

**FAC** This was the post-WW2 Swedish system that was primarily aimed at industry, although two small 'toy' sets were produced in the early days. FAC first appeared in 1952 and seems to have continued into the early 1980s. This account is based on various items of literature and photos, including some early material from Chris Freeman, manuals from Geoff Wright, and a large set that Colin Reed lent me for an extended period, so that I was able to get to know the parts and make some models. Thank you to all three. The set dates from before the introduction of the '1964' parts (see below), but some of the improved Gears, and a few other later parts had been added to it.

Before launching into detail, a preliminary sketch of FAC. Structures are made using 4mm Rods or Beams (opposite, essentially 2 Rods at 14mm centres joined by a web containing long slotted holes), or often a mix of both. They are held together by the range of Clamps opposite - some called Clamps, some Couplers, and some Clips).

The basic spacing of the Rods is 7mm centres, chosen because it just gives room for the M3 Bolts to pass between 2 Rods, but holes are more usually at 14mm centres.

Frames can be spaced apart using Rods or Beams but Threaded Rods are also widely used. These are 4mm Rods with each end turned down over 10mm and threaded M3.

Another element is the 2.5mm Ø Tie Rod (opposite), which is often used as cross bracing in frameworks. A neat structure can be made with frames made entirely of Tie Rods with Threaded Rods as cross members.

Fully perforated Plates with rows of slots like those in the Beams, spaced apart at 7mm, but with alternate rows staggered, can act as bases for structures, mechanisms, or subassemblies.

Both 4 & 6mm Shafts are used, and they run in special journals, both brass and ball bearings. In addition there are 6mm Tubular Shafts, and Grooved Shafts to allow Gears, etc to slide along them.

Among the many mechanical parts is a wide range of Gears and Sprockets.

**HISTORY** The earliest literature, a manual for the Nr.1 Set, dates from 1952 or soon after, and a Price List from about then shows 110 parts, including all the basic structural components but with relatively few mechanical items, and no Plates or large circular pieces. Manuals for Sets 1 & 2 are listed, but no other sets are mentioned. This is rather surprising as the 1 & 2 are toy sets, albeit technically oriented, but the parts in the List go beyond 'toy' items, with Rods of up to 2m long for instance. So were there 'industrial' outfits at this stage, or did industrial customers just buy parts as required?. Prices in the List are given for both single items and larger packs. Both the Manual and the List carry the name of the company, Mark Sylwan AB, Hornsgatan 89, Stockholm Sv.

By 1959 the system had grown to 158 parts and these are the ones shown in MCS/FB. 2 large industrial outfits, the X1 & X2, were available and as far as is known no toy sets were being made. Agents in 12 countries were listed in the manual, as well as a General Agent, Transitoria Trading Company AB, Kungsgatan 29, Stockholm C.

Transitoria is the only company mentioned in a 1964 manual but with a new address - Gjörwellsgatan 15, Stockholm K. Sylwan is credited as the inventor of the system and for preparing the manual. It is in 2 parts and is mostly entirely new, the revision being needed to reflect the major changes that had been made to the system. A few parts were discontinued, but many were improved, and many more were introduced, giving a total of 214. The sets were changed too and now there were three, with a Standard, a Structural & a Gear Kit. Listed on the back cover of the second part are the patent numbers in 14 countries.

A 1965 UK Price List shows all the 1964 manual parts but has been amended in ink, 'Valid from 1/1/70', to show a some changes in the contents of the sets & the deletion of a

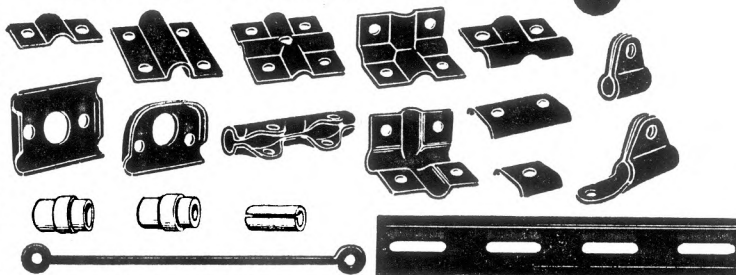
few parts. It was from Technical Prototypes Co., 535 Bradford Road, Huddersfield, whereas the agent in 1959 had been Weyco (Sales) Ltd., 19-20 Dames Road, London E.7.

The first part of a 1975 manual is identical to the 1964 one, but is under the name of FAC Systems AB, Floravägen 6, S-80228 Gävle, Sweden, and Sylwan isn't mentioned. The second part, which lists all the parts, isn't available.

## FAC in about 1953

**The Parts** The range of parts comprised:

- The 13 Clamps shown below.



- 4mm Rods in 19 lengths from 18 to 386mm, plus 500, 1000 & 2000mm.

- 4mm Threaded Rods in 7 lengths, from 30 to 90mm o/a.

- 8 Tie Rods (above) made from 2½mm rod, with formed eye ends (like PRIMUS), at 18.5 to 170mm centres.

- 6mm Ø Shafts, 68, 120 & 180mm long.

- 14 Beams (above) from 23 to 386mm long (1 to 14 slots). Later ones were rolled but none are known from this time.

- 4 & 6mm bore Bushings, shown above under the Clamps with the large centre hole. A pair of either of the latter hold either of the Bushings, and clamp onto 4mm Rods.

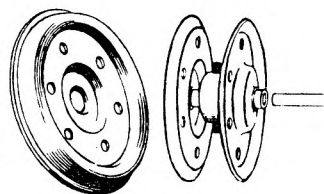
- A 12mm long, 6mm o.d. Split Sleeve, 4mm i.d. (above, to the right of the Bushings). This can be used in any part with a 6mm bore to allow it to be held to a 4mm Shaft.

- 4 & 6mm bore Collars. 6mm o.d. Sleeves, 5, 12 & 20mm long, bored 4mm. These can also be used as bearings when held between suitable Clamps. A 2mm wide Spacer for 6mm Shafts, 8mm o.d.

- A 46mm Ø, 6mm bore Bush Wheel with a 6-hole disc, 2mm thick. 111

- A 4mm bore, 16mm Loose Pulley.

- A 42mm Half Pulley with a 6mm centre hole. A pair bolted together (opposite, right) can be held to the Shaft by a 6mm bore Collar between them. On a 4mm Shaft a Split Bush is used inside the Collar.



- A 54mm Flanged Disc (above). It can be bolted to the Bush Wheel, or the Half pulley.

- A Tyre to fit the Half Pulley, and another, 104mm o.d. for the Flanged Disc. Both are shown with FAC SWEDEN on the side walls.

- 7 Mod.0.7 Gears with 16,24,32,48,64,80 & 96t (12.6 to 68.6mm Ø), and all with a 3mm wide face. The smallest is bored 4mm and the others 6mm. Probably all are made of steel. The larger ones have 6 holes in the face. A steel 2-start Worm and brass Worm Wheel giving a 22:1 reduction. A small Bevel, and a pair giving a 3:1 ratio, all in brass.

- Cheeseheaded M3 Bolts, 6,8,12,19mm u/h, with 6mm o.d. Washers, and hex Nuts. 5mm long M3 Grub Screws. An Eye Bolt (opposite) with 12mm of thread. 4mm Ø Tapped Sleeves, 5.2 & 12.2mm long, tapped M3.

- A Crank Handle, 10cm long, with 90° bends; a 10x15mm Spring; a flat Hook (above with the Clamps); a black handled Screwdriver; a 2-ended Spanner, cranked at one end.

Bosses and Collars appear to be double-tapped across a diameter. 4mm Shafts aren't listed so presumably the 4mm Rods also served as axles.

**The Nr.1 Set** It is packed in a cardboard box which scales at 31\*23cm, and is divided by card partitioning into 16 areas, large and small. The lid is red with FAC in yellow

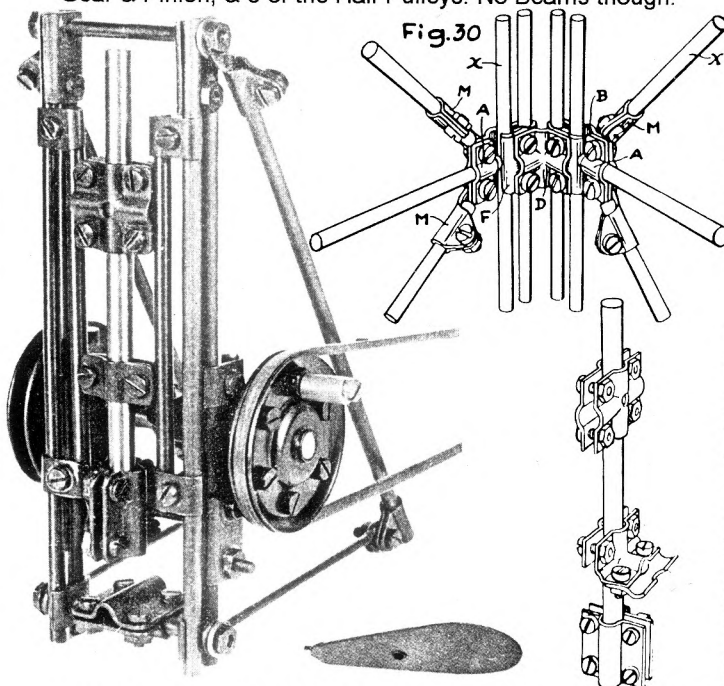
and large line drawings of a Crane and Motorcycle in white.

Details of the contents are given in MCS, and broadly consist of 48 Clamps, 30 4mm Rods up to 218mm long, 3 Threaded Rods, 6 Ties, 2x6mm Shafts, 17 Collars, Sleeves, etc, 4 Half Pulleys, 1x16mm Pulley, 2 Tyres, a Hook, a Crank Handle, & some 80 N&B. All the parts look black except the bright Tools & 6mm Shafts, and the brass Sleeves.

As well as a manual the set contains a card about the size of the box, with 3 Windmill Vanes & a Balance Scale printed on it. One Vane is shown by the Hammer below.

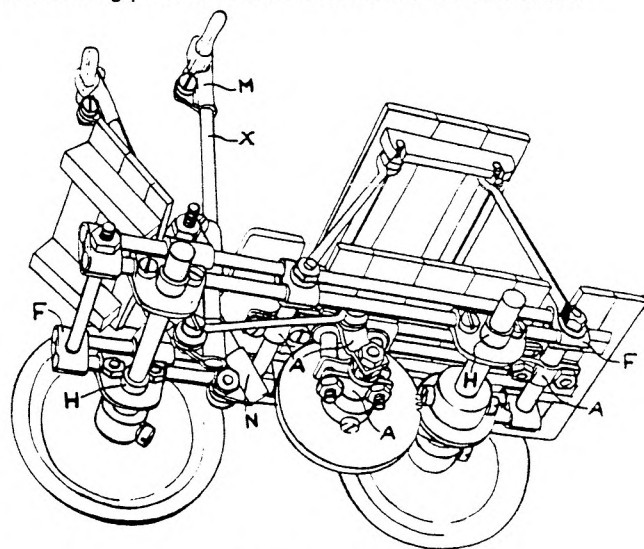
**The Nr.1 Manual** Including the covers, It has 24 unnumbered pages, 207\*144mm deep. The cover is shown in MCS and has a B&W photo of a small Crane, similar to the one on the lid, with FAC in red at top left, and under it KONSTRUKTIONER in small letters, the only time the name is used. On the back cover are reprints of 7 press reports on FAC, all from 1952 and the first dated April 26. Like the rest of the manual they are in Swedish.

The inside covers show some of the parts, the set contents, and some basic constructions - with 3 more pages of the latter following the Introduction. After that come 11 models, from a Skottkärra (single-wheel Barrow) to the Smideshammare (Trip Hammer) below left. For most a photo and a sketch or two, in many cases illustrating how to make good use of the parts. The models include a Telfer Span, a Winch, & a 3-Wheel Truck with a pivoting front wheel - all are fairly simple really but a child with a mechanical bent would probably find them interesting to make. However there might not be much scope for more ambitious models from the parts in the set. To show the way ahead a photo of a Hammerhead Crane made from a Nr.2 is included. It's still quite small but among the parts are a Gear & Pinion, & 8 of the Half Pulleys. No Beams though.



**The Patent** David Hobson kindly gave me a copy of the UK Patent, No.745129, in the name of Mark Christopher Sylwan, Swedish, of Kopmangatan 10, Stockholm. The application was made in May 1952, and the patent granted in 1956. The Beam is defined (without the later centre hole in the slots), and its importance stressed, but the figures relate mainly to structures made of Rods. Most of the Clamps already shown are used, including the 2 that can hold Bushings, to form bearings. It is said that the building system described could be used at full scale as well as for models. Much is made of the way that Clamps can be bolted one to another to allow, for example, the corner joint shown above (Fig.30). No mention is made of mechanical assemblies but to illustrate 'the versatility of the construction set', a working model of a lever-operated toy Railway

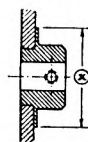
Trolley is shown (below), without any description. None of the decking parts are known from other FAC literature.



## FAC in 1959

**General Notes on the Parts** The thread is M3 and as most of the holes are intended to take Bolts of this size, they won't accommodate the smallest (4mm) Shafts used.

All parts are steel unless otherwise noted. Most bosses are steel and 14mm Ø, but unless the part is machined from the solid, each has a thin 21mm Ø (X in the illustration) flange which sits against the face of the part and allows other bolted on parts to locate on it and so run concentrically. The 1953 illustrations don't show this feature.

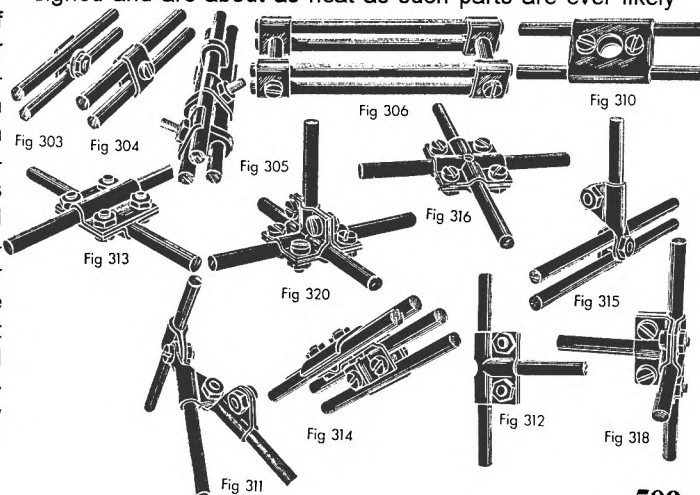


Another change is that bosses have 3 radial holes at 120°, 2 tapped for Grub Screws, and a pilot hole to allow the Shaft to be drilled, if required, to take a 1.7mm Roll Pin.

The only parts to have bosses are Gears and the Bush Wheel (called a Disc Hub). All the other circular parts are either attached to built-up hubs or sometimes, the Bush Wheel. Many of the circular parts are pierced with one or more rings of holes and there are usually 6, or multiples of 6, holes in each ring. The radii of the rings are multiples of 14mm, that is twice the basic 7mm module.

4 & 6mm Shafts are supplied and while some parts are in both sizes, many are bored only for 6mm, and inserts are provided to allow them to be used with the 4mm Shafts.

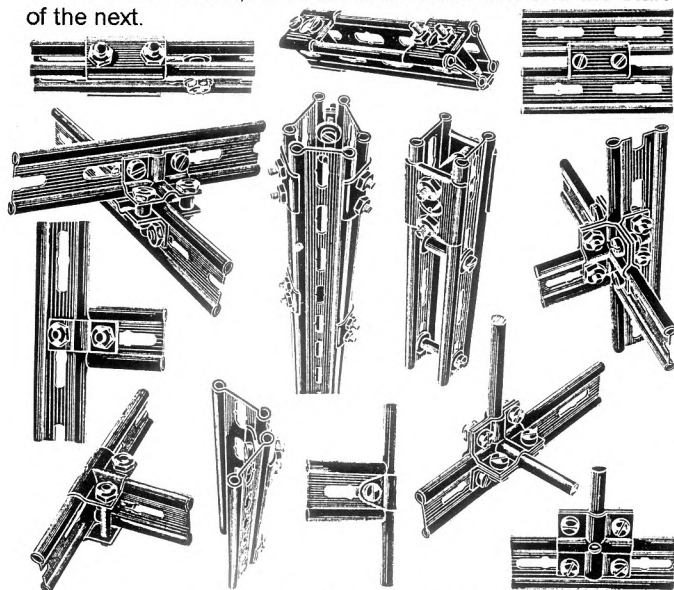
**Structures** The 4mm Rods are now in 8 lengths from 24 to 136mm, plus a 556mm one. (As with all parts the user is expected to cut to size as necessary.) 19 examples of joints are given in the manual and some are shown below. Notice the Inside and Outside Angles in Fig.318, and the Short Clamp used with a Washer (Fig.303), in pairs (Fig. 304), and to unite 3 Rods (Fig.305). The holes in the Clamps that have 2 N&B are at 14mm pitch. The pair used in Fig.310 are the 1953 type, but this part now has an elongated centre hole (PN L8-02). The Clamps are well designed and are about as neat as such parts are ever likely



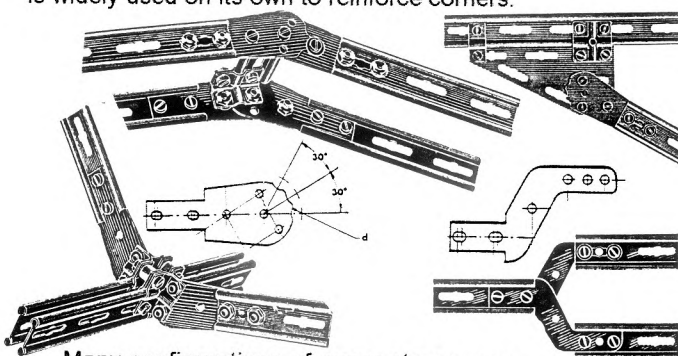


to be. They are made of 1mm thick steel and when the clamping Bolts are tightened up fully the joints are solid and strong. However although I didn't ever strip a thread, the degree of tightening needed sometimes felt excessive for the diameter of the Bolts.

Beams are rolled from .8mm steel and are very rigid. 20 lengths are now listed with the longest increased to 556mm (20 slots), and each slot has a 4mm hole in the middle to allow a Rod or Shaft to pass through. Some of the ways shown of joining the Beams and forming composite girders are reproduced below. Again it all works very well but a Clamp that is attached to a Beam by 2 Bolts can only be positioned at 14mm intervals along it, with the Bolts at either end of one slot, or at the end of one slot and the start of the next.



2 new parts are meant for use with the Beams to allow them to be offset and joined at an angle. They are shown below with some examples of the many ways in which they can be used. The notches at the end of the End Plate allow a pair to be locked together at 30° & 60° to each other. This part can also be used with a Triangular Plate, as below, to allow Beams to be joined at an angle. The Triangular Plate is widely used on its own to reinforce corners.

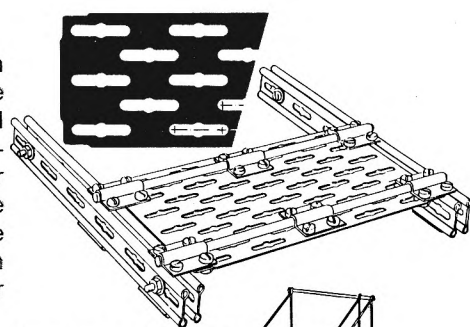


Many configurations of super strong members can be built up and one simple example using 2 Beams is shown opposite.

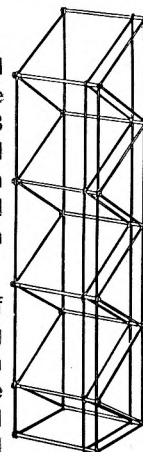
The Threaded Rods are very useful parts and a typical use has already been shown in Figs.306. The 2 lengths of Tapped Sleeve add greatly to their versatility, the short one reducing the outstanding length of thread on the end, and the long one covering it completely. Thus a Rod can be threaded at one end and plain at the other. It's all very versatile but the Sleeves are not that robust and a number in the Set were damaged in one way or another. The longer ones are also used to join Threaded Rods but they aren't really strong enough if the composite Rod is subject to much bending. 6mm o.d. plain Sleeves can be used over the Rods to reinforce them, as can Tubular Shafts which are available in longer lengths.

As already mentioned the Plates are fully perforated and 5 sizes are listed, from 38\*80mm to 136mm square. All are

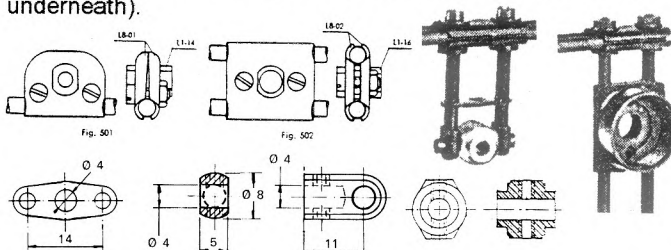
made in both 1 and .6mm thick steel. They can be used within structures and an example is shown opposite, with Rods used for stiffening. In addition there was a large Flanged Base Plate, 252mm square, often used as the foundation for frameworks.



The Tie Rod is now made from a length of rod with the ends stamped flat to accommodate the 3mm end holes. It is still listed in 10 lengths (19.8 to 158.4mm centres) but these have been revised to allow lattice structures to be made up based on isosceles triangles. They are most neatly fitted using Threaded Rods as cross members, as in the framework opposite.



**Bearings** There are now more than one type of plain bearing. Figs.501/2 below show the Bushing Clamps with the brass Bushing trapped between (but now modified to fit the elongated holes in the Clamps. An alternative is the newly introduced brass Shaft Head (either 4 or 6mm bore) bolted between 2 Eye Screws (below centre with the Head itself underneath).



The steel 3-Hole Link (above left) that is used to space the Rods in the Shaft Head bearing, has a 4mm centre hole and this provides a much simpler bearing by, for example, standing it off with spacers on one or both sides of the centre hole in a slot in a Beam. Also if long Bolts are used in the Bushing Clamps the Link can be fitted at their ends to act as a steady. There is no equivalent for 6mm Shafts.

Another part sometimes used as a 4mm bearing is the 5mm thick, brass, Rod End (above centre), which is double-tapped for Grub Screws to secure it on the end of a Rod.

A 19mm o.d. Ball Bearing with 6mm bore is provided, with a nylon Insert to allow use with 4mm Shafts. It pushes into a cast alloy housing (called a Ball Bearing Box), only 22\*23.5\*12.4mm deep, which has a plastic push-fit cover. The Box has tapped holes in its back face and can be clamped onto any pair of Rods at 14mm centres by a standard Bushing Clamp. An empty Box is shown above right. It's a splendid unit and there certainly ought to be a MECCANO equivalent.

**Circular Parts** The range of Pulleys has been extended but is still not extensive. In addition to the 16mm Loose Pulley there's a similar one bored 6mm which can be fixed by a Grub Screw running in from the bottom of the vee - it can of course be used with a Split Sleeve on 4mm shafts. Added to the 43mm Ø formed Half Pulley is a similar part but with 6 'spokes' pressed into it. The new Shaft Head can be clamped between a pair of either of these to provide a tapped boss. It's very neat but to relocate a Pulley fixed to a Shaft it has to be dismantled, the boss moved, and then the Pulley bolted up again. A Ball Bearing can also be clamped between the Half Pulleys.

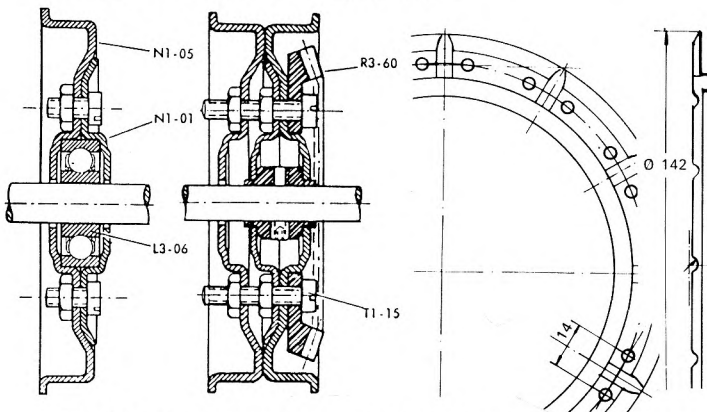
When used in pairs the 54mm Ø Flanged Disc and the (new) 88mm Ø Flanged Rim can take a flat belt of up to about 15mm wide (or provide a very small vee groove, but they were probably not intended to be used like that).

The 54mm Flanged Disc is the smallest part that can be used as a flanged wheel and it is shaped to allow a Half

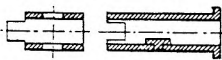
Pulley to be bolted to it, or more usually a pair with a Shaft Head or Ball Bearing between them. The 88mm Flanged Ring is bolted to a 63mm Ø flat Disc Web, which in turn is bolted to the (very heavy) Bush Wheel. (2 of the 6 holes in the face of the latter are now 4mm rather than 3mm to allow Shafts to pass through in certain applications.)

The other new circular parts are a 63mm Ø, dished, 3-spoke Hand Wheel, with a hole in the rim for a handle, and a Slewing Ring with 12 pairs of holes on a 126mm pcd. Its use isn't explained but it is probably meant to run on 16mm Pulleys. A drawing of a section of it is shown below, right.

Naturally it's possible to combine the circular parts in different ways, and other parts such as Gears can be bolted to them. Shown below are a simple flanged wheel with a Ball Bearing hub, and the same assembly but with a Shaft Head between the parts, and a second Flanged Disc bolted on one side and a Bevel on the other.



**Shafts** There are 4 types of Shaft: 4mm solid; 6mm solid; 6mm tubular, bored 4.1mm; and 4mm with a groove in it 2mm wide by 1.2mm deep. All are in 556mm lengths, to be cut as required. The range of brass Collars and Sleeves is similar to 1953 but additions are Fixed and Sliding Dogs (below) to carry Gears. The Sliding type has an internal key about 4mm long which engages the Grooved Shaft. There's also an M6 Lead Screw, a Lead Nut, and a 9mm Ø screw on End Fitting bored to provide a 4mm bush.

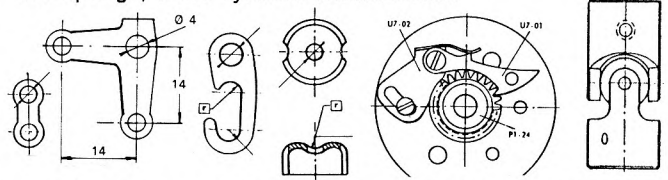


**Gears** The 7 steel, machine cut Spur Gears remain unchanged apart from the modified boss pattern. They are all shown with a 3mm wide face, but all three 16t ones in the Set are only 2½mm, and while one has the expected 3 holes in the boss, the second is double-, and the third single-tapped. Remnants from the early days? Most of the Gears do not mesh at centres which are multiples of 14mm, but because of the method of mounting the bearings, this isn't usually a disadvantage. Gears fastened to the Sliding Dog are moved by a short Rod which acts between the flange on the end of the Dog and the outer face of the Gear's boss. New Gears, both steel, are a 64t internal Gear Ring, 3mm thick, & a 77mm long Rack, 4mm thick, with 35 teeth and keyed ends. The Worm Wheel is now of reinforced fabric and has 40 teeth. The brass Bevels continue, and the 3:1 pair have 20 & 60t. The latter has no boss but is bolted to any suitable part. 2 Sprockets with 14 and 28t (25 & 45mm Ø) are listed, & Ladder Chain to run on them.

**N&B** The M3 Bolts have slightly tapering cheeseheads of 5.3mm Ø, or a little less on some, with (now) 6,9,15 & 24mm u/h; the pressed hex Nut is 5.9mm A/F by 2mm thick. The Washer is 8x.8mm. There's an extra Grub Screw, 2.75mm long, and slotted & Allen types are listed for both lengths.

**Other Parts** Not mentioned so far is a very useful Link with 2 holes 7mm apart; a small Bell Crank; a different flat Hook, 22.5mm o/a; a 42mm Ø steel Cam Blank, 2mm thick, marked with concentric circles 1mm apart; a Seating for the strong 10mm Ø Compression Spring; a Tension

Spring 278mm long; a Ratchet Pawl and Spring for it; a Universal, 11mm Ø & 26mm long; and an additional Tyre, 26mm o.d., to fit the 16mm Pulley. All but the Cam Blank, the Springs, & the Tyre are shown below.



**Quality** The parts are well made and most have a durable black metallic finish. The exceptions are the plain steel Shafts, Gears, Bush Wheel and Cam Blank; and most of the small brass items. Most parts aren't marked but some of the Clamps and Gears are stamped FAC. Tolerances are given in the manual and the clearance between the Shafts and the bore of the Gears works out at .0008" ± .0008". For non-critical holes the maximum variation is ± .0014". My only serious criticism are the pressed Nuts, which, like all such, do not always have the bore exactly normal to the base, and that can lead to a screwed rod locked to a plate by two Nuts, being askew enough to matter.

**The Manual** The manual (PN Z1-04) has 78 ring bound A5-size pages plus covers, and in the introduction Mark Sylwan hopes that users will have as much pleasure working with FAC as he had developing it. The book is divided into 7 chapters dealing with structures, rotary movement, gear trains, etc, followed by dimensioned drawings of all the parts. The PNs are all different from the 1953 ones. There are no detailed instructions, but instead, for some 2 dozen models or mechanisms, a photo or two, with perhaps a drawing of a detail, and a limited discussion of one or two of the main features and some of the parts. I found it difficult to pick up quickly how some components were meant to be used and I found myself wishing for a 'How to Use FAC Parts'.

Quite advanced mechanisms are shown such as a Mechanical Integrator and a Torque Amplifier, as well as other more usual, though quite complex, models: for instance a Gang Saw, and a large Travelling Bridge Crane. Both the latter are shown in MCS and they are really the only photos of large models that show worthwhile detail when copied. But below and overleaf are the details given of some of the more straightforward mechanisms. The 4mm bore Shaft Head is the main part in the Connecting Rod End and Tapped Sleeves are fitted to the Bolt that holds it to the Bush Wheel and those through the Eye Bolts. Eye Bolts (T3-12) are also used in the other gear assemblies. (The Eye Screws referred to are what I've called Eye Bolts.)

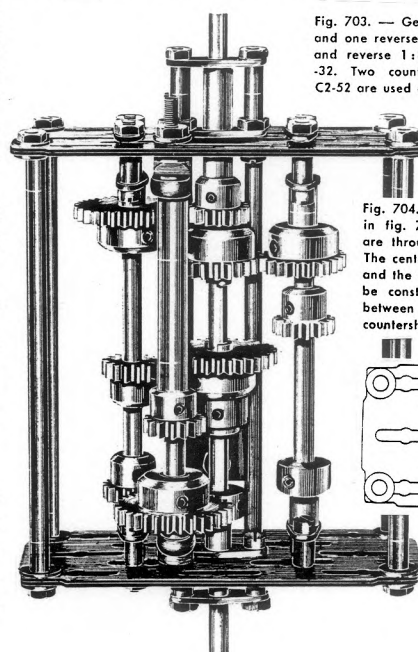
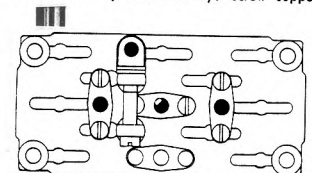


Fig. 703. — Gearbox with three forward speeds and one reverse, with reductions 1:1, 1:2, 1:4, and reverse 1:8, using Gears P1-16, -24, and -32. Two countershafts are employed; Plates C2-52 are used as end plates.

Fig. 704. — Shaft arrangement of the gearbox in fig. 703. Only the input and output shafts are through shafts, carried in Three-Hole Links. The center distance between all shafts is 2.4 in, and the supports of all other shafts must therefore be constructed. The countershafts are installed between Three-Hole Links, and the reverse countershaft by means of Eye Screw supports.



**FAC**



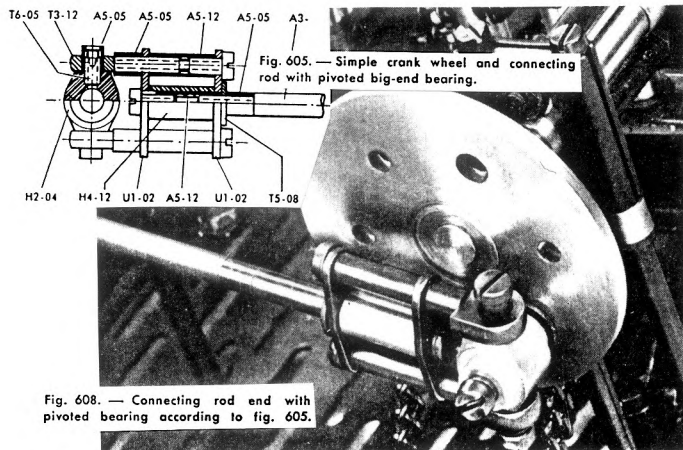


Fig. 711. — Bevel gear drive and differential suitable for self-propelled vehicles, as used in the railcar bogie of figs. 430 and 618.

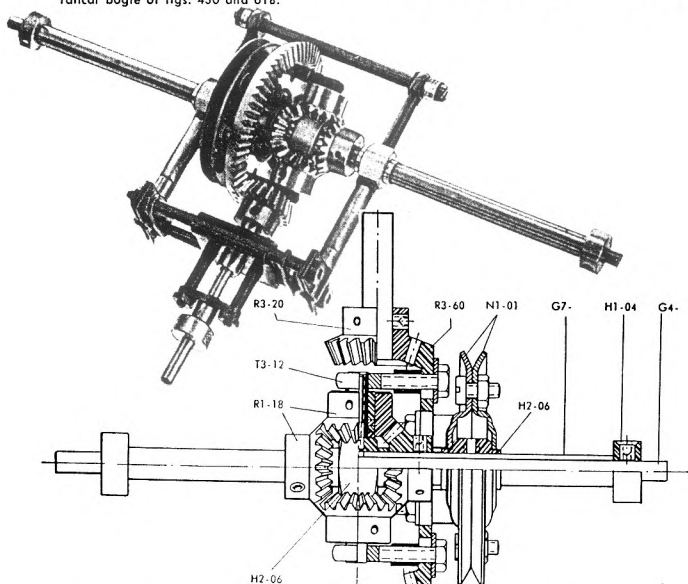


Fig. 712. — To build the differential in fig. 711, begin by assembling Wheel Discs N1-01 and Shaft Head H2-06; then install four Screws T1-15 fitted with Tapped Sleeves A5-05, and use Sleeves H4-05 and Rings H3-04 as spaces between Wheel and Crown Gear. Take care that the wheel is correctly mounted on the shaft and does not wobble. Then mount Crown Gear complete with satellite shafts. The satellites are fitted with a Sleeve H4-05 and three Rings H3-04 each, serving as bushings. When mounting the Eye Screws holding the satellite shafts, check that the Tapped Sleeves A5-05 do not touch the gears.

Fig. 708. — Photo of planetary gear of fig. 707.

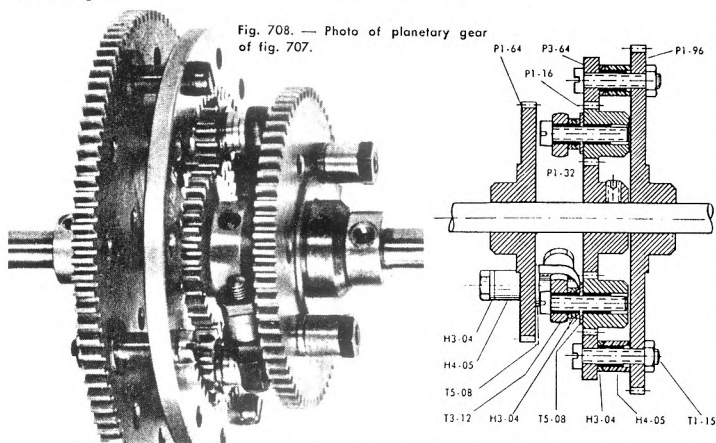
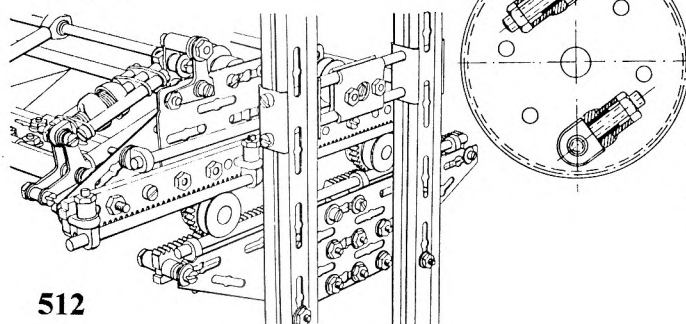


Fig. 707. — This planetary gear is built with a sun gear P1-32, two satellites P1-16, and a ring gear P3-64. As the orbit of the satellite shafts does not coincide with the standard hole circle of the supporting gear — in this case a Spur Gear P1-64 — the shafts have been mounted in Eye Screws as shown on the right.

Fig. 613. — Detail showing guide mechanism in fig. 612.

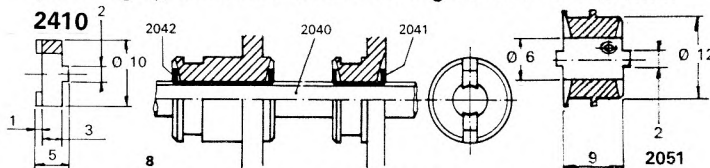


**Sets** The 2 sets of the period, X1 & X2, are illustrated at the back of the manual. The X1 has about 2600 parts, weighs 13kg, and is packed in a wooden box 60\*39\*7½cm. The bottom is subdivided into small and large compartments, and above is a moulded plastic tray containing Plates and circular parts. The larger set has 4700 parts and weighs in at about 20kg; its box is similar but is 11cm deep with 3 layers: Plates, Beams, Axles, N&B, etc within wooden partitions in the bottom, 2 partitioned wooden trays for small parts above and on top a green formed plastic tray for all the circular parts. No detailed account of contents is available, and Colin's set isn't complete enough to provide an inventory. From photos it can be seen that the X1 doesn't have the 2 Slewing Rings, and the one each of the largest Gears and the Gear Ring, that are in the X2.

## FAC in 1964

### The Major Changes

The most important of these was the redesign of the boss as shown opposite. Across both ends is a 2mm wide shallow groove which increases in depth towards the centre (I'll call it a grooved end). This allows the drive to pass from one boss to another with a Coupling Ring (#2410 below), like a double-sided dog clutch, in between. Alternatively the grooved ends can accommodate the ends of a pair of shallow, long U-shaped Keys, 2mm wide, that then run along inside the boss on opposite sides (as in Fig. 8), and these slide in the 2 grooves in a new 6mm



Ø Grooved Shaft (#2040). Thus the parts can move axially, and movement is effected by a Gear Shift Fork which engages the 3.3mm wide circumferential groove now cut into the outside of the boss. A new Sliding Coupling (#2051 above) positioned between 2 parts with the new bosses, can be moved by the Shift Fork to engage either of them. (A similar part but without the dogs is called a Hub (#4000), and another Hub (#4001) is the same but is made of brass, has a 10mm Ø extension at one end, and is single tapped. I don't know what either are used for.) This whole system replaced the earlier 4mm Grooved Shaft and Sliding Dog, and was no doubt a significant improvement. I didn't try it in earnest because there were none of the U Keys in the set, but some DIY ones made of rather soft steel seemed to work quite well. Another change was that the Roll Pin was no longer listed & the pilot hole for them no longer provided.

The other radical step was to make all the Plates from aluminium instead of steel. They are more rigid with the smaller ones 2mm thick, and the larger 3mm. The Base Plate, now of 3mm aluminium, is no longer flanged and is smaller at 252\*168mm.

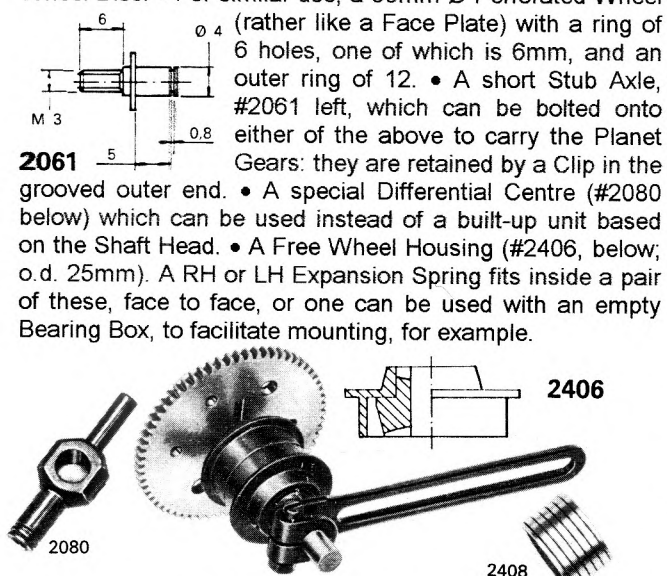
Several new Bearings were added. • A 4mm Bushing (#2124), 11mm long, held between a pair of new Clamps (#1611, right). • A Ball Bearing with a spherical outer race (to make it self-align I suppose), and 2 for 4mm Shafts, one of them to take axial loads. These last have a smaller o.d. (13mm) than the 6mm ones and are housed in a Bearing Cage (above). Its spigot can be held in the new Clamps, 1611, for example, or the whole Cage will fit into the standard Housing, retained by a Circular Clip.

The range of Gears was greatly expanded with: • Addi-

tional 20, 28, 36, 40, 44, 52, 56 & 72 tooth Spur Gears, and a 16t with a 6mm bore. • A pair of Spiral Gears (#3801, called Worms) to run at 14mm centres, with no boss but a single tapped hole through the teeth. • 2 extra Worm/Worm Wheel pairs with 5:1 & 10:1 ratios. All 3 pairs run at 21mm centres, and all the Worms have the single tapped hole instead of a boss. • Planet Gears for 4mm Shafts with 16 & 24 teeth, for use in epicyclic units. They are made of reinforced fabric, and are 3mm thick without a boss. • Roller Chain with a proper Spring Link, but no half link, and 3 new Sprockets for it with 10, 15 & 30 teeth. The pitch of the Chain is  $\frac{1}{4}$ ", against 4.5mm for the Ladder Chain. • Gears made of steel now have a BZP finish.

More Pulleys were added. The size of the 16mm/6mm bore one was increased to 26mm Ø, with bosses on each side just deep enough to take the 'dog' grooves. It was now steel, but the other 2 newcomers were aluminium, 66 & 132mm Ø, with standard bosses. The larger has 6x28mm lightening holes in its face. Another part that can be used as a Pulley is a 70mm o.d., steel Flywheel Ring which has the same diameter vee-groove as the 66mm Pulley, and 6 tapped holes which allows it to be bolted to the Perforated Wheel (described below), for instance.

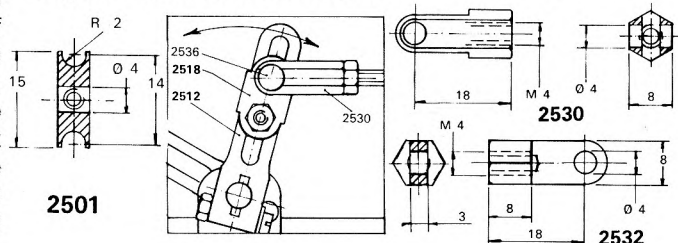
**New or Modified Gear Unit Parts** • The old Bush Wheel has 3 additional 4mm holes added (at 16.8mm radius) for use in epicyclic units, and is now called a Planet Wheel Disc. • For similar use, a 63mm Ø Perforated Wheel (rather like a Face Plate) with a ring of 6 holes, one of which is 6mm, and an outer ring of 12. • A short Stub Axle, #2061 left, which can be bolted onto either of the above to carry the Planet Gears: they are retained by a Clip in the grooved outer end. • A special Differential Centre (#2080 below) which can be used instead of a built-up unit based on the Shaft Head. • A Free Wheel Housing (#2406, below; o.d. 25mm). A RH or LH Expansion Spring fits inside a pair of these, face to face, or one can be used with an empty Bearing Box, to facilitate mounting, for example.



**New Structural Parts** • An Angular Coupling, #1620 - an angle bracket with triangular webs at the sides, and contoured outside faces to fit into the sides of Beams. It simplifies attaching Beams at right angles to each other, or to Plates. • M4 Studding in 500mm lengths with Nuts & Washers to suit. • 2 longer Threaded Rods (98 & 116mm). • 6mm Tubular Shafts in 7 shorter lengths from 35 to 146mm. Although these are called Shafts, and can be used as such, the emphasis is now on their use in structures, to act as a pillar around the 4mm Studding for example. These parts in Colin's set are black whereas the other Shafts are polished steel.

**Other New or Modified Parts** • The illustration of the cross section of the Beam shows it solid rather than rolled. Has anyone a Beam from this time? • 6mm Shafts in 6 shorter lengths from 60 to 148mm. • A steel Shaft Sleeve, (Coupling), #2420, which serves to join 6mm, or with Split Sleeves, 4mm Shafts. It is 12mm Ø by 21mm long, with grooved ends, and is double-tapped at 90° at each end. • The Lead Screw now has 56mm of smooth 6mm Ø shaft at one end, and the End Bush Fitting is no longer listed. • The Cam Blank is replaced by a paper Cam Pattern and an aluminium Cam

Disc, 2.5mm thick. Both are 63mm Ø and the Pattern has radial as well as the 1mm spaced circular lines on it. • The Hand Wheel has been redesigned as a disc, still dished, with 4x15mm lightening holes in it. • A brass Sliding Cross Head (#2501 below), 18mm long, grooved to slide between 4mm Shafts at 14mm centres; it has a centre 4mm hole with M3 tapping out to the edges. • 4 Rocker [Crank] Arms (#2511-4) which clamp onto 6mm Shafts, and are pierced with one slot, 18 to 60mm long. One can be seen below with the Lock Plate #2518 bolted over the slot. The pivoting arm is held to it with a 4mm Connecting Pin, #2536, which is 10.2mm long with a 6mm Ø, flat round head, and the end of the shank grooved for a Clip. • Also below, a Fork Head, #2530, & a Tongue Head, #2532, both machined from 8mm A/F brass hex bar, drilled and tapped M4 at one end, and with a 4mm hole through the fork/tongue at the other. • A heavy, pressed, angled Support Leg (#1605 below), 11cm long, with the top on 3 sides shaped to fit into the sides of Beams. So it can be bolted inside a corner formed by 2 Beams. • 2 Rubber Rings, 11 & 35mm i.d. • A 65mm Ø unperforated Friction Disc with a 4mm deep flange, which pushes onto the Perforated Wheel. It is used in variable radius friction drives with the Rubber Rings. • 4mm Ø Plastic Cord in metre lengths. • Various Lock Washers.



**Other Discontinued Parts** • Beams with 11 to 19 slots, and the Beam End Plate. • The useful 4-hole Clamp that would hold a 4mm Rod against a flat surface. • The 43mm Half Pulley with 6 impressed spokes. • Slotted Grub Screws. • The very useful 2-Hole Link. • The Hook. • The Ratchet and Spring for it. • The 2 smaller Tyres.

For some purposes there is no substitute for the Hook, Ratchet, and 2-Hole Link. When it can be used instead, the 3-Hole version of the latter looks untidy.

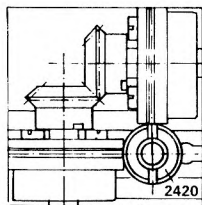
4 parts have been crossed out in the 1970 ink amendment to the 1965 UK Price List. These are the 500mm Grooved Shaft (leaving the 108mm as the longest), the Slewing Ring (now called a Centreless Wheel), the (remaining) Tyre, and the paper Cam Pattern.

**Prices** There are only a limited number of parts which can be fairly compared with MECCANO (MCO) prices, but it's interesting to try. Rods were 25% cheaper than MCO Axles but 4mm Shafts cost twice as much. Beams were about double the price of MCO A/Gs, and FAC Plates were 4 times dearer. FAC Nuts were nearly twice as much. The Slewing Ring cost 50% more than M143 but it was a more elaborate part. A comparable small FAC Gear was twice the price of an M26, and the equivalent of an M27a was nearly 4 times dearer. Most parts were considerably more expensive but not all: Ladder Chain was about half the price and so was FAC Studding.

**The Manual** It is now in 2 parts, PN 0106 & 0107, with the same page size as before. #0107 contains pages 101-147, and after a brief but useful Introduction, and the names of the parts, all in Swedish, English, German & French, there are dimensioned drawings of all the parts as before. All the PN's are different. For some parts an additional drawing is added showing the part in a typical application: this is often very helpful but unfortunately some of the more obscure parts aren't shown in this way. And there



are a few of them that I simply gave up on, like the one opposite which shows the end view of the subject part, the Shaft Sleeve (Coupling #2420) mentioned earlier, but what use it's meant to illustrate I can't fathom.



The first part, the manual proper, runs to page 51 and is in English only. It is broken down into more sections than the earlier one and most give a better idea of the subject under discussion, with more drawings and specific comments, and sometimes a photo showing all the relevant parts needed for a particular type of mechanism - planetary gearing for instance. But it's still hard work trying to work out the function of many of the parts, and some aren't even mentioned. All that's included on a Differential is shown on the facing page, and all on one of the more comprehensively covered designs, on the back cover; the Extra MCS Sheets will include several other mechanisms including a Double Planetary Gear unit.

It is noticeable that more emphasis is given to mechanisms (particularly epicyclic units) and machinery, and the examples of realistic modelling have been reduced. The new thicker Plates are more often used in the frameworks for mechanisms than before.

**SETS** 3 sets are listed in the 1965 Price List, a Standard Kit, a Structural Kit, and a Gear Kit, with details of their contents. They were priced at £98, £66 & £114 respectively, and these were unchanged in the 1970 amendment, although a few of the quantities were varied, mostly reduced a little. By way of comparison a MECCANO No.10 rose from £50 to £80 over that period, but it isn't really possible to compare contents because the FAC sets contained large numbers of small parts like Retaining Washers, Spacers, etc, and at the other extreme some of the parts were in 500mm lengths. As an idea though, in terms of N+B, the 3 sets had 1050, 1750 & 645, against 1516 in the No.10, and 48, 0 & 93 toothed parts against 61.

A photo of what are probably these sets is shown in a leaflet, undated but certainly from this period. They are called the Standard, Industrial Kit I & II (with Moving, & Structural Parts), with 3023, 1998, & 4457 parts respectively. All are in wooden boxes, each of which has a neat lid that consists of the front, most of the top, and half the sides of the box (cut diagonally); it hinges back to form a shelf with a back and sides. The parts are in compartmentalised plastic trays, the smaller ones with hinged transparent lids. All the boxes are 61cm long and 19.5cm deep, with depths of 20, 20 & 13.5cm, and they weigh 14.5, 13 & 14kg.

## Some Comments

After a little experimenting with the parts I made two FAC models. The first was the little Crane shown for the Nr.1 Set in MCS, and the main thing it taught me was that the 12mm long, close tolerance Bushings held in Bushing Clamps, are not easy to align if the Shaft through them is to run entirely freely. If one follows the examples in the manual most bearings are clamped onto Rods, and this makes fine adjustment somewhat hit and miss. In the Crane, with easy access, all was eventually well, but in the next model I resorted in one case to having one end of the Shaft only half way through the bearing. Another hand-operated Shaft, which had to be 6mm for various reasons, would have been perfectly at home in a hole in a strip or bracket, but no suitable part with such a hole is included in the system. Another slight problem was adjusting a tapering framework to be completely symmetrical in all directions, and anything other than near perfection could make lining up bearings even more difficult. But I thought it an appealing model when it was finished.

What to make next. I thought about trying the 3-speed & reverse Gearbox shown earlier but I found that some of the small parts needed were missing from the set. It is I sup-

pose the equivalent of an all Pinion one I had made in the early 1970s from a design in the April 1969 MM (and which helped to convince me that MECCANO is the hobby): it is about the same size except that the MCO one is 2" wide against 3½" for the FAC, though that could be reduced by ½" without much difficulty. Also with the Shaft spacing it wouldn't be possible to use Ball Bearings, and using any of the brass bushed bearings would be difficult - in fact most of the Shafts run in the centre hole of the steel 3-Hole Link.

FAC obviously isn't intended for some of the types of model often made in MECCANO, so I thought that it would be interesting to try one based on a prewar Super Model, from before Flexible Plates were introduced. Given the parts in the set I decided on the original version of SML 11, the Single-Cylinder Horizontal Steam Engine, in part because the 136mm Pulley with a Slewing Ring bolted to either side, made a passable looking flywheel of about the same diameter as the Circular Girder used in the original.

I made the framework from Beams and Rods using as many of the different Clamps as possible and it turned out to be very rigid (and heavy). The only problem was that sometimes at corners the Clamps interfered with one another, but reasonable alternatives always presented themselves.

With the close tolerance parts I expected to be able to make a crankshaft that would run true, but despite several attempts a small wobble persisted. However the Ball Bearings used for the main bearings, though not the self-aligning type, had enough slop in them to accommodate the misalignment. They were quite difficult to line up though, but I've already mentioned that.

The cylinder was rolled from a Plate, and the valve chest made up, after much experimenting and not a little cussing, from a Plate, 2 Beams, and a number of Clamps. For this type of modelling FAC lacks suitable brackets and other small parts. As the crosshead a Sliding Cross Head worked perfectly running between 2 Rods. (There wasn't any 4mm Shaft in the set, but the Rods are quite straight over 6" or so) There is no FAC eccentric so I fitted Joy valve gear with the several linkages made entirely of Tie Rods, and they avoided it having a clumsy look. They were invaluable too for the arms of the governor.

The decking might have been made of Plates but their sizes weren't very suitable so I used a combination of Beams and flat Clamps which looked quite well, particularly with the handrails fitted, made again from those so useful Tie Rods.

Several motors are shown in the manuals but none are listed as being FAC. For this model a commercial 12v motor was hidden away in the base, driving the governor through 2 stages of reduction gearing, and then the crankshaft was back driven from the governor, through a pair of Bevels and a Pulley drive. The Gears all ran sweetly, as might be expected given their quality and the brass bearings used for the shafts. The other gearing underneath was a Worm drive from a hand wheel to change the valve gear setting. Although in theory there was plenty of room in the base it was actually quite difficult to fit in and adjust all the gearing and the bearings for it.

To FAC's credit the Engine ran smoothly, survived 5 outings, and a total running time which must amount to some 50 hours, without any problems, adjustments, or lubrication, after the initial setting up.

Apart from the difficulties already mentioned, the main problems arose from my unfamiliarity with the parts, and a tendency to try to find MECCANO solutions to FAC problems. That said, and although it became easier as I went along, I was never able to make even quite simple mechanical drives as compact as I hoped. In part this was perhaps a question of the natural scale for FAC with its basic pitch, in many cases, of 14mm against MECCANO's 12.7 - not much but it means that the volume increases by a third. This isn't of course a criticism of FAC because for

## DIFFERENTIAL WITH 3:1 RATIO BETWEEN GEARS

**FAC**

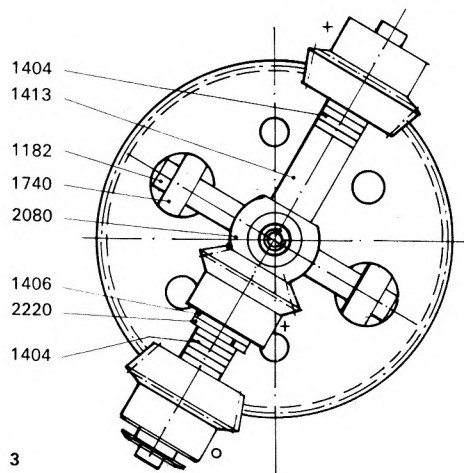
In the differential illustrated in Fig. 1-3, both differential gears are located on the same side of the centre, in which is journaled the shaft that continues the movement from one planet wheel to the other, giving a ratio of 3:1 between the differential gears; see also drawing, Fig. 2. The differential gears are indicated by A and C and the centre by B. Presuming A to be the drive gear, the movement is continued to bevel gear 3718 via shaft 1415, which is mounted on the extension of the 4-mm. differential centre stub axle formed by threaded rod 1102. Freely mounted on the same shaft, gear C is connected with bevel gear ring 3760, which constitutes the other differential gear. Planet wheels 3718 and 3720 are mounted on the diametrically opposed shaft, as illustrated, and the resultant ratio between the differential gears is thus 3:1. The differential centre is united with gear B.

Fig. 3 shows the planet wheel mounting. For increased balance and guidance, the other end of the planet wheel shaft is freely journaled in a bevel gear 3720. The construction is further illustrated by Fig. 2.

### Ratios

In the adjacent table o indicates locked gear and - reversed movement.

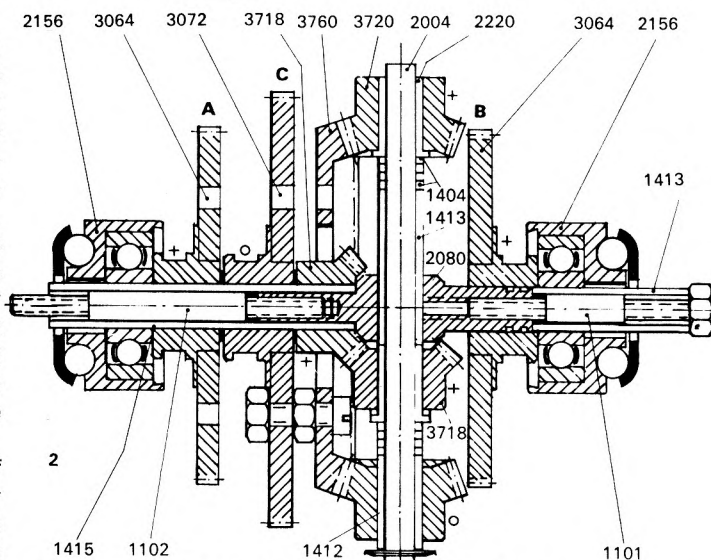
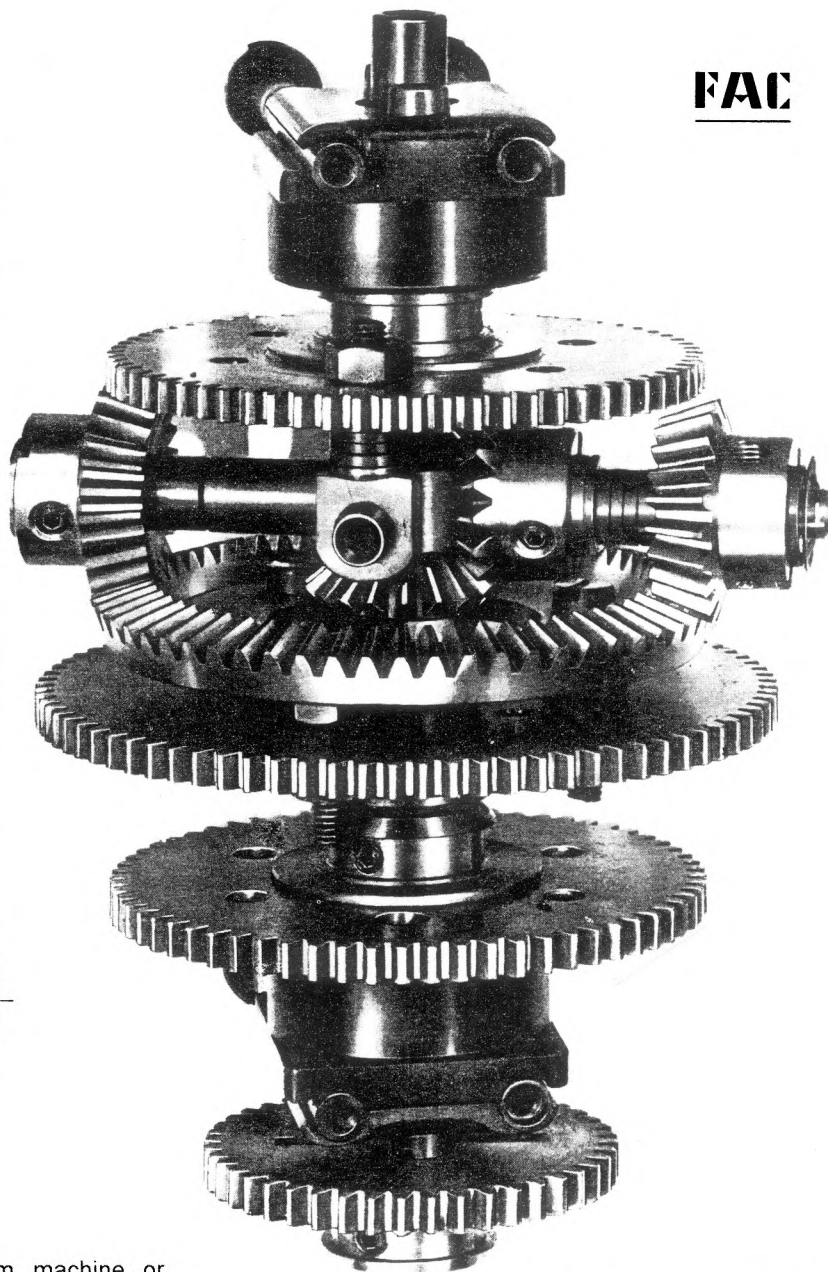
A	B	C
o	3	4
3	o	-1
4	1	o



its intended users, the size of a mechanism, machine, or model, wouldn't usually matter.

When Colin lent me his set he included some notes on his experience with it, and I deliberately didn't read these until I had finished making my models. He found it difficult to use FAC as he had hoped, to improve part of the mechanism in his MECCANO Rapier Loom, and he emphasised the space needed for the bearings, and the difficulty of lining them up. Another problem, that I found too, was in tightening some Nuts where the shape of the Clamps prevented the spanner getting a good purchase. He also made the point that although FAC models of particular subjects can be built, and look attractive, the system isn't suited to general purpose modelling, although an industrial user would benefit to an extent from a willingness to cut up or otherwise adapt the parts to suit his needs, and to use 'foreign' parts as necessary.

So how would an industrial user view FAC? The cost of the parts probably wouldn't matter at all in most cases. For small pieces of laboratory or workshop machinery I can imagine that someone experienced in using the system would find it easy to make substantial, rigid frameworks, and the Ball Bearings and 6mm Shafts would be very useful in providing what is often needed, a robust, reliable piece of equipment. Most machinery of this type is basically fairly simple, and it would be relatively easy to overcome any deficiencies inherent in the system. For demonstration models, mock-ups of prototype machinery, and experimental schemes, FAC would again have much to recommend it. The special parts for differentials and epicyclics would save

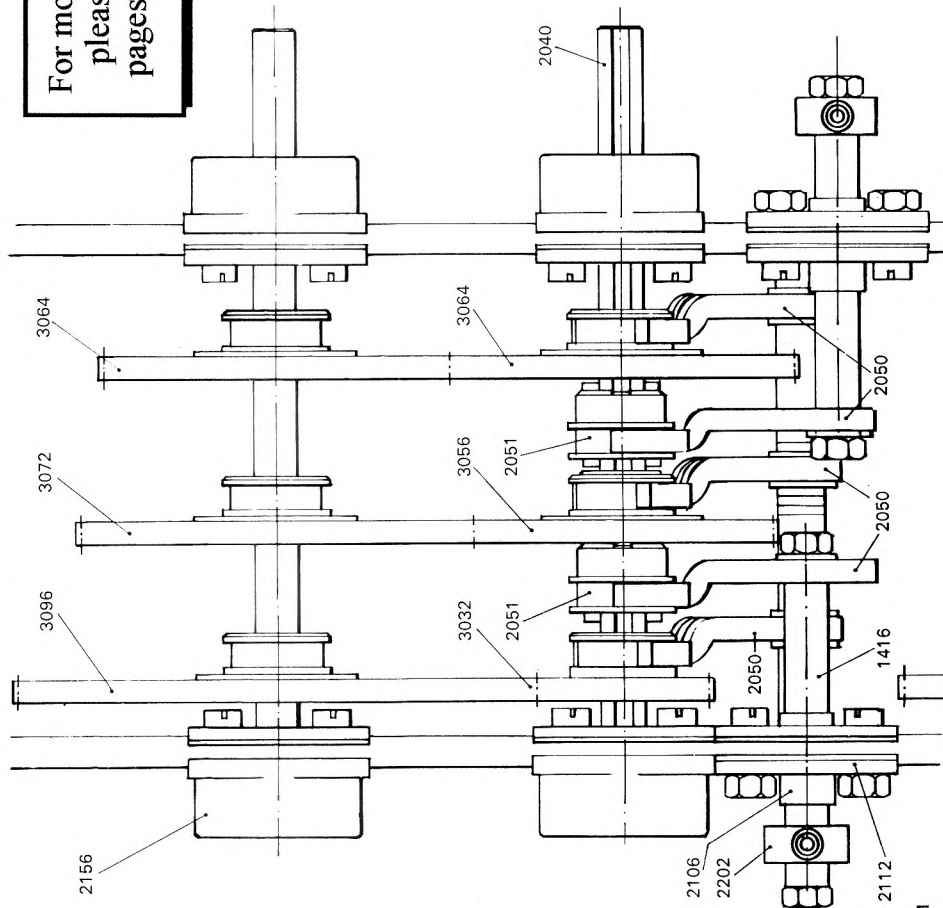


time, and the Grooved Shafts and sliding Gears would allow a wide range of gearbox and similar applications.

And even if all this, or even more, could be done with a 'toy' system, a major plus for FAC would be the accuracy of the parts. I well remember my disillusionment when I found that most of the A/Gs in my new 'toy' set weren't bent at anywhere near 90°, and I doubt if I'm the only modeller who has spent ages going through all his Couplings to find some which have their cross bores more or less at right angles.



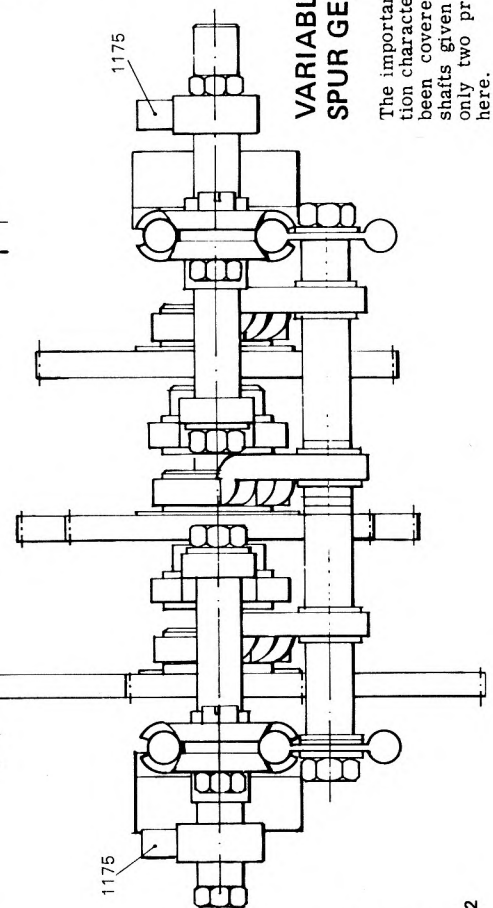
For more on FAC  
please turn to  
pages 508-515.



**FAC**

## VARIABLE RATIOS BETWEEN SPUR GEARS

The important points as regards the construction characteristics of gear boxes have already been covered in the description of hubs and shafts given under "Fac standards", page 5; only two principal types will be illustrated here.



Gear box, constant mesh.  
This type of gear box is most effective in operation, since it permits ratios to be changed whilst engaged. Two drawings of this type of unit are shown in Fig. 1 and 2. The driving spur gears 3032, 3056 and 3064 are mounted in bearings on the driving grooved shaft 2040 and located axially by gear shift fork 2050. Between these gears, sliding couplings 2051, with keys 2041 attached, are held in position by gear shift forks. The sliding couplings are engaged with the grooves of the hub, and the shaft movement is thus continued to the driving gears.

**More on FAC** Since the notes in 18/508, Chris Freeman, David Hobson, Thomas Morzinck, & Jacques Pitrat have kindly sent more information, including material from <http://home1.swipnet.se/~w-14485/meccano/fac.htm>, an Internet site run by Staffan Kjellin from Sweden.

**History** First from the Site. It is said that FAC was invented by the artist Mark Sylwan (1914-1993), and it was first shown at the Technical Museum in Stockholm in the spring of 1952. It was patented in 1953 and though the first production was of 'toy' sets, it was soon developed for engineers and model builders.

In the *Facts about FAC #1* (see later), dated Oct 1958, it is said that the system was completely revised in 1957 on the basis of experience by Swedish users. It was launched internationally in 1958.

**The 'Toy' Sets** The Site includes an illustration of an 'early' No.0 Set and none of the 6 models shown on the inside of the lid are in the #1 manual described in 18/509. The contents differ too with a Plate & 4 small Wheels with Tyres (possibly the 26mm Ø W1-01) in the #0, that aren't in the #1. Possibly the sets weren't progressive but more likely the #0 is from a later, improved range. The models on the lid, though blurry, look more up-to-date than those in the #1 manual - one for instance is a smart looking Motor Scooter.

There's also an illustration of a #2b Set, also apparently a 'toy' outfit. It looks quite large with the parts loose in a partitioned wooden box with tray. The top half of the manual cover is red with FAC in white, and the bottom is white with some dark illustrations on it.

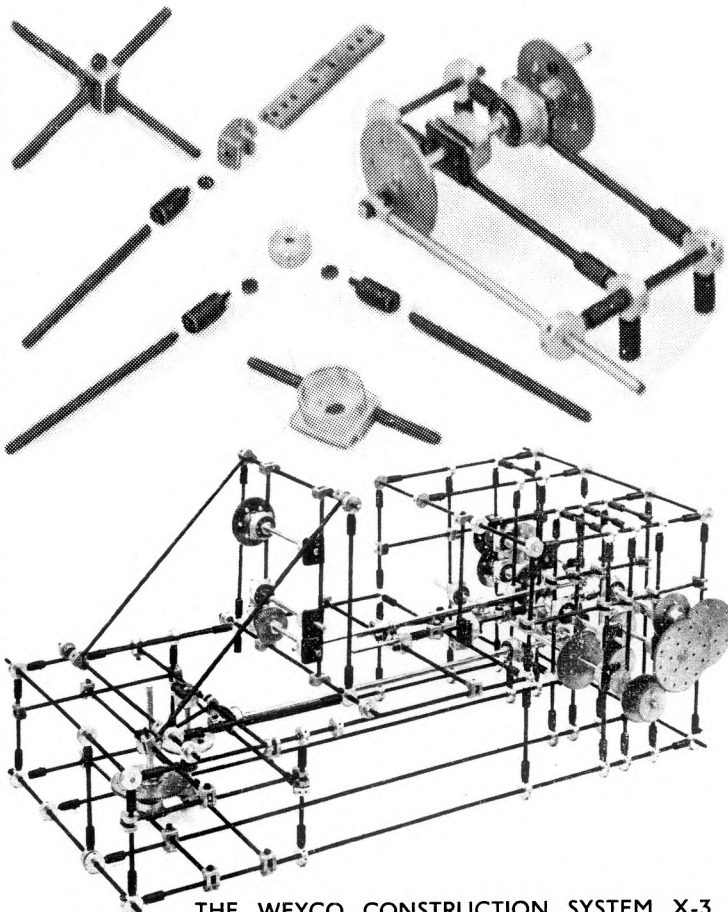
**X1 & X2 Set Contents** Details of these became available too late to discuss in OSN 18 but were included in the Extra Sheets. They were issued by Weyco, the UK agent, and one is dated June 1960. The X.2 contained 2370 parts plus 2050 N+B, & 300 Washers, making about 4700 in all. There were 34 toothed parts.

The X.1 contained all the parts in the X.2 except the Slewing Ring, the 96t Gear, the Gear Ring, & the Rack, but fewer of them. In all 1300, including 25 toothed parts, plus 1050 N+B, & 200 Washers, making a total of about 2600.

All the 1964 parts shown in MCS FAC[b] were included in the X2 except certain lengths of Beam, the 2 larger Tyres, the 3 Lead Screw parts G9-40,41, & the Bushing G9-42. An official FAC Set Contents includes certain parts which were not to be available until May 1961, and which, at least at that stage, weren't shown as being in the X Sets. They were the Lead Screw parts & Bushing already mentioned; a 4mm Ball Bearing, and the bearing parts shown at the bottom of 18/512; the Diff Centre, 2080, & Sliding Cross Head, see 18/513; and various lengths of Tubular Shaft. They were all included in the '1964' Sets, although the lengths of Tubular Shaft had been changed.

**Literature** The Weyco Set Contents above were found in an X2 Set, together with the Z1-04 Manual described in 18/511, a Z2-03 Parts List dated Nov. 1957, & various other leaflets. The *Facts about FAC #1* was one & there was also #3 from April 1960. #1 (8 A5 pages) has a general account of the system & some details of a Guilloche machine; #3 (4 pages) describes in outline a Machine for winding nylon, built at a Dutch firm (which had 20 X2 Sets 'in constant use'), & a 5-speed Transmission used to drive a pump in the Stockholm Thorax Clinic. Both were good publicity material. In addition there were 2 items from Weyco, a glossy brochure & a leaflet, both with a good general description of the system and photos of various machines, none too awesome & some relatively simple. There was also a duplicated copy of a 1959 letter from A.E.I. saying that their Kit 'has saved considerable time in the development of various types of Test Gear'. In one case cited, construction was completed in 3 days with a saving of 3 months in time & at least £500.

**The WEYCO CONSTRUCTION SYSTEM X-3** Also in the Set were 2 leaflets with photos of 2 frameworks carrying bearings and gears, & the structural parts to make them. Headed THE WEYCO CONSTRUCTION SYSTEM X-3,



THE WEYCO CONSTRUCTION SYSTEM X-3

they otherwise bear just Weyco's name and Dames Road address. The Rods, Gears, & Bearing Housings look as if they could be standard FAC; the other parts are: • A 'J' Clamp to allow 2 Rods to be held at right angles. It is also used to hold the Rack Strip, with a Rod Socket in its end tapped hole, to allow connection to a Rod. • The Hub, a 4-way collar with an additional radial tapping used to lock a Rod through the centre hole. • The Rod Socket which screws into the Hub and is held by a lock Nut. Thus up to 4 Rods can be so attached to one Hub.

One framework & details showing the use of the new parts are shown above, although the illustrations are very blurry. One or two other parts that may be FAC can be seen, for instance one bearing looks as if it might be an Eye Bolt screwed into a Hub.

So why did Weyco market an alternative to FAC, or at least, if in fact certain FAC parts were used, an alternative method of making frameworks. Perhaps it was thought that FAC was too expensive or too complicated. Certainly the Weyco method is conceptually simpler, but whether it would be cheaper, with machined Hubs & Rod Sockets instead of pressed Clamps, seems doubtful, and somehow the frameworks shown don't look to me as if they would be rigid enough to maintain the alignment of the Bearings under heavy loads.

**FAC Now Available Again** The Site has an announcement that a company has bought the remaining FAC parts & tooling, and plans to have a full range of parts available shortly. There's a price list of those currently obtainable and at a glance, of the 1964 parts, the main ones missing are all the Tie Rods except the 2 shortest, the Beam Offset Plate, & the longest (500mm) Grooved Shaft. Some of the smaller parts are not sold singly.

Also listed are 2 Sets, 'Training Equipment' #4001 at SEK6500, and 'Standard Equipment' #4002 at SEK11000. The latter has 2673 parts, weighs 14kg, & its box measures 600\*200\*200mm. There's a small picture of it and the box and packaging look similar to the those of the 1964 sets.

All the prices above exclude Swedish VAT and P & P. Parts and sets can be ordered through Staffan by e-mail at [staffan.kjellin@mbox200.swipnet.se](mailto:staffan.kjellin@mbox200.swipnet.se) or by post to him at Skolgatan 31, S-643 31 VINGÅKER, Sweden.



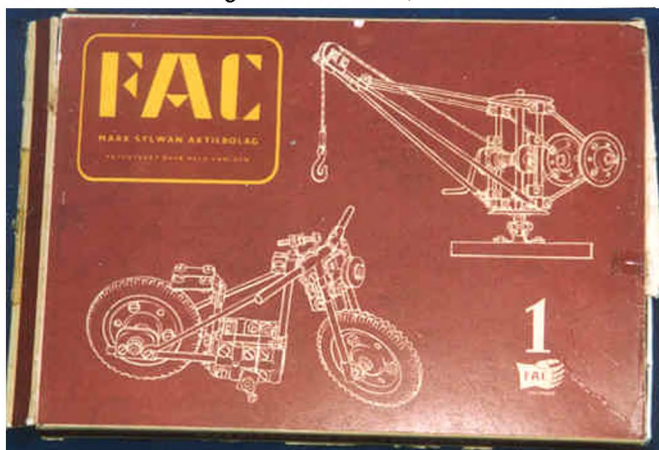


**The 'Basic' Indian MECHANIX Set** This is a smaller version of the Junior outfit described in 22/627. The box is smaller, 33\*21½\*3½cm, but the packaging is similar, and the EEC label again has © 1997 on it. The Item No. above the(stuck-on) barcode is 055/091; for the Junior it was /093.

**Another FAC No.1 Set** This Set, kindly lent by David Hobson, has different packaging to the one described in 18/508. It is complete apart from the manual, the Tools, Tyres, some NBW, and one or two other parts.

The box is brown cardboard, 31½\*18\*1½cm, and is divided up into 11 areas by 4½mm thick wooden partitions. Printed in dark red on the lid is: 'FAC', & some Swedish words ending in 'MARK SYLVAN A.B.', at top left; and '1' & the Glove logo, bottom right. Pasted on in the middle is a colour photo of a Crane sitting on rocks, as in the manual cover in MCS. This box may be earlier than the No.1 box described in 18/508 – both the lid & the partitioning look less of a 'production job'. Not much can be seen in a copy of the lid so below the one from the OSN 18 No.1 Set – it is printed white on dark red, with the FAC panel in yellow.

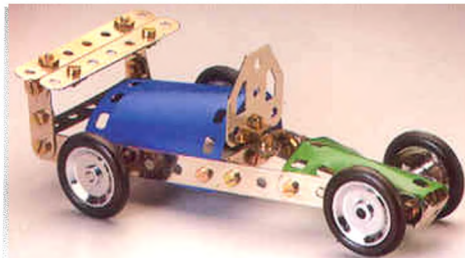
The parts are mostly as the 1953 parts in OSN 18 with the following exceptions & amplifications: • Collars are double-tapped. • The Hook is 33½mm o/a. • The Loose Pulley is brass and 16mm o.d. • Compared to the Set Contents, there are 5 instead of 4x 90mm Rods & 4 instead of 5x 106mm. • The throw of the Crank Handle is 30mm, and its handle is about 22mm long. • The Washer is 8mm o.d. and not the 6mm stated by mistake in OSN 18. • Some of the remaining N&B are the normal FAC black ones, with Bolts in all the appropriate lengths, but there are also some plain steel ones with smaller Nuts, 5.4mm A/F, and 8 & 12mm Bolts with larger cheeseheads, 5.3 to 5.5mm Ø.



On the bottom right of the lid is 'ART. NO. 52', there was nothing similar on the earlier Sets. Otherwise the lid is generally similar to the Junior, red with photos of 5 models on it.

The Set has 25 N&B against 37 in the Junior and the total number of other parts is reduced by about the same proportion. The 6 parts omitted completely are the Flanged Plate, Trunnion, ½" & 1" Loose Pulley, Crank Handle, & Driving Band. Those remaining are identical to their Junior counterparts except that the 1" Pulley is black plastic (with the same nickel boss) and the Screwdriver, missing from the Set, must be shorter, judging by the 12cm long recess for it in the packaging.

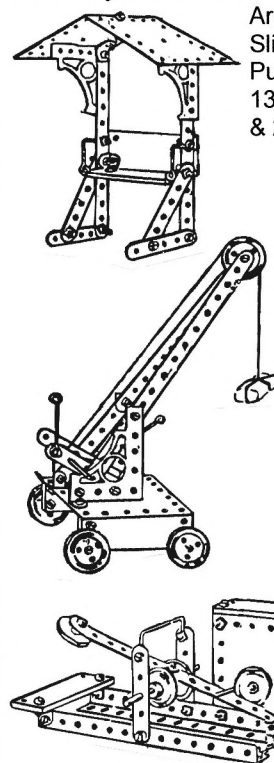
The Model Sheet is generally similar too, but smaller at 47\*35½cm, and the Set Contents are shown in the centre on the back. 7 models, from ROBOT to CRANE, are on the front side with the name panel, with 3 photo steps for each. Overleaf are 10 more, from MINI CAR to TRICYCLE, with just one photo of each model. 2 of the 'Basic' models were on the Junior Sheet, including the Helicopter of 22/628, & a few others are modified versions of earlier designs. One of the better models is shown right, and it could easily be improved using the rest of the parts in the Set.



**PRIMIUS OUTFITS A, B & C** David Hobson kindly gave me a photocopy of the Model Leaflet for these small sets, hitherto only known by name. They are thought to have been introduced in 1924, no doubt in an attempt to boost sales in the face of difficult times for the company.

The Leaflet is a sheet about 17\*8½" folded into three. On one side a panel in which is shown 2 boys playing with a Crane, with a Coach & an open set in the foreground, a well known PRIMUS scene, and 30, 54 & 84 models are claimed for Sets A, B & C. Alongside are the 30 'C' models, while on the back are those for Outfits A & B. The models aren't named or numbered, and there is a small line drawing of each.

From the models, the main parts in Set A are 2x 11h & 6x 5h Strips, a 6\*6h Plate, 2x 1" Loose Pulleys, & 2 1½" Wire Stays. Added in 'B' are: 4x 6h Strips, another Plate, 2 Architraves, a Crank Handle, 2 Wood Slips, and 2 each 1" Loose & Fast Pulleys; extra in 'C': 2x 13h Strips, 2x 13h A/Gs, 2 Slips, 2x 1" Fast Pulleys, & 2 each 1½" & 3½" Stays.



As might be expected Set C is appreciably smaller than the smallest standard outfit, No.0, and the range of parts in the two are rather different, with no Architraves in the No.0. All the A/B/C models are very simple of course, and some could be improved from the parts in the Sets, but the Architraves do improve the appearance in some cases, and nearly all the 'A' models are much better than those for the very small JUNIOR ENGINEER'S OUTFIT described in 9/231. The models on the left are actual size - the Seat & Crane are for Set B & the Trip Hammer for 'C'.



5. **THALE** Graham Aldous is continuing to research the history of this East German system and I hope to be able to included his findings later on. One thing has emerged though, the summary chart in 38/1138 is incorrect for the early years because the parts & manual thought to be from 1957 are almost certainly earlier than 1955, and the change from the Motorcycle to the Jib Crane manual occurred in 1955-56.

Graham has also found that the pitch of the holes in some early THALE parts is 12.75mm, instead of the 12.5mm later. This led me to check the pitch of the parts described in 38/1138 and (to my shame, that I hadn't done so before) I found it to be ½" or very nearly (12.7±.02mm in the various different types of part).

**THALE STAHLBAU TECHNIK: S4** [40/1197]

6. **FAC** Jacques Pitrat wrote that the FAC web site, www.facsystem.se, contains much of interest. As well as details of the current products there are photos of a number of models, old sets, and also pdf files of old manuals including 4 in English. The site has English, French & German language versions as well as Swedish.

**FAC: S1** [40/1197]

7. **MERKUR in 2008**, from the English version of the Merkur web site. Little has changed since 2007 (see 37/1103) except that the American M-KUR Apache set has appeared as the MERKUR Helikopter Set (#3314) with 486 parts, and the same model on the lid.(

Both the Classic C01 and C02 sets are listed with the same reference number, 3345, and the difference in weight between the two seems to be because the C02 is in a wooden box.

One correction to 33/991, the Set 030 has 310 parts.

**MERKUR [1] S7** [40/1197]

8. **Snippet. FERROX** A No.2 set similar to the 'in between' one noted in 38/1134 was offered on Ebay. It was not so complete, the main parts missing being the Flanged Plate and the 1\*5\*1 DAS. Also the the tools were a wooden-handled Screwdriver, & a Spanner with one open end and a ring at the other – similar to the one in the Phase 3 set in Fig.3b of 36/1090.

The most notable difference though was that certain parts were painted a medium blue. These comprised the Large Flanged Disc, the longest DAS (1\*9\*1h in this set, a size not mentioned before, but the length of the long DAS in the OSN 38 No.2 couldn't be seen), and the 5 & 11h Strips (the latter the longest in, or remaining in, the set). The only other painted parts were the green 6\*10h Perforated Plate and the red 1\*3h SAS, the same shade as in the OSN 38 No.2.

The present set's box was said measure 35\*21\*2.8cm and the maker was Drösler as before.

**FERROX S4** [40/1197]

9. **Snippet. THE THATCHER TIN CAN TOY** The picture inside the lid of the wooden box for this 'DIY' set was shown in 33/973. An Ebay set in the same box, 17\*10\*3¼", contained some tools and a booklet ©1920 entitled Gilbert Tin Can Toy Making. The set is pictured in it and the contents that can be seen include a mallet, scribe, pliers, snips, dividers, ruler, bending jig, forming block, soldering iron, & some smaller items.

**THE THATCHER TIN CAN TOY: S2** [40/1197]

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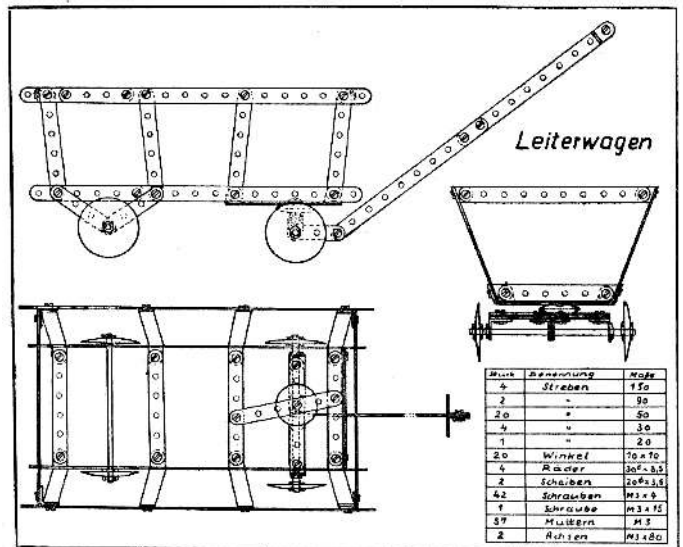
10. **STAHL-BAUKASTEN** Since the Snippet on this early post-WW2 German system in 38/1160, Jürgen Kahlfeldt has kindly sent more details, via Thomas Morzinck.

The parts are made of .7mm thick aluminium, and the holes are 3.3mm Ø at 10.0mm pitch. Below the set contents given

Inhalt des Kartons:								
Stück	Bezeichnung	Beulänge	Stück	Bezeichnung	Abmessungen	Stück	Bezeichnung	Abmessungen
4	Blechstreifen	10mm	26	Winkel	10 x 10mm	1	Grundplatte	100 x 60 x 10
11	"	20 "	2	Winkelstücke	100 x 10 x 10	4	Schreiben	20 x 3,5 <sup>ø</sup>
6	"	30 "	2	Schrauben	M 3 x 15	4	"	30 x 3,5 <sup>ø</sup>
2	"	40 "	51	"	M 3 x 4	1	Schraubenzieher	
25	"	50 "	60	Muttern	M 3	1	Schrauben -	
16	"	90 "	2	Gewindestifte	M 3 x 80		schlüssel	
4	"	100 "	2	"	M 3 x 30	1	Vorlageheft	
4	"	150 "	2	"	M 3 x 20			

on the front of the manual. In order, the parts are 4,11,6,2,25, 16,4,4 of 10,20,30,40,50,90,100,150mm Strips (those lengths are overall so perhaps the 10mm is a sort of washer); 26 10\*10mm A/Bs; 2x 100mm A/Gs, 10\*10mm in section; 2,51 M3 Bolts, 15,4mm long; 60 M3 Nuts; 2 each M3 Screwed Rods, 80,30,20mm long; 1 Flanged Plate 100\*60mm; 4 each Discs, 20,30mm Ø, and (probably) dished by 3.5mm; 1 each Screwdriver, Spanner, Manual.

The manual has 8 pages including covers – the front as in OSN 38. 6 models are shown on pp2-7, one to a page, with a 2- or 3-view engineering drawing for each, plus a list of parts. The first model is the Leiterwagon below (slightly rearranged),



and the last is Treppe (a Stairway with Landing). The other models are the Slewing Crane, Radio Tower, & Electric Pylon on the lid, and a Girder Bridge. The back cover has the side elevation of 5 more models including a Lorry, another Crane, and a Guyed Pylon.

**STAHL-BAUKASTEN [2] S2** [40/1197]

11. **PHILIPS** In 39/1187 the change from colourless to red Wheels was associated with the introduction of the new sets ME 1201 & 1250, which replaced the ME 1200 outfit. But the change seems not to have been so clear cut because Paul Goodman has found red Wheels in one of his three ME 1200 sets.

**PHILIPS: S9** [40/1197]

**OSN – Your Credit Balance:**  
 was after OSN 39  
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**Snippets. The FAC 'Toy' Sets** These little outfits were aimed at youngsters before FAC got into its stride as a 'professional' system. A little about them was given in 18/508, 19/526 & 24/712; the new material in these notes is largely based on items kindly sent by Chris Freeman, David Hobson, & John Timms, and photos from Tradera, the Swedish Ebay equivalent ([www.tradera.com](http://www.tradera.com)). The 3 manuals for the sets can be downloaded from [www.facsystm.se](http://www.facsystm.se). All the material seen in in Swedish.

**HISTORY** The sets known are Nos.0, 1 & 2, a linking set No.1-2, and No.2B, a repackaged No.2. The system is said to have appeared in 1952 – all other dates quoted are from the literature to hand. The first sets were probably Nos.1 & 2: the No.1 manual doesn't have a date in it but it has reviews of FAC from 1952 on the back cover, and the No.2 has a PR of 'Mauritzons / Stockholm 1952 52-3241'. The No.0 manual has 'Stockholm 1954. Berglins Tryckeri' as a PR and 1954 is the likely date of its introduction because it contains parts not in Sets 1 & 2, and not listed in a Parts Price List 53-3559. It isn't known how long the toy sets were made but only one edition of each of the manuals is known.

All the sets seen bear the name Mark Sylwan AB, Stockholm, the FAC designer's company, and most also have AB O. Mustad & Son, Gothenburg, the company that made FAC parts. The name hasn't been seen on Set 1 though it may be that it is on a lid apron not visible in the photos to hand.

**The PARTS** Those in the sets are listed in Fig.9 and the notes below cover parts not adequately described in the Figure or in the illustrations in Fig.8.

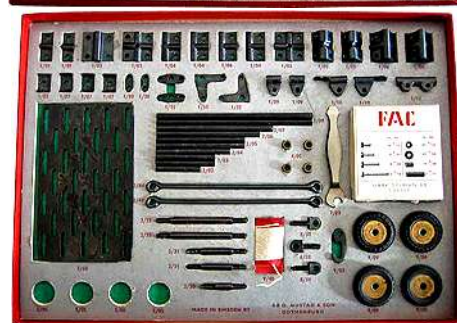
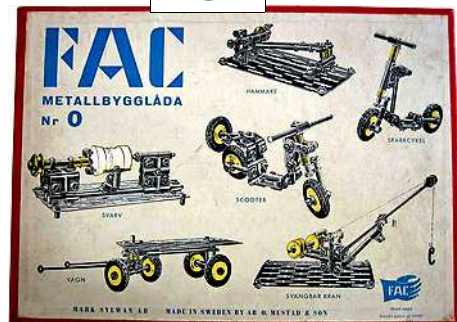
- The centre hole of the **3h Link** and the apex hole of the **Bell Crank** are 4mm Ø.
- The **64t Gear** has 6 face holes.
- The **Screwdriver** has a black handle and scales at 10½cm long; the **Spanner** at 7cm.
- The hole in the **Eye Bolt** is 4mm Ø.
- The **Hooks** are flat; #9/03 is a smaller, simpler version of 9/02, see Fig.2.
- The **Cord** is white, wound on a red card.

Additional parts in the 1953 List are Rods up to 2000mm long; 3 extra Rods with Screwed Ends, up to 90mm long; 3 extra Tie Rods from 18.5 to 170mm long; a 6mm Ø Axle, 180mm long; 14 extra Beams from 23 to 386mm long; a 54mm Ø Pulley Disc; 5 extra Gears from 24 to 96t; a 6h Bush Wheel, 46mm Ø & 6mm bore, with a 2mm thick disc; a Worm & 22t Worm Wheel; 3 Bevels for 1:1 & 1:3 ratios.

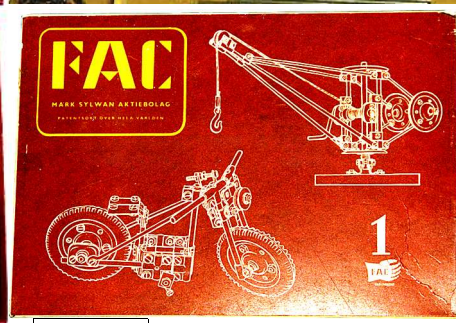
Parts in the No.0 set which are not in the 1953 List include the Plate, Bell Crank, Eye Bolt, Tyre #9/09, & the 2 & 3h Links.

**The SETS** Those known are described below. The contents of the main sets are given in Fig.9 with my names.

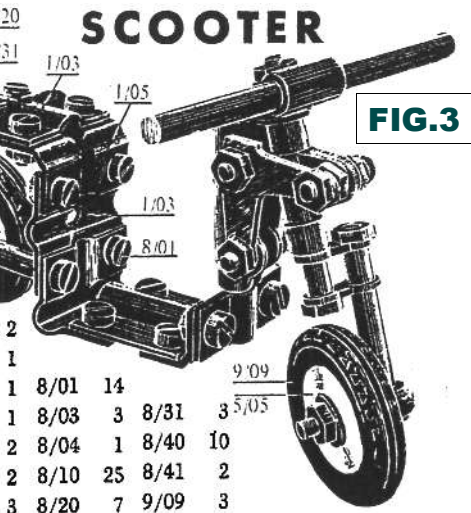
**No.0.** As **FIG.1** mentioned above this set was probably



**FIG.2**



**FIG.5**



**FIG.3**

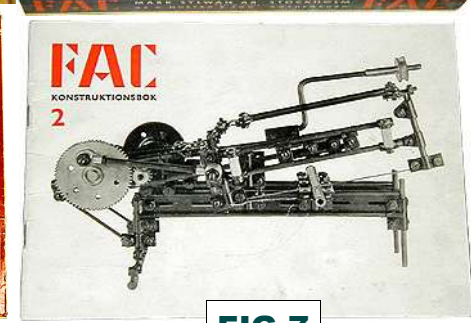
introduced 2 years after the main sets, and even excluding the new parts it contains lengths of the various Rods not in Sets 1 & 2.

**The box** is 21\*29.5cm and its lid & base are shown in Figs.1 & 2. Apart from the small parts in the white box there is a cutout in the backing card for each part and a green under layer shows through the holes rather attractively (in Fig.2 the brass Pulleys inside the Tyres would originally have been in the 4 circular cutouts bottom left).

**The manual** has 16 pages including covers, about 24\*16cm landscape, and is printed in B&W. The cover has only the name & 2 of the manual models on it – a Motor Scooter (as Fig.3) & a Field Gun. p2 has an introduction and the first model, SÄCKKÄRRA (Hand Truck). Then 9 more models ending with HAMMARE (Mechanical Hammers) on pp14-15. The back cover has the set contents. The models are fairly complicated but for each is a parts list, written instructions, and for most, step-by-step assembly drawings. Sometimes 2 pages in all are devoted to one model. In the step-by-step illustrations the existing parts are shown black with white lines and the new parts with black lines on white. I wonder if anyone had used step-by-step instructions for a toy set before. The instructions in the earlier No.1 & No.2 manuals take a different form and perhaps it was felt that an easier presentation was needed for youngsters who might build from the smaller outfit.

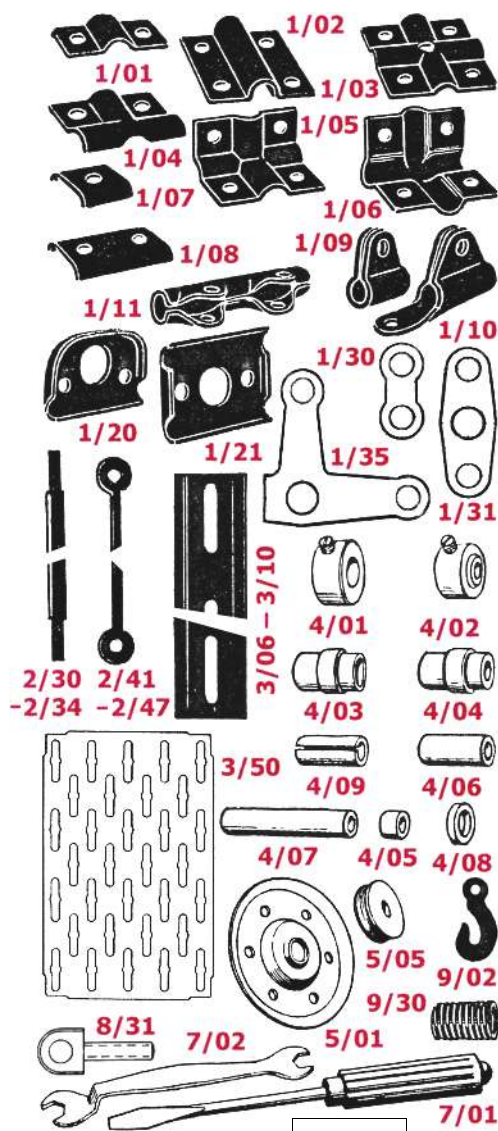
Rather surprisingly the only illustrations of the set's parts are in the models, but I think it likely that either there was a leaflet with the set which showed them, and perhaps the whole range of parts available, or else they were shown inside the lid.

The model all look the part, and apart from those on the



**FIG.6**





**FIG.8**

cover, they include a Crane, a Cable Car, & a Lathe. The model in Fig.3 is the one on the cover and is shown here at the original size (with the parts list but without the 11 building steps in the Manual).

**No.1.** Recapping from OSN 24 & 18: first, a possible early set in a brown cardboard box, 31½\*18\*1½cm. It has wooden partitions giving 11 compartments in 3 rows and the picture on the lid (Fig.4) has been pasted on. Its manual was missing.

Secondly, the No.1 set commonly seen (Fig.5). **The box** measures 31\*23cm and is partitioned into 16 compartments in 4 rows. The lid of the box for N&B etc is white with FAC in red. The card with the vanes etc printed on it is white. An illustrated price list of parts is often found with the set – it is one sheet folded into two with LÖSDELAR on the front. The example to hand is the one from 1953 mentioned earlier. In one Tradera set the inside of the lid is shown and has a list and illustrations of parts on it. Some though are not in the No.1 and the same layout is used on the bottom of the No.2's box and in its manual.

**The manual** was described in OSN 18 and its cover is the photo on the Fig.4 lid but in B&W with FAC in red. The 11 models are larger than those for the No.0 and in general not as 'cute'. 3 or 4 are not very exciting frameworks on wheels, but several do give the impression of mechanical complexity, even if in fact they are really quite straightforward. The most complex is the Hammer in Fig.10 overleaf. A Cord on Pulley brake is fitted to a Winch but not to the Crane on the cover. No parts list is provided for any of the models but building

Part	Set: PN	0	1	2	Part	Set: PN	0	1	2
Clamp	1/01	2	8	16	6/68mm Axle	2/51		1	1
Clamp	1/02	1	4	4	6/120mm Axle	2/53		1	1
Clamp	1/03	2	4	8	Beam 162mm	3/06			2
Clamp	1/04	4	4	8	Beam 274mm	3/10			2
Clamp	1/05	2	4	8	Plate 66*108mm	3/50	1		
Clamp	1/06	2	4	8	Collar 6mm	4/01		2	2
Clamp	1/07	4	8	16	Collar 4mm	4/02			4
Clamp	1/08		4	8	Bush 6mm	4/03		2	2
Clamp	1/09	2	2	4	Bush 4mm	4/04			4
Clamp	1/10	2	2	6	4/6mm Sleeve 5mm	4/05	4	4	4
Clamp	1/11	1			4/6mm Sleeve 12mm	4/06		2	4
Clamp	1/20		4	8	4/6mm Sleeve 20mm	4/07		1	2
Clamp	1/21		4		6/8mm Spacer 2mm	4/08		4	6
Link 2h	1/30	2			4/6mm Split Sleeve 12mm	4/09		2	3
Link 3h	1/31	2			Pulley Disc 42mm	5/01		4	8
Bell Crank	1/35	2			Pulley 16mm	5/05	4	1	1
4/18mm Rod	2/01		4		Pinion 16t, 4mm bore	6/16			1
4/30mm Rod	2/02	1	4		Gear 64t, 6mm bore	6/64			1
4/40mm Rod	2/03	2	2	4	Screwdriver	7/01		1	1
4/50mm Rod	2/04	1	3	4	Spanner	7/02		1	1
4/60mm Rod	2/05	2	2	2	Span'driver	7/03	1		
4/70mm Rod	2/06	1	4	2	M3 Bolt 6mm	8/01	14	60	85
4/78mm Rod	2/07	1	6		M3 Bolt 8mm	8/02	5	20	30
4/90mm Rod	2/08		4	2	M3 Bolt 12mm	8/03	8	12	20
4/106mm Rod	2/09	2	5	6	M3 Bolt 19mm	8/04	2	8	12
4/134mm Rod	2/10		4	4	Grub Screw 5mm	8/08			16
4/162mm Rod	2/11		4	2	M3 Nut	8/10	35	80	140
4/218mm Rod	2/13		4		8*3.2*.8mm Washer	8/20	25	8	40
4/246mm Rod	2/14		4		Eye Bolt, M3*12mm	8/31	3		
4/174mm Rod	2/15		4		4mm Thr'd Sleeve 5.2mm	8/40	10		
Scr End Rod 3cm	2/30	1	1	2	4mm Thr'd Sleeve 12.2mm	8/41	4		
Scr End Rod 4cm	2/31	2	2	2	Crank Handle 10cm	9/01		1	1
Scr End Rod 5cm	2/33	2	2		Hook	9/02		1	1
Scr End Rod 7cm	2/34		2	2	Hook	9/03	1		
Tie Rod 51mm	2/41		4	4	Tyre for #5/05	9/09	4		
Tie Rod 91mm	2/43		2		Tyre for #5/01	9/10		2	4
Tie Rod 110mm	2/44	2			Spring 10*15mm	9/30			2
Tie Rod 150mm	2/46	2			Cord		1	1	1
Tie Rod 170mm	2/47		2		Manual		#0	#1	#2

**FIG.9**

instructions and scrap views are included. The 31 standard constructions at the beginning of the manual are a little daunting en masse, but the builder is usually directed to which ones apply to the model being built. Fig.10 is the original size but in the manual there is also another view of the model from the front, and half a page of building instructions.

**No.1-2.** The box is the same as the No.1 except for the number on the lid, and 2 compartments in one row are merged to take the longer Rods & Beams. If the quantities of parts in the manual are correct the No.1 has a few more of several parts than the No.2. This would mean that not all the No.1 models could be made with Set 2 but no problem since it seems that a No.1 manual was not included in the No.2.

**No.2.** **The box** is 21¾\*30¼\*4cm with an end opening and 2 trays of parts inside. The lid, Fig.6, features 2 of the manual models and many of the parts in the set are shown on the bottom of the box. One tray has 16 compartments in 5 rows, and the other, 12 in 3 rows, though in some sets there is an extra compartment in one row.

**The manual** has 32 unnumbered pages 211\*147mm including covers. The front, Fig.7, has one of the manual models on the lid. p2 (C2) has the illustrated parts as on the bottom of the box. p3 has the introduction followed by 57 standard constructions on pp4-8 (more than for Set 1 because



the No.2 contains Beams). Then on p9 a model called MODELLKONSTRUKTIONEER (a very simple 4-Wheel Chassis) which is probably just an exercise in assembling the wheels & bearings. The real models go from a MOTORCYKEL (Motor-

cycle) on p10 to CHASSI TILL PEDALDRIVEN BIL (Pedal-driven Car Chassis) on pp28-30. Next the set contents on pp30-31 and, on the back cover, magazine cuttings about FAC from 1952 & a PR '1952 52-3241'.

As well as the models above, and the Mechanical Hacksaw on the cover, the models include 2 Cranes (though not the one for Set 2 in the No.1 manual), a Bench Drill, a Cable Car & Winch, and a Pile Driver. As one would expect all the models are more ambitious than for Set 1, and as always with FAC, they look impressive, to my eyes anyway. Fig.11 show all the illustrations for the Chassis at their original size, but not the instructions – they cover all the ringed numbers.

One set seen has the different design of lid right, with part of the set's manual over the bottom right corner. The models on the lid are both in the manual but the view of the Cart is different (the righthand one is the Pile Driver).

**No.2B** The wooden boxed set right has a hinged lid, wooden partitions in the bottom giving 17 compartments in 4 rows, and a wooden tray with 11 in 3 rows. I'm not sure what the 'B' indicates but the main parts in the 2 sets seen appear to be the same as the cardboard No.2. Neither of the two No.2B's seen though had a manual with it.

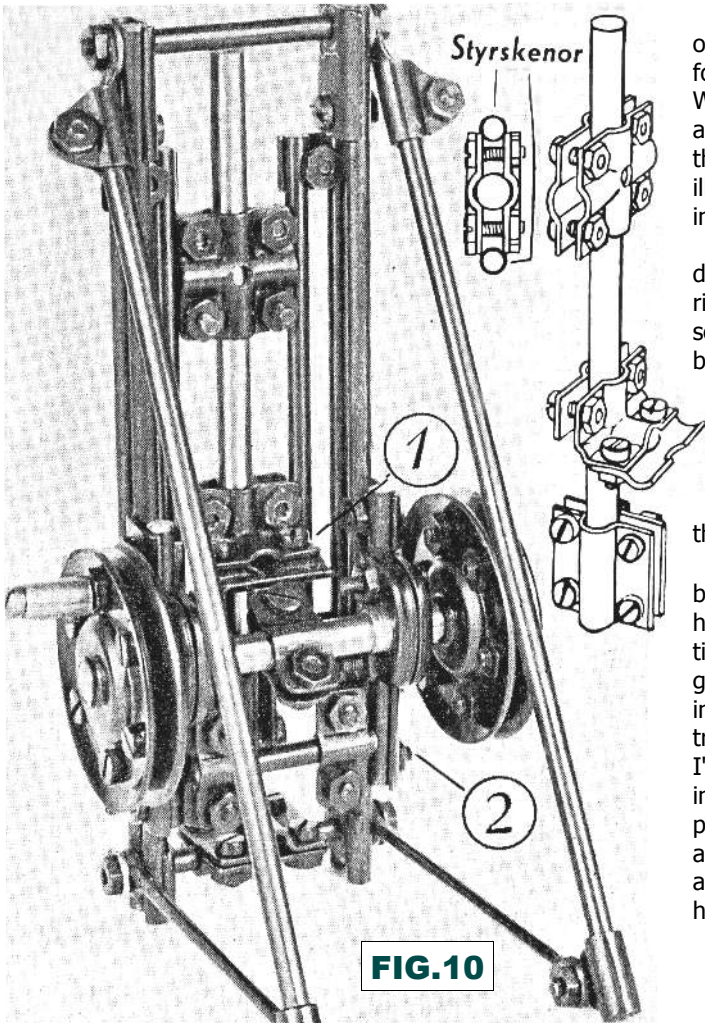


Fig. 37. *Smideshammar.*

CHASSI TILL PEDALDRIVEN BIL

Fig. 90

