

An underside view of the tender showing the simple layout of the chassis and wheel arrangement. Note the plate overlap.

approximately $2\frac{1}{4}$ in. apart—at which time Strips 37 should form a reasonable boiler—and two Face Plates 39 are bolted one to each set of Angle Brackets 38 at each end. A $1\frac{1}{8}$ in. Bolt is next fixed in the boss of one of the Face Plates, is passed through the centre hole in Flanged Disc 35 and corresponding Plate 30 to be secured by a Nut, thus fixing the boiler to the firebox. Two further $9\frac{1}{2}$ in. compound narrow strips 40 are bolted to the outside of the boiler to help strap Strips 37 together.

Coming to the smokebox, two $4\frac{1}{2} \times 2\frac{1}{2}$ in. Flat Plates 41 are joined together at the front by two $3\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strips 42, the Bolts fixing the upper Double Angle Strip also helping to hold two $4\frac{1}{2} \times 2\frac{1}{2}$ in. Plastic Plates 43 in place. The rear edges of Plates 41 and 43 are attached by Angle Brackets to the long lugs of Angle Brackets 38, the securing Bolts also fixing two 4 in. Stepped Curved Strips 44 in position. At the top, these Curved Strips are brought together and bolted to the centre of a $\frac{1}{2}$ in. Reversed Angle Bracket 45 secured to the top of the boiler.

Another two 4 in. Stepped Curved Strips 46 are bolted, along with a $3\frac{1}{2} \times 2\frac{1}{2}$ in. Plastic Plate 47, to upper Double Angle Strip 42, Plate 47 being extended by a similar $3\frac{1}{2} \times 2\frac{1}{2}$ in. Plastic Plate 48 which is in turn bolted to lower Double Angle Strip 42. Curved

Strips 46 are also brought together at the top and are fixed, together with a $2\frac{1}{2} \times 2\frac{1}{2}$ in. Triangular Flexible Plate 49, to an Angle Bracket 50. Note that Plate 49 is further secured to Curved Strips 46 by the trapping action of Washers on Bolts held in the Curved Strips.

Plastic Plates 43 will later be curved round and bolted to Angle Bracket 50, but first the chimney should be produced. A 2 in. Pulley 51 is fixed on a $\frac{3}{4}$ in. Bolt to be followed by a Conical Disc and three 8-hole Wheel Discs 52, after which the Bolt is screwed into one transverse tapped bore of a Threaded Boss. The resulting construction is then mounted on one end of a Cylinder 53, where it is held in place by a $\frac{3}{8}$ in. Bolt which is passed through the end hole in the side of the Cylinder, is fitted with a Collar to act as a spacer and is screwed into the longitudinal bore of the Threaded Boss. The Cylinder is butt-jointed to a second Cylinder 54 by two $3\frac{1}{2}$ in. Narrow Strips inside the Cylinders, two Angle Brackets 55 being bolted to the lower end of Cylinder 54. Plastic Plates 43 are now curved together, the join overlaid by a $2\frac{1}{2}$ in. Strip, the chimney added, then everything is bolted to Angle Bracket 50 and Reversed Angle Bracket 45.

The completed assembly is now secured to the chassis by six stanchions placed three at each side in the positions shown. Each stanchion consists of two $1\frac{1}{2}$ in. Corner Brackets 56 connected by two Double Brackets, one of the Bolts securing the lower Double Bracket also holding in place an Angle Bracket to which a 2 in. Strip 57 is bolted. The Double Brackets, of course, provide the anchoring points for the stanchions.

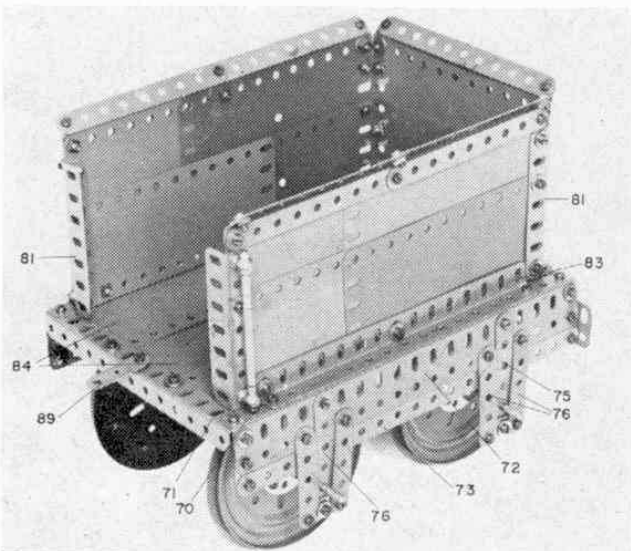
Once the body of the model has been mated to the chassis, mudguards for the main driving wheels are each provided by a shaped $7\frac{1}{2}$ in. Strip 58 which is attached by Angle Brackets to a $7\frac{1}{2}$ in. compound curved strip 59, obtained from three $2\frac{1}{2}$ in. Curved Strips and two Fishplates. Compound strip 59 is fixed by Nuts on two $\frac{3}{4}$ in. Bolts 60 held by Nuts in the side members of the chassis.

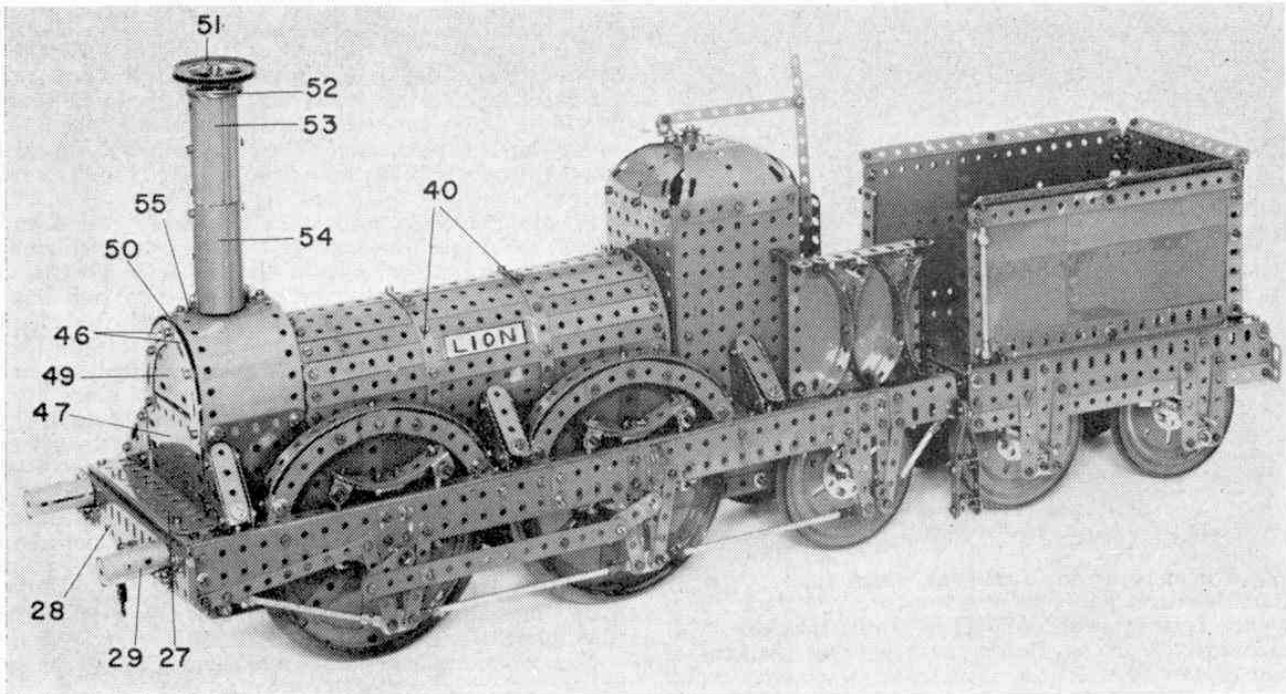
Each side of the footplate is enclosed by a "barrier" built up from two $3\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plates 61 overlapped two holes and attached to the footplate by a $3\frac{1}{2}$ in. Angle Girder 62. A second $3\frac{1}{2}$ in. Angle Girder 63 is bolted to the rear of Plate 61, a third similar Girder 64 being bolted to the top edges of the Plates, as also is a $\frac{1}{2} \times \frac{1}{2}$ in. Angle Bracket and a $1 \times \frac{1}{2}$ in. Angle Bracket 65. Embellishment is added by four curved $3\frac{1}{2}$ in. Strips 66 bolted together in pairs, each pair being attached by an Angle Bracket to Girder 64. This Girder is also connected to compound girder 1 by a 4 in. Screwed Rod 67, as shown, then a set of steps is provided by two 3 in. Narrow Strips 68 joined by two Double Brackets. The Strips are bent together at the top and bolted to an Angle Bracket which is in turn bolted to Flat Girder 6. A Threaded Pin 69 fixed in the centre of rear compound girder 2 serves as the coupling hook for the tender linkage.

Tender

We are now left only with the tender to be built and this is not difficult. The chassis consists of two $9\frac{1}{2}$ in. Angle Girders 70 joined by two $6\frac{1}{2}$ in. compound angle girders 71, each of the latter built up from two $5\frac{1}{2}$ in. Angle Girders. Bolted to the vertical flange of each Girder 70 is a $9\frac{1}{2}$ in. Flat Girder 72, to which a $9\frac{1}{2}$ in. Strip 73 is attached by Fishplates,

The tender, as this picture shows, is perfectly straightforward in design and should present no constructional difficulties.





The Meccano version of the historic railway locomotive "Lion", built in 1838 for the Liverpool and Manchester Railway. Since then, it has had a colourful career ranging from a pumping engine in Liverpool Docks to a star in films and is shortly due to be preserved for all time in Liverpool Museum.

mounted on a $7\frac{1}{2}$ in. compound rod held by Collars in the apex holes of Triangular Plates 11, the rod consisting of one $3\frac{1}{2}$ in. and one 4 in. Rod joined, as before, by a Coupling. Bolted to rear compound girder 2 as well as to girders 1 is a $5\frac{1}{2} \times 3\frac{1}{2}$ in. Flat Plate 25 extended five holes up each side by two $3 \times 1\frac{1}{2}$ in. Flat Plates 26, the latter also bolted to girders 1. At the front of the model, a $5\frac{1}{2}$ in. Flat Girder 27 is bolted to the horizontal flange of the other girder 1, five $7\frac{1}{2}$ in. Flat Girders 28 being bolted to the vertical flange of the same girder. A pair of buffers are represented by two Sleeve Pieces 29 attached by Angle Brackets to Flat Girders 28. A Chimney Adaptor is wedged in the end of each Sleeve Piece, then a coupling is represented by a small Hook attached by a short length of Sprocket Chain to the centre of Flat Girders 28.

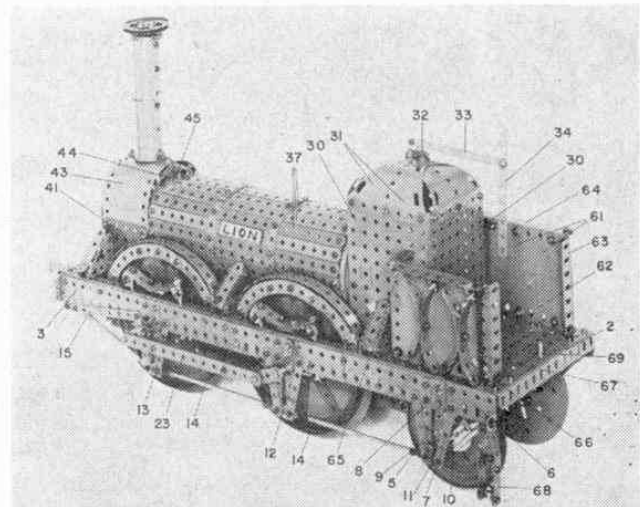
Firebox, boiler and smokebox

Turning to the firebox, boiler and smokebox, it is best to build up these items into one complete unit separately and to add it to the chassis when finished. The firebox is simply produced from four $5\frac{1}{2}$ in. Angle Girders to which four $5\frac{1}{2} \times 3\frac{1}{2}$ in. Flat Plates 30 are bolted to form a box shape. A top is supplied by eight $3\frac{1}{2} \times 2$ in. Triangular Flexible Plates 31 bolted in pairs as shown to each Flat Plate. The apex of the resulting triangles are curved over and are bolted together in the centre, then the imitation regulator gear is added. This consists of a $\frac{1}{2}$ in. Pulley without boss 32 fixed to the top of the firebox and an Angle Bracket separated from the firebox by three Washers on the shank of the securing Bolt. Lock-nutted to the free lug of the Angle Bracket is a $4\frac{1}{2}$ in. Narrow Strip 33 to the other end of which a second $4\frac{1}{2}$ in. Narrow Strip 34 is bolted at right angles to the former. An

In this general view of the Meccano "Lion", the fine detail built into this basically simple model locomotive is shown.

imitation firebox door is represented by two $2\frac{1}{2}$ in. Narrow Strips bolted, with one hole separating them, to rear Plate 30. The "handle" is supplied by a Handrail Support in which a 1 in. Rod is fixed. A Ball Thrust Race Flanged Disc 35 is bolted to front Plate 30 in the position shown, while two $2\frac{1}{2} \times 2\frac{1}{2}$ in. Flat Plates 36 are bolted one to the lower edge of each side Plate 30. Plates 36 are connected by a $3\frac{1}{2} \times 2\frac{1}{2}$ in. Flanged Plate to provide a mounting for a motor if one should be fitted. The drive could, in due course, be taken to Sprocket Wheel 19.

To build the boiler, nineteen $12\frac{1}{2}$ in. Strips 37 are bolted between two $9\frac{1}{2}$ in. compound narrow strips, the fourth, seventh, tenth, thirteenth and sixteenth securing Bolts also each fixing a $1 \times \frac{1}{2}$ in. Angle Bracket 38 to the underside of the narrow strips. The narrow strips are then curved round until their ends are



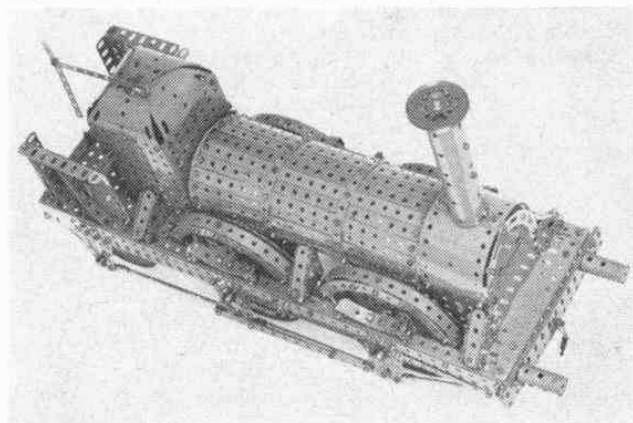
THE "LION" LOCOMOTIVE

by Spanner

An historic railway locomotive re-built in Meccano for advanced modellers. The "Lion" Meccano model is really impressive when completed.

IN THE May 1968 issue of Meccano Magazine, Mike Rickett described the discovery in 1929 of a dilapidated old steam engine that was being used for pumping water in Liverpool docks. Before she could be banished to the scrapyards, however, researchers found that, instead of being just another heap of rusted junk, the engine was in fact one of the early locomotives built in 1938 for the historic Liverpool and Manchester Railway who had christened her "Lion". It was saved and subsequently restored to health by the Liverpool Engineering Society and the London, Midland and Scottish Railway Company. Since then it has had a distinguished film and exhibition career and is shortly due to go on permanent display in Liverpool Museum's new transport section.

The photograph of the restored "Lion" which was published in last May's M.M. was all that Meccano Magazine's chief model-builder required for a blueprint, and from this he has now built the advanced model featured here. It is actually not as complicated as it looks, but it is certainly extremely rugged and has the particularly novel feature of "floating" bearings for the main driving wheel axles. It is not



motorised, but sufficient space for a motor has been included in case any builders should wish to incorporate one. Construction is not difficult.

Chassis

Beginning with the chassis, a rectangle is produced from two $20\frac{1}{2}$ in. compound angle girders 1 joined at their ends by two $6\frac{1}{2}$ in. compound angle girders 2. Each large girder consists of an $18\frac{1}{2}$ in. Angle Girder extended by a 3 in. Angle Girder, while each small girder is made up from two $5\frac{1}{2}$ in. Angle Girders overlapped nine holes. Bolted to the vertical flange of each $18\frac{1}{2}$ in. Angle Girder is a *double-thickness* $18\frac{1}{2}$ in. compound flat girder 3, obtained from two pairs of $9\frac{1}{2}$ in. Flat Girders, the securing Bolts also fixing a $1\frac{1}{2}$ in. Strip 4 in position at the front end of the Girder and a 3 in. Narrow Strip 5 in place at the rear. A single 2 in. Flat Girder 6 is bolted to the 3 in. Angle Girder.

Narrow Strip 5 is braced by a $2\frac{1}{2}$ in. Narrow Strip 7, as also is a second 3 in. Narrow Strip 8, the Bolts fixing the short Strips to Strips 5 and 8 also fixing two Rod and Strip Connectors 9 and 10 and a 1 in. Triangular Plate 11 in place. Another two similar Narrow Strip arrangements 12 and 13 are added to the chassis in the positions shown, the arrangements being produced identically to the first example except that Triangular Plate 11 is replaced by a Fishplate. By using the Rod and Strip Connectors, the three finished arrangements are joined together by two $5\frac{1}{2}$ in. Rods 14, then Rod and Strip Connector 10 is connected by a $2\frac{1}{2}$ in. Rod to a further Rod and Strip Connector bolted to Flat Girder 6. The forward Connector in the front Narrow Strip arrangement is connected by a $3\frac{1}{2}$ in. Rod to a final Strip Connector bolted to a $4\frac{1}{2}$ in. Narrow Strip 15 fixed between Strip 4 and compound flat girder 3.

At this point the floating bearings for the main driving wheels can be built up. Four curved leaf springs 16 are each produced from two 3 in. Strips, two 2 in. Strips and two Fishplates. Two Angle Brackets are bolted one to each end of the 3 in. Strips and, to the free lugs of these are fixed two Collars in each of which a $1\frac{1}{2}$ in. Rod is held. These Rods are then inserted into holes in girders 1, as shown, and a Coupling 17 is mounted on the lower end of each Rod. These Couplings are connected by two further $1\frac{1}{2}$ in. Rods joined by another Coupling 18, care being taken to ensure that the centre transverse bore of this Coupling remains clear and also coincides with the gap between the two 3 in. Narrow Strips in the above-mentioned Narrow Strip arrangements.

Journalled free in the centre transverse bore of each pair of Couplings 18 is one of the two main axles, both of which are built up from one $3\frac{1}{2}$ in. and one $4\frac{1}{2}$ in. Rod joined by a Coupling. Each axle projects through the gaps between the Narrow Strips; each is held in place by Collars inside Couplings 18 and each carries two main driving wheels, the rear axle also carrying a 3 in. Sprocket Wheel 19. Each main wheel, by the way, consists of a 6 in. Circular Plate 20, to which a Hub Disc, overlaid in the centre by an 8-hole Bush Wheel 21, is bolted. Two washers space each Coupling 18 from the appropriate Narrow Strip arrangement, then a Crank 22 is mounted on the end of each axle outside the Narrow Strips. Lock-nutted between Cranks 22 at each side is a 7 in. compound strip 23, obtained from two $5\frac{1}{2}$ in. Strips.

The small trailing wheels at the back of the model each consist of a 4 in. Circular Plate 24 to which a Ball Thrust Race Flanged Disc, centrally overlaid by an 8-hole Bush Wheel, is fixed. The wheels are