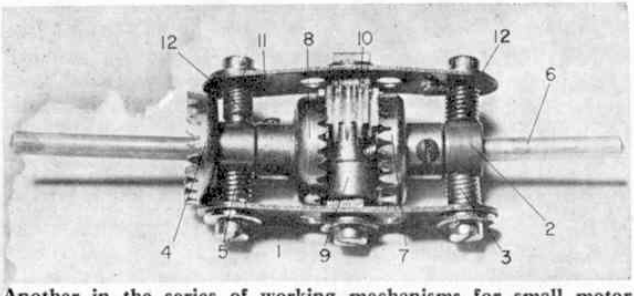
AMONG THE MODEL BUILDERS

with 'Spanner'



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" BABY " DIFFERENTIAL

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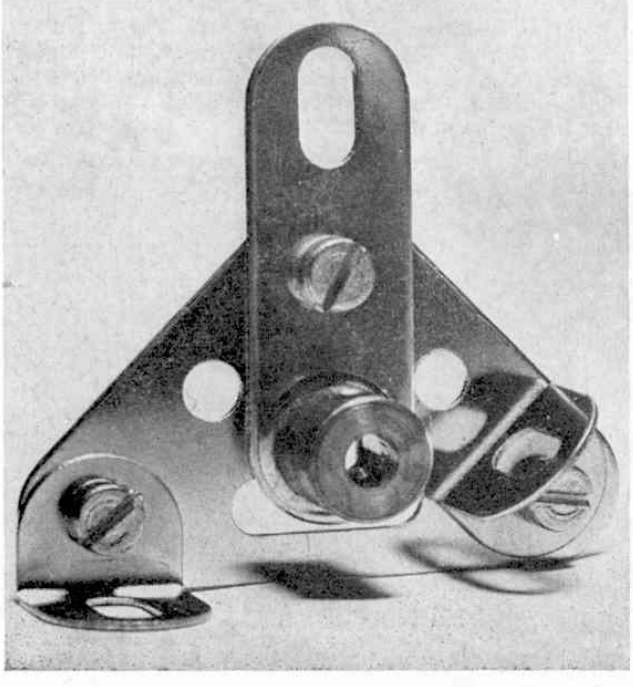

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Construction of the mechanism has been made possible by the new-design 2 in. Strips with the additional hole in the centre. Secured by a Nut in the centre hole of one of these new 2 in. Strips 1 is a $1\frac{1}{8}$ in. Bolt, a Washer between the head of the Bolt and the Strip. One end of the Strip is then secured to a Collar 2 by a $\frac{3}{8}$ in. Bolt, but is spaced from it by a Cord Anchoring Spring 3 on the shank of the Bolt, a Washer also being carried between the bolthead and the Strip. At its other end, the Strip is secured to the boss of a $\frac{3}{4}$ in. Contrate Wheel 4, again being spaced from it by a Cord Anchoring Spring 5 and carrying a Washer under the bolthead.

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To finish the Unit off, the ends of Strip 11, like Strip 1, are secured to Collar 2 and the boss of Contrate Wheel 4 by $\frac{3}{8}$ in. Bolts, Cord Anchoring Springs 12 again being used as spacers, and Washers again being carried, one under the head of each Bolt. A certain amount of careful adjustment may be required before the mechanism will operate freely, and it will be necessary to curve the 2 in. Strips slightly, but I can assure readers that Mr. Grady's sample unit illustrated worked extremely well, indeed.

PARTS REQUIRED

2—6	1—26c	3—37a	1—59
1—17	3—29	8—38	4—111c
1—18a			1—111d

For the Mathematically-minded

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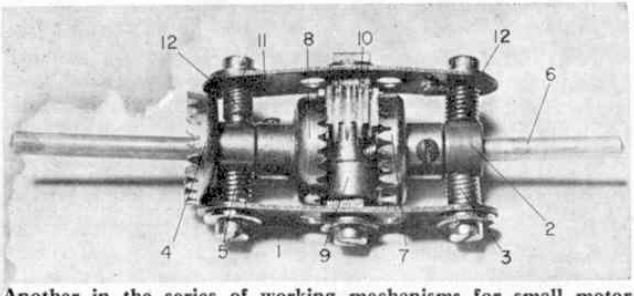

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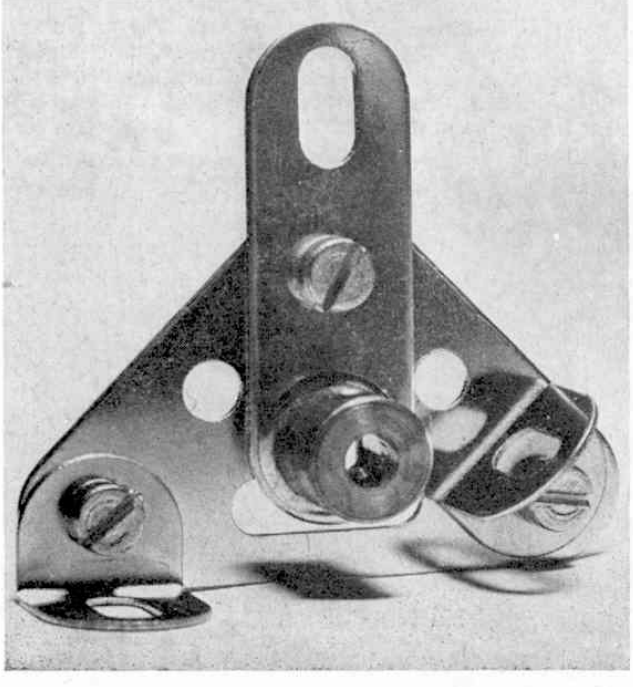

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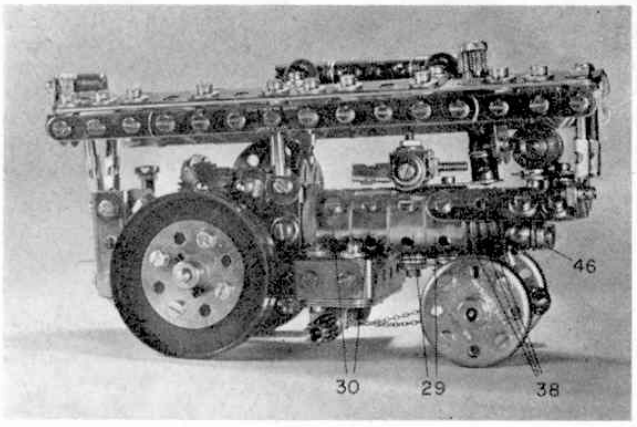


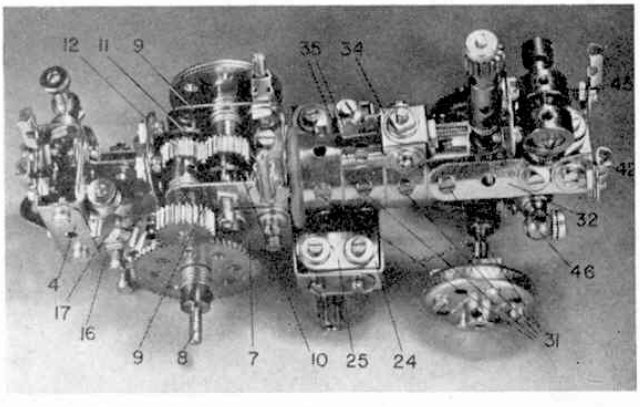
MEET THE CUP WINNER

Here she is at last—the magnificent little Showman's Traction Engine, designed and built by Mr. H. J. Halliday of London, which won the Meccano Cup at this Year's Model Engineer Exhibition.

Spanner describes the magnificent Traction Engine which gained the Meccano Cup at this year's M.E. Exhibition

NEVER LET IT BE SAID that Meccano Magazine does not keep its word ! In the write-up on this year's Model Engineer Exhibition in the April issue we reported that the Meccano Cup was won by veteran modeller H. J. Halliday with an outstanding miniature Traction Engine which, despite its small size, was packed with detail and we promised at the time that we would do our best to feature it in full in a " subsequent edition ". Well, this is that subsequent edition and here follows a full constructional article !

Just before describing the model, however, I would like to extend my personal congratulations to Mr. Halliday for a first-class model. It is only eight inches long, yet is overflowing with realistic detail. When pushed along, various gears and a flywheel spin merrily around and it even includes working steering, although this is controlled, not from the cab, but by a pinion protruding from beneath the belly tank. A very interesting visual effect has been obtained by the liberal use of brass-finished Set Screws which contrast well with the silver-coloured parts. In fact, Set Screws have been used in many cases in place of standard Bolts, their slightly smaller size enabling them to fit into places where the ordinary Bolts might prove a little awkward. When fitting Bolts, by the way, Mr. Halliday stresses the importance of using Washers beneath the heads of all Bolts passing through elongated holes, particularly the holes in the Plastic Plates of the canopy. This is a standard practice which should always be followed.



In this view, the canopy and rear wheels have been removed to show the layout of the gear arrangement in the tender section.

Tender

Dealing first with the construction of the body, or tender, the base of this section is a 3 in. Flat Girder 1 to which two 3 in. Angle Girders 2 are bolted, using their circular holes, the forward securing Bolts also fixing two Fishplates 3 in position through their elongated holes. The free ends of these Fishplates are brought together as shown. Attached to the rear ends of Girders 2 through their circular holes are two Angle Brackets, the heads of the fixing Bolts uppermost. Bolted to the vertical lugs of these Brackets are two $1\frac{1}{2}$ in. Angle Girders 4, the rear securing Bolts also fixing a $1 \times \frac{1}{2}$ in. Angle Bracket 5 and a 1 in. Triangular Plate 6 in position. Note that the apex of this Triangular Plate is bent rearwards at 90 degrees to form a towing lug, while bolted to the free lug of Angle Bracket 5 are two Rod and Strip Connectors spaced from the Bracket and from each other by two Washers in each case. Right-hand Angle Girder 4 is also bolted to nearby Girder 2.

Now fixed through their round holes to the vertical flanges of Angle Girders 2 are two 2 in. Flat Girders 7, these being positioned in the upper limits of the elongated holes of Girders 2. Journalled in the lower third holes of these Girders and in the corresponding holes of Girders 2 is a 4 in. compound rod 8 on which a Collar and a Coupling are mounted between the girders. The compound rod consists of two 2 in. Rods,

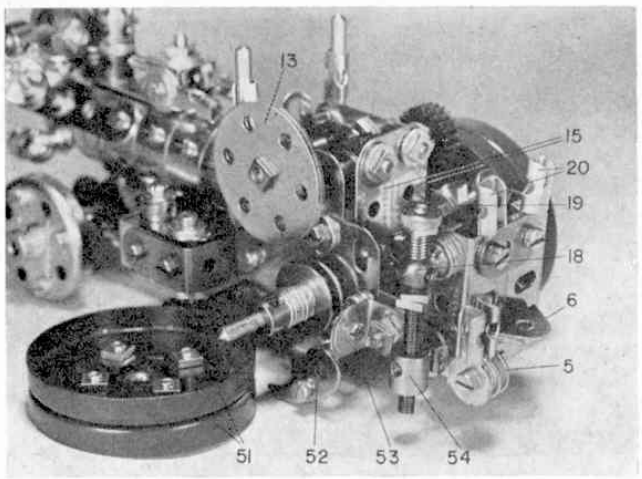
the left-hand Rod passing through the Collar and halfway into the bore of the Coupling, the right-hand Rod taking up the remainder of the Coupling. Note that the 5/32 in. Grub Screws in both the Collar and Couplings should be replaced with 7/64 in. Grub Screws and that the Rods should be fixed so that they revolve independently.

Flat Girders 7 are each extended upwards by a 1½ in. Flat Girder 9, a ⅜ in. Bolt being used in the forward right-hand position. Screwed onto this Bolt, but spaced from the Flat Girder by two Washers, is a Threaded Coupling, arranged with its centre transverse bore horizontal. Secured on the centre right-hand fixing Bolt and spaced from the Flat Girder by a Collar, are two Fishplates 10, the circular holes in these Fishplates coinciding with the upper centre hole in Flat Girder 9. Another two Fishplates 11 are similarly fixed to the left-hand Flat Girder, but note that these are mounted at the rear end of the Girder —not in the centre. Journalled in the free holes in these and in the upper rear holes in right-hand Flat Girders 9 is a 1½ in. Rod held in place by a ½ in. Pinion 12, fitted with a 7/64 in. Grub Screw, and a ¾ in. Pinion, Pinion 12 being spaced from the Flat Girder 9 is a 1½ in. Rod held in place by a ½ in. with a 60-teeth Gear Wheel fixed on the right-hand section of compound rod 8, while Pinion 12 meshes with a second ½ in. Pinion fixed on a Long Threaded Pin journalled in Fishplates 10 and in the centre hole in left-hand Flat Girder 9. The Pinion is spaced from the Girder by three Washers, another three Washers spacing the "nut" of the Threaded Pin from the Girder. Two 6-hole Wheel Discs 13, one on top of the other, are fixed on the threaded shank of the Pin to serve as a flywheel, whereas the final drive pinion is represented by an electrical Contact Screw 14, held by Nuts in the upper centre hole of right-hand Flat Girder 9.

Two 1 × ½ in. Angle Brackets are next fixed through their short lugs to the horizontal flanges of Angle Girders 2 three holes from the rear end. Secured by Set Screws to the long lugs of these Angle Brackets, but spaced from the lugs by a Washer in each case, are two 1½ in. Strips 15, the upper ends of which are joined by a Fishplate held in place by Set Screws, the heads of which point forward. Strips 15, with their Angle Brackets, should be bent rearwards slightly to ensure that the heads of the Set Screws do not foul Pinion 12 and that the Angle Brackets do not foul the half-shaft bearings.

Now fixed to the vertical flange of right-hand Angle Girder 2, through its second hole, is a Fishplate 16, held in place by two Nuts on the shank of a protruding ⅜ in. Bolt representing a step. Another ⅜ in. Bolt is held in the lower hole of the Fishplate to serve the same purpose. A ½ in. Bolt is fixed, shank outwards, in the second hole of left-hand Girder 2 to later serve as the brake pivot, then the steering wheel is represented by an electrical Contact Stud 17 held by Nuts in an Angle Bracket which is bolted at an oblique angle to the upper rear corner of right-hand Flat Girder 7.

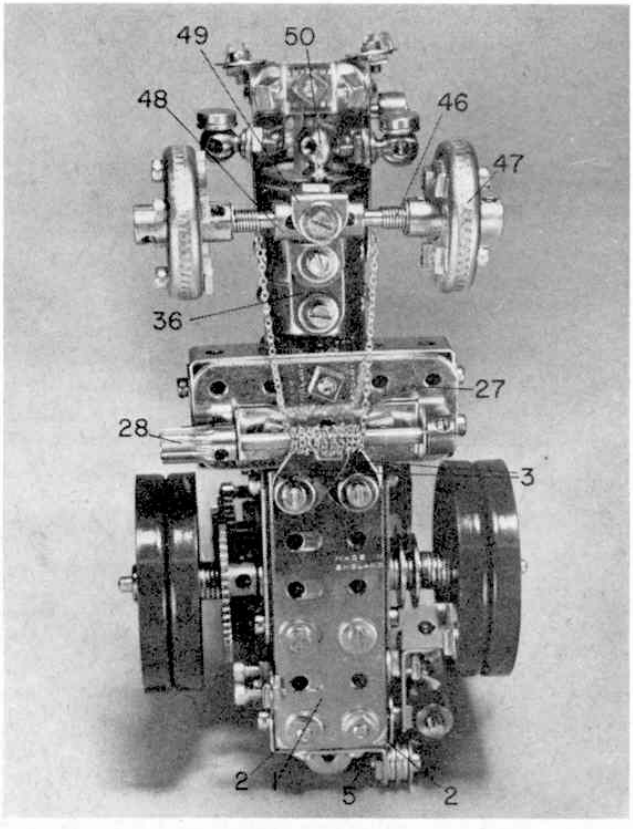
At the rear of the tender, a Handrail Support 18 is attached to the top of left-hand Girder 4, being spaced from the Girder by three Washers, at the same time securing an Angle Bracket to the inside of the Girder. Bolted to this Angle Bracket is a vertically-mounted 1½ in. Flat Girder 19, also fixed to the top of right-hand Angle Girder 4 by a 1 × ½ in. Angle Bracket. Bolted to the centre right-hand hole of the Flat Girder is an ordinary Angle Bracket, in the free lug of which a Bolt, carrying a Washer, is held by an electrical Terminal Nut, this Nut uppermost.



A close-up view of the rear of the body showing the screw-controlled brake fitted to the Traction Engine.

To the tops of the rear flanges of Girders 4, inside, are bolted two Rod and Strip Connectors 20, the securing Bolts fixing two Fishplates to the outside of the Girders, one on top of the other. The Rod and Strip Connectors will later form two of the anchoring points for the canopy.

To be continued



An underside view of the model, without the canopy. Note the non-Meccano steering chain supplied by cheap locket chain.

MEET THE CUP WINNER

described by 'Spanner'

PART II

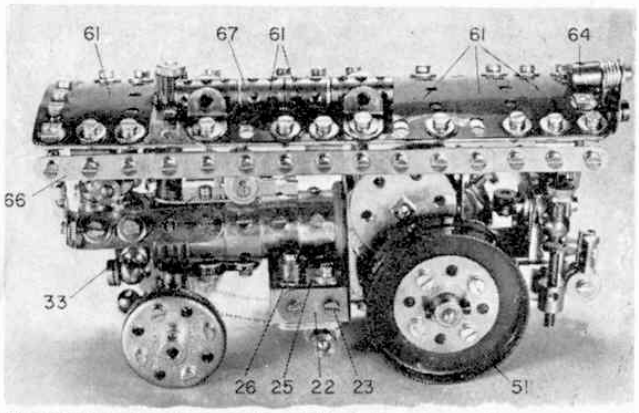
Belly Tank

Fitted to the front of the body, beneath where the boiler will later be positioned, is a feature known as a "belly tank". This is built up from a $2\frac{1}{2} \times 1$ in. Double Angle Strip 21, to each lug of which a 1×1 in. Angle Bracket 22 is bolted, the forward securing Bolt fixing an Angle Bracket through its circular hole to the inside of each lug. The rear securing Bolt, numbered 23 in the accompanying illustration, is actually a Set Screw and is screwed, not into a Nut, but into the transverse bore of a Threaded Boss. Bolted to the free lug of Angle Bracket 22 at each side is an Obtuse Angle Bracket 24 and a Fishplate 25, but note that the securing Bolt in the case of the left-hand assembly is a $\frac{1}{2}$ in. Bolt which is also fitted with a Collar 26. An ordinary Bolt with a Washer is used in the right-hand assembly. A second Obtuse Angle Bracket is fixed to the free end of the Fishplate, the securing Bolt being screwed into the longitudinal bore of the above Threaded Boss.

The base of the tank is supplied by three $2\frac{1}{2}$ in. Flat Girders 27, one on top of the other, with similar-shaped holes coinciding. Bolted to the top of these Girders, through the centre circular holes, is a $\frac{1}{2} \times \frac{1}{2}$ in. Reversed Angle Bracket, free lug pointing outwards, the securing Bolt passing through the lug with the circular hole. Two Angle Brackets are then bolted to the underside of the Girders in the positions shown, each Bracket being spaced from the Girder by a Washer on the shank of the securing Bolt which, incidentally, passes through the elongated holes both of the Bracket and the Girder. The Brackets are adjusted forward in the Girder's elongated holes. A $2\frac{1}{2}$ in. Rod is journalled in the circular holes in the Angle Brackets, where it is held in place by a Collar and a Driving Pinion from a No. 1 Clockwork Motor 28. The whole assembly is then screwed to the above-mentioned Threaded Bosses, as well as being fixed to Fishplates 3 by a $\frac{3}{8}$ in. Bolt, shank pointing downwards, with two Washers fitted beneath its head.

Boiler

Coming to the boiler, two $3\frac{1}{2}$ in. Strips 29 are formed into a complete circle, the ends overlapping one hole, two $2\frac{1}{2}$ in. Strips 30 being bent to follow the same radius. Using Set Screws 31, all these Strips are fixed to two 2 in. Slotted Strips, bent longitudinally to follow the curve of the Strips, the forward end securing Set Screws also fixing two further 2 in. Slotted Strips 32 in position. A $\frac{3}{4}$ in. Bolt, shank upwards, is then inserted through the centre hole in the rearmost Strip 29, is fitted with a Crank 33 and a Washer, after which it is secured by a Nut. Fixed by Nuts on the protruding shank of the Bolt are a Double Bracket 34 and an Angle Bracket, the latter



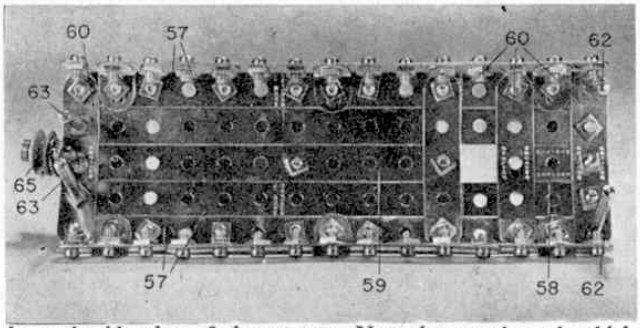
Considering its size—only eight inches long—the amount of detail built into the Traction Engine is amazing, as this general view of the finished model suggests.

with a $\frac{1}{2}$ in. Bolt secured in its free lug, as shown. Two Rod and Strip Connectors 35 are bolted, one to each lug of the Double Bracket. Crank 33 is further bolted to foremost Strip 29 through the centre hole in the arm of the Crank.

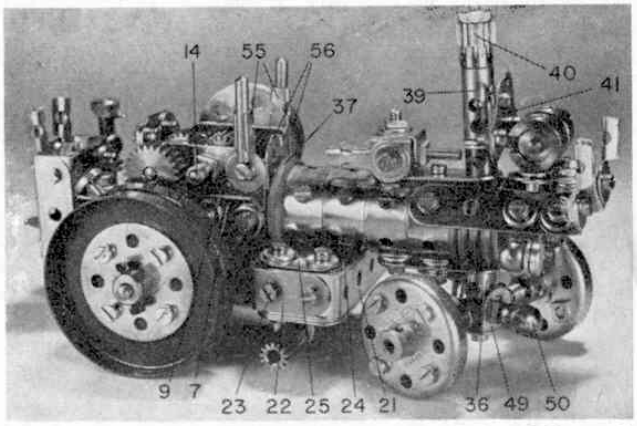
Attached to the underside of the boiler, but spaced from it by a Washer on the shank of the securing $\frac{3}{8}$ in. Bolt, is a Threaded Crank 36, the Bolt also passing through the holes in the overlapped ends of forward Strip 29. An Angle Bracket, later acting as the steering check-stop, is held by the same Bolt, this Bracket being spaced from the arm of the Threaded Crank by another Washer. The end of the Threaded Crank is now bolted to rear Strip 29, being spaced from it by a Washer, the securing Bolt also fixing the boiler to the free lug of the $\frac{1}{2}$ in. Reversed Angle Bracket included in the belly tank. Note that the lug fits behind the overlapped ends of the Strip, inside the boiler.

It will be noticed at this stage that a gap remains between rear Strip 30 and the front of the tender. Inserted into this gap is a 1 in. loose Pulley fitted with a Rubber Ring 37, after which a $3\frac{1}{2}$ in. Rod is mounted in the centre hole of the Pulley and secured in the Threaded Coupling carried inside the tender. Mounted on the front end of the Rod are three further 1 in. loose Pulleys 38, all clamped tightly against forward Strip 29 by a 1 in. fixed Pulley. The Boss of this last Pulley is fitted with a Set Screw to represent the smokebox door handle.

In building the Chimney, a 1 in. Rod is fixed in the boss of Crank 33, the Rod then being fitted with two Washers and a Threaded Coupling 39. Screwed into the longitudinal tapped bore of this Coupling is a 1 in. Screwed Rod, on which a $\frac{7}{16}$ in. Pinion 40 is held by an electrical Terminal Nut. Secured to the



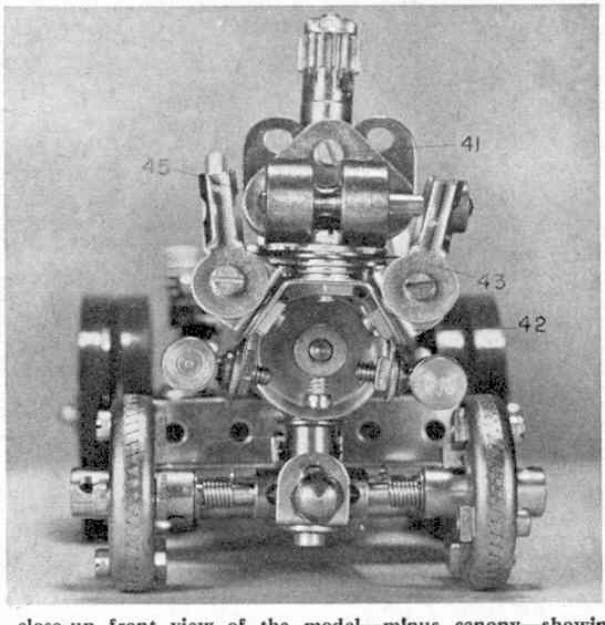
An underside view of the canopy. Note the gap through which the chimney protrudes.



The strong and sturdy construction of the body, boiler and belly tank is clearly shown in this illustration.

forward face of the Threaded Coupling through one centre transverse tapped bore, but spaced from the Coupling by a Washer, is a 1 in. Corner Bracket 41, the fixing Set Screw passing through the apex hole of the Bracket. Two upward-pointing Fishplates are bolted one to each base corner of the Bracket, the whole arrangement representing a heat shield.

Fixed between the forward ends of Slotted Strips 32, in front of the heat shield, is a Double Bracket, the lugs of which are opened out to correspond with the slope of the Strips. The securing Bolts each fix an Angle Bracket 42 to its respective Slotted Strip, a Rod and Strip Connector 43 being bolted, in turn, to the free lug of this Angle Bracket. Secured to the centre of the Double Bracket, but spaced from it by three Washers on the shank of the fixing $\frac{3}{8}$ in. Bolt, are two Fishplates, angled apart, a Socket Coupling 45 being fixed by Set Screws to the Free ends of these Fishplates. Two Washers are mounted on each securing Set Screw, one each side of the Fishplate to ensure that the shank of the Screw does not foul the large internal bore of the Socket Coupling. Carried in the large bores of the Coupling are two Collars, fixed on a $1\frac{1}{2}$ in. Rod arranged with one end projecting out of the Coupling. A Collar is mounted on the end of the Rod, the finished unit then providing a good imitation generator.



A close-up front view of the model—minus canopy—showing the smokebox and generator.

Two Obtuse Angle Brackets are bolted, one to each Slotted Strip 32, positioned in the rear end of the slot. Fixed to the free lug of each of these Angle Brackets, but spaced from it by a Washer, is a Handrail Support 46, in the head of which an electrical Contact Stud is secured to represent a headlamp. A Washer is carried on the shank of the Contact Stud.

Wheel assemblies

Coming to the wheel assemblies and dealing first with the front wheels, a Long Threaded Pin, head outwards, is fitted with, in order, a $1\frac{1}{2}$ in. Contrate Wheel, an electrical Thin Washer and a Cord Anchoring Spring 46, the last holding the Contrate against the nut of the Threaded Pin, but with sufficient freeway to allow the Contrate to spin freely on the Pin. A second Contrate Wheel 47 is bolted to the first Contrate, the teeth of the two intermeshing, then the Threaded Pin is fixed by 7/64 in. Grub Screws partway in the longitudinal bore of a Coupling 48, care being taken to ensure that the Pin does not obstruct the centre transverse bore of the Coupling.

Another Threaded Pin construction is built up and fixed in the other end of the Coupling, after which the Coupling is mounted, along with a Washer and an Angle Bracket 49, on a $\frac{3}{4}$ in. Bolt screwed into the boss of Threaded Crank 36 where it is held by Grub Screws. A Handrail Support 50 is then fitted with a Nut; is inserted through the elongated hole in the free lug of Angle Bracket 49; fitted with a Washer, and finally screwed into the centre tapped bore of Coupling 48. The complete axle can now be coupled to the $2\frac{1}{2}$ in. Rod carrying Pinion 28 and, to achieve this on the original, Mr. Halliday used a short length of small locket chain (obtainable from Woolworths) in the interests of realism. However, Meccano Cord would function perfectly well in its place. The chain or Cord is wound several times round the Rod and the ends attached to the eyes of Cord Anchoring Springs 46 on the front axle.

In the case of the rear axle 8, the assembly of this has already been described during the construction of the tender. The two rear wheels, however, are each supplied by two Wheel Flanges 51, bolted face to face, at the same time fixing a Bush Wheel to the outer Wheel Flange, boss pointing outwards. The right-hand wheel is mounted on the axle, being spaced from the 60-teeth Gear Wheel by five Washers, and a Collar, while the left-hand wheel is spaced from the tender side by, in order, two Washers, a $\frac{3}{4}$ in. Washer, another two Washers, a second $\frac{3}{4}$ in. Washer, seven more Washers and finally by a Collar.

Acting on the left-hand rear wheel is a brake, the shoe of which consists of a Pawl 52 bolted to the elongated-hole lug of a left-hand Corner Angle Bracket which is in turn bolted to the short lug of a $1 \times \frac{1}{2}$ in. Angle Bracket 53, pivotally held by Nuts on the protruding shank of the $\frac{1}{2}$ in. Bolt fixed in the second hole of left-hand Girder 2. Held by a Nut in the end hole in the long lug of Angle Bracket 53 is a Set Screw, shank pointing outwards. Screwed onto this shank is a Threaded Boss 54, in the longitudinal bore of which a 2 in. Screwed Rod is mounted, this Rod also passing through the smooth bore in the head of Handrail Support 18 where it is loosely held by two locked Nuts beneath the Support and by a Cord

Anchoring Spring and a Nut above the Support. An electrical Terminal Nut is fixed on the top end of the Screwed Rod to serve as a handwheel.

Canopy

This brings us to the canopy, but before dealing with it, it is advisable to fit the two centre canopy stays which are, in fact, only imitations, not actually being connected to the canopy. The flywheel must first be removed to allow access to the left-hand stay. Each stay consists of a Rod and Strip Connector 55 bolted to the top forward hole of Flat Girder 9, the securing Bolt also fixing an Angle Bracket to the inside of the Girder. Attached to the free lug of this Angle Bracket, but spaced from it by a Washer, is a second Angle Bracket 56, the free lug of which projects upwards as shown. Note that the two Angle Brackets should be bolted together before being fixed to the Flat Girder. A 1 in. Rod is fixed in each Rod and Strip Connector.

Construction of the canopy, proper, should present no problems. Four 7½ in. Strips 57, a 1½ in. Strip 58 and a 5½ in. Strip 59 are connected together at the ends and through their third and fifth holes by four slightly curved 2½ in. Strips 60, at the same time fixing six 2½ × 1½ in. Plastic Plates 61 in position. Note that the Strips and Plates are situated so as to leave a space towards the front centre of the canopy, through which the chimney will project. Note also that front corner fixing is achieved, not by Bolts, but by Long Threaded Pins 62, the Plastic Plates being protected by electrical Thin Washers. Long Threaded Pins 63, fitted with Thin Washers, are also used to fix the rear ends of inside Strips 57 to Strips 60. The rear end of Strip 59, on the other hand is secured by a Bolt screwed into one transverse bore of a Threaded Boss 64, in the longitudinal bore of which a ½ in. Bolt, carrying two Fishplates separated by five Washers, is fixed. Secured in the free end holes of the Fishplates is a Pivot Bolt on which a ½ in. Pulley 65 is mounted between the Fishplates, this assembly representing the lifting tackle usually fitted to showman's traction engines. A 7½ in. compound narrow strip 66, built up from one 4½ in. and two 2½ in. Narow Strips, is attached to each side of the canopy by three Angle Brackets, positioned as shown. All the holes in the compound strip are fitted with Set Screws to represent lamps.

Finally, a removable chimney extension 67 is supplied by two Short Couplings, each separated from an ordinary Coupling by a Washer, all being mounted on a 2½ in. Rod, using 7/64 in. Grub Screws. The assembly is held between the free lugs of four Angle Brackets bolted to the canopy, where it is held by $\frac{7}{32}$ in. Grub Screws protruding from the Couplings through the holes in the Angle Brackets' lugs. The finished canopy is then mounted in position by fixing Threaded Pins 62 and 63 in Rod and Strip Connectors 43 and 20 respectively. With the model completed, it is easy to see why it gained the Meccano Cup for Mr. Halliday !

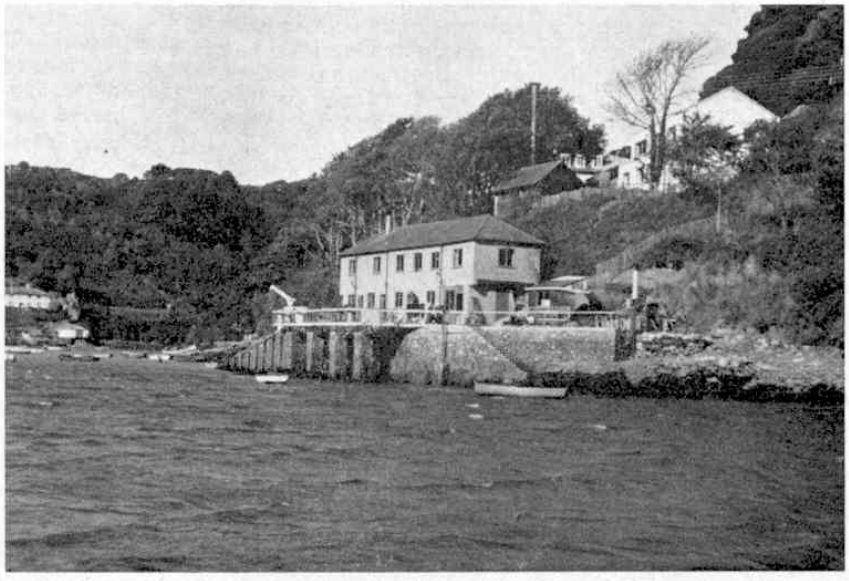
PARTS REQUIRED

4—1b	4—22a	3—63	1—125
1—2	1—23	2—63c	1—133a
2—3	2—24	2—63d	4—136
6—5	2—24c	4—64	4—137
4—6a	1—25	64—69	1—147b
2—9c	2—26	4—69b	1—147c
2—9f	1—26c	24—69c	1—154a
15—10	1—27d	1—77	1—155
1—11	4—28	1—81	1—171
27—12	66—37b	1—82	3—176
2—12a	144—37a	1—103e	6—194
5—12b	109—38	3—103f	10—212
6—12c	2—38d	2—103g	4—231
1—16	1—46	3—103h	4—235
2—16a	4—55a	2—111	2—235d
2—17	10—59	7—111a	3—542
3—18b	1—62	16—111c	1—543
1—22	1—62a	7—115a	6—544
1—No. 1 Clockwork Motor		Drive Pinion	6—651

PREVENTING SHIP FOULING

by

Alan P. Major



The Red Hand Marine Coatings Station at Newton Ferrers in Devonshire.

AT THE DEPARTMENT OF BOTANY, Leeds University, Yorkshire, Dr. L. V. Evans, in collaboration with Dr. Christie, a biochemist working for International Red Hand Marine Coatings at the latter's Newton Ferrers Marine Biological Station,

(Continued overleaf)