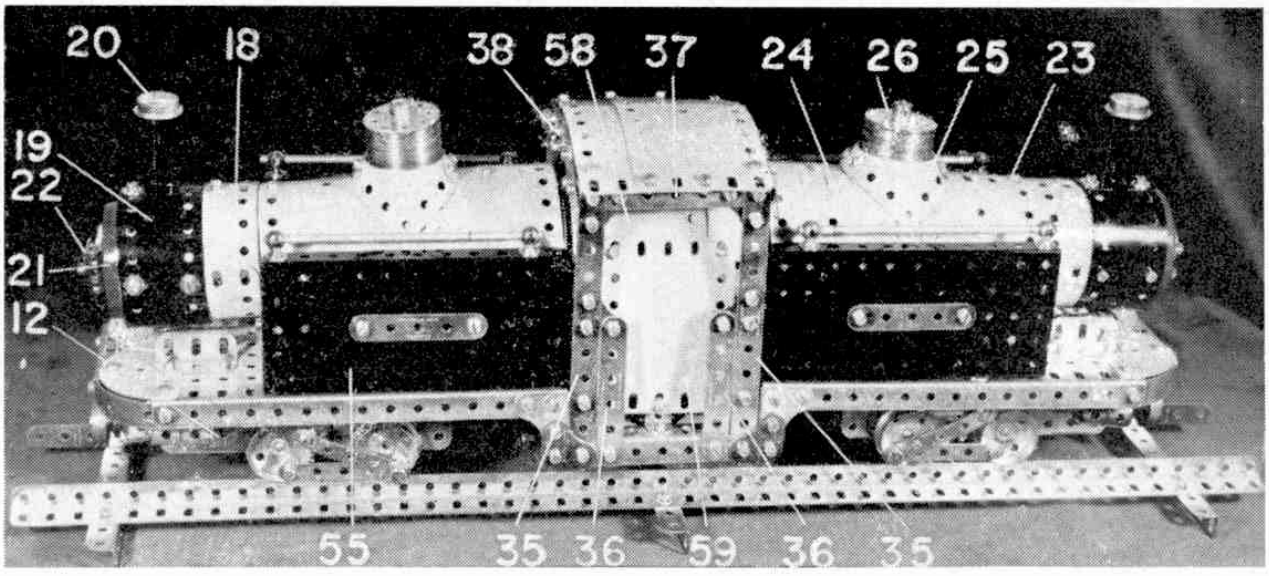
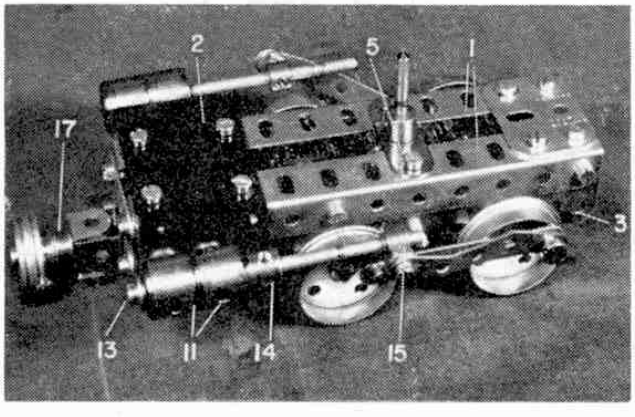


STEAM LOCO WITH A DIFFERENCE by Spanner

RAILWAY LOCOMOTIVES or, more particularly, steam railway locomotives have always held a fascination for me. The trouble is, however, that steam locomotives—at least in Britain—are virtually things of the past. You just don't see them any more, except on very rare occasions, unless, that is, you live near one of the privately-owned, narrow-gauge lines that have been specially preserved by independent organisations.

These small lines deserve our undying gratitude. They are undoubtedly the last bastions of steam in this country and I firmly believe that they have every intention of continuing with steam-power as long as they remain in existence. Their fame, though, is not due to their use of steam power alone. Even before the final withdrawal of steam services by British Rail, the independent narrow-gauge railways had long been tourist attractions, not only because they were "independent narrow-gauge railways", but particularly because they nearly all use unique equipment and rolling stock. Most unique of all, however, are the two highly distinctive, double-ended locomotives operated by the Festiniog Railway in North Wales.



A close-up view of one of the bogies showing its strong framework and imitation pistons. The pistons themselves are fixed but a moving effect is obtained by Coupling 15 sliding on its Rod.

Known as a "Double Fairlie" each of these two locomotives is a genuine "double-ender" with two complete boilers and smoke boxes separated by a single centrally-situated cab. The cab itself is fitted with two sets of controls—one for each boiler—so that, no matter which way the engine is working, it is always pointing in the right direction! Frankly, for a long time now I have been intrigued by "Iarll Meirionnyd" (Earl of Merioneth) and "Merddin Emrys", as the two locomotives are named and so I was particularly pleased when I received details and photographs of a first-class Meccano model, based on these splendid machines. It had been built by M.M. reader **Dr. Stephen Lacey**, of Hinckley, Leicestershire, and I left bound to include it in the M.M. The following article was supplied by Dr. Lacey, himself, while Bert Love of Birmingham took the photos.

Festiniog Double Fairlie

This model is based on the two locomotives "Iarll Meirionnyd" and "Merddin Emrys", owned by the Festiniog Railway in North Wales. Built more than 80 years ago at the Railway's own Boston Lodge Works, both locomotives are still very much in use today, working on the 9½-mile narrow gauge line now running from Portmadoc to Ddaullt, although, until a year or so ago, the line was only open between Portmadoc and Tan-y-Bwlch—a distance of some 7½ miles. The model, for ease of assembly, is built in five separate units: two power bogies, two boiler-smokeboxes and one main frame with cab and side-tanks.

Power bogies

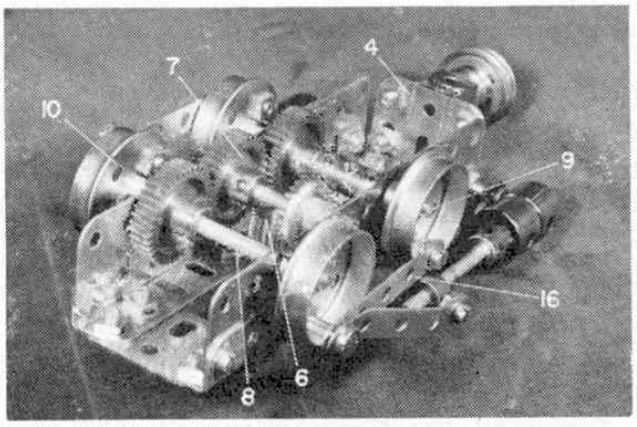
Beginning with the power bogies, two 5½ in. Angle

Girders 1 are joined, at one end, by a $1\frac{1}{2}$ in. Flat Girder and, at the other end, by a $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flanged Plate 2, the latter being spaced from the Angle Girders by a $2\frac{1}{2}$ in. Strip in each case. Note the use of the elongated holes in the Girders. The vertical flange of each Girder 1 is extended by a $5\frac{1}{2}$ in. Flat Girder 3, use again being made of its elongated holes, then one end of the arrangement is enclosed by a $1\frac{1}{2}$ in. Flat Girder 4, attached to Girders 1 by Angle Brackets.

A Double Arm Crank 5, boss uppermost, is next bolted between the horizontal flanges of Girders 1 through their seventh holes from the Flanged Plate end. Journalled free in the boss of this Crank is a $1\frac{1}{2}$ in. Rod, in the case of one bogey, and a 3 in. Rod, in the case of the second bogey, on the lower end of which is fixed a $\frac{1}{2}$ in. Pinion 6 spaced from the Crank by a Washer. This Pinion meshes with a $\frac{3}{4}$ in. Contrate Wheel on a 2 in. Rod mounted in the seventh holes of Flat Girders 3. Also fixed on the Rod is a 1 in. Gear 7 which meshes with two further 1 in. Gears, fixed one each side of it on a $2\frac{1}{2}$ in. Rod 8 and a $2\frac{1}{2}$ in. compound rod 9, built up from a 1 in. and a $1\frac{1}{2}$ in. Rod joined by a Coupling. These Rods are journalled in the fifth and ninth holes respectively of Flat Girders 3. A $1\frac{1}{4}$ in. Flanged Wheel 10 is mounted on each end of each of the Rods.

Two cylinders for both bogies each consist of two Chimney Adaptors 11 bolted through the first and second holes of the flange of Flanged Plate 2. In one of the bogies, a Large Fork Piece 12 is fixed through the third hole in the Flanged Plate's flange, being spaced from the flange by Washers and arranged with its boss inside the second Chimney Adaptor, its bore in line with the holes in the ends of the Adaptors. In the other bogey, the Fork Piece is omitted and replaced by a Rod Socket fixed by Bolt 13 to the end of the first Chimney Adaptor. (The bogey illustrated in close-up here uses this latter method.) Mounted in the Rod Socket or in the boss of the Fork Piece, as the case may be, is a $2\frac{1}{2}$ in. Rod, on which a Coupling 14 is fixed.

Free to slide on the same Rod is a Collar 15, to which is lock-nutted a $2\frac{1}{2}$ in. Narrow Strip, bent as shown to represent the connecting rod. The other end of the Strip is mounted, along with another $2\frac{1}{2}$ in. Narrow Strip 16, on a Pivot Bolt fixed to the rear $1\frac{1}{4}$ in. Flanged Wheel. The other end of Narrow Strip 16, representing the coupling rod, is mounted on a $\frac{1}{2}$ in. Bolt secured to the forward Flanged Wheel. The bogey is then completed by a single central buffer 17 supplied by two 1 in. Pulleys, two $\frac{1}{2}$ in. Pulleys and a Double Bracket on a $\frac{3}{4}$ in. Bolt fixed in a Double Bent Strip bolted to Flat Girder 4.



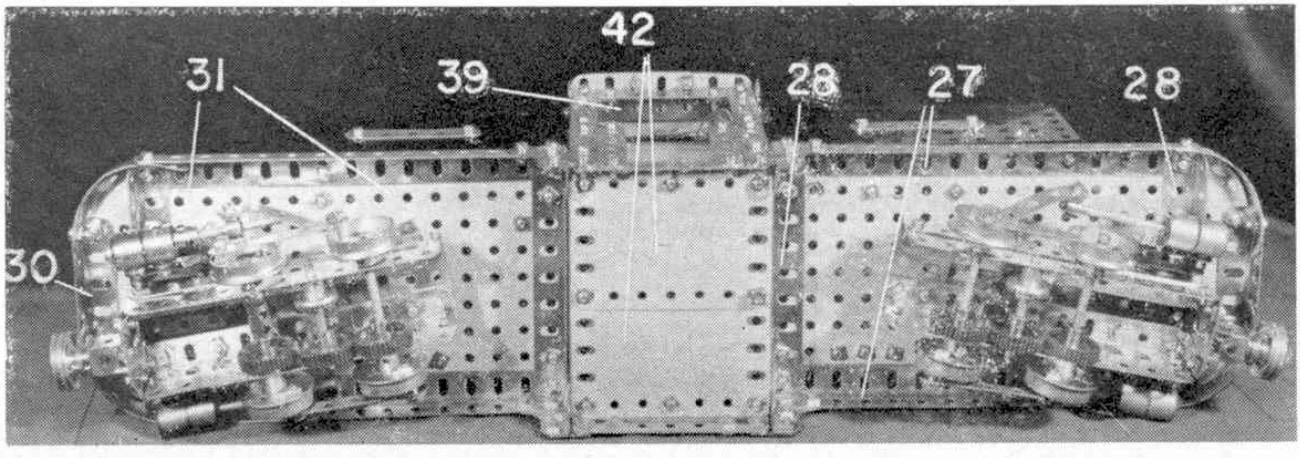
An underside view of the bogey showing the gear arrangements which transfer the drive to both sets of wheels.

Smokebox/boiler units

In the case of each of the two smokebox/boiler assemblies, four $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strips are fixed by their lugs to the non-boss side of a Face Plate in such positions that they lie just inside the edge of the Face Plate, the securing Bolts passing through the elongated holes of the Plate. To the backs of these Double Angle Strips are bolted four $2\frac{1}{2} \times 2\frac{1}{2}$ in. Curved Plates 18 overlaid as shown by two $5\frac{1}{2} \times 1\frac{1}{2}$ in. Plastic Plates 19, the latter forming the smokebox. Fixed to the top of the smokebox is the chimney, supplied by a Sleeve Piece topped by an inverted $\frac{3}{4}$ in. Flanged Wheel 20 on a 2 in. Screwed Rod inserted in the centre hole of upper Plate 19 and secured internally by a Nut. A Wheel Flange 21 serves as the smokebox door, through the centre of which runs a $1\frac{1}{8}$ in. Bolt, holding a $\frac{3}{4}$ in. Washer and a Collar. The Wheel Flange is secured to the earlier-mentioned Face Plate by a second $\frac{3}{4}$ in. Bolt, carrying a Coupling 22, the Bolt passing through the centre threaded bore of the Coupling. Locked by Nuts in the end threaded bores of the Coupling are two further $1\frac{1}{8}$ in. Bolts, representing hinges.

Returning to the above $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strips, Bolts are fixed by Nuts in the free rear lugs of the upper and two side of these, then three $5\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strips are secured on the Bolts by further Nuts. Attached, in turn, to the free lugs of these latter Double Angle Strips is a semi-circular construction consisting of two 3 in. Stepped Curved Strips, their

In this general underside view of the model the layout of the bogies in relation to the chassis is clearly shown.



ends joined by a 4½ in. Strip. Note that the joining Bolts pass through the *second* holes from each end of the 4½ in. Strip (to give a tapered effect to the 5½ × ½ in. Double Angle Strips), and that, in every case, ¾ in. Bolts are used with their heads pointing towards the chimney. The boiler is then completed by, from the front, backwards, two 2½ × 2½ in. Curved Plates 23, overlapping a laterally-mounted 4½ × 2½ in. Flexible Plate by two holes, and finally three 2½ × 2½ in. Curved Plates 24 also overlapping the 4½ × 2½ in. Plate by two holes. A dome is of course added, this consisting of two Flexible Gusset Plates 25 bolted together and enclosing a 1½ in. Pulley surmounted by twelve Wheel Discs fixed on a 2 in. Screwed Rod, topped by an 8-hole Bush Wheel 26.

Chassis

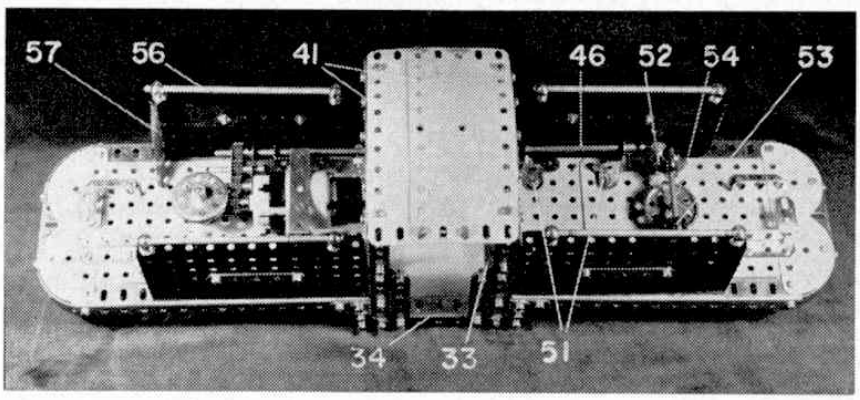
In construction of the chassis, two similar arrangements are first each built up from two 7½ in. Angle Girders 27 joined at each end, through their elongated holes, by a 4½ in. Angle Girder 28, at the same time fixing in place at one end as shown, two overlapping Semi-circular Plates 29. Bolted between the front holes of these Plates is a 2½ in. Angle Girder 30, its ends connected to Girders 27 by Formed Slotted Strips, while two 5½ × 3½ in. Flat Plates 31, suitably overlapped, are fixed between Girders 28. Bolted to these Plates and to Semi-circular Plates 29 are two 1½ in. Angle Girders, to one of which a 1 × ½ in. Angle Bracket 32 is secured to form a saddle for the smokebox. (Alternatively, here, a 1½ × ½ in. Double Angle Strip could be bolted between the Angle Girders.)

Now attached at right-angles to the inside end of each Girder 27 is a 1½ in. Angle Girder, the join being strengthened by a 1 in. Corner Bracket. The 1½ in. Girders are themselves joined through their centre holes by a 4½ in. Angle Girder 33, then the two identical assemblies are fixed together by 3½ in. Angle Girders 34 bolted between the 1½ in. Angle Girders, the joins again being strengthened by 1 in. Corner Brackets, at the same time fixing two 5½ in. Strips 35 to Girders 34. Also fixed to each Girder, alongside Strips 35 are two 3 in. Strips 36, their upper ends connected to Strips 35 by 1 in. Corner Brackets, while the upper ends of Strips 35 are themselves connected by a 3½ in. Strip 37, 1 in. Corner Brackets again strengthening the join.

Attached by Angle Brackets between the top of each pair of Strips 35 *at opposite sides* are two 4 in. Stepped Curved Strips 38 overlapped five holes, the Angle Brackets being secured through the second holes from the ends of the Curved Strips. The securing Bolts, here, also fix a 3½ × ½ in. Double Angle Strip 39 between each pair of Strips 35 *at the same side*. A 2½ in. Curved Strip 40 is suspended from the centre of Curved Strips 39 by Fishplates to enclose the space above the boiler.

Three further 3½ × ½ in. Double Angle Strips are also bolted between Curved Strips 39 to support the cab roof which is supplied by two 5½ × 2½ in. Flexible Plates 41, overlapped three holes. The roof, however, should not be fitted at this stage, but after the boilers and side tanks have been built onto the chassis. The cab floor, on the other hand, can be fitted, and this is simply built up from two 3½ × 2½ in. Flexible Plates 42, overlapped two holes.

Coming to the driving system, a Power Drive Unit, on its side, is fixed as shown to 1 × 1 in. Angle Brackets, bolted to the edge of Flat Plates 31 and extended vertically by 1½ in. Strips. A 2½ × ½ in. Double Angle Strip 43 is attached by its lug to the Strip nearest the output shaft of the Power Drive Unit, is extended over the Unit and attached by its other lug to a Fishplate bolted, together with another 2½ × ½ in. Double Angle Strip 44, to a Girder Bracket 45, that is in turn bolted to Flat Plates 31. The lugs of Double Angle Strips 44 serve as the bearings for the drive shaft—an 11½ in. Rod 46—linking the two bogies.



In this view of the loco, the twin boilers have been removed to show the method of transferring the drive from the motor through geared shafts to both bogies.

Mounted on the output shaft of the Power Drive Unit is a ½ × ½ in. Pinion that meshes with a ½ × ¼ in. Pinion 47 on a 1 in. Rod journalled in a Channel Bearing 48. Pinion 47 meshes with another ½ in. Pinion on a 1½ in. Rod, while this Pinion, in turn, meshes with a further ½ in. Pinion 49, fixed on Rod 46. Also in mesh with the Pinion on the output shaft of the Unit is a 1½ in. Contrate Wheel 50, mounted, inverted, on the vertically-situated 3 in. Rod included in one of the bogies, this Rod turning freely in the boss of an 8-hole Bush Wheel bolted to the underside of Flat Plates 31. A Collar fixed on the Rod above the Plates holds the bogey in place.

Additional bearings for Rod 46 are supplied by two 1 × 1 in. Angle Brackets secured to the other set of Plates 31 by Corner Angle Brackets 51 spaced from the Plates by Washers. The Corner Angle Brackets are used to allow lateral movement of the Angle Brackets, this being achieved by using the elongated holes in the lugs of the Corner Angle Brackets. Fixed on the end of the Rod is a ¾ in. Bevel Gear which meshes with another similar Bevel 52 on a transversely-mounted 3½ in. Rod, held by a Collar and a ½ in. Pinion 53 in two 1 × 1 in. Angle Brackets bolted to Plates 31. Pinion 53 engages with another 1½ in. Contrate Wheel 54 secured to the top of the 1½ in. Rod included in the remaining bogey. As in the case of the first bogey, this Rod is journalled free in an 8-hole Bush Wheel bolted to the underside of Plates 31.

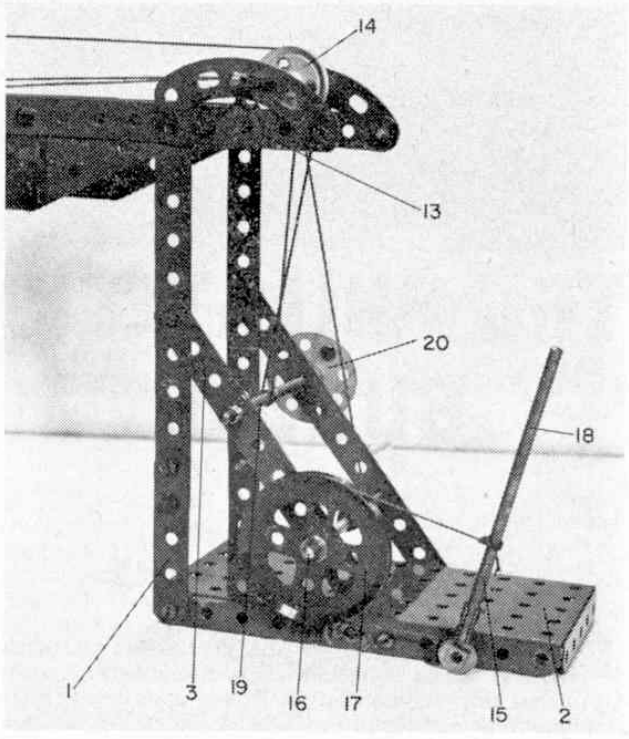
Continued on page 253

Clips in the lugs of this Double Bracket. At one end, the flanges of the Trunnions are extended by Fishplates 22, in which a $3\frac{1}{2}$ in. Rod is held by Spring Clips. Another $3\frac{1}{2}$ in. Rod 23 is similarly held in the flanges of the Trunnions, then four 1 in. Pulleys 24 are fixed on the Rods, being so spaced that they will run on the edges of Strips 8. Note, however, that, before the $3\frac{1}{2}$ in. Rods are positioned, a $2\frac{1}{2}$ in. Driving Band 25 is slipped over the centre of the Trunnions. A length of Cord is tied to this Driving Band, is passed round Pulley 15, is brought back and taken over Pulley 14. From there it is wrapped tightly a few times round Rod 19, is taken over the $3\frac{1}{2}$ in. Rod carrying Pulley 14 and is finally tied to Trunnions 21. The slack in the Cord is taken up by Driving Band 25.

PARTS REQUIRED

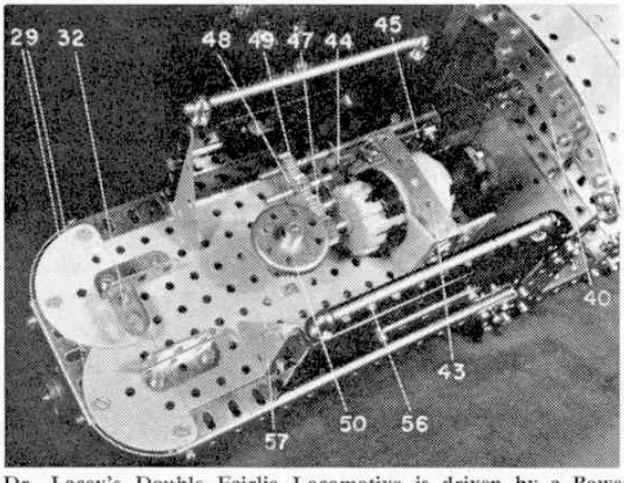
2—1	1—17	11—35	2—125
6—2	1—18b	56—37a	2—126
9—5	1—19s	47—37b	2—126
4—10	1—20a	10—38	1—176
1—11	4—22	2—48a	1—186
2—12	1—22a	1—52	2—188
2—15b	1—23	1—57c	2—189
3—16	1—24	4—90a	1—212
		6—111c	4—221

Finally, a pulley block is provided by two Flat Trunnions 26 fixed together but spaced apart by four Washers on the shank of each securing $\frac{3}{8}$ in. Bolt 27. A Hook 28 is mounted on another $\frac{3}{8}$ in. Bolt held in the apex of the Flat Trunnions, while a $\frac{1}{2}$ in. loose Pulley 29 is positioned in the top centre of the pulley block. A length of Cord is tied to the Double Angle Strip adjacent to Pulley 15, is passed over the 1 in. Rod in the Gantry Trolley and taken round Pulley 29 in the pulley block. It is then passed again over the 1 in. Rod in the trolley, taken along and over the Rod carrying 14 and is at last attached to Crank Handle 16.



A close-up of the main gantry support showing the two control wheels and the break for the load hook.

LOCO WITH A DIFFERENCE—continued from p.250



Dr. Lacey's Double Fairlie Locomotive is driven by a Power Drive Unit, the mounting of which is evident from this illustration.

Side tanks for the boilers are now each supplied by a $5\frac{1}{2} \times 2\frac{1}{2}$ in. Flanged Plate 55, to the centre of which a $2\frac{1}{2}$ in. Strip is bolted to represent a nameplate. A $5\frac{1}{2}$ in. Rod 56 is mounted in Handrail Supports fixed to the upper side flange of the Plate, while a $2\frac{1}{2} \times 1\frac{1}{2}$ in. Triangular Flexible Plate 57 is secured to the front end flange to enclose the space which would otherwise remain around the boiler. The boilers, themselves, are now attached by bolting the earlier-mentioned $5\frac{1}{2}$ in. Strips, fixed across their open ends, through the second holes from the top in the inside end flanges of Plates 55, the smoke boxes resting (not fixed) on their saddles. The protruding $\frac{3}{4}$ in. Bolts at the end of each boiler is joined across the cab to their opposite numbers by $3\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strips, to which are bolted two $4\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plates 58 overlapped three holes over the peak of the boilers and extended to the floor by two $3\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plates 59, one at each side, these Plates being attached to the floor by Angle Brackets. The motor leads can be brought out under one of these Plates to complete the model. It now remains for me only to stress that all the drive shafts must be very carefully aligned to ensure free running, and I must add that the original model did run extremely well.

PARTS REQUIRED

4—2	6—16a	2—38d	8—136
2—2a	1—16b	2—45	2—137
2—3	5—17	10—48a	1—154a
4—4	1—18a	8—48b	1—154b
4—5	8—20	6—48d	1—160
6—6a	2—20b	2—51	1—161
4—8b	2—21	4—52	2—163
4—9	4—22a	4—52a	8—164
6—9a	4—23	9—59	4—190a
2—9b	4—24	2—62b	3—191
2—9d	4—24a	2—63	3—192
8—9f	6—26	4—81	2—194
5—10	1—26a	4—89b	3—194d
2—11	2—28	2—90	17—200
13—12	2—29	4—90a	4—201
6—12a	2—30	4—103	4—214
2—12b	6—31	4—103h	4—215
1—13	362—37a	2—109	4—221
4—15	294—37b	4—116	8—235
1—16	46—38	16—133a	

1—Power Drive Unit.