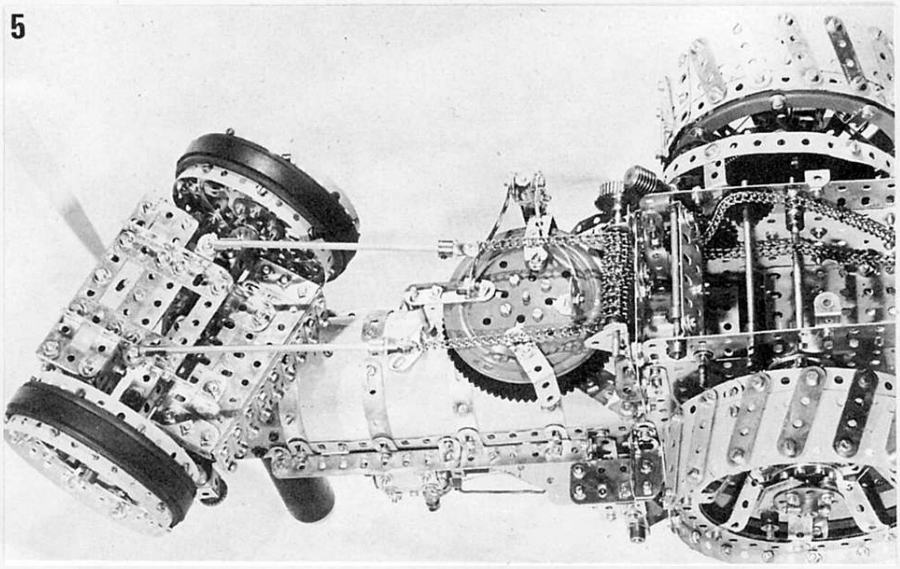

Fig. 5, above, an underside view of Norman Gilbert's Fowler BB1 Ploughing Engine showing the front axle, steering gear and lower winch supports. The loose chain in the section beneath the driving platform is used to take the drive from the powering electric motor which has been removed for this illustration.

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connecting rods for the pistons and Single throw Eccentrics are used for the valve gear. Reversing links on the valve-gear are 1½" Narrow Strips sandwiching the Eccentrics' lugs and the Rod & Strip Connectors on the 4½" Rods carrying the Eccentrics. The lower ends of these 1½" links ride, by lock-nutted Bolts, in double thickness Fishplates which are locked on a 2" Screwed Rod and separated by a Threaded Boss. Two more 1½" Narrow Strips are secured by Nuts to the right-hand end of the Screwed Rod to form a short lever connected to the reversing rod running back to the driver's position.

Sixteen 3" Curved Strips in four layers make a substantial rim for the flywheel which has six Narrow Strips spokes with a slight 'set' bent into them to simulate the Fowler design. A 10" flat rubber driving band for vacuum cleaners is used as the outer rim for appearance sake. Construction of the steam chest is shown in general form in Fig. 7, Channel Bearings and overlapped 2½" Semi-circular Plates forming front and rear facings respectively. Spacing of pistons and valve rods is across four holes, the Eccentric carrying rods being in the centre two holes and one hole above the alignment of the piston Rods. The steam chest and guide frame for the piston crossheads are built as one unit and then fixed like a saddle on to the boiler top.

WINCH GEAR

Fig. 4 shows how the drive shaft to the winch is in continuous mesh by Bevel Gears with the main crankshaft, engagement of the winch being operated by Dog Clutch and Socket Coupling arrangement, as shown, the shift lever being carried up to the driving position and normally locked by a toothed rack. Heavy tooth drive to the winch is arranged by ¾" Sprocket meshing with the toothed flange of a Meccano Ball Race and details of the winch are seen in Fig. 4. In the prototype the 'fairlead' which ensures smooth pay-out of the ploughing cable could be swivelled to effect ploughing "on either hand", but a fixed position is maintained in the model.

MAIN DRIVE

First and second gear comprise a 50t. Gear and 1" Sprocket running together on the Keyway end of the crankshaft and these can be meshed with the large intermediate double gear mounted on the offside of the engine. A back-to-back pair of 2½" Gears bolted to a 3" Sprocket provide adequate meshing faces for the intermediate gear which is in constant mesh with a pair of 3½" Gear Wheels, also back-to back for additional meshing face. Running through the framework is a 5" Axle Rod journalled in the vertical 4½" x 2½" Flat Plates, on the back row of holes, four holes down and this takes the drive to the other side of the engine where one more doubled-up pair of 3½" Gear Wheels is firmly locked to the rear axle, supplied by a cut or composite rod of 10½" length. The freely-running composite intermediate gear on the off-side of the engine is mounted on a Rod fixed in the centre transverse bore of a Coupling which is adjusted for height by lock-nuts on two 1" Screwed Rods mounted vertically on the engine frame. These Rods pass through the other two transverse bores of the Coupling, thus, by this method, the intermediate gear can be adjusted into position to mesh with the gear-change spacing required. The general arrangements may be seen in Figs. 2 and 4.

FITTINGS

Fittings are largely a matter of personal choice, but the running boards on the boiler, the boiler inspection plates, water pick-up hose and smoke box door are based on the original Fowler BB1. A 3" Pulley, plus Conical Disc and two 2½" Stepped Curved Strips make the smoke-box which is hinged to the boiler as shown. Ornamental lamps are optional, of course, but may be constructed from ½" Double Brackets, Contrate Wheels, etc., as shown. There is sufficient room inside the rear portion, below the footplate, to accommodate several different makes of Meccano electric motor (one at a time of course!) so that the model is set in motion by chain drive to the crankshaft. Mounted on a plinth with the wheels raised, this makes a very attractive exhibition model and, although Norman Gilbert only took up serious Meccano modelling last year on joining the S.A.M.C. it is clear from the model that he has already reached a very high standard.

The model, in fact, does illustrate an important point, namely that you do not have to be a modeller of countless years experience before being able to tackle advanced constructional projects. A basic mechanical ability is of course required, plus modelling commonsense and a knowledge of the Meccano parts available, with an understanding of their uses. A certain amount of courage is also desirable – the courage to knuckle down and actual start building – but, with the Fowler, Norman has proved that success is possible even for the comparative newcomer to the hobby.

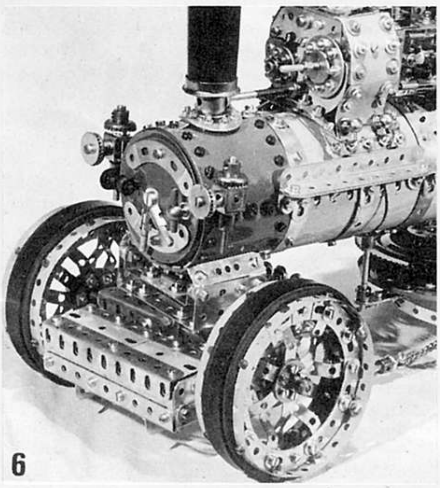
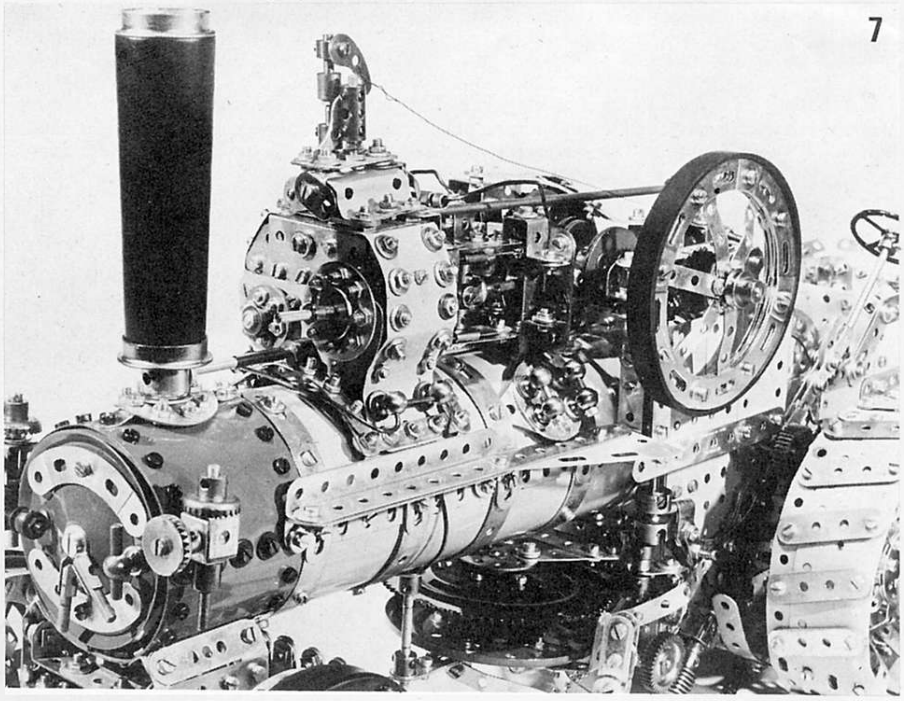


Fig. 6, above, a close-up view of the front axle and smoke box end of the boiler. Fig. 7, below, another close-up view, this one showing the steam chest, valve gear and flywheel. Note the simple but effective period headlamps secured to the side of the smokebox.



6-hole Bush Wheels are used inside, thus providing attachment points for the twelve bent and staggered spokes in the front wheels. Fig. 1 shows the general construction and it will be noted that only four-hole lengths of Narrow Strips are utilised. This means the use either of 2½" Narrow Strips the extra half-inches all stacked on the axle rod, or old Strips cut to four holes (they will finish up bent beyond redemption anyway!). It is important that each spoke is bent to identical shape before assembly (six external spokes and six internal – note slight difference in bending required for the internal large Bush Wheel hub). It is a good idea to set up half of the spokes and the rims and to spin the partially completed wheel to test for concentricity before adding the remainder of the spokes.

A feature of the Fowler Ploughing Engines was the large diameter and broad face of the front wheels. It must be remembered that the ploughing cable was operated at right angels to the boiler which applied a drag reaction to the whole engine and the heavy front wheels assisted in stabilising the engine. These massive engines were very heavy and narrow rim faces would have the engine bogged down rapidly in soft or muddy earth. Three 5½" x 1½" Flexible Plates form the wheel faces, or treads, curved and overlapped uniformly and fixed by ½" Angle Brackets to the wheel rims. By using Set Screws instead of standard Bolts, a shallower extension is achieved on the wheel treads. In the prototype, steel 'tyres' were employed, but the model is provided with rubber tyres made from bands cut from an old innertube.

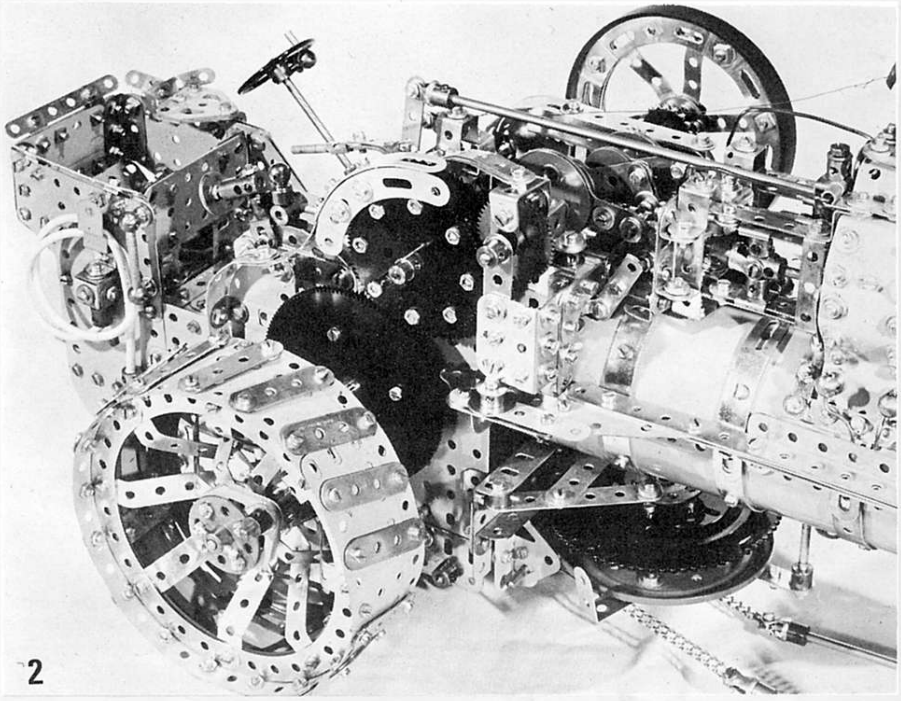


Fig 2, above, shows a close-up view of the crankshaft and right-hand gear train drive to the penultimate drive of Norman Gilbert's Fowler BB1 Ploughing Engine. Note that the larger gears illustrated are each provided by two Gear Wheels bolted face-to-face. Fig. 1 on opposite page is a general view of the completed model.

Rear wheels are constructed from 5½" Circular Girders overlaid on the outside view only with eight 2½" plain Curved Strips. This time, sixteen spokes are provided, each one being six holes long, using eight standard 3" Strips and eight 3" Narrow Strips. A 2" width of 'tread' is achieved on the rear wheels by having 5½" x 1½" Flexible Plates overlapped sideways by two holes. Tread grips are provided by 2" Strips bolted to the wheel faces as shown. Note that the rear wheels are on a solid back axle, but are free to revolve thereon. No differential was used in this Fowler engine, acute turning angels being accommodated by draw-pins which would disconnect the rear wheels from the driving plates on back axle, allowing one wheel to do the work. This operation required nippy action by the engine driver's mate!

FRONT AXLE AND STEERING

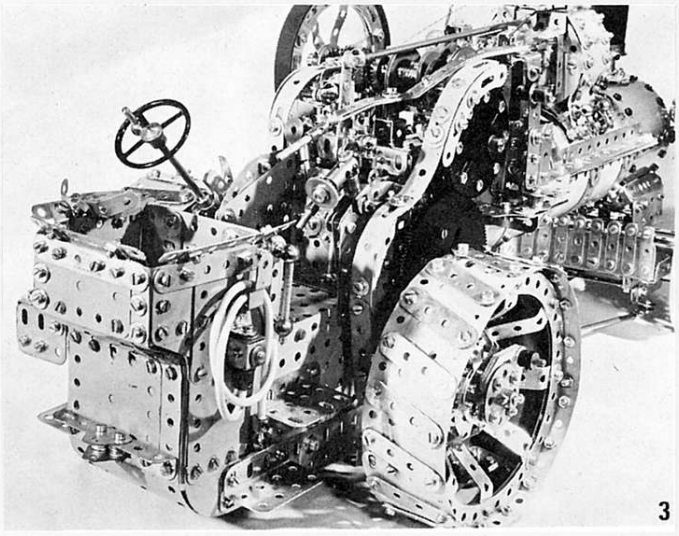
Fig. 5 shows the details of the front axle which is a pair of 5½" Girders, the lower Girder securing Couplings at each end which hold fixed 2½" Rods on which the front wheels turn freely, secured externally by Collars. The second 5½" Girder is fixed to the first by Bolts screwed into Threaded Bosses and the vertical slotted flanges of the paired Girders are fitted internally with 2½" Strips, centralised to give an axle pivot. The steering fork is a 1" x ½" Double Bracket locked to a Long Threaded Pin swivelling in 1½" Square Plates fixed in the framework below the smoke-box end of the boiler. Fishplates bolted by their slotted lugs and overlaid with a Washer reinforce the 1" lugs of the steering fork. A 1" Axle Rod passes through the steering fork and centre of the 5½" Girders and this Rod is held in place by an internal Collar set by a screwdriver poked through the centre Girder holes from below to lock the Grub Screw in the Collar.

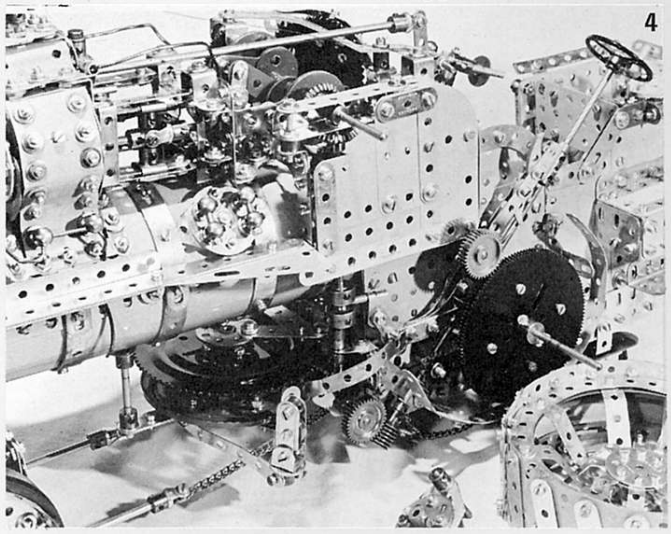
A toolbox with hinged lid and a "Spud rack" are attached to the other girder members of the front axle assembly as shown. Steering rods, as used in these Fowler Ploughing Engines, are made in the model from 5½" Rods fitted with Rod and Strip Connectors lock-nutted to the axle assembly as shown and then connected via End Bearings to Sprocket Chain on the steering barrel. "Spuds" are extra steal dogs which can be clamped to the rear wheels in extra-muddy conditions and the Fowler Ploughing engines carried these on a rack across the rear of the front axle.

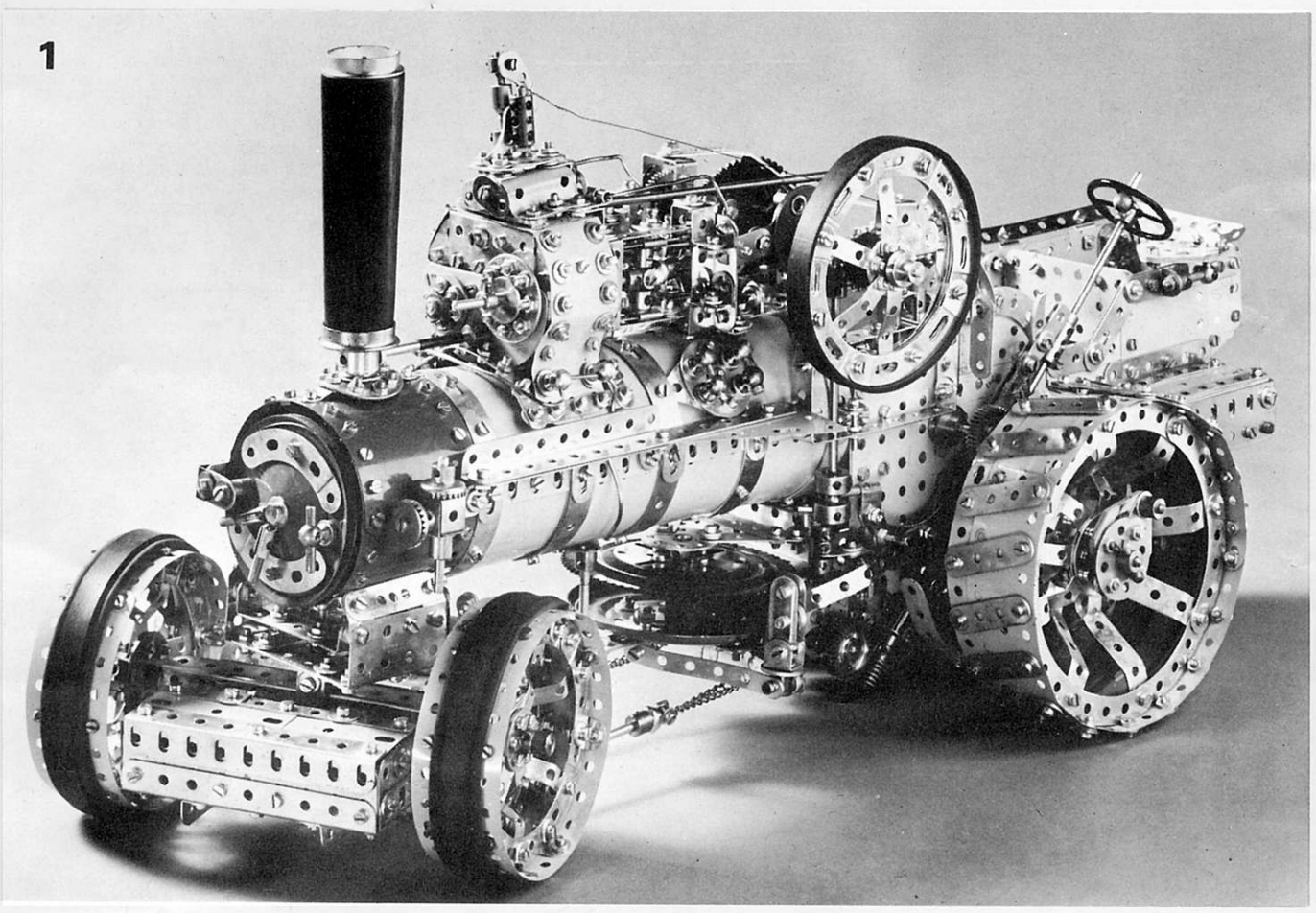
MOTION & STEAM CHEST

No attempt has been made to provide crankshafts on this model and a plain axle rod is used as a substitute. However, sliding gears are provided (two speeds) so that a Meccano Keyway Rod is required to form part of the substitute 'crankshaft', or a short section of Keyway Rod may be cut and extended by a Coupling. Fig. 2 shows the motion in close-up and the Crank supporting the outboard end of the crankshaft is a 'dummy' bearing, free, by lock-nutted Bolt attachment, to 'ride' on the end of the shaft, an inboard bearing actually providing the right-hand support for the crankshaft. Triple-throw Eccentrics are connected to the 2" Axle Rods acting as →

Fig. 3, below left, a close-up view of the rear end of the Ploughing Engine showing bunker construction and the driving platform, this filled with an array of interesting knobs and levers. Fig. 4, below right, is a detail view of the rear right-hand side of the model showing the final drive arrangement via double 3½" Gear Wheels to the back axle. Note the bevel drive from the main crankshaft to the winching gear below.







PLOUGHER – POWER!

A general look at a superb Fowler BB1 Ploughing Engine designed and built by NORMAN GILBERT

Scenic Showmen's Road Locomotives usually steal the glamour at Traction Engine Rallies but there is a great deal to be admired in the mechanical juggernauts which revolutionised agriculture in the UK at the turn of the century. Steam power harnessed to the plough opened up vast areas of the Fens in East Anglia where large tracts of flat land lent themselves to long hauls of the multi-furrow plough by cable between a pair of Fowler Compounds. Great strength in construction, high reserves of steam power and reliability were the hallmarks of the Fowler ploughing engines and they are still to be seen at steam rallies to this day where their owners have as much pride in them as any showman of yesteryear. Norman Gilbert chose the 1916 Fowler BB1 Compound Ploughing Engine for his model and he has achieved a high standard of realism as our cover shot illustrates. This general descriptive article is by Bert Love based on notes from Norman. Although the model appears extremely advanced, it is comparatively easy to construct so long as care is taken in assembly and alignment.

BOILER

With a 13" length and a 3" diameter this is formed from six pairs of 5½" x 2½" Flexible Plates set to the curvature of a 3" Pulley, overlapped on the first five pairs by one hole with the last pair being butted at the forward end of the boiler and clad externally with black or blue Plastic Plates. Internal reinforcement of the boiler is provided by three 12½" Strips each side, the bottom of the boiler being bolted on to them as the curved pairs of Flexible Plates are assembled. Co-incident with the lapping of the boiler plating are five sets of four 3" Formed Slotted Strips which provide ornamental banding. Inside, at the rear end of the boiler, additional shorter Strips are added to the 12½" Strips to give extra support and two 4½" x 2½" Flat Plates are bolted on outside to form the first section of the firebox from which the driving platform and bunker are extended. These Plates are mounted vertically, bolted three holes down from the top to the side joint of the boiler, allowing one hole extension of the Plates behind the rear end of the boiler.

A chimney plate is made from an 8-hole Wheel Disc, carrying a Chimney Adaptor and secured to the boiler top by a 2½" Narrow Strip running fore and aft. An 8" Screwed Rod passes right through the chimney assembly and is secured inside the smoke box to a 2½" Double Angle Strip bolted across the boiler internally and centralised by packing Washers. Norman's model uses a tapered chimney which can be made from tinplate or cardboard but Standard Flanged Wheels are provided as shown in the illustrations so that the Meccano 3" Cylinder may be used if preferred.

WHEELS

Use is made of Meccano Curved Strips in the rims of both front and rear wheels, eight 3" Curved Strips being used for each front wheel. These are set up carefully to form a true pair of circles and are spaced by four ½" Double Brackets to give parallel rims. Small Bush Wheels form the outer hubs and standard