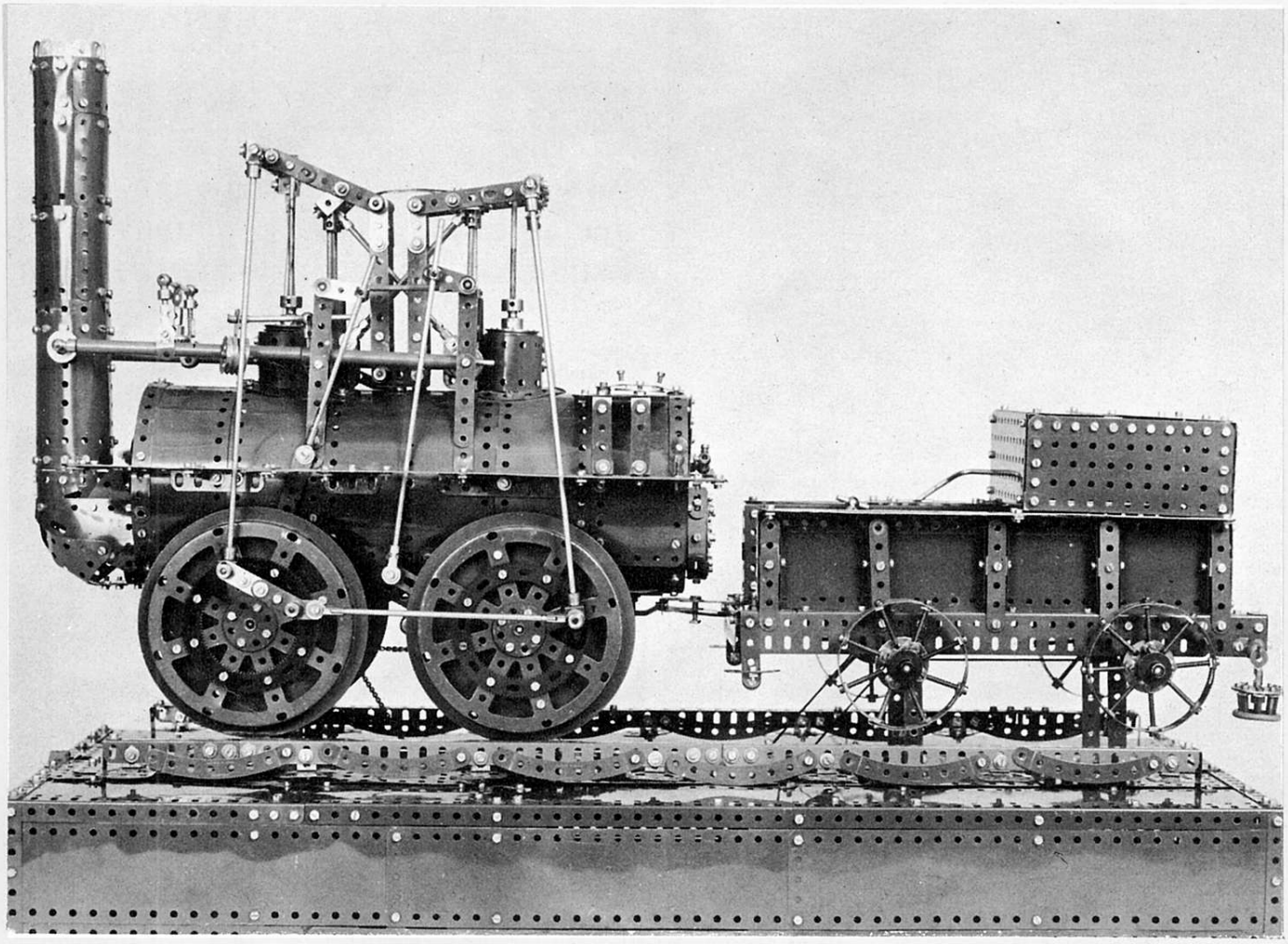


LOCOMOTION No.1

A fine display model built & described by F.A.Beadle

Now preserved for posterity in the Darlington Railway Museum, Co. Durham, Locomotion No. 1 is one of the most famous locomotives of railway history. It hauled the first-ever passenger train on its 'maiden' trip from Darlington to Stockton, a distance of 14 miles, on Tuesday, September 27th, 1825. Described here is an impressive model of Locomotion, built by the author, and it makes an interesting departure from the more usual type of railway engine in that a wealth of movement can be see over the top of the boiler, reproducing the attractive, if rather ungainly rhythm of the original. These working parts represent the only difficult part of the construction and require careful setting before the model is completed.

BOILER

Beginning description with the boiler, this has a 5½" Circular Girder at each end, joined by a 12½" Angle Girder along the top, this extended four holes with a 2" Angle Girder, both overlapped by a 3" Strip. The pistons eventually pass through this Angle Girder. A frame of the same length is built to form a subframe and a wheel bearing frame, before being fitted into the boiler in a horizontal position at its lowest chord. This frame is 3½" wide and has two Strips four holes and eight holes from the rear end, with a 5½" x 3½" Flat Plate situated two holes from the front end to give stability. The frame is joined to the Circular Girders by four Obtuse Angle Brackets.

Perforated Strips run along each side of the boiler to give extra support to the Flexible Plates which serve as boiler cladding. In fitting the Flexible Plates, which can be of any suitable size, care should be taken to allow the pistons to pass through the top of the boiler eight holes from the front for the front piston and a further 13 holes (21 holes in all) for the rear piston. The Plates are carried right round the boiler, 2½" from each end, but those in-between terminate at the horizontal subframe to allow wheel mountings to be fitted.

Bolted to the subframe are 2½" Triangular Plates to carry the axles, the front wheels being positioned seven holes from the front end of the boiler, whilst the rear wheels are nine holes from the fire box end. Some Flexible Plates will need to be bolted after these and other parts are bolted to the frame. Wheel Discs are fitted to the Triangular Plates to give bearing area for the main axles, the Bolt holding the Discs to the Plates also carrying a 1½" x ½" Double Angle Bracket to which the Perforated Strips of 2½" x 1½" form the triangular shape of the main axle's brackets. Two Obtuse Brackets join these Strips.

ENGINE SUPPORT FRAME

Four stanchions are then built onto the Boiler to extend from the subframe to the top of the plinth and give clearance to the wheels when the model is in motion. These two frames are twelve holes from the frame to the plinth, the first being situated one hole behind the front axle and the rear one, one hole forward of the rear axle. These frames are to carry the entire weight of the engine and are built from doubled Strips and have 2½" x 1½" Double Angle Brackets at their lower ends to bolt to the plinth later. They

are also cross-braced along the boiler to give extra strength and are well concealed by the wheels.

CYLINDERS

Each cylinder is identical and has two 1½" x ½" Double Angle Strips bolted to opposite holes of a 1½" Pulley 1 mounted boss uppermost. A 5½" x 1½" Flexible Plate is fixed through the centre holes at one side, whilst a Channel Bearing is bolted to the other Double Angle Strip. The ends of the Flexible Plates are bolted to the side holes of the Channel Bearings after the Cylinder is mounted to the Boiler by the lower holes of the Double Angle Strips.

Socket Couplings are fixed to each Cylinder head. These are held in place by ¾" Bolts, two fixed to the 1½" Pulley boss. Care should be taken that the piston rods pass freely into the boiler at this stage. The Cylinders are situated eight holes from the front and nine holes from the rear of the boiler, respectively.

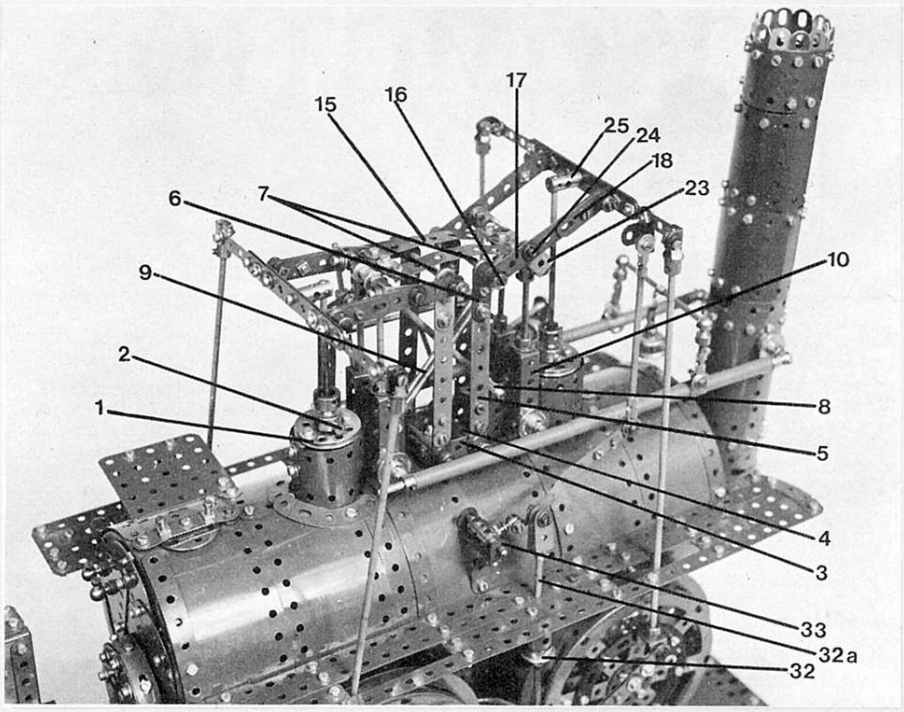
BOILER OVER FRAME

Between the centres of the two cylinders a 1½" x 1½" Flat Plate is bolted. This carries a 1½" Angle Girder, 3 on each side, 2½" axles passing through the outer holes of each of these to carry Cranks 4 on each side. The vertical lever arms 5 are 5" long and made up from 4½" Strips joined to the Cranks at the lower end, whilst they carry a further four Cranks 6 at the upper end, the 3" Rods 7 passing through the last hole of the 4½" Strips as well as the crank boss.

Rod and Strip Connectors 8 are secured on each side of the Channel Bearings with 1" Bolts, the two front examples being outside the Channel Bearings, whilst the rear ones are inside to allow the rod braces to cross over one another. Each of these braces is a 4" Rod 9 which has a further Rod and Strip Connector at its top end.

The four pillars, or stanchions, of the frame consist of 2½" x ½" Double Angle Brackets 10 bolted to the Channel Bearings by the same Bolts 11 which hold the ends of the Flexible Plates from the cylinders. A further 2½" x ½" Double Angle Bracket is fixed to each by 4½" Rods 12 which pass through the pairs and have collars 13 to secure them at the top ends of the Double Angle Brackets. Two-inch Rods are fixed to four Couplings 14 at the upper end of Rods 12, these Couplings carrying horizontal Rods on which, between the Couplings, are the Rod and Strip Connectors from the cross braces with a Right-angled Rod and Strip Connector to take the 1½" Strips and the 3½" Strips 15 to form the top frame. These 3½" Strips can be slightly bent for appearance, as shown. Carried on each Rod 7 is a 3½" Strip 17, between Washers held in place by Collars 16.

Four Threaded Cranks 18 are fixed to the outer ends of the Strips, the arms being joined to the crossheads with 2½" x ½" Double Angle Strips 19. The crossheads are built up from 4½" Strips 20, in pairs for strength, with 2½" Narrow Strips 21 clamped between them and ½" x ½" Angle Brackets 22 at each end to complete these members.

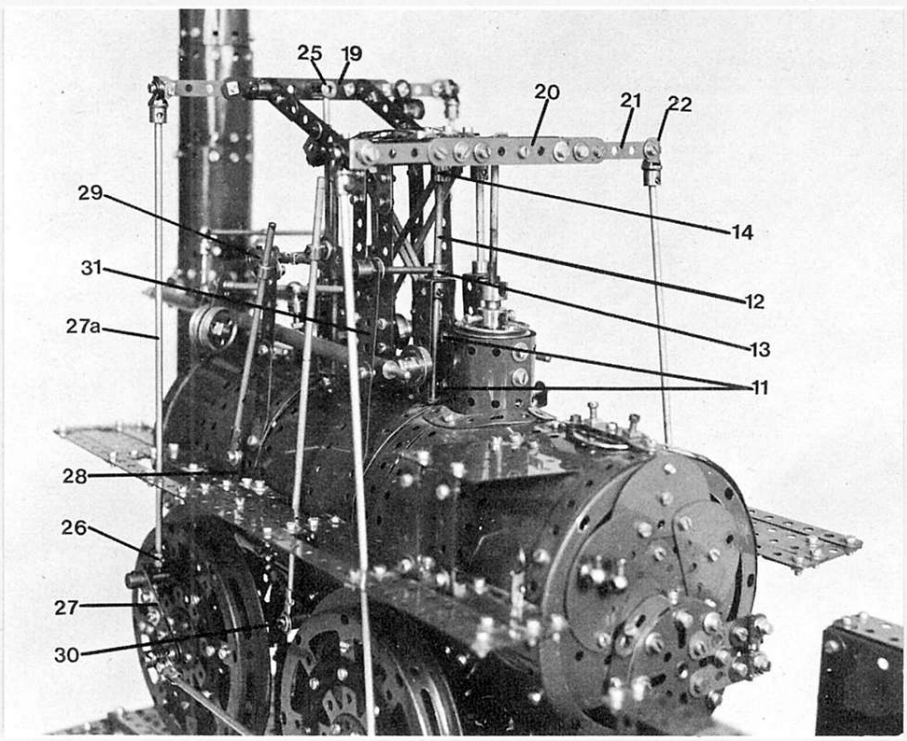


A close-up view of the author's "Locomotion" showing the boiler top with the cylinders, crosshead and valve gear as well as the main driving rods. The appearance is a lot different from later breeds of steam locomotives!

The horizontal 2" Rods in Couplings 14 each carry Collars outside the Couplings, these Collars having 1" x ½" Angle Brackets 23 firmly bolted to them, but with Washers to allow the Collars to move freely on the 2" Rods. The long holes of Brackets 23 are locknutted to the lever arm Strips through their third hole 24, and allowed to slide along when the arm is in operation.

Strip Couplings 25 are bolted to the centre holes of the crossheads to carry the piston rods which are 6½" long. All parts of the entire assembly should have Washers at all points of contact and adjustments will be necessary before the system operates without restrictions.

Another close-up shot of the historic locomotive viewed from the rear. Again the cylinders and the associated connecting rods, crosshead gear, etc. can be seen to good advantage.



DRIVING WHEELS

The driving wheels are built from 6" Circular Plates to which Double Arm Cranks are bolted to take the connecting rod spindles. The Hub Discs which form the flanged part of the wheel have Gear Rings fixed to them before being held to the Circular Plates by two ¾" Bolts at right-angles to the Double Arm Crank inside the wheel. Bush Wheels are fitted to both the Hub Disc and the Circular Plates, with the boss towards the inner part of the wheel in each case. Secured in the Double Arm Cranks, and passing also through the Gear Ring, are 2" (or shorter) Rods, each carrying a Large Fork Piece 26 spaced with Washers.

At this stage the front wheels differ from the rear as they carry a 2½" Strip 27, to which two Cranks are bolted, the lower example packed with a Washer to compensate for the thickness of the upper one. The Strip must form an exact chord on the centre line of the Gear Ring before it is tightened. The 6½" connecting rod to each wheel is fitted with a Rod and Strip Connector at each end, a Fish-plate also being bolted to the front Rod and Strip Connector to allow the important factor of movement along its long hole when the model is in motion. A Collar holds the front end of the connecting rod, with two Collars to bring the rear end level and a further Collar at the outer end.

DRIVING RODS, VALVE GEAR & PUMP

The four upright driving rods 27a are 10½" long and should be cut from 11" Rods or joined to make up this length. The lower end of each

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LOCOMOTION No.1

continued from previous page.

Rod is fixed in Large Fork Pieces 26 and the top end in End Bearings which are locknutted to Angle Brackets already fixed to the ends of the crossheads. Some minor adjustments will be necessary to ensure smooth running, and, this being a display model, care should be taken to see that smooth-running is achieved.

Single-throw Eccentrics are mounted on each main axle next to the inner Bush Wheel on the left side of the model. In the actual original, both eccentrics came from the front axle and were of very slender design. The front Eccentric is attached to a 4½" Strip 28 slightly bent to the curvature of the boiler with a Rod and Strip Connector at its upper end, into which a 5" Rod is fitted to activate a Crank 29 fitted to move freely on a 2" Screwed Rod secured into one of the holes of the Collar holding the frame stanchion, or uprights. The rear wheel Eccentric has a 2½" Strip attached by two holes, this Strip being locknutted to a Bell Crank which, in turn, is connected to a Crank fitted to the main sub-frame in the boiler. The opposite arm of the Bell Crank is fitted with a Threaded Boss to which a Rod and Strip Connector is *pivotally* attached by a ¾" Bolt 30. Located in this Rod and Strip Connector is a 9" Rod, the upper end of which is attached to the Crank which represents the other valve on the upper frame. The Strips through which the outer end of the valve mountings pass are taken from the bandings of the boiler 31 and, again, have Rod and Strip Connectors to join the two with a horizontal 3" Rod.

The Water Pump on the right side of the Boiler is built up from a Sleeve Piece attached by a ½" Angle Bracket to the walkway along the boiler, 13 holes from the boiler front. A ¾" Flanged Wheel 32 is held at the lower end of the Sleeve Piece and, from this, a realistic water pipe can be taken to the tender tank, with the aid of a few Rods, Crank Handles and Rod Connectors. The compensating valve for the pump is fixed two holes forward and employs a Chimney Adaptor, ¾" Flanged Wheel and long Bolt. A 2" Rod 32a serves as the plunger, the upper end being fixed to a Single Bent Strip with Springs. Locknutted to the outer holes of the Strip is a 3½" Narrow Strip, bent to provide an arm, a Handrail Coupling being bolted to its rear end. The threaded part of the Handrail Coupling is screwed into a Coupling fixed on a 2" Rod mounted in a 1½" x ½" Double Angle Bracket 33 which is attached to the boiler by two Obtuse Brackets and a 1½" Perforated Strip. The 3½" Rod which activates the pump is fitted with a Rod and Strip Connector at each end and is joined to the crosshead with a Double Bracket and Fishplate.

CHIMNEY AND STEAM PIPES

The chimney is quite straightforward and, although only one Boiler without ends was used, two can be incorporated. A 4" Rod passes horizontally through the chimney to give it stability and take the steam pipes at each side, these being represented by Flanged Wheels, with a Handrail Coupling to take the 11½" Rods to the cylinders. Each steam pipe is fixed only at the rear cylinder by a Collar and Flanged Wheel to each stanchion of the main frame. The front cylinder outlets are merely 'floating' ¾" Flanged Wheels fixed to the front stanchions. A 6" and 4" Red Plastic Meccano Rod is used on each steam pipe to give proportional size.

The curvature at the base of the chimney is best arranged last to allow access to the chimney, but various Triangular Plates make up the base and Fishplates represent the serrated outlet end at the top.

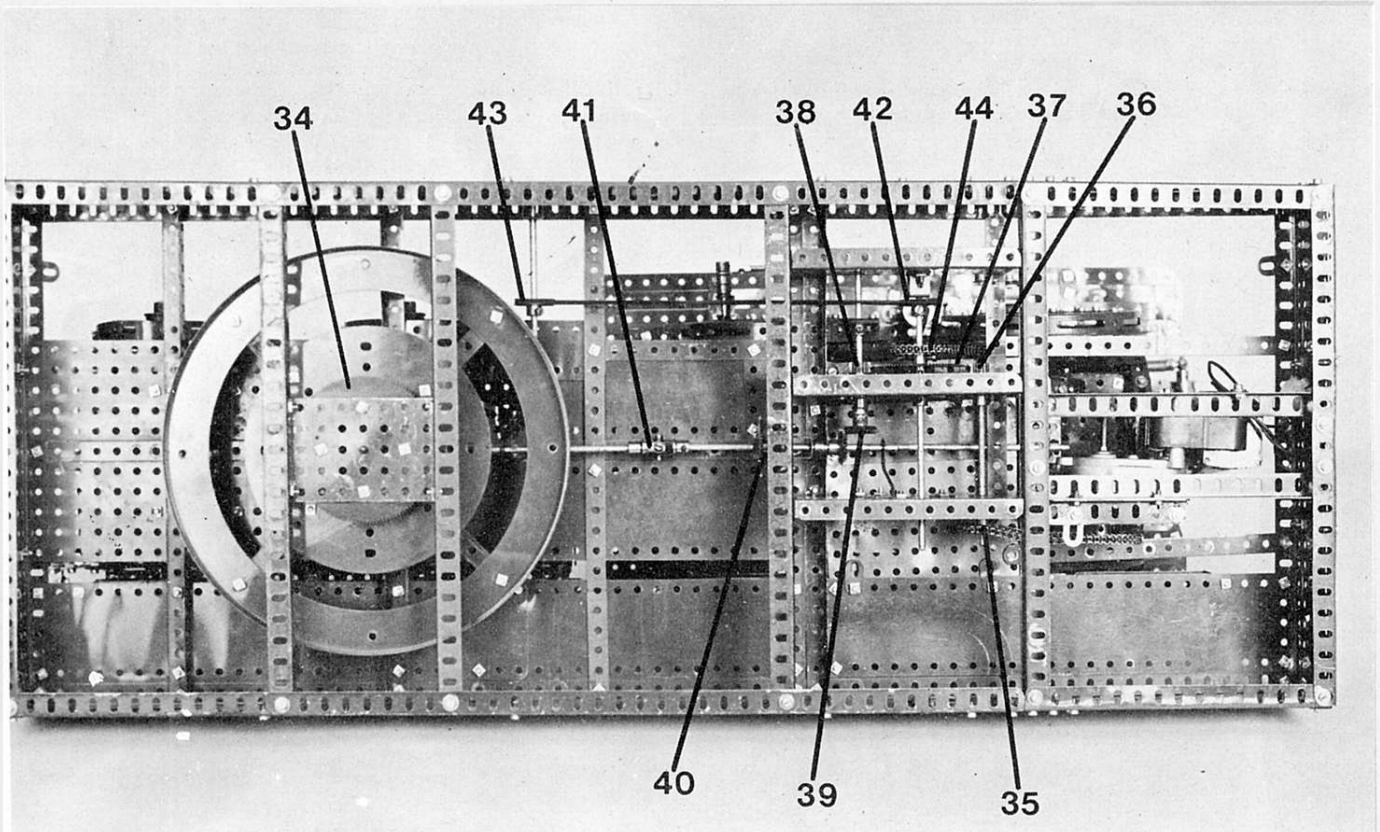
THE TENDER

Turning, now, to the tender, the chassis consists of 12½" Angle Girders extended by 1½" Angle Girders, which in turn carry Flat Girders of similar length staggered along the outsides. The floor is made up of 5½" x 3½" Flat Plates stopping two holes short at the rear end. Further Angle Girders are set one hole in to carry the 12½" x 2½" Strip Plates which have 12½" Angle Girders to their outsides to bring the top of the sides out again to full width. 2½" Angle Girders are bolted in an upright position at each end to form part of the pillars which represent the heavy wooden frame of the original. Each is made up of 3" Strips bolted to the outside of the Flat Girders, each Strip carrying a Double Angle Bracket and a 2½" Strip on each side.

The Water Tank is built as a separate unit from Flat Plates, the completed tank being secured in place by Angle Brackets. Rivets are represented by Bolts and Nuts all round the plating. Perforated Strips are added to the top rail of the tender sides and held by Fishplates at intervals. It should be noted that bolted to the right-hand side Strips is a 2" Formed Slotted Strip through which the water pipe from the boiler is taken at an angle.

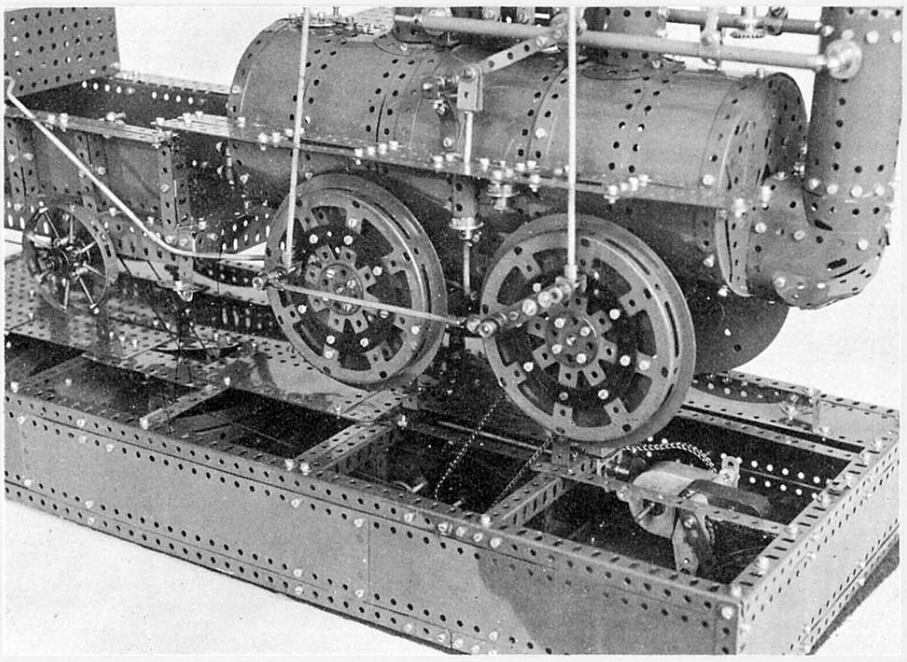
Tender wheels are built up, each consisting of four 3" Formed Slotted Strips locked to

An underside view of the plinth on which "Locomotion" is mounted for display purposes. The model incorporates various working movements and, as can be seen, the motor and initial drive gearing for these are carried in the plinth.



four 1⅛" Bolts, the ends of which are suitably adjusted in the holes of Collars fixed to a Bush Wheel which forms the hub. The wheels will need to be run by hand on a Rod at this stage to ensure a true circle, after which four further long Bolts are added for appearance. These four are *not* fixed to Collars at the hub. A ¾" Flanged Wheel is placed at the outer end of each axle, which is an 8" Rod journalled in Flat Trunnions bolted to the chassis.

When completed, the tender is raised by 4½" Double Angle Brackets at four concealed positions. These have a Trunnion at the upper end and are spaced 3½" apart across the tender. The rear axle carries a 1" Pulley and the front axle two 1" Pulleys for powering Driving Bands though Sprockets and Chain could be used to give a more positive drive to the wheels.



A close-up view of the locomotive's driving wheels and the plinth with part of the top removed. Note the mains motor which the author used for its long-running display characteristics.

PLINTH

As this model was built for display purposes, it is plinth-mounted, the plinth housing the driving mechanism. The plinth is built up from a 32" x 12½" x 3½" framework of Angle Girders, with additional side bracing provided by 2½" Strips. Strip Plates are bolted to these Strips and to the 3½" Girders to enclose the sides. 12½" Angle Girders are fixed across the top of the Plinth at appropriate positions to give support to the eight stanchions of both engine and tender and a 12½" Strip is also bolted across the plinth, in a central position, to give support to later plating.

On the lower, or table surface of the plinth a 12½" Angle Girder is positioned across 7½" from the front end where two Girders of that length run from the front to form motor mountings. Three 5½" x 2½" Flanged Plates are bolted to the 12½" Girder, 3" apart in the case of the central two, with the third 3" to the right side to take the driving mechanism. The flywheel mounting is made from two 12½" Angle Girders spaced by a 3½" x 2½" Flanged Plate, the central hole of which is 8½" from the rear of the plinth. The driving mechanism should now be installed before plating for the plinth upper surface is completed.

DRIVING MECHANISM

The model was successfully driven by an E20R long sideplate Motor with the gearing mounted between the plates. An Enicron Motor was installed at a later date, and the description given here applies to that motor or any suitable 60 r.p.m. Mains motor.

A large flywheel is seen in a horizontal position mounted 17 holes from the rear of the plinth. The bearings consists of a 3" Gear Wheel 34 bolted to the 3½" x 2½" Flanged Plate mentioned above, with a Collar for spacing on a 3½" Rod, the upper end of which passes through a 12½" Perforated Strip bolted along the centre top of the plinth upper surface. The flywheel itself is built from two 9⅞" Flanged Rings and two 6" Circular Plates held with 9½" Perforated Strips to the Flanged Plates, with a Bush Wheel at each side of the Plates to form the hub. A ¾" Pinion is mounted above the wheel which engages with a ¾" Contrate Wheel to take the drive to the gearbox.

A 1" Sprocket 35 on a 4" Rod takes the drive from a 2" Sprocket on the motor shaft. At the other end of the Rod a ½" Pinion 36 engages with a 2½" Gear 37 on a 6" Rod passing through all three 5½" x 2½" Flanged Plates. A ½" Pinion 38 on a 4" Rod also engages with the 2½" Gear and takes the drive speed up again for the flywheel. A Bevel Gear 39 transfers the drive to a lateral rod which also carries a 50-t Gear 40 outside the 3½" x 2½" Flanged Plate which forms the gearbox end. The lateral rod 41 consists of an 11½" and a 5½" Rod joined by a Universal Coupling.

A 1" Pulley is connected by a Driving Band to another 1" Pulley 43 fixed on a 6½" Rod journalled at one end in two 1" Angle Brackets bolted to the central Strip on the Plinth and, at the other end in a Double Bent Strip. A further 1" Pulley behind the flywheel takes the drive to the front axle of the tender, which has further 1" Pulleys and Driving Bands between the wheels. A 1½" Sprocket Wheel 44 takes the drive to the 2" Sprocket on the right side of the front wheel of the engine, where two 1" Sprockets, one on each main axle, ensure that the wheels turn in unison.

To ensure smooth running and to compensate for the weight of the cranks and connecting rods, the front driving wheels each have two Semi-circular Plates bolted to their inside surfaces opposite the Cranks, whilst the rear driving wheels each have one Semi-circular Plate to maintain balance.

The model should be earthed if using a Mains motor.

RAILWAY LINES

These represent the 'fishbellied' type of the era and can be built as separate units mounted only by 1" Reversed Angle Brackets at each end, with a further two Brackets spaced along the rail length. The representations of the original stone sleeper blocks are made from Flat Trunnions, each bolted to an Angle Bracket. The entire right-hand side rails lift off in one piece for the same reason.

OTHER FITTINGS

An opening firedoor is made from a Face Plate with 3" Formed Slotted Strips on its boss side. The hinges are bolted to two Collars on a 1" Rod and to a further Collar bolted to an Angle Bracket joined by a Fishplate to the Circular Girder of the boiler end. The remainder of the boiler end is made up from Semi-circular Plates, the whole unit being hung on the Bolt from where it can be easily lifted off for access.

The Bell behind the chimney is made from a Bevel Gear and a ¾" Contrate on a 1½" Rod which has a Rod and Strip Connector hanging on a Cord Anchoring Spring placed centrally on a 3½" Rod. Each end of the Rod is fitted with a Handrail Coupling, a 1" Rod, Rod and Strip Connector and two Obtuse Brackets to clamp to the steam pipes.

The Steam Weight at the front left of the boiler is represented by 1" Pulleys without boss, hanging on a 4" Rod fixed by a further Handrail Coupling and a 1" Screwed Rod to the Flanged Wheel of the Steam Pipes. The Fire Bucket on the rear left side end of the tender is made from a Bush Wheel with eight ¾" Bolts inside a 1" Rubber Ring. These Bolts should be almost tight to grip the rubber ring. A Small Hook serves as the type of bracket of the day.

The linkage between engine and tender has a Trunnion bolted to the underside of the boiler, a Single Bent Strip locknutted to this, with a 2" Slotted Strip and Corner Bracket to allow for movement. A Pivot Bolt adds further realism. A Fireshovel can also be built from a 1" Triangular Plate, Rod and Strip Connector, 2" Rod, Handrail Coupling and a 1" Rod.

Finally, the walkway on the right side of the boiler is supported by a 12½" Angle Girder which has its end level with the boiler rear Circular Girder. This is not the case for the left walkway supports, which consist of a 5½" Angle Girder at the rear end, a 2½" Girder at the front end, with a 1½" Angle Girder in-between the Rods activating the steam valves from the Eccentrics.

PARTS REQUIRED

10 - 1	8 - 18b	11 - 70	2 - 160
3 - 1a	2 - 19s	1 - 72	1 - 162b
4 - 1b	12 - 20b	1 - 74	1 - 163
16 - 2	2 - 21	4 - 76	1 - 164
10 - 2a	7 - 22	1 - 77	4 - 166
40 - 3	4 - 22a	2 - 81	2 - 167b
3 - 4	8 - 24a	2 - 82	2 - 171
49 - 5	1 - 24c	12 - 89b	1 - 175
14 - 6	1 - 25	1 - 102	3 - 176
16 - 6a	3 - 26	1 - 103	4 - 180
4 - 7	1 - 27a	2 - 103b	1 - 186
29 - 8	1 - 27b	1 - 103d	2 - 186a
6 - 8b	1 - 27c	3 - 103h	7 - 188
3 - 9	2 - 29	3 - 103g	5 - 189
7 - 9b	3 - 30	1 - 103f	3 - 190
6 - 9d	600 - 37	1 - 109	8 - 192
3 - 9e	3 - 45	18 - 111	2 - 196
2 - 9f	1 - 46	10 - 111a	17 - 197
43 - 10	2 - 47	28 - 111c	6 - 200
13 - 11	7 - 48	33 - 111d	1 - 207
50 - 12	15 - 48a	4 - 116	24 - 212
4 - 12a	4 - 48c	4 - 118	2 - 212a
10 - 12b	4 - 48d	8 - 124	3 - 213
6 - 13	3 - 52	5 - 126	14 - 214
4 - 13a	3 - 52a	19 - 126a	24 - 215
5 - 14	7 - 53	1 - 128	2 - 221
2 - 14a	2 - 53a	2 - 130a	4 - 222
3 - 15	2 - 55a	1 - 133a	2 - 223
1 - 15a	1 - 57c	3 - 136	2 - 225
1 - 15b	70 - 59	6 - 136a	5 - 235
5 - 16	12 - 62	1 - 140	1 - 235b
6 - 16a	6 - 62a	2 - 143	2 - P65
4 - 16b	8 - 62b	6 - 146	2 - P67
7 - 17	5 - 63	1 - 147b	
8 - 18a	2 - 63c	1 - 155	

Enicron or E20R motor with extra gearing