my hands in disgust several times, I realized that using the traditional approach of indexing engines chronologically was not feasible with the Cox series. Chronological (1949-1993) sequence would make the history difficult to follow and produce a distortion of information. Consequently, I decided to list the engines by classification as follows:

Part II The Product Engines
Part III The Hobby Engines
Part IV O.E.M.
Part V Prototypes and Experimentals
Part VI Other Engines
Part VII Miscellaneous Information

During the past 40 years, there has been considerable discussion among collectors about what constitutes a "production engine". Many collectors have many ideas. They all have merits. Generally, collectors like to think that engines were manufactured specifically for collectors, rather than to make a profit for the company. We would like to think that manufacturers never co-mingled parts - that when the production of a new model commenced, all of the parts for the old model were discarded. This, actually, was more the exception to the rule than reality, especially with the mass production of small American engines. Many of the small engines were produced in such large quantities that advertent and/or inadvertent mixing of parts occurred. Consequently some engines were shipped from a manufacturer in a configuration in which there never was an intention to produce that particular engine.

For example; during one period when Cox was producing the #191-6 engine, they ran out of crankcases. Rather than shut down the assembly line, Cox substituted Black Widow crankcases until the proper crankcase could be manufactured again. Consequently 3000 #191-6 engines were shipped with Black Widow crankcases. My research deals only with those engines that were actually designed by Cox with an intention to be produced. I will let everyone take it from there.

I will also use a different numbering system to describe the engines. This will eliminate repeating the same information. The following block (representing a photograph of an engine) will describe the numbering system that I will use:

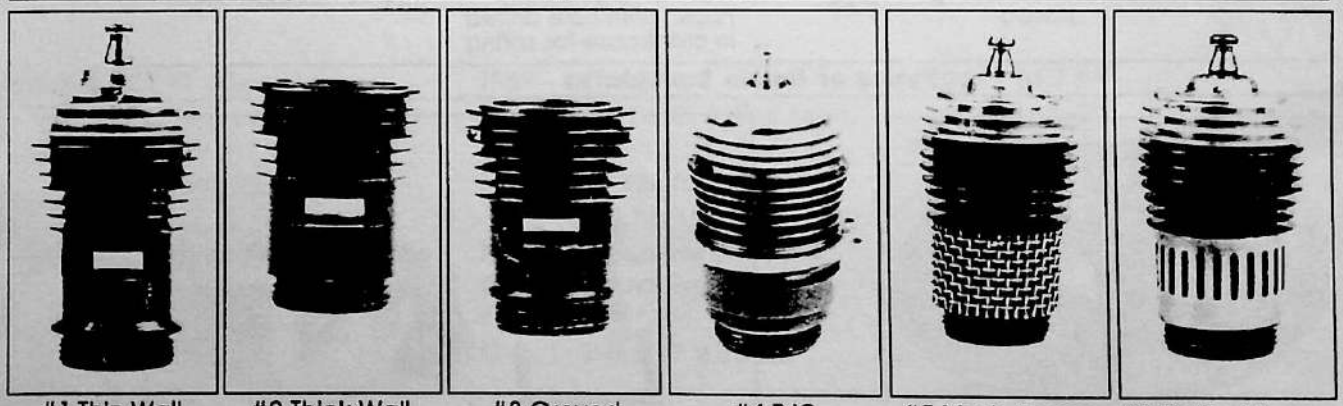


1977 350-1
8, 9, 11, 23, 28, 59
36a

1) The number 36 represents the ECJ (Engine Collectors' Journal) index number for that particular engine model.
2) 1977 is the first year that model was produced.
3) 350-1 is the Cox Catalog number.
4) 8, 9, 11, 23, 28, 59 etc, are the number for the parts that constitute the engine in the photograph.
5) 36a is the first variation of that model, also the ECJ index number for that variation. It will also have a group of numbers.

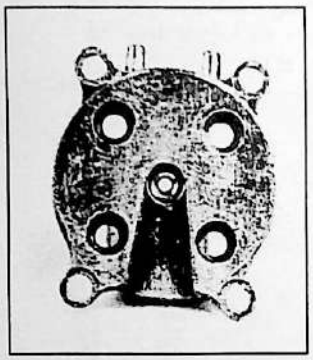
Beware that Cox often used different catalog numbers for the

Types of Cylinders

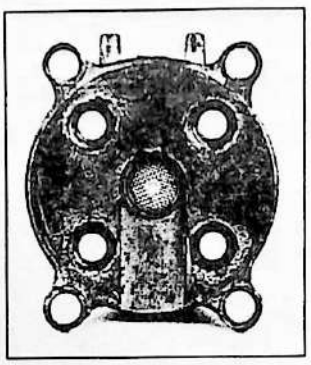


#1 Thin Wall | #2 Thick Wall | #3 Groved | #4 R/C | #5 Mesh Screen | #6 Slotted Screen

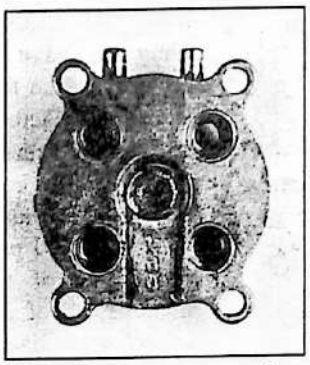
Types of Metal Backplates



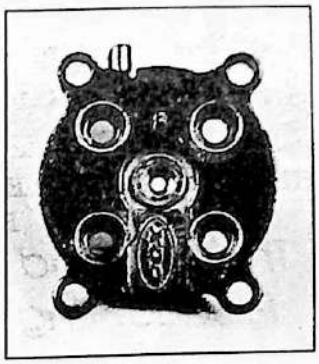
#7 - Without screen intake
#7a - With screen intake



#8 - No coining around screen. No Cox logo in intake slot
#8a - With Cox logo in intake slot



#8-1 - Coining around screen, Cox logo in air intake slot, two fuel tubes



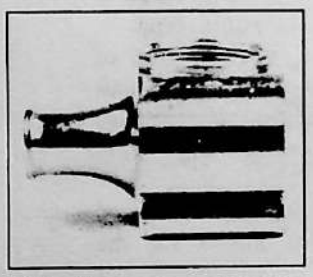
Coining around screen, One fuel tube, Cox logo in intake slot.
#9 - with screen, not plated
#9a - without screen, not plated
#9b - without screen, plated yellow
#9c - with screen, plated yellow

same engine and the same number for different engines. This also occurred with some engine parts. I will clarify these various numbers as we progress through the history of the Cox engines.

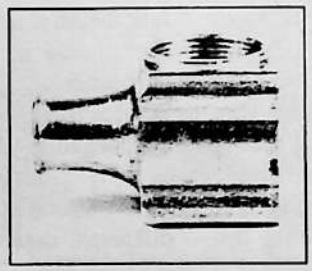
The .020 and .045 Product Engines

Why an .020 engine? No particular reason. Cox just decided to make a "Half Size" Babe Bee and .020 sounded good. There was no sophisticated market research, or polling of modelers. Cox just decided on an .020 and did it! The Pee Wee .020 and its companion, the Babe Bee .049 are the longest continuous run engines in history. Both have been in production for 37 years!

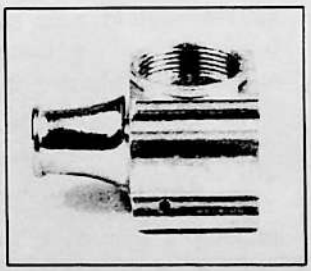
Types of Crankcases



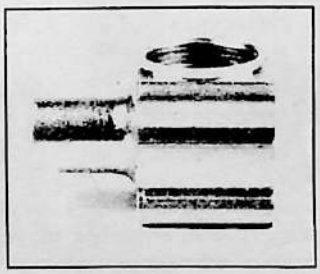
#10 - Narrow neck nose



#11 - Enlarged neck nosed

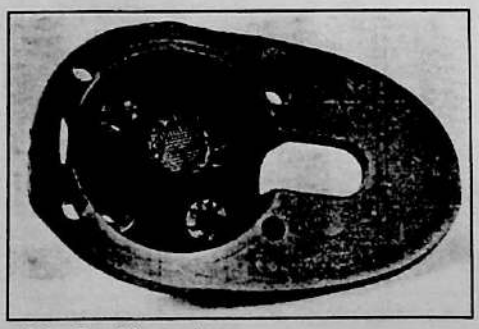


#12 - Enlarged neck nosed with hole drilled in crankcase for spring

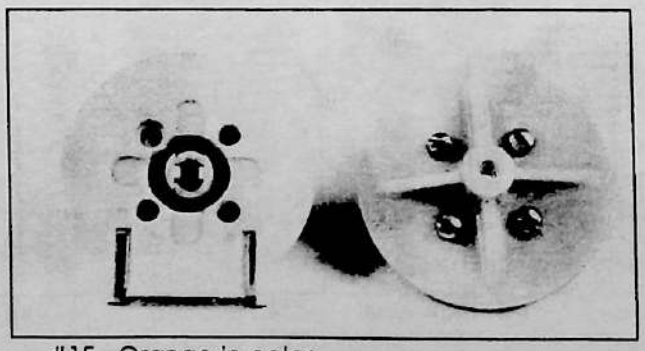


#13 - Straight nose

Types of Delrin Backplates

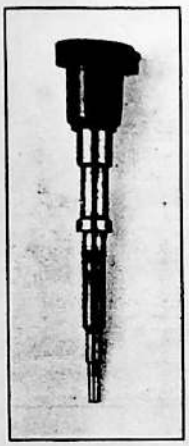


#14 - Red in color



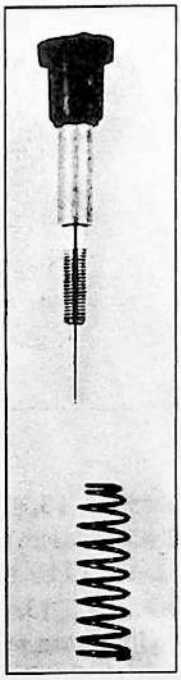
#15 - Orange in color

Types of Needle Valve Stems



#16 - Brass with nylon seal

#17 - Aluminum with spring

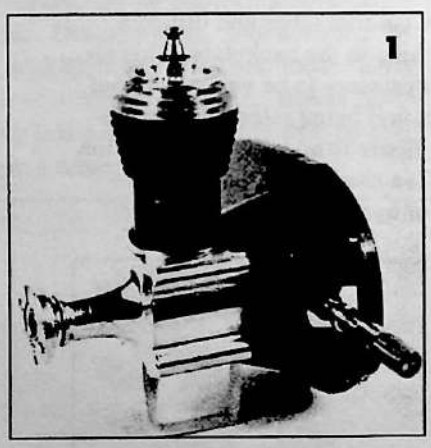


#18 - Aluminum with spring

#19 - Brass with black nylon seal

#20 - Black oxide steel with spring

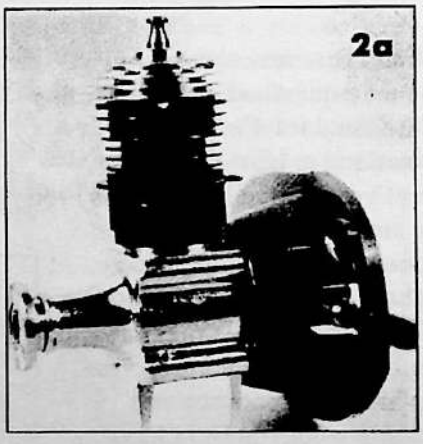
NOTE: All .020 Product Engines have slotted head screws.



90

1969 - ECJ #1 (shown)
1, 10, 14, 19
1969 - ECJ #1a
3, 11, 14, 19

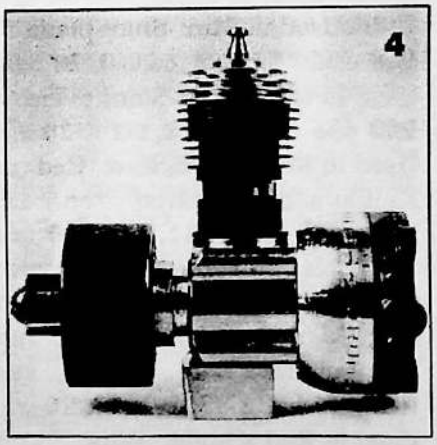
Used in the Ryan PT-19 Airplane



90-1

1969 - ECJ #2
4, 10 (with drilled case), 14, 19
1969 - ECJ #2a (shown)
4, 12,14, 19
NOTE: Crankcase drilled to facilitate starter spring

Used in Ryan ST Airplane

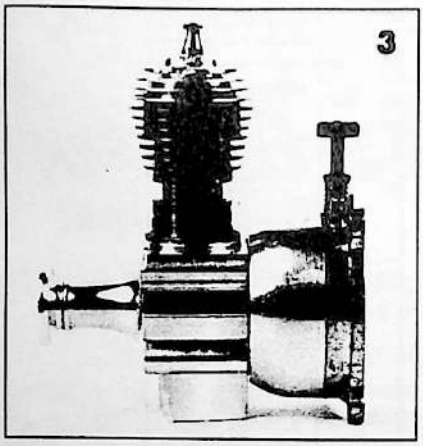


100-1

1968 - ECJ #4
1, 8, 20

NOTE: This engine has a unique crankcase as shown in the photograph. The pinion gear has 12 teeth.

Used in the Camero and GTO cars

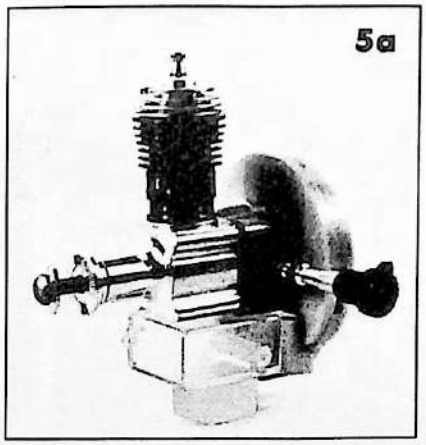


100 and 100-2

1958 - ECJ #3 (shown)
1, 7, 10, 20
1959 - ECJ #3a with "Thimble drome" on the fuel tank
1, 7, 10, 20
Both used in the Little Stinker and Super Sabre F-100
1968 - ECJ #3b - 1, 7a, 10, 20
Used in Mini-Stunt plane
1968 - ECJ #3c - 1, 8, 10, 20
Used in Mini-Stunt plane
1968 - ECJ #3d - 1, 8a, 10, 20
Used in Mini-Stunt plane
1969 - ECJ #3e - 3, 8-1, 11, 20
Used in Mini-Stunt, Red Knight and Red Baron
1969 - ECJ #3f - 3, 8-1, 11, 20
"Thimbledrome" removed from fuel tank. Used in Mini-Stunt, Red Knight and Red Baron
1972 - ECJ #3g - 3, 8-1, 13, 20
Used in Red Knight, Pitts Special & 1975 Skycopter

NOTE 1: The Mini-Stunt airplane was assigned engine number 100-2. All other engines in this series were assigned engine number 100

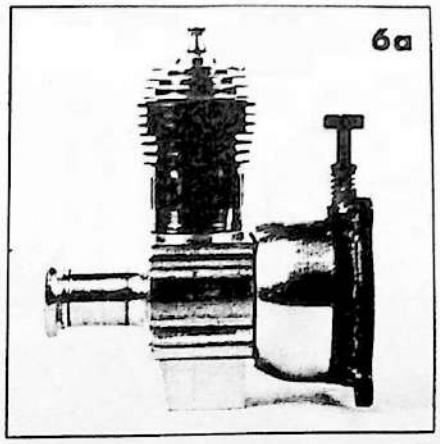
NOTE 2: Cox increased the diameter of the crankcase nose section to prevent failure during "nose-in" crashes.



100-4

1975 - ECJ #5 - 3, 13, 15, 16
1976 - ECJ #5a (shown)
3, 13, 15, 17 or 18
1976 - ECJ #5b - 3, 13, 15, 17 or 18 (with nylon seal)
1976 - ECJ #5c - 5, 13, 15, 17 or 18 (with nylon seal)
1977 - ECJ #5d - 6, 13, 15, 17 or 18 (with nylon seal)
Used in Skycopter Helicopter

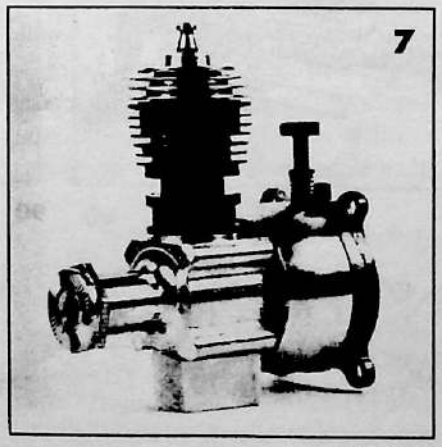
NOTE: There are many unanswered questions regarding the 100-4 engine. Cox manufactured at least four different variations of the #1960 needle stem. Two of these variations were randomly used throughout the 100-4 production run. The K-resin fuel tanks are known in three colors; clear white, transparent orange and transparent smoky gray. I have seen only one clear tank and that was in a bag of Cox parts. Although orange and smoky gray tanks are common, orange predominate. I have not been able to determine if the various color tanks were used in specific years (Cox catalogs are not a reliable source of information). Perhaps someone who worked at Cox during that time period could provide this information.



20102

1979 - ECJ #6 - 6, 9, 13, 20
1979 - ECJ #6a (shown)
6, 9a, 13, 20
1979 - ECJ #6b - 6, 9b, 13, 20
1979 - ECJ #6c - 6, 9c, 13, 20
Used in the R/C Cub Trainer Plane

NOTE: In the process of filling the fuel tank under pressure, there was a tendency for fuel to exit from the other fuel tube and splash on the modeler. For safety, Cox plugged one of the fuel tubes and drilled a small hole in the backplate. This allowed pressure to be vented without excess fuel being released from the tank. There is no logical explanation why Cox used four different variations of backplates on this engine.



90430100

1991 - ECJ #7 - 3, 9c, 13, 20
Used in the Turbo Centurion plane

NOTE: Hex prop driver

Engine of the Month

Mighty Mites

Caught by Dan Sitter

History of the Cox Engines -- Part 1

Figure 1. LeRoy (Roy) M. Cox showing off several of the gas powered models he was famous for.

LeRoy (Roy) M. Cox's father owned a bicycle shop in Placentia, California. It was in this shop that Roy spent many of his hours after school and during the weekends. This exposure developed a keen interest in mechanical devices that formed the basis of his life work, manufacturing and selling toys.

Roy Cox as an entrepreneur, not a man content to take a lunch bucket and work a forty hour week in a local factory. With an inventive spirit, Roy Cox launched into his first business before World War II, the manufacture of photographic enlargers. Unfortunately, the scarcity of metal during WWII soon forced Roy to abandon this project. It was during this period of his life that he began a career as an electrician.

In 1944, Roy Cox's entrepreneurial spirit became restless and contributed to an intense desire to again develop his own business. He recognized a baby boom was developing and decided to target his market towards young people. In his garage he developed a wooden pop gun. He used wood because of the scarcity of metal. Cox built a few guns and distributed them to neighbor kids for analysis. The pop guns were an instant hit and soon he had to hire local house wives to work in his garage to manufacture the pop guns.

Business was very successful until after the war when metal again became readily available and large manufacturers with machine shop capabilities could produce metal pop guns at a more competitive price. Once again Roy Cox was looking for a new venture.

The bicycle wheels in Roy's father's shop began to turn in Roy's head. In 1947, he and a partner, Mark Mica, developed a push pull car for toddlers to play with while scooting around on the floor. This model automotive concept developed into a tethered "whip car" that a youngster could whip around in a circle at considerable speed.

Roy noted that modelers were building and racing model cars with .60 cubic inch engines that were hopped up to pure brute force, attaining speeds over 100 miles per hour. The average price for a car, engine, gears and other mechanism was over $100, quite a sum in that era. Again, Roy Cox saw a niche in the market to develop a model race car for youngsters to emulate their older brothers.

Cox developed a cast aluminum race car and utilized engines

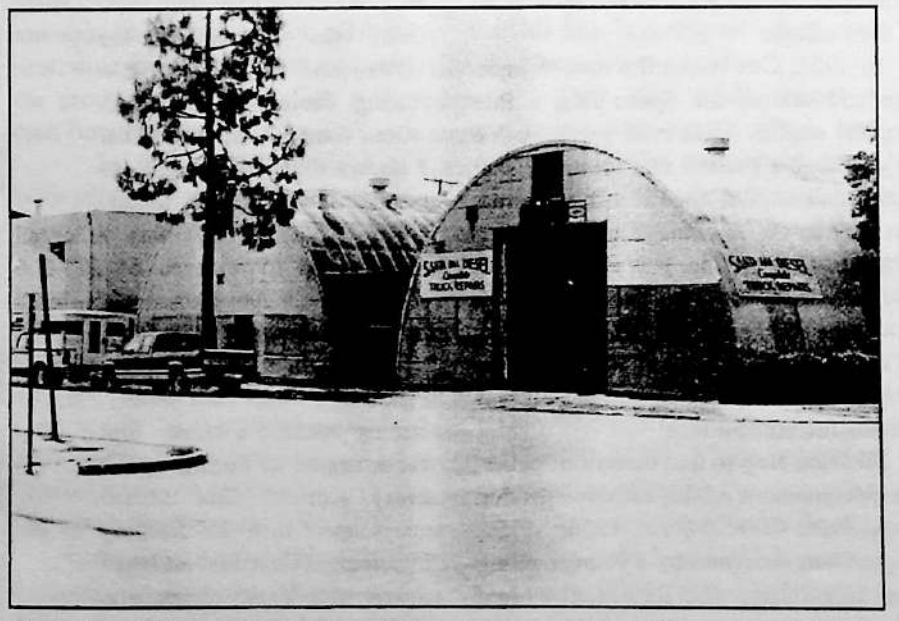


Figure 2. 1947 saw Cox outgrow his garage and moved into a larger facility at 730 Poinsettia Avenue, Santa Ana, California. Santa Ana Diesel occupies those buildings today.

Figure 3. In 1963, Cox moved out of the quonset huts and into this much larger facility. With expansions, this served until 1990.

which were manufactured by Cameron Brothers. The race car sold for $19.95 and was an instant hit, generating $200,000 in sales during the first year of production. Production of gas powered cars soon outgrew Roy Cox's garage. In 1947, Cox moved his production facilities from his garage to 730 Poinsettia Avenue, Santa Ana, California. This facility consisted of two quonset huts. Later a concrete tilt up building was added. Figure 2 shows these buildings as they appear today.

In 1949, Cox developed and manufactured their first model engine. Cylinders, head, pistons and rods from the Spitzy .045 were purchased from Mel Anderson. These units were incorporated in a self contained race car power pack. The entire power pack included the fuel tank, enclosed flywheel, enclosed case hardened steel planetary reduction gears (4:1 ratio), built in muffler, automatic lubrication of gears and bearings and an exhaust pipe. The air intake was through the right axle. An amazing feat of engineering in 1949. This engine became known as the "O Forty Five". Later, Mel Anderson supplied .060 displacement cylinder/pistons for Cox to produce a larger car engine.

As model car racing began to lose its mass appeal, Roy Cox searched for another project to develop. Again, he focused on the young people. In 1950, Roy Cox and two engineering associates spent the entire year designing and developing a model airplane engine. Although they almost went bankrupt in the process, the Space Bug .049 was the result of their efforts.

In 1952, Cox began the manufacture and sale of the Space Bug .049 contest engine. This reed valve engine was such a success that it sent all other small engine manufacturers back to the drawing board. The engine was used to power Cox's first ready to fly airplane, the TD 1, which hit the market in 1953. Cox was now solidly established in the model aviation field. Now all that was left was to eliminate the competition!

The first step in that direction was the development of the extruded crankcase Babe Bee .049 in 1956. This engine was designed by a young engineer, Bill Selzer, who Roy hired in 1952. Selzer had spent three years working at Pratt & Whitney Aircraft Engines before joining Cox. Using the extruded crankcase design, Cox was able to lower production costs on the Babe Bee, which enabled the engine to retail for $3.95.

LeRoy Cox performed a market coup in 1957 when he took over the flying circle at Disneyland. In this large caged arena, Cox employees performed hourly flying demonstrations, teaching young modelers how to fly Cox models. This exposure of Cox products to tens of thousands of people each day was a marketing managers dream. Cox maintained the flying circle at Disneyland until 1962 when Disney decided to use the space for expansion of Tomorrowland.

In 1960, Bill Atwood was hired by Cox to develop a line of competition engines. Atwood developed the Medallion and Tee Dee line of engines. The Tee Dee engines put Cox "over the top". Each issue of the model airplane magazines began to carry full page Cox advertisements which proclaimed that Cox Tee Dee engines won first, second, third place in many major contests including the Nationals. This was a tremendous marketing boost for L.M. Cox Mfg. Co.

Cox was outgrowing the quonset huts, and in 1963 built a manufacturing facility at 1505 E. Warner Ave., Santa Ana, California. Figure 3 shows the facility as it appears today. The original 80,000 square foot facility was enlarged three times to an area of 225,000 square feet. An immense building for a model engine manufacturer.

Soon after Cox became established in their new Santa Ana facility, slot car racing became a craze. Slot car business began to spring up on every street corner. Cox shifted gears and jumped into the slot car business. Their product line included ready to run slot cars, controllers, motors and everything that was required to build and run slot cars. The

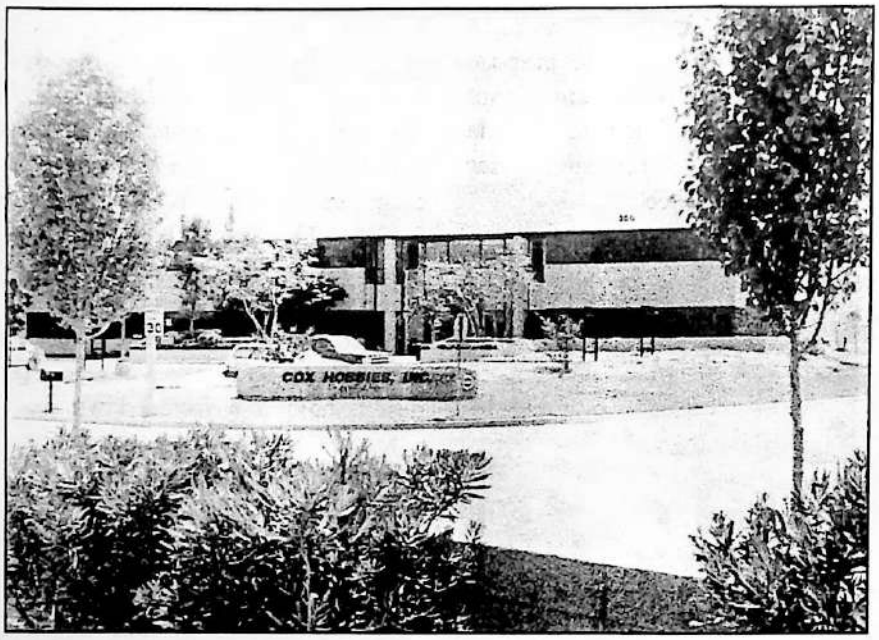


Figure 4. Since 1990, this building at 350 Rincon Street in Corona, California has served as the headquarters and manufacturing facility for Cox.

demand was intense and it was a supreme effort just to supply the industry needs. To assist in fulfilling this need, Cox International was established in 1965 in Hong Kong to produce slot car products.

As suddenly as the slot car craze began in 1962, it died in 1967! Several large distributors and hundreds of slot car establishments suddenly closed their doors. Cox had an immense inventory of slot car products with diminishing outlets to sell the products. This left Cox with a cash flow problem.

In this same period, Roy's beloved wife died. At that time, California inheritance tax laws required a spouse to pay inheritance taxes on their spouses estate. Mrs. Cox was a stockholder of L. M. Cox, and this compounded the cash flow problem. Roy Cox was beginning to have his own health care problems, and in 1969 decided to retire. He sold his beloved business to Leisure Dynamics, which was based in Minnesota.

Before LeRoy M. Cox left his business, he held the distinction of being the worlds most successful model engine manufacturer. No one had produced more engines than Cox. He literally eliminated every other small engine manufacturer off the face of the earth.

In 1971, Leisure Dynamics moved all of the model manufacturing production to its Minnesota facilities, leaving the engine manufacturing in Santa Ana. Leisure Dynamics expanded the lines on model airplane engines and added trains, kites, rockets and radio control equipment to the Cox line, boosting sales from 6 to 25 million dollars per year.

They also manufactured a one horsepower engine which was used on bicycles and chain saws. With such a diversified product line, the company name was changed to Cox Hobbies Incorporated in 1976. At this time an adjacent building at 1525 E. Warner St was acquired. Business flourished and new product lines were added each year.

The U.S. economy went into a tailspin in 1979. With a full blown recession in effect in the early 80's, the bottom collapsed under Leisure Dynamics, which resulted in Leisure Dynamics filing for bankruptcy and taking Cox Hobbies with them.

The business languished until 1983 when President Bill Selzer (the same young engineer Roy Cox hired in 1972) and a business associate purchased Cox Hobbies out of bankruptcy. All manufacturing facilities were returned to Santa Ana. During the following years, emphasis was placed on rebuilding the company. The line of radio control cars and airplanes was expanded and radio control equipment and model kits were added to the line.

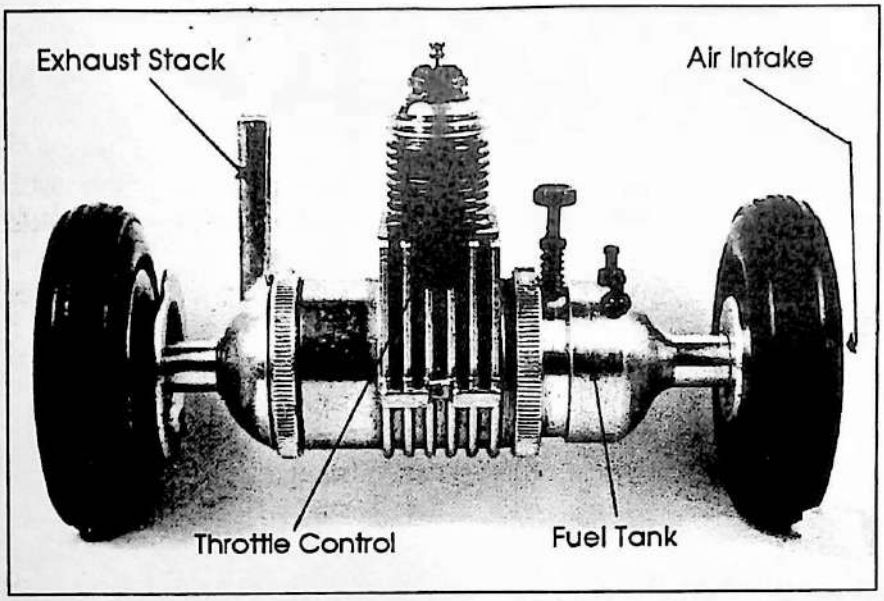
Business flourished in the 1980's and in 1990, Cox Hobbies moved to their new facility at 350 Rincon Street, Corona, California. Figure 4 shows Cox's present facilities. In 1993, the company name was changed to Cox Products.

The history of Cox Products is incredible. Their product line defies anything that has ever occurred in model aviation history. The Pee Wee .020 and Babe Bee .049 have been in continuous production since 1957. An incredible lifespan, when historically a model engine's marketable life is only a few years. The PT 19 Trainer model airplane has been in continuous production since 1960 with a production of over 1,000,000 airplanes.

LeRoy M. Cox was just a little guy, working out in his garage with a dream. He was the epitome of the American Dream that anyone with the desire, ambition and perseverance can rise to the top of their profession. In the manufacture of small model engines, LeRoy M. Cox was more than a professional, he was the KING!

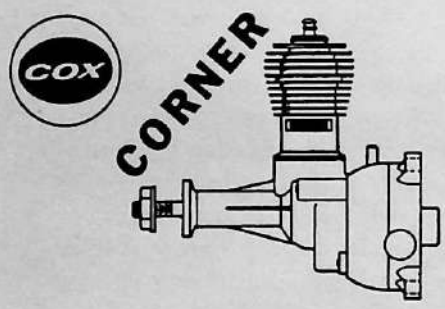
Since the Engine Collectors' Journal began publishing in 1963, numerous biographies have been written about model engine manufacturers. The stories usually concluded with the statement that another engine manufacturer discontinued business because they could not compete with the large manufacturers. The Cox story does not end here, there is much more to come.

Next: The First Cox Engines.



1949 **O-Forty-Five**

This car engine was the first engine produced by Cox. The engine power pack included the fuel tank, enclosed flywheel, enclosed case hardened steel planetary reduction gears (4:1 ratio), built in muffler, automatic lubrication of gears and bearings and an exhaust pipe. The air intake was through the right axle. The cylinder head, cylinder, piston and connecting rod were purchased from Mel Anderson, and were from the Spitzy .045.



As promised in the last issue here is the listing of Cox Product engines. Product engines are those that are used in Ready-to-go model as opposed to Hobby engines which are sold individually packaged in your local hobby shop showcase.

This first listing is a partial list of these engines as furnished by Dale Kirn at Cox. As we progress, Dale will furnish more complete descriptions of each engine. It may not come as a real surprise, but the people at Cox aren't as certain as you might think about what they made!

Cat. No.	Year	Product
190	1961	Shinn
190-1	1961	Stuka
190-2	1961	P-51 Bendix
190-2	1976	Stinger
190-3	1962	(Sales No. Only)
190-4	1969	Bushmaster
190-5	1967	Eagle (car)
190-5	1972	Vega & Pinto
190-6	1969	Revised Eagle
190-6	1974	P-51
190-7	1972	Miss America
190-8	1969	Dragster
190-9	1972	Sandblaster
191	1972	Sopwith Camel Fokker Triplane
191-1	1972	Snowmobile
191-2	1973	Fokker D-VIII
191-3	1973	F-1 Trainer
191-4	1972	Jeep
191-5	1972	PT-19
191-6	1973	Van
191-7	1974	ME-109
191-8	1975	Cessna Skymaster P-39 & Comanche
191-9	1975	Crusader
290	1963	Spook
350	1956	Babe Bee
350-1	1959	P-40
350-R/C		Sales Item
350-2	1959	Curtiss Pusher
350-2	1968	Super Bee - P-40 Throttle
350-3	1960	Mercedes
350-3	1969	Sea Bee
350-4	1964	Buick
350-4	1971	Dune Buggy
350-4J	1972	JoMac (Dem)
350-5	1964	Sting Ray-Ford GT
350-6	1964	Spitfire
350-7	1965	Chaparral
350-7	1976	Monza
350-8	1967	Eagle (car)
350-8	1971	Trike
350-9	1971	Rivets
352	1968	Shrike
360	1979	R/C Piper Arrow
120-2.049	1967	Testors R/C Plane
450	1965	QZ PT-19
450-1	1965	QZ Sting Ray
450-2	1966	QZ Stuka
450-3	1966	QZ Chaparral
450-4	1967	QZ T-28
450-5	----	-------
450-6		450-2 Variation
90 .020	1968	Ryan PT-22
90-1 "	1968	Ryan ST
100 "	1957	Pee Wee .020
100R/C "		w/throttle
100-1 "	1967	Pontiac
100-2 "	1967	Mini-Stunter
100-3 "		Demo Engine
100-4 "	1975	Sky Copter
20102 "	1978	R/C Piper Cub
20452	1976	R/C Cessna
20361		
20362		
20363		
21920	1976	F-15
21922	1976	Mantis
21924	1978	Wings
21925	1980	Starfighter
1100	1959	Comanche