

MODEL OF THE MONTH:

Mechanical Excavator

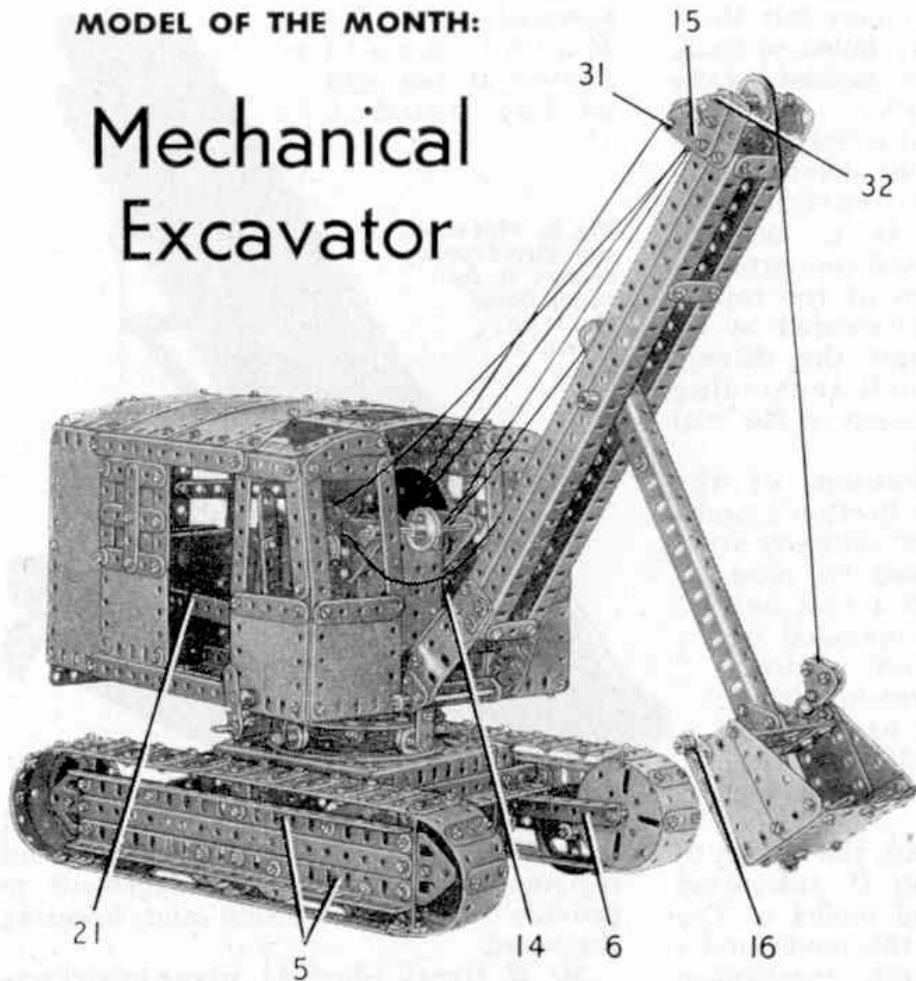
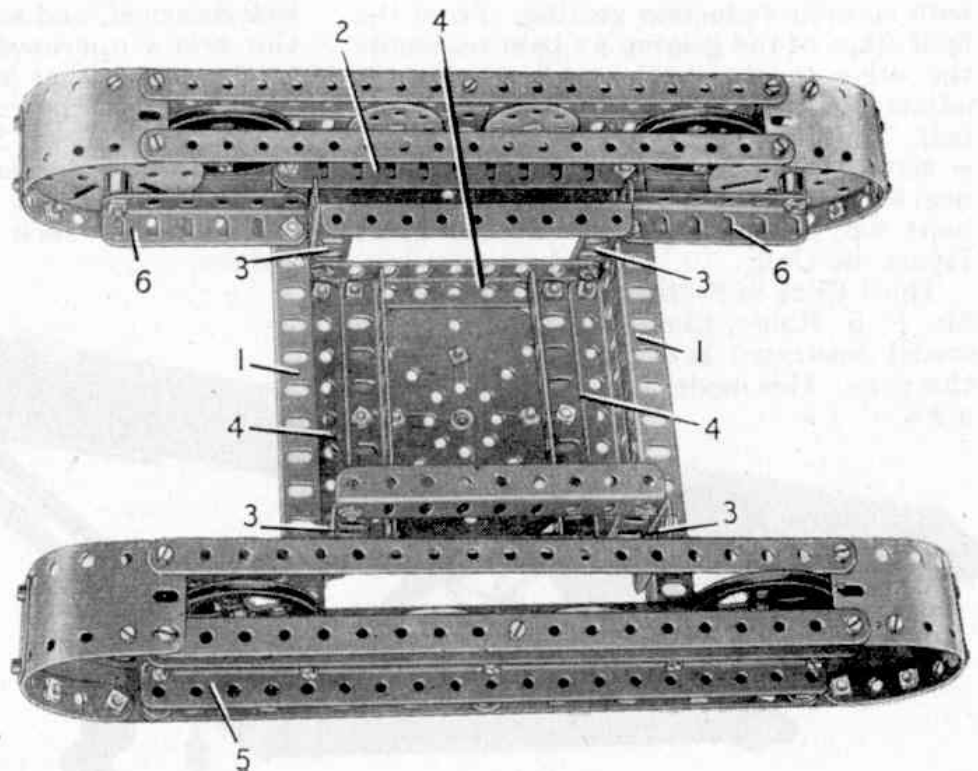


Fig. 1. Full constructional details and a list of the parts required to build this splendid model Excavator can be obtained from the Editor.

MACHINES of many different kinds are available to modern engineers and contractors to speed up site clearing and excavating operations. Excavators that will remove tons of spoil at a time, bulldozers that push aside obstacles and level the ground with apparent ease—these machines and many more are to be found at work on sites all over the world.

It is fascinating to watch these machines in

Fig. 2. A detail view of the Excavator undercarriage, showing the assembly of the track units,



operation, and most model-builders no doubt have stopped to follow the movements of an excavator as its bucket bit into the ground, and then swung round to empty its load of spoil into a waiting lorry or a dumper truck. Indeed, an excavator with its interesting movements and sturdy construction, makes an ideal subject for experienced model-builders, and this month we have chosen a typical one as our Model of the Month.

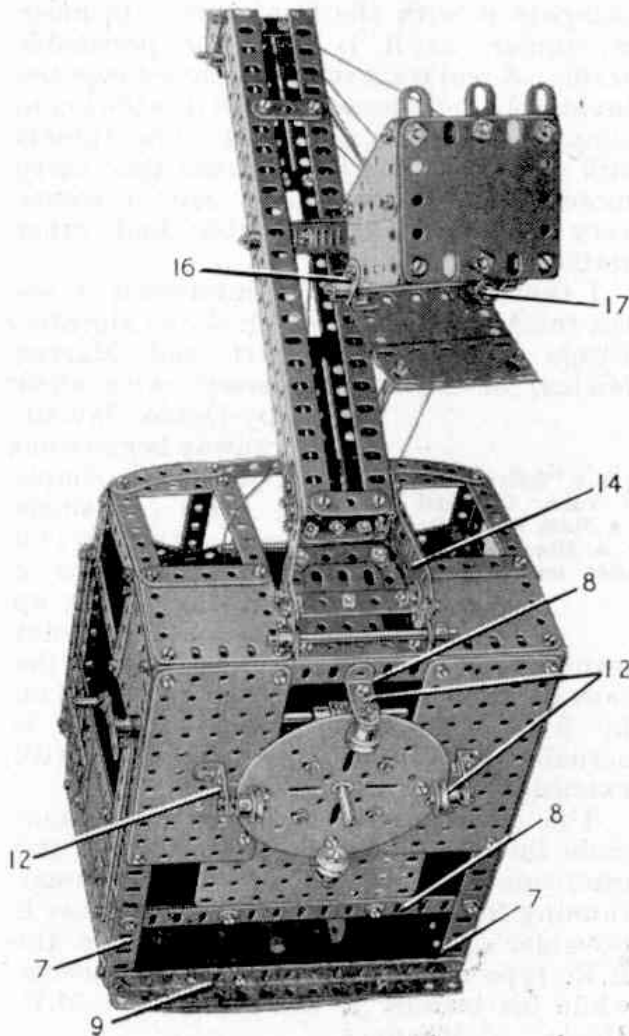
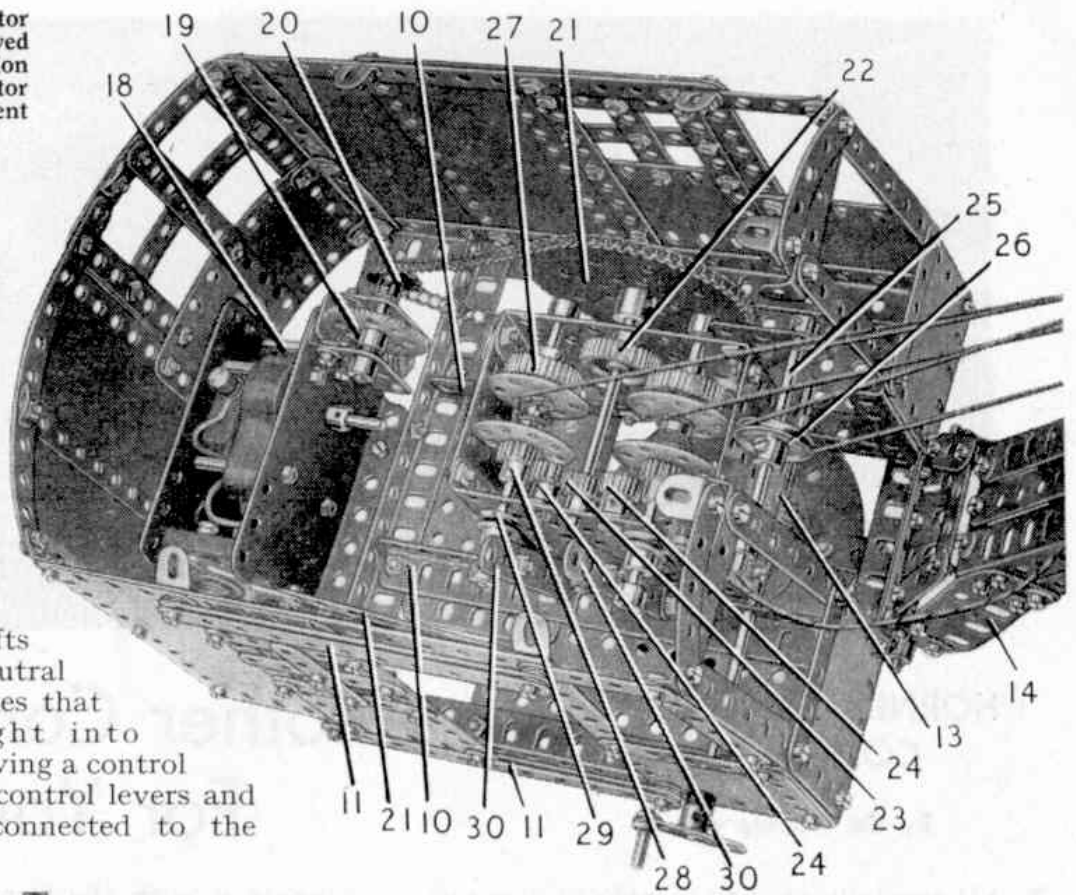
The Meccano model follows the original closely in its sturdy construction, with Angle Girders playing a big part in the design. In order to simplify it as much as possible the creeper tracks are represented by Flexible Plates and Strips, and the model is mounted

on wheels concealed in the track assemblies.

An E20R (S) Electric Motor is mounted in the cab and this provides power for raising and lowering the jib and for

Fig. 3. The Excavator with the roof removed to show the position of the Electric Motor and the arrangement of the gear-box.

operating the digging movement of the bucket. These two power-operated movements are controlled through a simple gear-box with two winding shafts. Each of these shafts has forward, neutral and reverse drives that can be brought into operation by moving a control lever. The two control levers and a third lever connected to the



Motor switch are grouped together, and can be reached easily through a sliding door at one side of the cab. A Cord that operates a simple catch on the bucket also is led into the cab. When this catch is disengaged a hinged flap fitted to the bucket is released and allows the spoil to be discharged. The slewing or rotating movement of the cab and jib is manually controlled.

The construction of the model can be divided into four convenient sections. First the undercarriage or base should be assembled, followed by the construction of the cab and its roller bearing. The next stage should be the assembly of the jib and the bucket with its supporting arm, and finally the Motor unit and the gear-box should be built and fitted in the cab.

If you would like to build this attractive working model, send a letter to the Editor mentioning "Model of the Month—Excavator." Full constructional details and a list of the parts required to build the model will then be sent to you free of charge. Please enclose a 1½d. stamp to cover postage.

Fig. 4. This underneath view of the Excavator superstructure shows the roller bearing and the digger bucket in detail.

MODEL OF THE MONTHEXCAVATORAssembly of the Undercarriage.

The Undercarriage is shown separately in Fig. 2. The centre section is made by bolting two $7\frac{1}{2}$ " Angle Girders 1 between two $5\frac{1}{2}$ " Angle Girders, one of which is indicated at 2. Four vertical $2\frac{1}{2}$ " Angle Girders 3 are fixed to the Girders 1 and these four Girders are connected at their upper ends by four $4\frac{1}{2}$ " Angle Girders 4. The lower ends of the Girders 3 on each side are connected by further $4\frac{1}{2}$ " Angle Girders.

A 4" Circular Plate, with a Face Plate fixed centrally to it, is bolted to two $4\frac{1}{2}$ " Angle Girders supported by two of the Girders 4.

Each of the track assemblies is made by connecting two $9\frac{1}{2}$ " Angle Girders 5 and a $9\frac{1}{2}$ " Strip at each end to a Flat Trunnion. A $2\frac{1}{2}$ " x $1\frac{1}{2}$ " Double Angle Strip is fixed vertically at each end of the Girders 5 and a third Double Angle Strip is attached similarly to the centres of the Girders. The parts used to represent the creeper track are attached to the lugs of the three Double Angle Strips. The track is built up from four $5\frac{1}{2}$ " x $1\frac{1}{2}$ " Flexible Plates and two $9\frac{1}{2}$ " Strips, with further $9\frac{1}{2}$ " Strips bolted to the edges of the Plates for strengthening purposes. A series of $1\frac{1}{2}$ " Strips fixed across the Plates represent the track sections.

The track assemblies are fixed in place by bolting them to the Girders 2. Four 3" Angle Girders 6 are bolted to the Girders 1, and to each of these a 2" Sprocket and a Face Plate are attached by a $1\frac{1}{2}$ " Bolt. Two Wheel Discs are bolted to the lower one of the Girders 5 on each side, and two 2" Pulleys are mounted freely on $\frac{3}{4}$ " Bolts attached to the same Girder by two nuts each.

Details of the Cab.

The base of the cab is formed by two $9\frac{1}{2}$ " Angle Girders 7 connected by three $7\frac{1}{2}$ " Angle Girders indicated at 8 and 9. Two $7\frac{1}{2}$ " Angle Girders 10 are fixed between the Girders 8 (Fig. 3), and a $4\frac{1}{2}$ " x $2\frac{1}{2}$ " and two $5\frac{1}{2}$ " x $2\frac{1}{2}$ " Flat Plates are fixed to these Girders.

Each side of the cab consists of a $2\frac{1}{2}$ " x $2\frac{1}{2}$ " and two $5\frac{1}{2}$ " x $2\frac{1}{2}$ " Flexible Plates strengthened by Strips, with further Strips used to represent the window frame. The sliding door (Fig. 1) is made by bolting a $2\frac{1}{2}$ " x $2\frac{1}{2}$ " Flexible Plate and $2\frac{1}{2}$ " Strips to two vertical $5\frac{1}{2}$ " Strips. The ends of the $5\frac{1}{2}$ " Strips are arranged between pairs of $5\frac{1}{2}$ " Strips 11 that form guides. Each pair consists of two $5\frac{1}{2}$ " Strips spaced by Washers on $\frac{5}{8}$ " Bolts, with further Washers between the Strips and the side of the cab. On the side opposite to the one seen in Fig. 1 the door constructed similarly but it is fixed in place and does not open.

The rear of the cab is made from two $5\frac{1}{2}$ " x $2\frac{1}{2}$ " Flexible Plates and two $2\frac{1}{2}$ " x $2\frac{1}{2}$ " Flexible Plates, with Strips used to make the window frame. The back is attached to the sides by Obtuse Angle Brackets. Each side of the front of the cab is made by bolting a $2\frac{1}{2}$ " x $2\frac{1}{2}$ " Flexible Plate and two $3\frac{1}{2}$ " Strips to $2\frac{1}{2}$ " Angle Girders, which are fixed to the front one of the Girders 8. The $3\frac{1}{2}$ " Strips are connected at their upper ends by a $2\frac{1}{2}$ " x $1\frac{1}{2}$ " Double Angle Strip and a $2\frac{1}{2}$ " Curved Strip.

At this stage the roof of the cab can be made, but it should not be bolted in place until the mechanism is installed. The main section of the roof consists of six $4\frac{1}{2}$ " x $2\frac{1}{2}$ " Flexible Plates bolted together in pairs, with two $2\frac{1}{2}$ " x $1\frac{1}{2}$ " Flexible Plates and two $2\frac{1}{2}$ " x 2" Triangular Flexible Plates arranged to cover the rounded section of the rear. The front section of the roof consists of Strips arranged as seen

in Fig. 1. When the model is completed the roof is attached to the sides, rear and front of the cab by Angle Brackets and Obtuse Angle Brackets.

Details of the Roller Bearing (Fig. 4).

Each roller of the bearing unit is a $\frac{1}{2}$ " fixed Pulley that is free to turn on a $\frac{3}{4}$ " Bolt held by two nuts in a 1" x $\frac{1}{2}$ " Angle Bracket 12. These Angle Brackets are bolted to the base of the cab and to them are fixed further 1" x $\frac{1}{2}$ " Angle Bracket that support a 4" Circular Plate. It should be noted that the $\frac{1}{2}$ " Pulleys must not touch this Circular Plate, which has a Face Plate bolted to it.

A 57-tooth Gear is fixed to one end of a 2" Rod, with a Collar approximately $\frac{1}{4}$ " below the Gear. The Rod is passed through the Face Plate attached to the cab section of the bearing, and is fixed in the Face Plate bolted to the undercarriage. The cab can be turned or slewed by means of a handle formed by a threaded Pin in a Double Arm Crank. The Double Arm Crank is fixed on a $6\frac{1}{2}$ " Rod mounted in the Girders 10 and held in place by a Collar. A Worm 13 on the Rod engages the 57-tooth Gear.

The Jib, Bucket Arm and the Bucket.

Each side of the jib consists of two $12\frac{1}{2}$ " Angle Girders joined by a 3" Flat Girder 14 and a $1\frac{1}{2}$ " Flat Girder that supports a $1\frac{1}{2}$ " Corner Bracket 15. The Sides are connected as shown by $1\frac{1}{2}$ " Strips, and the Flat Girders 14 are bent slightly so that a $2\frac{1}{2}$ " x $\frac{1}{2}$ " Double Angle Strip can be fitted between their lower ends. A 2" Flat Girder is supported by two $1\frac{1}{2}$ " Strips bolted to the Double Angle Strip, and a 1" Triangular Plate is fixed to each of the Flat Girders 14. The jib pivots on a $3\frac{1}{2}$ " Rod passed through the Triangular Plates and through the lugs on a $2\frac{1}{2}$ " x $\frac{1}{2}$ " Double Angle Strip bolted to the front of the Cab.

The bucket arm is formed by two $9\frac{1}{2}$ " Angle Girders and it pivots on a $2\frac{1}{2}$ " Rod held in the jib by Collars. A 1" Triangular Plate is bolted to each side of the arm and two ^{Double} Brackets are fixed to the Triangular Plates and to a $2\frac{1}{2}$ " Flat Girder, which is attached to $1\frac{1}{2}$ " Angle Girders bolted to the sides of the bucket. Each side is made from a $2\frac{1}{2}$ " x $1\frac{1}{2}$ " Flexible Plate and a $2\frac{1}{2}$ " x $1\frac{1}{2}$ " Triangular Flexible Plate. The base of the bucket is a $2\frac{1}{2}$ " x $2\frac{1}{2}$ " Flexible Plate attached to $2\frac{1}{2}$ " Angle Girders bolted to the sides.

The hinged flap of the bucket is a $2\frac{1}{2}$ " x $2\frac{1}{2}$ " Flexible Plate extended downward one row of holes by a $2\frac{1}{2}$ " x $1\frac{1}{2}$ " Flexible Plate. A $2\frac{1}{2}$ " x $\frac{1}{2}$ " Double Angle Strip is bolted to the upper edge of the flap, and a $3\frac{1}{2}$ " rod is passed through the lugs of this Double Angle Strip and through the slotted holes of Fishplates 16. Normally the lower edge of the flap engages in front of a bolt 17, which is fixed by a nut in a Fishplate bolted to the base. To release the flap for unloading the bucket, it is raised in the slotted holes in the Fishplates 16 until its edge clears the bolt 17. The flap is raised by means of a Cord fastened inside the cab, passed round the Rod on which the bucket arm pivots, and tied to the $3\frac{1}{2}$ " Rod mounted in Fishplate 16.

The Motor and Gear Box.

An E20R(S) Electric Motor is bolted to one of the Girders 8 and is connected to the Girder 9 by a $\frac{1}{2}$ " Reversed Angle Bracket. A $\frac{1}{2}$ " Pinion on the armature shaft drives a 57-tooth Gear on a 4" Rod 18, mounted in the Motor side Plates. A 57-tooth Gear 19 is fixed on a 2" Rod supported in $1\frac{1}{2}$ " Flat Girders bolted to 1" Angle Girders fixed to the Motor, and this Rod carries also a $\frac{3}{4}$ " Sprocket 20. The Motor control switch is extended by a $4\frac{1}{2}$ " Strip 21.

The gear-box housing is formed two $5\frac{1}{2}$ " x $2\frac{1}{2}$ " Flanged Plates connected by two $2\frac{1}{2}$ " x $2\frac{1}{2}$ " Flat Plates, and it is supported by four $1\frac{1}{2}$ " Strips bolted to the Girders 10. A 3" Sprocket 21 is fixed on a 4" Rod that carries a 1" Gear 22 and a $\frac{1}{2}$ " Pinion 23, and the Sprocket is connected by Chain to the $\frac{3}{4}$ " Sprocket 20. The Pinion drives two $\frac{1}{2}$ " Pinions 24, each of which is mounted freely on a $\frac{3}{4}$ " Bolt fixed in the housing by two nuts. Two $1\frac{1}{2}$ " Corner Brackets are bolted to the housing and these support a Rod 25 that carries a 1" Pulley 26.

The two winding drum shafts are identical in design and in operation. Each consists of a 4" Rod fitted with a 1" Gear 27, a $\frac{1}{2}$ " Pinion 28, a $\frac{1}{2}$ " Pulley 29 and a winding drum formed by two Bush Wheels placed with their bosses together. By sliding the shaft in its bearings the Gears 27 and 22 can be brought into mesh, or the Pinions 28 and 24 can be engaged to reverse the direction of the drive. The sliding movement of the shaft is controlled by a $3\frac{1}{2}$ " Strip 30 that is lock-nutted to one lug of a $1\frac{1}{2}$ " x $\frac{1}{2}$ " Double Strip bolted to the gear-box housing. A $\frac{3}{8}$ " Bolt held in the Strip by two nuts engages between the Pulley 29 and a Collar on the shaft. A light braking effect is maintained by a $2\frac{1}{2}$ " Driving Band passed round Pulley 29 and looped over a $\frac{3}{8}$ " Bolt fixed in the housing.

Arrangements of the Cords.

A length of Cord tied to the drum on the front winding shaft is passed round a 1" Pulley on a $2\frac{1}{2}$ " Rod 31, round the Pulley 26 and round a second 1" Pulley on Rod 31. This Cord finally is tied to the Rod 25. A length of Cord fastened to the second drum is passed over a 1" Pulley on a $2\frac{1}{2}$ " Rod 32, and is tied to one of three Bolts used to join together two 1" Triangular Plates. A small Loaded Hook is pivoted on another of these Bolts and is attached to the bucket.

Parts required to build the Excavator:

| | | | |
|-------------|-------------|--------------|---------------------------|
| 8 of No. 1a | 4 of No. 12 | 62 of No. 38 | 6 of No. 109 |
| 2 " " 1b ✓ | 8 " " 12b | 2 " " 40 | 10 " " 111 |
| 15 " " 2 | 12 " " 12c | 1 " " 48 | 10 " " 111c |
| 11 " " 2a | 1 " " 14 | 10 " " 48a | 4 " " 111d |
| 13 " " 3 | 3 " " 15b | 2 " " 53 | 1 " " 115 |
| 4 " " 4 | 2 " " 16 | 1 " " 53a | 1 " " 125 |
| 12 " " 5 | 3 " " 16a | 1 " " 57c | 4 " " 126a |
| 5 " " 6 | 2 " " 17 | 13 " " 59 | 4 " " 133 |
| 39 " " 6a | 4 " " 20a | 1 " " 62b | 2 " " 133a |
| 4 " " 8 | 3 " " 22 | 2 " " 70 | 2 " " 146a |
| 8 " " 8a | 1 " " 22a | 4 " " 77 | 2 " " 186 |
| 7 " " 8b | 6 " " 23a | 2 " " 90 | 5 " " 188 |
| 2 " " 9 | 4 " " 24 | 1 " " 94 | 8 " " 189 |
| 6 " " 9a | 4 " " 24a | 4 " " 95 | 10 " " 190 |
| 1 " " 9b | 6 " " 26 | 1 " " 95b | 6 " " 191 |
| 4 " " 9c | 3 " " 27a | 1 " " 96a | 6 " " 192 |
| 10 " " 9d | 3 " " 31 | 2 " " 103e | 4 " " 221 |
| 4 " " 9f | 1 " " 32 | 1 " " 103f | 2 " " 222 |
| 6 " " 10 | 395 " " 37a | 1 " " 103g | 1 E20R(S) Electric Motor. |
| 2 " " 11 | 438 " " 37b | 4 " " 103h | |