CONSTRUCTION: The Main Model

The Bogies

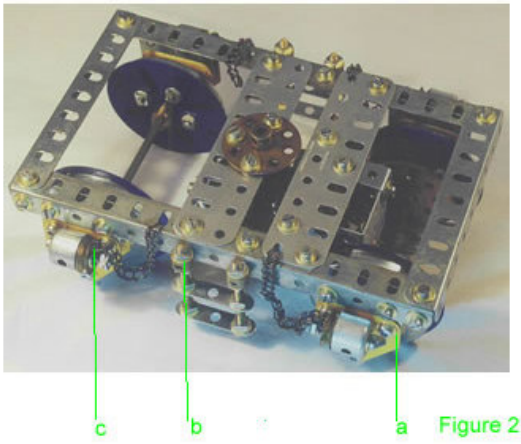

Figure 2

The frame is constructed with 4 1/2" and 7 1/2" girders. Across the top as pivot mount and motor mount are 4 1/2" flat girders. Below the middle 4 1/2" flat girder is a 4 1/2" angle girder bolted together via their oval holes. In the centre an 8-hole bush wheel bolted bush up as per the pivot. One hole from the ends, 1 1/2" flat girders are bolted on the inner edge of the 7 1/2" girder and a trunnion (Fig 2a) bolted flush to it. 1/2" bolts are used, with a collar in between and another trunnion and 1 1/2" girder on the inside for thickness effect.

The wheels are built up from a wheel flange (p#137) and a face plate (p#109), spaced with plastic collars and 1/2" bolts so not to distort the wheel flange. The wheels roll on 4 1/2" rods, spaced away from the inner trunnion with washers.

On the outer edge of the trunnions, chimney adaptors are bolted on. 1 1/8" bolts in the end hole hold a pulley and a piece of chain on as to represent the brake cylinders (Fig 2b).

2" threaded rods carry two 1 1/2" thin strips as steps and are held onto the center of the 7 1/2" angle girder lock nutted to collars (Fig 2c) bolted onto the girder.

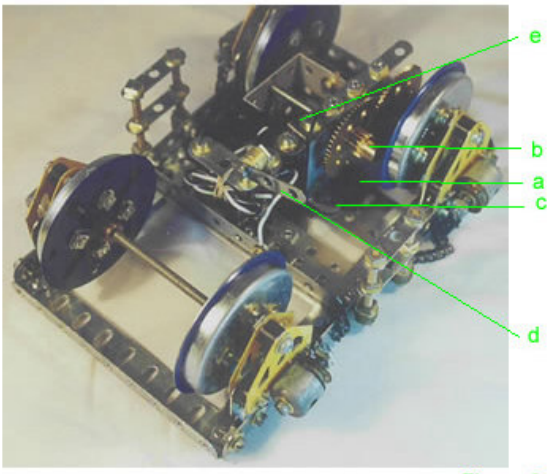

Figure 3

An MO motor is bolted to the open face of the 1 1/2" square channel piece (p#160g). The motor shaft carries a worm. The worm meshes with a 1/2" pinion carried on a 2" rod in the top center hole. On the outer end of the shaft another 1/2" pinion (Fig 3a) meshes with a 57T gear running on a 2 1/2" rod. A 15T pinion (Fig 3b) rides face to face with the 57T gear. The 15T gear meshes with a 60T on the 4 1/2" driving shaft.

1/2" angle brackets (Fig 3c) are used to bolt the 1 1/2" square channel piece to the underside of the 4 1/2" flat girder. The switch actuator (Fig 3d) is bolted to the underside of the MO, spaced appropriately to actuate the switch on the track.

The electrical pick up is a hinge (Fig 3e) bolted to the MO as insulation. A 2 1/2" narrow strip is bolted to the other half of the hinge. The screws with washers are to weigh down the pick up for better contact. The positive wire to the MO is bolted to the 2 1/2" narrow strip and the negative to the frame of the bogie.

Chassis

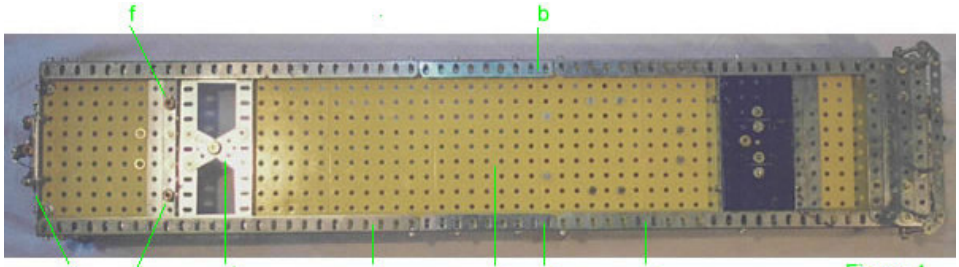

Figure 4

The chassis is started with bolting a 3 1/2" x 5 1/2" flat plate (Fig 4a) to the middle, oval holes of a 24 1/2" angle girder. Bolt another 24 1/2" angle girder on the other side of the plate. On either end of the 3 1/2" x 5 1/2" plate, bolt on a 3 1/2" x 5 1/2" plate. Next, bolt on 2 1/2" x 5 1/2" plates to the ends of these. Next is a 5 1/2" angle girder by its oval holes with outer edge facing toward the middle, 3 hole space and another 5 1/2" angle girder by its oval holes with outer edge facing outside. Next are two 5 1/2" strips next to each other and finally a 3 1/2" x 5 1/2" plate on the ends. 2 1/2" angle girders are butt joined to the 24 1/2" angle girder on both ends, each side. Bolt a 4 1/2" angle girder (Fig 4b) to the middle of the 24 1/2" angle girder by its round holes, on the outside to form a U girder. Butt join two 12 1/2" angle girders (Fig 4c) to the ends of the 4 1/2" angle girder to form a U girder along the length of the chassis. This will form the mount for the cover.

Using 2 1/2" strips (Fig 4d), bolt then in an X pattern between the 5 1/2" angle girders, front and rear. On top of the X, bolt a double arm crank, boss up. Bolt a 1 1/2" rod in the boss as the mount for the bogies. The rod will pass through the bush wheel on top of the bogie, and be tightened with a collar underneath.

Pick one end to be the front, and using two angle brackets, tighten a 5 1/2" strip (Fig 4e) on to close up the U girders.

Bolt two cranks (Fig 4f) to the 5 1/2" strip nearest to the foremost 5 1/2" angle girder. This will be the pivot for the driver's seats. Bolt three 2 1/2" x 1 1/2" flanged plates over the top of the front 5 1/2" angle girders.

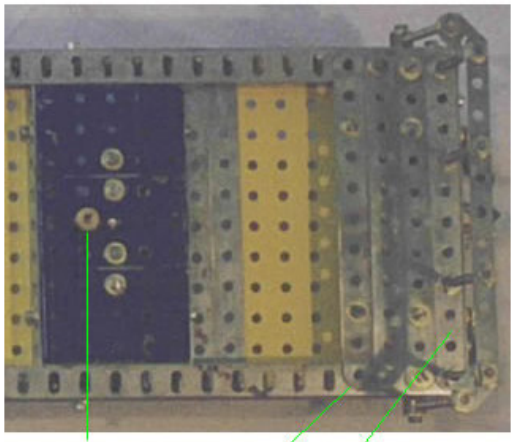

Figure 5

The same cover is done for the rear (optional). On the rear cover, bolt a threaded collar (Fig 5a) to the centre flanged plate. This will form the mount for the head end engine.

Using 2" rods, lock nut a 5 1/2" angle girder (Fig 5b) to the end. Spread evenly from the middle of the 5 1/2" angle girder, lock nut another two 2" rods. Tighten collars one hole from the end on the side of the U girder as the outer railing supports. Across the top of the 2" rods, lock nut a 5 1/2" narrow strip and fish plates on the end. Butt join three 5 1/2" strips from the edge of the 5 1/2" angle girder to form the catwalk.

Rear Bumper

At the rear bolt a 1 1/2" angle girder to the 3 1/2" x 5 1/2" plate (Fig 6a) by its round holes with the oval holes facing down and rearwards.

Construct the rear bumper by stacking six 3 1/2" strips on top of each other, next to another six 3 1/2" strips joined at the ends with fish plates and 1/2" bolts. Lock nut two tension springs to the top bolts to represent electric and hydraulic connectors. A coupling is bolted to the lower 3 1/2" strips, and angle brackets and obtuse angle brackets form the coupling.

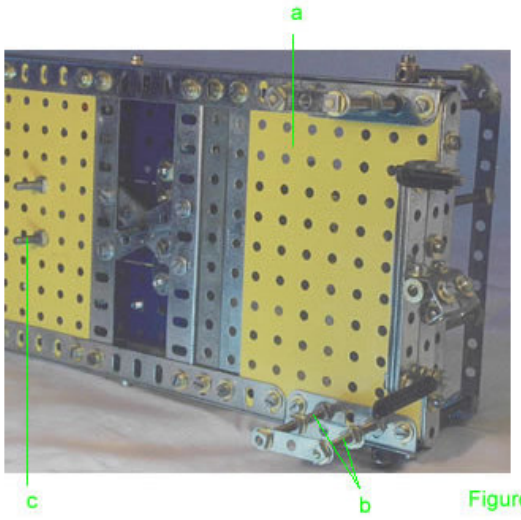

Figure 6

Using 1/2" bolts in the top strips, bolt the bumper to the 1 1/2" angle girder.

One hole from the rear, lock nut a 2" threaded rod (Fig 6b), and two holes later another 2" rod in the U girder. Lock nut two 1 1/2" narrow strips on to form steps. Do this on both sides.

Note the two 3/4" bolts (Fig 6c). They are bolted to the 2 1/2" x 5 1/2" plate to form stops for the bogies. They stop the bogies from spinning 180 degrees when transporting and only allow limited bogie travel left and right.

CowCatcher

A 2 1/2" flat girder (Fig 7a) is bolted via its round holes to the middle of the 5 1/2" strip across the front of the chassis.

1 1/2" strips (Fig 7b) hold the top three center 2 1/2" strips (Fig 7b) together. On the lower 2 1/2" strip, obtuse angle brackets and fishplates hold the bottom two 2 1/2" strips on.

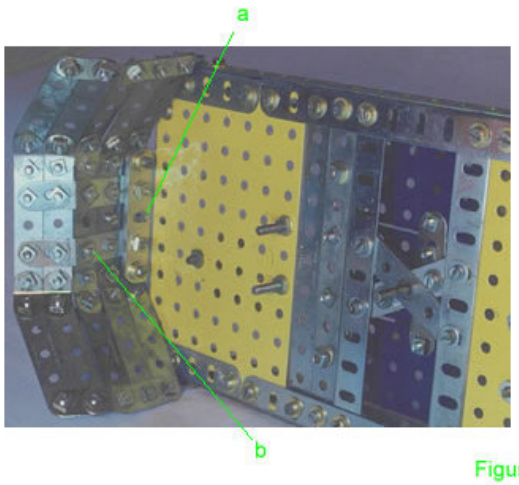

Figure 7

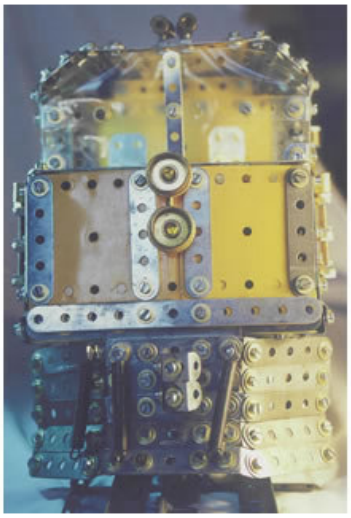

Figure 8

Obtuse angle brackets on the ends of the center strips hold the end 2 1/2" strips on. At the end of the outer strips 1 1/2" strips and fishplates hold the strips together.

A coupling is bolted to the second center strip and obtuse angle brackets and angle brackets are bolted together and onto it to form the coupling. Tension springs represent electrical and hydraulic connectors (Fig 8).

Fuel Tanks

Bolt an 8-hole bush wheel to the inside of a wheel flange. Secure a 4 1/2" rod (Fig 9a) to the bush wheel.

Place 3/8" bolts (Fig 9b) through the holes in the boilers to mount them to the chassis. Secure a 1/2" pulley as the fuel filler. The opposite wheel flange is bolted in place on the 4 1/2" rod through the semicircular gap at the end of the boiler.

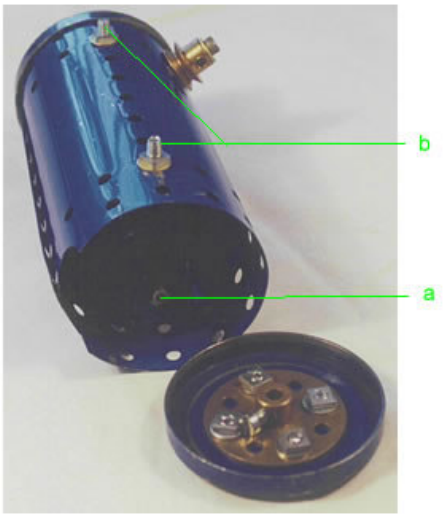

Figure 9

Battery Box

Join a 3" x 3 1/2" plate to a 1 1/2" x 1 1/2" plate with a 3 1/2" strip. Above bolt two reverse angle brackets (Fig 10a) seven holes apart as the mount to the chassis. Screws are put in "nut up" to form the battery studs in the lid. This forms the "lid."

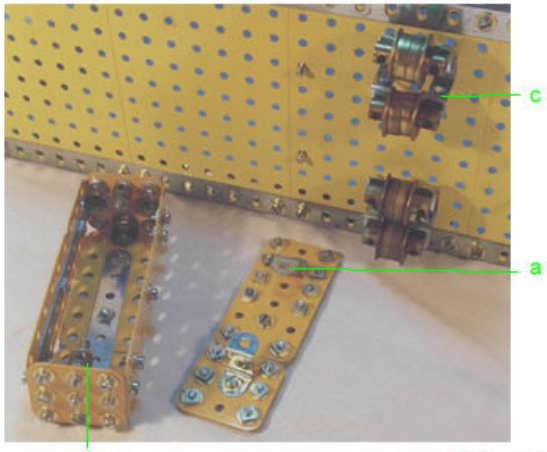

Figure 10

Join three more 3" x 1 1/2" plates to three more 1 1/2" x 1 1/2" plates as above and form a box using angle brackets and 1 1/2" x 1 1/2" plates as the ends. Bolt collars (Fig 10b) into the top middle holes of the end plates to allow the lid to be screwed down.

Brake air cylinders

Secure eight 3/4" flanged wheels face to face with 1" rods. Use part #825a (thin strip reverse angle brackets) (Fig 10c) secured to the bosses of the 3/4" flanged wheels. The reverse angle brackets are then bolted to the underside of the chassis.

Seats

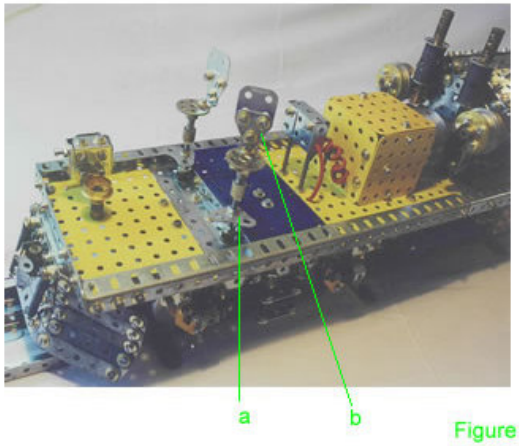

Figure 11

A corner bracket (p#133a) is bolted 3/4" the way up a 2" threaded rod (Fig 11a). Two nuts are lock nutted at the bottom and it pivots through a crank bolted to the cabin floor. Two nuts lock nutted underneath allow it to rotate. The threaded rod bolts into a threaded rod adapter. Place a spring over the exposed rod of the adaptor and bolt a small bush wheel onto the end. A 1" flat girder and triangular plate (Fig 11b), part number 76, make up the rest of the seat with a 1/2" bracket bolting it to the 1" 6 hole bush wheel (p#518).

Toilet

Bolt two 2" angle brackets into a U girder. Bolt 2" flat girders to the outside. Bolt another 2" angle girders on the other side and another 2" angle girder across the top. Below, bolt a triangular plate (p#77). A 1/2" bolt passes through the bottom hole of the triangular plate and lock nuts into the boss of the 3/4" wheel flange. A 1 1/8" bolt bolts the toilet to the chassis spaced by two collars.

Body

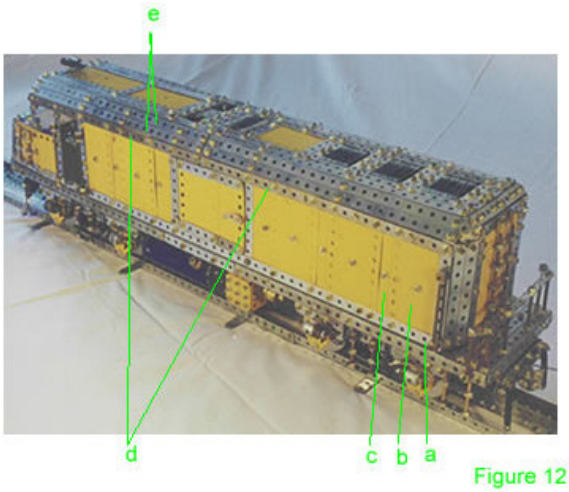

Figure 12

Starting from the rear, bolt a 4 1/2" strip, 2 1/2" x 4 1/2" plate and an obtuse angle bracket to the end round hole of a 24 1/2" angle girder (Fig 12a). Next to the 2 1/2" x 4 1/2" plate (Fig 12b), bolt on another 2 1/2" x 4 1/2" plate (Fig 12c) overlapped by two holes. Bolt six plates together like this up to the 20th hole. Bolt a vertical 4 1/2" strip to the 20th hole. Skip eight holes and bolt a 4 1/2" strip and another 2 1/2" x 4 1/2" plate. Bolt four together up to the 42nd hole. Bolt a vertical 4 1/2" strip to the 42nd hole. Skip three holes and bolt a 2 1/2" x 4 1/2" plate (Fig 14a) sideways with a 2 1/2" strip over the plate's oval holes. Butt join a 3" angle girder to the 24 1/2" girder using a 2 1/2" strip inside the plate. Across the top of the side-plates, butt join two 12 1/2" strips (Fig 12d) with a 2 1/2" strip. The top of the roof is curved in using butt joined 12 1/2" strips (Fig 12e). They are placed using regularly spaced obtuse angle brackets and fishplates.

The rear is made up from three 2 1/2" x 3 1/2" plates overlapping each other to form a 5" x 3 1/2" plate. 3 1/2" strips and 4 1/2" strips form the ends. Next the two sides are joined together with the rear end. On each side of the rear plate, two 4 1/2" strips (Fig 13a) are bolted together with obtuse angle brackets and fishplates top and bottom. The 3 1/2" strip (Fig 13b) across the top of the composite 5" x 3 1/2" plate has obtuse angle brackets and fishplates as fillers on its ends.

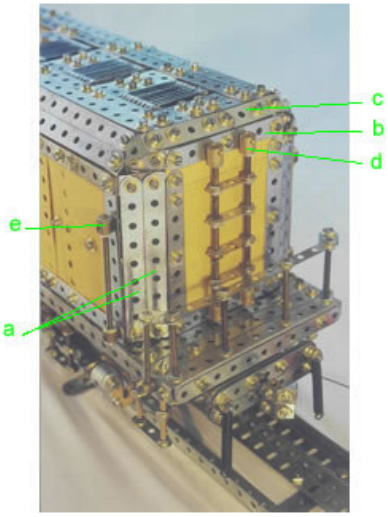

Figure 13

Using obtuse angle brackets, bolt a composite 4" strip (Fig 13c) from 2 x 2 1/2" strips with obtuse angle brackets on the ends. Using 4 1/2" threaded rods and threaded bosses (Fig 13d) as anchors, form a ladder with four 1/2" narrow strips. At the rear, on each side, form a handrail support using collars (Fig 13e) and 3 1/2" threaded rods locknutted on.

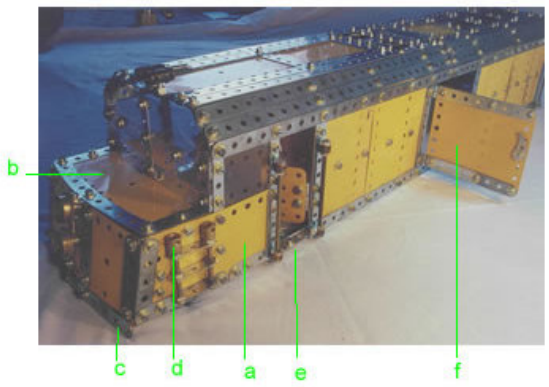

Figure 14

Join the front with a 2 1/2" x 5 1/2" plate (Fig 14b) forming the bonnet. It must line up with the front edge of the sideways 2 1/2" x 4 1/2" plates. Bolt a curved 5 1/2" strip across the front of the top plate. The front is made up from a 2 1/2" x 5 1/2" plate (curved slightly).Bolt a 5 1/2" strip (Fig 14c) across the bottom, spaced one hole down with fishplates. Use 2 1/2" strips on the edges of the bonnet plate, side plates and front plate to neaten up. Bolt 3/4" flanged wheels to the front as lights. I placed LED lights in mine, wired up to the battery box used to power the motor for the fans.

One hole from the front, using threaded bosses (Fig 14d) at the top end, 2" threaded rods create a ladder with two 2 1/2" narrow strips. The side windows are 1 1/2" x 2 1/2" clear plates, held in a frame made of 2 1/2" narrow strips bolted to the 12 1/2" strip and 2 1/2" x 4 1/2" plate. The driver doors are two 1 1/2" x 1 1/2" plates bolted together to form a 2" x 1 1/2" plate. Two hinges hold the doors on.

A step is made from angle brackets and a 1 1/2" strip (Fig 14e). Handrail supports on either side of the door are made up with collars and 3 1/2" threaded rods locknutted to the rods.

The front window is made of two 1 1/2" x 5 1/2" clear plates joined to each other to form a 2 1/2" x 5 1/2" plate (or you could use a 2 1/2" x 5 1/2" clear plate).

A center 2 1/2" narrow strip and angle bracket secures the middle, with angle brackets holding on the ends. The top is curved into the body a bit.

The access doors are made up from two 2 1/2" x 3 1/2" plates together to form a 4" plate (Fig 14f). 2 1/2" strips across the top and bottom neaten up the holes. A latch is made up from a cam, locknutted to a 1" narrow strip on the other side. The door is held on with two hinges.

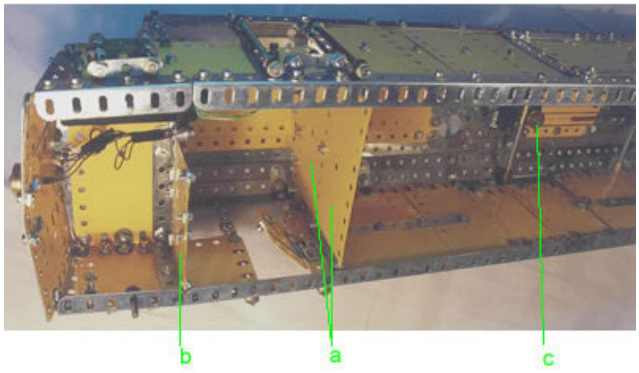

Figure 15

The driver cab partition is made up with two 2 1/2" x 5 1/2" plates (Fig 15a) bolted on with angle brackets. 4 1/2" strips on the sides neaten up the holes.

The front of the cab has a divider under the bonnet. It is a 3 1/2" x 2 1/2" (Fig 15b) plate with 2 1/2" strips to neaten the holes. Use angle brackets to attach it to the edge of the 2 1/2" x 5 1/2" plate (bonnet). The 2" gap allows finger access to the battery box to switch the fans on and off.

Roof

Starting from the front, the roof is made up as follows:

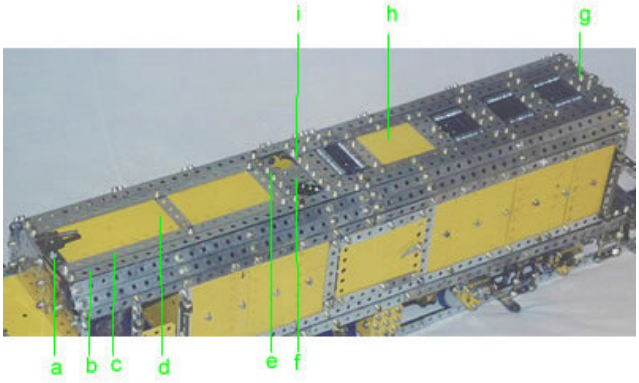

Figure 16

Two 2 1/2" strips form a 4" strip (Fig 16a) across the top. From the ends of the 4" strip, 12 1/2" strips (Fig 16b) are bolted, then 9 1/2" strips (Fig16c) and two 2 1/2" x 5 1/2" plates side by side overlapped by 4 holes. A further two 2 1/2" x 5 1/2" plates are bolted in to form a 3" x 10" plate (Fig 16d). At the end (20th hole) bolt two 2 1/2" strips to form a 4" strip (Fig 16e). Skip two holes and bolt another 4" composite strip. Across the middle of the gap, bolt two 2" strips (Fig 16f). Bolt fishplates in to fill in the corner of the holes slightly. This forms the exhaust holes.

At the rear, bolt on a composite 4" strip (Fig 16g). On either side, bolt on two 12 1/2" strips. Where they meet in the middle, butt join them with 2 1/2" strips underneath.

From the rear, next to the 4" strip, bolt a 3" strip, skip three holes and bolt in two 3" strips.

Skip three holes, bolt in two 3" strips. Skip another three holes and bolt in two 3" strips. Under the last 3" strip, bolt in two 3 1/2" plates (Fig 16h) overlapped. Use a 3" strip on the end.

Skip three holes and bolt on another 3" strip. You should meet the 4" composite strip (Fig 16i).

The rear radiator is made up from two 3" threaded rods passing through the end holes of nine 2" narrow strips equally spaced with washers. The radiator is clamped to the underneath of the roof with 2" strips holding onto the threaded rods.

For the next two radiators, 2" narrow strips are bolted to two 6" threaded rods. Each radiator comprises of nine 2" narrow strips equally spaced by washers. 2" strips clamp the ends of the 6" rods to the underside of the roof.

The middle radiator is made up from two 3" threaded rods passing through the end holes of thirteen equally spaced 1 1/2" narrow strips. It is clamped on sideways with fishplates.

The Fans

From the rear, bolt rod sockets (Fig 17a) on either side in the 4th, 9th, 14th and 25th holes of the topside 12 1/2" strips.

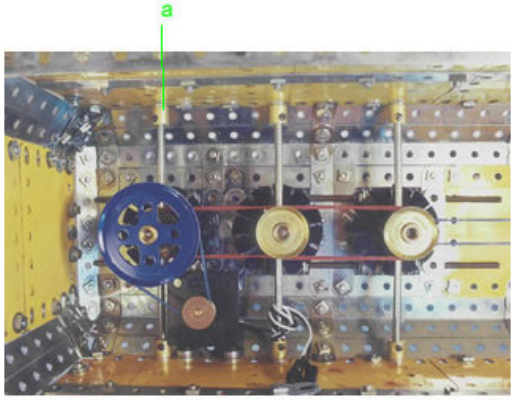

Figure 17

Clamp 2" rods in the sockets joined in the middle with couplings. The middle hole of the coupling forms the bearing for the fan to run in. Use 1 1/2" rods to mount the fan and pulleys.

The rear fan has a 1" pulley and a 2" pulley on the 1 1/2" rod. The next has two 1" pulleys, the third a 1/2" and 1" pulley. The foremost fan (Fig 15c) has a 1/2" pulley.

Bolt a MO motor to the side of the body in the top 12 1/2" strip, spaced away with washers. The motor carries a 1/2" pulley. I used elastics to join the pulleys.

You may have to bend the fins of the fans down slightly to stop them knocking against the radiators.

The 3 Volt battery box is bolted to the side plate at the front. This makes it possible to switch the fans on and off easily.

Miscellaneous

At the front, across the top of the body, use two threaded pins on couplings with 1" rods in them to simulate the horns.

On the inside of the body, bolt 9 1/2" strips to the middle holes of the side plates to keep them pressed neatly together. Use a 5 1/2" strips for the front side plates.

Use collars to clamp 1" rods to the bottom as locating pins when joining the body to the chassis. Use couplings bolted in the chassis U girder to keep the two halves from floating in the oval holes.