

MODEL OF THE MONTH

MOTOR CHASSIS.

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Assembly of the Chassis Frame

The centre section of each of the chassis side-members consists of a $9\frac{1}{2}$ " Angle Girder 1 and a $7\frac{1}{2}$ " Angle Girder bolted to a $12\frac{1}{2}$ " Flat Girder. The front end of the Flat Girder is bent slightly as shown and is strengthened by two $3\frac{1}{2}$ " Angle Girders. A $5\frac{1}{2}$ " Angle Girder 2 is fixed to the Flat Girder and the joint between them is braced by a 1" Corner Bracket. The centre section is extended at the rear by a $2\frac{1}{2}$ " Curved Strip 3 and 4" Stepped Curved Strip 4. Two $2\frac{1}{2}$ " Curved Strips that support a $5\frac{1}{2}$ " Angle Girder 5 are attached to the Curved Strips 3 and 4. A $4\frac{1}{2}$ " Strip is fixed between the upper flanges of the Girders 1 and 5.

The side-members are connected at the rear by a $7\frac{1}{2}$ " Angle Girder 6 and a channel girder 7 made from two $7\frac{1}{2}$ " Angle Girders. Another $7\frac{1}{2}$ " Angle Girder 8 is bolted in position, and the front ends of the Girders 2 are connected by a $4\frac{1}{2}$ " Angle Girder 9.

The side-members are braced by two girders 10, each of which consists of two $7\frac{1}{2}$ " Angle Girders bolted to a $7\frac{1}{2}$ " Flat Girder so that they overhang one end of it by one clear hole. The overhanging ends of the two girders 10 are connected by a $2\frac{1}{2}$ " Flat Girder 11. The front end of each of the girders 10 is extended by a 2" Strip bolted to the Girder 2 and by a $1\frac{1}{2}$ " Strip bolted to an Angle Bracket fixed to the lower front corner of the $12\frac{1}{2}$ " Flat Girder.

A $4\frac{1}{2}$ " Angle Girder 12 is attached to each of the girders 10 by a 1" Corner Bracket and a $2\frac{1}{2}$ " Strip. The Girders 12 are extended by $4\frac{1}{2}$ " and $2\frac{1}{2}$ " Strips connected by Angle Brackets, and the $4\frac{1}{2}$ " Strips are bolted to the chassis side-members.

The petrol tank is formed by a $2\frac{1}{2}$ " x $1\frac{1}{2}$ ", a $5\frac{1}{2}$ " x $1\frac{1}{2}$ ", two $5\frac{1}{2}$ " x $2\frac{1}{2}$ " and two $2\frac{1}{2}$ " x $2\frac{1}{2}$ " Flexible Plates rolled to form an oval cylinder and bolted together as shown. Each end of the tank consists of a Wheel Disc, a 3" Strip and two $2\frac{1}{2}$ " Curved Strips bolted together. The ends are held in place by bolts screwed into Threaded Bosses attached to the Flexible Plates by bolts passed through them. The petrol filler pipe is a Crank Handle without grip and it is fixed inside the tank in a Collar screwed on to a bolt 13. The tank is attached to the girder 7 by two $\frac{1}{2}$ " Bolts and to the Girder 6 by $1\frac{1}{2}$ " Strips and Angle Brackets.

Details of the Rear Axle and Springs

The rear axle casing should be assembled in two sections. One section consists of a Boiler End and a Face Plate connected by four $3\frac{1}{2}$ " x $\frac{1}{2}$ " Double Angle Strips, while in the other section four $2\frac{1}{2}$ " x $\frac{1}{2}$ " Double Angle Strips are used. A $6\frac{1}{2}$ " Rod is passed through the larger section and on it a $1\frac{1}{2}$ " Contrate is mounted freely. A $\frac{3}{4}$ " Contrate 14 is fixed on the Rod, which is then passed into the long bore of a Coupling. A $1\frac{1}{2}$ " Rod is fixed centrally in the centre cross bore of the Coupling, and is fitted with a Collar at each end. A 1" Screwed Rod is screwed into each Collar and is held in a hole in the $1\frac{1}{2}$ " Contrate by two nuts. Two $\frac{3}{4}$ " Pinions are mounted on Pivot Bolts and each of these Bolts is screwed into a threaded centre hole of the Coupling, so that its $\frac{3}{4}$ " Pinion meshes with the Contrate 14. A $4\frac{1}{2}$ " Rod is passed through the shorter section of the axle casing and a $\frac{3}{4}$ " Contrate on it is arranged to engage the $\frac{3}{4}$ " Pinions.

The rear axle is completed by connecting the Boiler Ends by means of four 2" Strips. One of these Strips supports a Double Bent Strip and is spaced from the Boiler Ends by three Washers on each Bolt. A $1\frac{1}{2}$ " Rod mounted in the Double Bent Strip and the 2" Strip carries a $\frac{1}{2}$ " Pinion that engages the the $1\frac{1}{2}$ " Contrate. Washers should be placed on the Rods carrying the differential gears so that these gears mesh accurately.

The rear springs are formed by $7\frac{1}{2}$ ", $5\frac{1}{2}$ ", $4\frac{1}{2}$ ", $3\frac{1}{2}$ " and $2\frac{1}{2}$ " Strips, with Double Brackets bolted to the ends of each spring. The front end of each spring is mounted on a $\frac{3}{4}$ " Bolt that is fixed by a nut in the chassis, and the Double Bracket is held on this Bolt by lock-nuts. The rear Double Bracket is lock-nutted to a Fishplate and a $\frac{1}{2}$ " Reversed Angle Bracket, which are lock-nutted also to the chassis. The rear axle is attached to the springs by $1\frac{1}{2}$ " Strips placed over the axle casing and connected to the springs by $1\frac{1}{8}$ " Bolts.

Front Suspension and Steering Mechanism

Four 1" Corner Brackets, numbered 15 and 16, are bolted to two $1\frac{1}{2}$ " Angle Girders fixed to each side of the chassis. The Corner Brackets 15 on each side are connected by two $2\frac{1}{2}$ " Strips. On each side a Coupling 17 is pivoted on bolts passed through the Corner Brackets 16, and this Coupling supports a $1\frac{1}{2}$ " Rod that carries a Swivel Bearing 18. A 2" Rod is passed through the "spider" of the Swivel Bearing. This Rod carries a Coupling 19, and it passes through another Swivel Bearing 20 and is held in place by a Collar. Swivel Bearing 20 is connected by a 1" Rod to a small Fork Piece, which pivots on a $\frac{3}{4}$ " Bolt lock-nutted in a Double Bracket bolted to the chassis. Three $7\frac{1}{2}$ " Strips 21 placed face to face are fastened to Coupling 17 by a bolt and their rear ends are bolted to the chassis.

A Rod and Strip Connector is placed over the lower end of each of the 2" Rods, and is linked by a 3" Rod to another Rod and Strip Connector bolted to the chassis. One of the 2" Rods carries a Crank 22 and the other is fitted with a Bell Crank 23. These Cranks are connected by a $6\frac{1}{2}$ " Rod held in Swivel Bearings, which pivot on $\frac{3}{8}$ " Bolts.

The front wheels are 3" Pulleys fitted with two Semi-Circular Plates, with Conical Discs clamped by the heads of the bolts passed through them. These bolts secure also Wheel Flanges that form the brake drums. Each Wheel is mounted freely on a $1\frac{1}{8}$ " Bolt. Two Semi-Circular Plates are fixed on the Bolt by two nuts, and the Bolt is then screwed into the lower threaded hole in Coupling 19. A Bolt passed through one of the Semi-Circular Plates is screwed into the upper threaded hole in the Coupling.

The steering column is an 8" Rod mounted in two Fishplates bolted to the lugs of two $1\frac{1}{2}$ " x $\frac{1}{2}$ " Double Angle Strips. Those Double Angle Strips are attached to the chassis by a 1" x $\frac{1}{2}$ " Angle Bracket and a Fishplate. A Worm on the steering column between the two Fishplates engages a $7/16$ " Pinion on a $1\frac{1}{2}$ " Rod mounted in the centre holes of the Double Angle Strips. This Rod carries a Crank 24 extended by a 2" Strip. A Collar 25 is screwed on to a bolt held in the Strip by a nut, and a $1\frac{1}{2}$ " Rod in the Collar carries an End Bearing that is lock-nutted to an arm of the Bell Crank 23.

Construction of the Engine Unit and the Clutch.

Each side of the engine unit is a $3\frac{1}{2}$ " x $2\frac{1}{2}$ " Flanged Plate and the ends are 3" x $1\frac{1}{2}$ " Flat Plates. On each side a $3\frac{1}{2}$ " Strip is attached to Angle Brackets fixed to the lower corners of the Flat Plates. A Bush Wheel is bolted to the front of the unit and a Wheel Disc to the rear. Two $2\frac{1}{2}$ " x $2\frac{1}{2}$ " and two $2\frac{1}{2}$ " x $1\frac{1}{2}$ " Flexible Plates form the top of the engine and they are curved to the same radius as the Bush Wheel and the Wheel Disc. The general arrangement of the exhaust manifold can be seen in Fig. 1. The

curved sections of the exhaust pipe are formed by Flexible Coupling Units. The induction manifold consists of a large Fork Piece bolted to the centre of a Double Bent Strip, which is fixed to the side of the engine. A horizontal 2" Rod passed through the Double Bent Strip carries two Couplings, and a vertical $1\frac{1}{2}$ " Rod in the large Fork Piece is fitted with two Couplings. The upper one of these is bolted to a Chimney Adaptor fitted in a Sleeve Piece, which is fixed to the top of the engine.

The fan is formed by a $2\frac{1}{2}$ " Strip attached to a Rod Socket, which is fixed on a $4\frac{1}{2}$ " Rod that carries a $\frac{1}{2}$ " fixed Pulley 26. The dynamo consists of two Chimney Adaptors bolted to the side of the engine. A $1\frac{1}{2}$ " Rod is held in them by a Collar and a $\frac{1}{2}$ " fixed Pulley, and a 6" Driving Band is passed round this Pulley, the Pulley 26 and round a 1" Pulley 27. Pulley 27 is fixed on a 5" Rod that carries a 1" Sprocket 28 and a 2" Sprocket 29. The starter motor is made in the same way as the dynamo but the $\frac{1}{2}$ " Pulley of the dynamo is replaced by a $\frac{3}{4}$ " Sprocket.

The clutch housing is made by bolting two Semi-Circular Plates to the rear end of the engine. A $2\frac{1}{2}$ " x 1" Double Angle Strip and two 1" x 1" Angle Brackets are fixed to the Semi-Circular Plates. Four $2\frac{1}{2}$ " Strips 30 are bolted to the Angle Brackets and to the lugs of the Double Angle Strip, and the other ends of these Strips are attached to the lugs of two $1\frac{1}{2}$ " x $\frac{1}{2}$ " Double Angle Strips fixed across three Wheel Discs 31 bolted face to face. The clutch output shaft is a $3\frac{1}{2}$ " Rod 32. It carries a $1\frac{1}{2}$ " Pulley fitted with a Tyre, a Socket Coupling, a Compression Spring, a Collar 33 and another Collar that prevents the Rod from sliding in the housing. The $1\frac{1}{2}$ " Pulley is gripped in one end of the Socket Coupling and the assembly is loose on the Rod. The Compression Spring is placed between the Socket Coupling and the Collar 33, which is fitted with a $7/32$ " Bolt that engages the slot in the Socket Coupling. The Compression Spring normally forces the Tyre against the Sprocket 29.

The clutch release pedal is a Rod and Strip Connector on a 1" Rod held in a Short Coupling. The Short Coupling is fixed on a $3\frac{1}{2}$ " Rod 34 mounted in 1" Corner Brackets bolted to two of the Strips 30. The Rod is held in place by a Collar, and two Couplings on the Rod carry $\frac{1}{2}$ " Bolts that engage in the groove in the Socket Coupling.

The engine unit is supported by two 1" x $\frac{1}{2}$ " Angle Brackets bolted to the $1\frac{1}{2}$ " Angle Girders that carry the Corner Brackets 15 and 16.

Assembly of the Gear-Box

The sides of the gear-box are made from $3\frac{1}{2}$ " and $1\frac{1}{2}$ " Strips, and they are connected at the front end by three $1\frac{1}{2}$ " x $\frac{1}{2}$ " Double Angle Strips and at the rear by two $1\frac{1}{2}$ " x $\frac{1}{2}$ " Double Angle Strips. A $\frac{1}{2}$ " Pinion 35 is mounted loosely on a $\frac{3}{4}$ " Bolt fixed in the centre Double Angle Strip at the front by two nuts. The gear-box frame is bolted to the Wheel Discs 31. A $1\frac{1}{2}$ " x $\frac{1}{2}$ " Double Angle Strip is fixed inside the frame and is spaced from the sides by a Washer on each bolt. This Double Angle Strip supports the end of Rod 32, which carries a $\frac{1}{2}$ " Pinion 36 and a 1" Gear 37. The gear-box output shaft is a $2\frac{1}{2}$ " Rod fitted with a 1" Gear 38, a 50-tooth Gear 39 and a 57-tooth Gear 40. Rod 32 projects part way into the boss of Gear 40. The layshaft is a $4\frac{1}{2}$ " Rod that carries the Gears and Pinions seen in Fig. 4. The gear-box can be arranged to provide three forward speeds and reverse, but in the model the layshaft is prevented from sliding by a Collar and the 1" Gears on it are set to mesh with the 1" Gears 37 and 38. The Pinions on the layshaft are set in neutral positions.

The gear change lever is a 2" Rod in a Coupling locked on a $1\frac{1}{8}$ " Bolt that is fixed by nuts in two 2" Slotted Strips 41. Each of these strips is attached to one side of the gear-box by a $\frac{3}{8}$ " Bolt. The gear-box output shaft is connected to the rear axle driving shaft by a 4" Rod and two Universal Couplings. The gear-box is connected to the chassis by two 2" Angle Girders and two 1" Triangular Plates.

The Brakes and the Radiator

Each brake shoe consists of a bolt in a 1" Triangular Plate fixed by a nut on a $\frac{1}{2}$ " Bolt. The $\frac{1}{2}$ " Bolt is passed through a Face Plate of the rear axle or a Semi Circular Plate of the front axle, using Washers for spacing purposes, and a Fishplate is locked on it by two nuts. A short length of Spring Cord is used as a return spring for the brake shoe.

The brakes are operated by flexible wire passed through **lengths of Spring Cord.** One end of each length of Spring Cord is clamped by a bolt in a Collar, which is screwed on to a bolt passed through the Face Plate or the Semi-Circular Plate carrying the brake shoe. The other end of the Spring Cord is similarly held in a Collar screwed on to a bolt fixed in the chassis. One end of each length of wire is fastened to the Fishplate of each brake, and the other end is connected to an arm of one of two Double Arm Cranks 42. The Double Arm Cranks are fixed on a 5" Rod mounted in the girders 10. The brake pedal 43 is formed by a Rod and Strip Connector on a $1\frac{1}{2}$ " Rod, which is held in another Rod and Strip Connector bolted to one of the Double Arm Cranks 42.

The radiator is formed by three $2\frac{1}{2}$ " Angle Girders, two $2\frac{1}{2}$ " Strips and two $1\frac{1}{2}$ " Strips arranged as shown in Fig. 1. The water tubes are represented by Tension Springs passed over 2" Screwed Rods supported in Angle Brackets.

The Base and Driving Mechanism.

The base is assembled from $24\frac{1}{2}$ " and $9\frac{1}{2}$ " Angle Girders arranged as shown in Fig. 1 and filled in by eight $12\frac{1}{2}$ " x $2\frac{1}{2}$ " Strip Plates. An E2OR(S) Electric Motor is bolted to two of the $9\frac{1}{2}$ " Angle Girders, and a $\frac{7}{16}$ " Pinion on its armature shaft engages a 60-tooth Gear on a Rod mounted in the side-plates. A $\frac{7}{16}$ " Pinion on the same Rod as the Gear drives another 60-tooth Gear on a Rod supported in the upper corner holes of the side-plates. This Rod carries a $\frac{3}{4}$ " Sprocket, and when the chassis is in position on the base the Sprocket is connected by Chain to the Sprocket 28 of the engine unit.

The rear end of the chassis is supported by two $4\frac{1}{2}$ " Angle Girders bolted between the base and the girder 7. The front end is supported by two 3" Angle Girders bolted to the base and connected at their upper ends by a Flat Trunnion, which is bolted to one of the Strips attached to the Corner Brackets 15.