

# TRACTION EN

*Using a combination of fairly simple woodworking and metalworking, Dennis Horler comes up with a toy traction engine with working piston and steering and simulated piston drive*

**T**HIS model was built mostly from reclaimed material. The boiler was part of an old oak table leg, the bearings from brass mat well edging, the chimney was part of a brush handle and the crankshaft came from a discarded rotary clothes line.

## Basic woodwork

First the boiler was turned from the length of oak. This was cut to the required length, the hole for the chimney was marked off and drilled. The piece was then set up centrally in the four-jaw chuck and centre drilled to receive the tail centre. This was now turned parallel leaving a square shank, this being later used to fix the driver's cab to the boiler. The  $\frac{1}{16}$  by  $\frac{1}{16}$ in. grooves were turned next. These represent the boiler casing bands. The boiler front was then finished leaving a short stub to be cut off when completed.

A chord was next cut for a length of 2in. from the front face and removed by cutting at rightangles. This formed a seating for the steering block bearing and should be carefully cut with a tenon saw.

Seatings were shaped from hardwood, one for mounting the base of the cab to the boiler and the other for fitting the cylinder to the top of the boiler. The concave side is best cut using a fly cutter in the lathe set to the diameter of the boiler. However in the absence of a lathe, a Surform or similar cutter could be used in an electric drill or even a half-round wood rasp by hand.

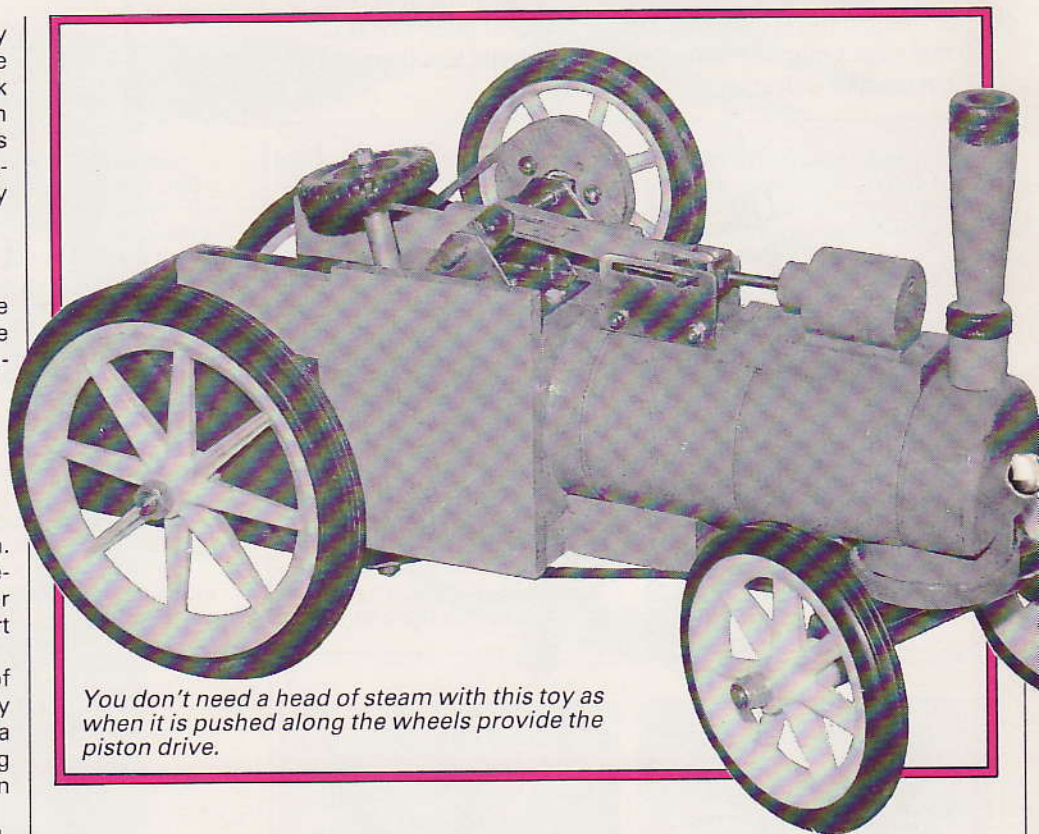
The cylinder is simple turning. After drilling for the piston, a flat is filed and the distance piece glued on. This is then glued and pinned to the seating which is finally screwed to the boiler top behind the chimney hole.

The chimney is turned as shown and glued in position after painting.

## The cab

The cab base seating is glued in position under the boiler flush with the square edge of the boiler end. The cab base can now be screwed through the seating into the boiler thus forming a rigid fixing.

The cab itself is simple handwork, glued and pinned together. The coal bunker is a slide fit over the rear of the cab and is glued and pinned together. The holes for the rear axle must be carefully marked and drilled through from each side after the coal bunker is in place.



*You don't need a head of steam with this toy as when it is pushed along the wheels provide the piston drive.*

## Steering blocks

Both blocks A and B are turned from hardwood. These are recessed and shouldered to fit together with a smooth rotating fit. The OBA bolt head is recessed into the boiler flat and block A is screwed onto the flat surface. The centre hole is bored out to allow the locking nut to fit flush thus preventing the bolt working loose; note that the locking nut is a 'halt nut'.

## Pulley wheels

As shown in the drawing, the centre hole was bored out to fit over the wheel boss and held in position by three bolts spaced at approximately 120 degrees to clear the wheel spokes. These bolts were screwed into the clamping plates. To enable the pulleys and clamping plates to seat flat against the spokes, the spokes were turned flat on each side. The rubber tyre on the flywheel was turned square in section to resemble a real flywheel with a heavy-duty elastic band serving as a belt.

## Crankshaft assembly

The two shafts are cut to length and threaded as shown in the drawing. Next the crank webs are shaped with hack-saw and file and tapped to receive the shafts. At this stage clamp both webs

together and work on both at once, filing the edges and drilling the hole for the small end pin. The shafts are now screwed tightly home and filed flush on the inside faces and soldered. It is worthwhile to countersink the holes slightly to allow the solder to penetrate.

The 'con rod' is shaped as shown and placed on the 'big end' shouldered pin. Note that the shoulders should project each side beyond the thickness of the 'con rod'. A thin washer is placed each side, the webs checked for alignment, and the pin riveted over each side.

The crosshead, 'small end' pin, and piston rod can now be made and fitted thus completing the crankshaft assembly.

## Bearing blocks

The two angled plates, the baseplate, and the outboard bearing plate were all cut from brass and drilled. The four 4BA bolts were countersunk into the baseplate and soldered to enable the nuts to be tightened. The outboard bearing was fitted last of all by clamping in position, adjusting to allow free rotation of the shaft, then drilling fixing holes.

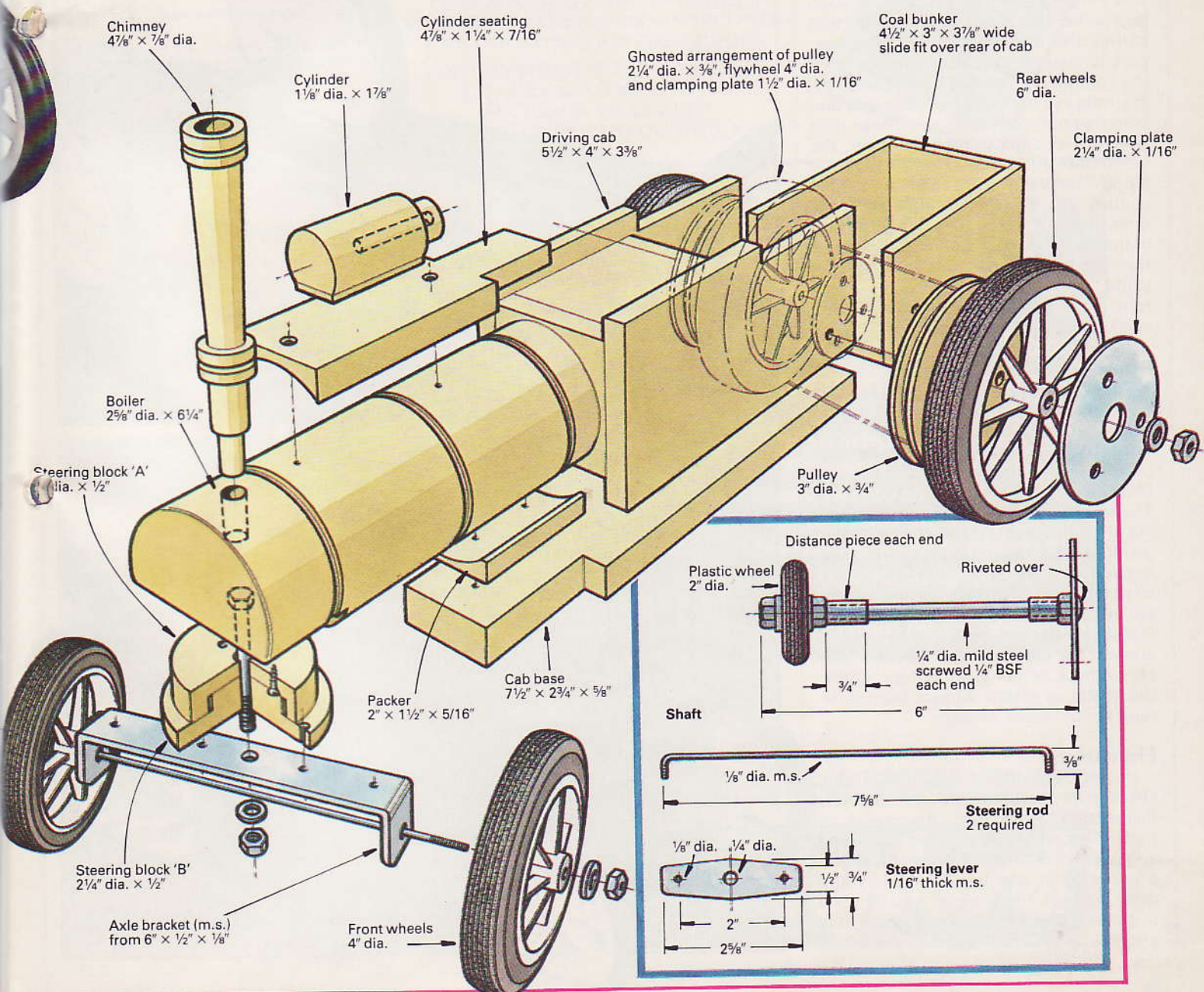
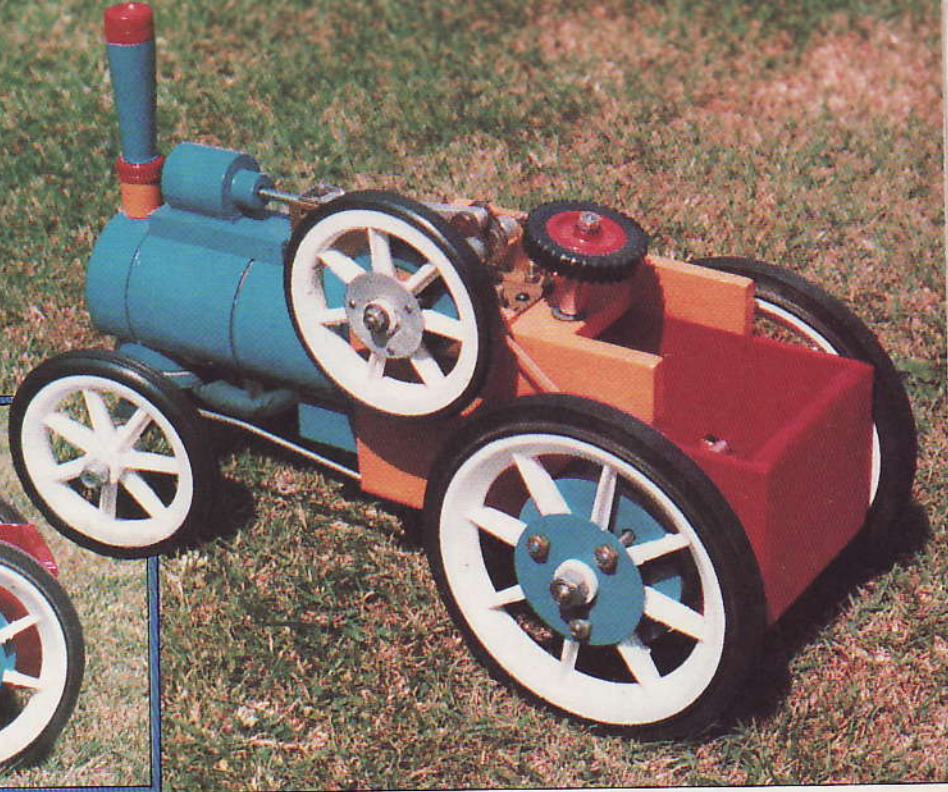
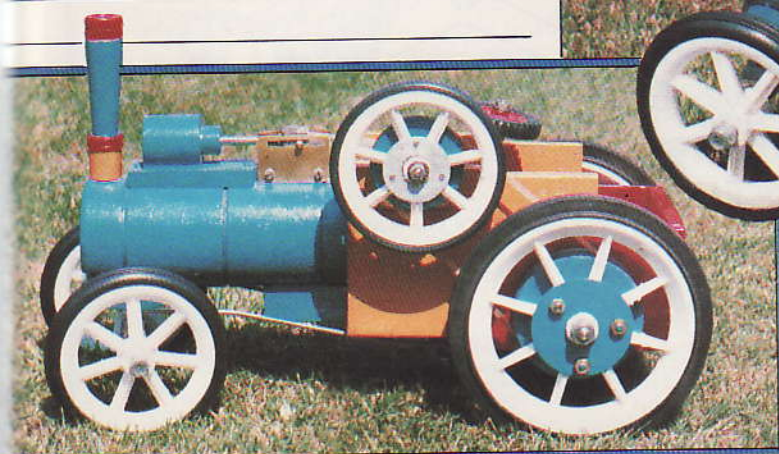
## Crosshead guides

These were cut to shape, and the slots cut by drilling and filing using the

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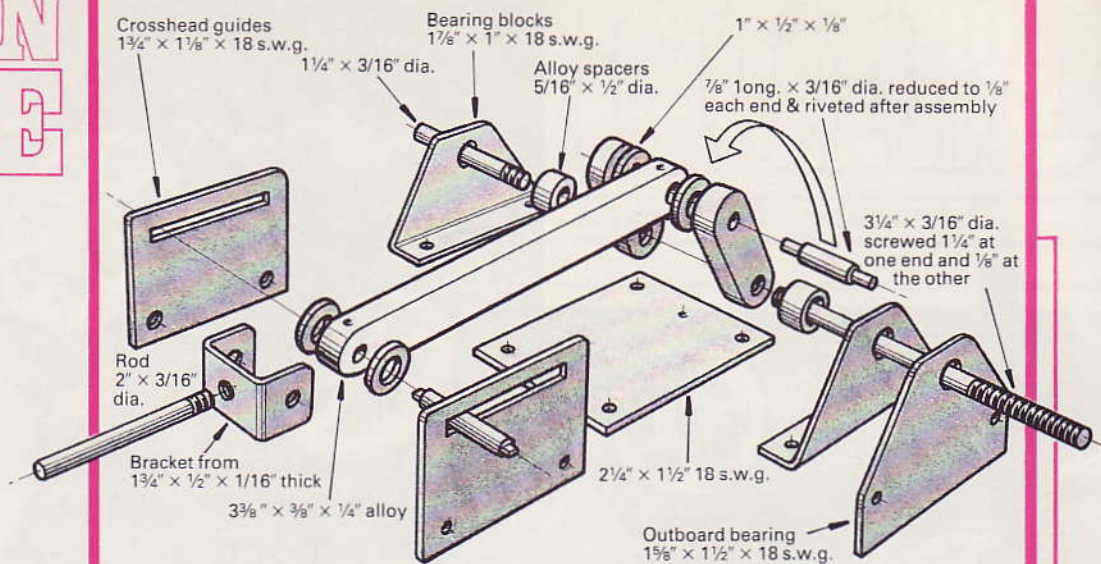


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top of the vice jaw as a guide. Both were clamped together and finished as one including the fixing holes.

## Steering gear

A length of mild steel bent at each end and drilled forms the front part and carries the axle and wheels. The rear part is clamped between two nuts on the column and riveted over. The steering rods are bent over at each end and held free to move with nuts. These rods should be slightly bent to clear the wood base and checked for the required length between front and rear hole centres. The steering column holes are drilled through the wood construction in the centre of the cab width and about five degrees to the vertical giving a slight slope. Small lengths of metal tube are used as spacers to take up the slack.

## Road wheels and shafts

The road wheels were purchased at a hobby shop for less than £3 and seemed to be more fitting than solid turned wooden wheels. The shafts were of mild steel – front  $\frac{1}{4}''$  in. diameter by  $6\frac{3}{4}''$  in. and the rear  $\frac{5}{16}''$  in. diameter by  $7\frac{1}{4}''$  in. These lengths allowed for threading the thickness of a nut at each end giving a neat appearance and tightening up to the end of the thread. The rear shaft requires a spacer to line up the pulleys. A  $\frac{1}{16}''$  hole is drilled through the shaft near the centre of the cab to screw it to the floor and prevent side play. Check wheel sizes before cutting the shafts as plastic wheels from different shops seem to vary.

## Finishing

Having assembled the model and checked its operation, it was completely dismantled, apart from the glued up parts. This was now cleaned up, rough edges sanded, any blemishes filled and a primer coat applied. After this using masking tape the project was finished in three colours, red, orange and blue enamel.

View of the underside showing the steering rods which are the link from the steering column to the front axle bracket.

