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JULY 1972 VOLUME 57 NUMBER 7

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FRONT COVER

Passengers wait to board a "Bluebell Train" at Sheffield Park Station. (*Photo by Stephen Goodger*)

NEXT MONTH

Papermaking and the Road Research Laboratory are two of next month's features, while Meccano Models include a walking tractor (!) and a tracked lorry. Plus another full-size model plan, of course.

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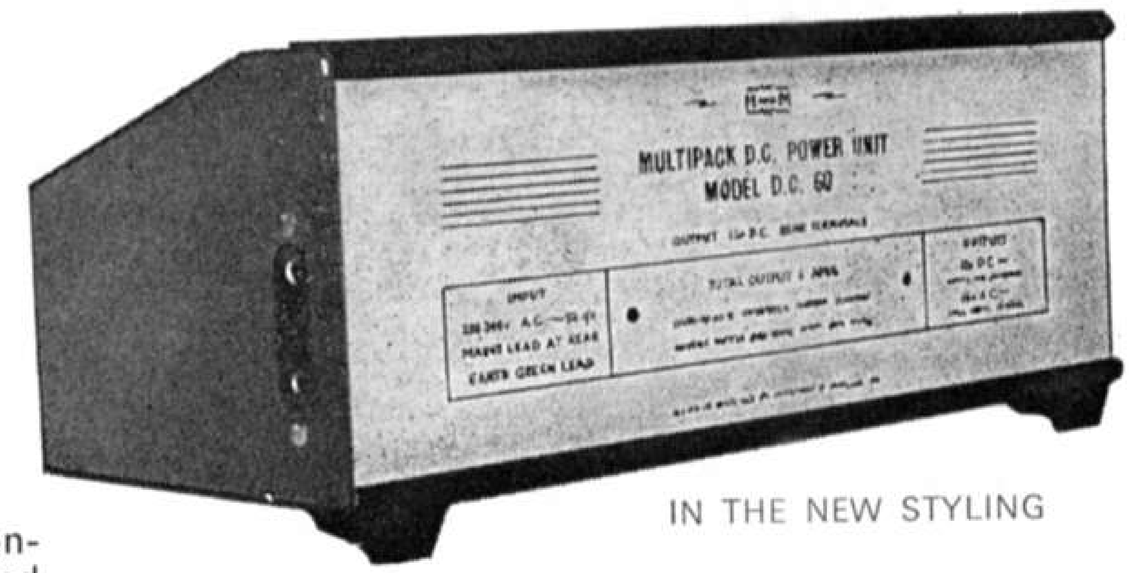

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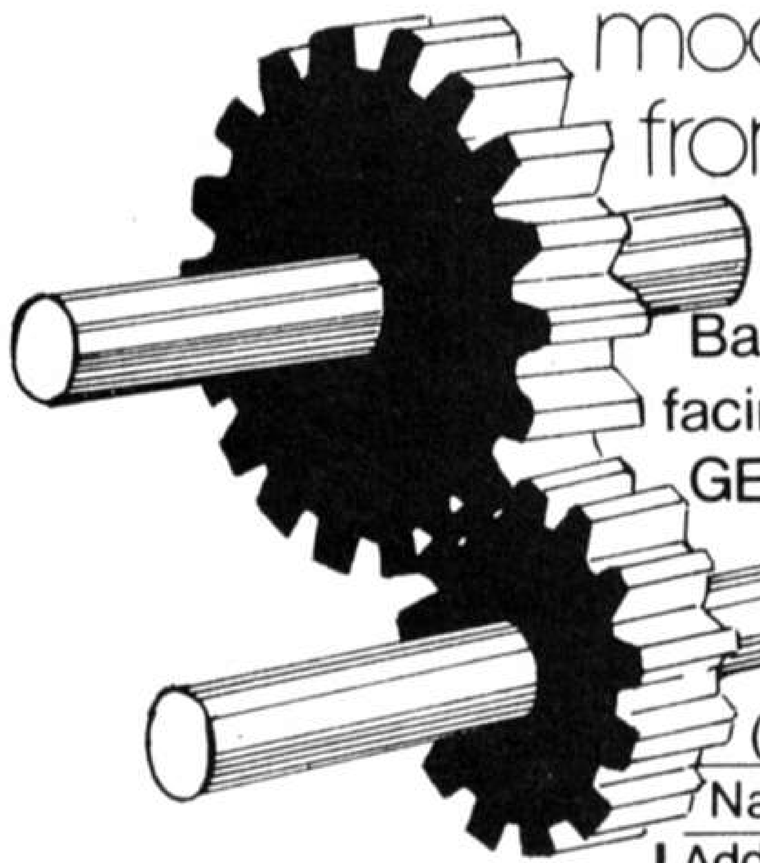

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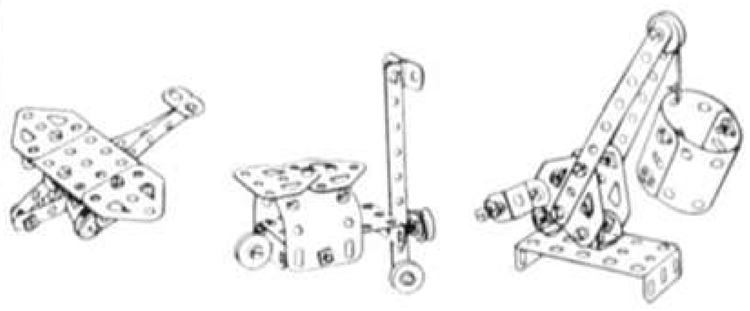

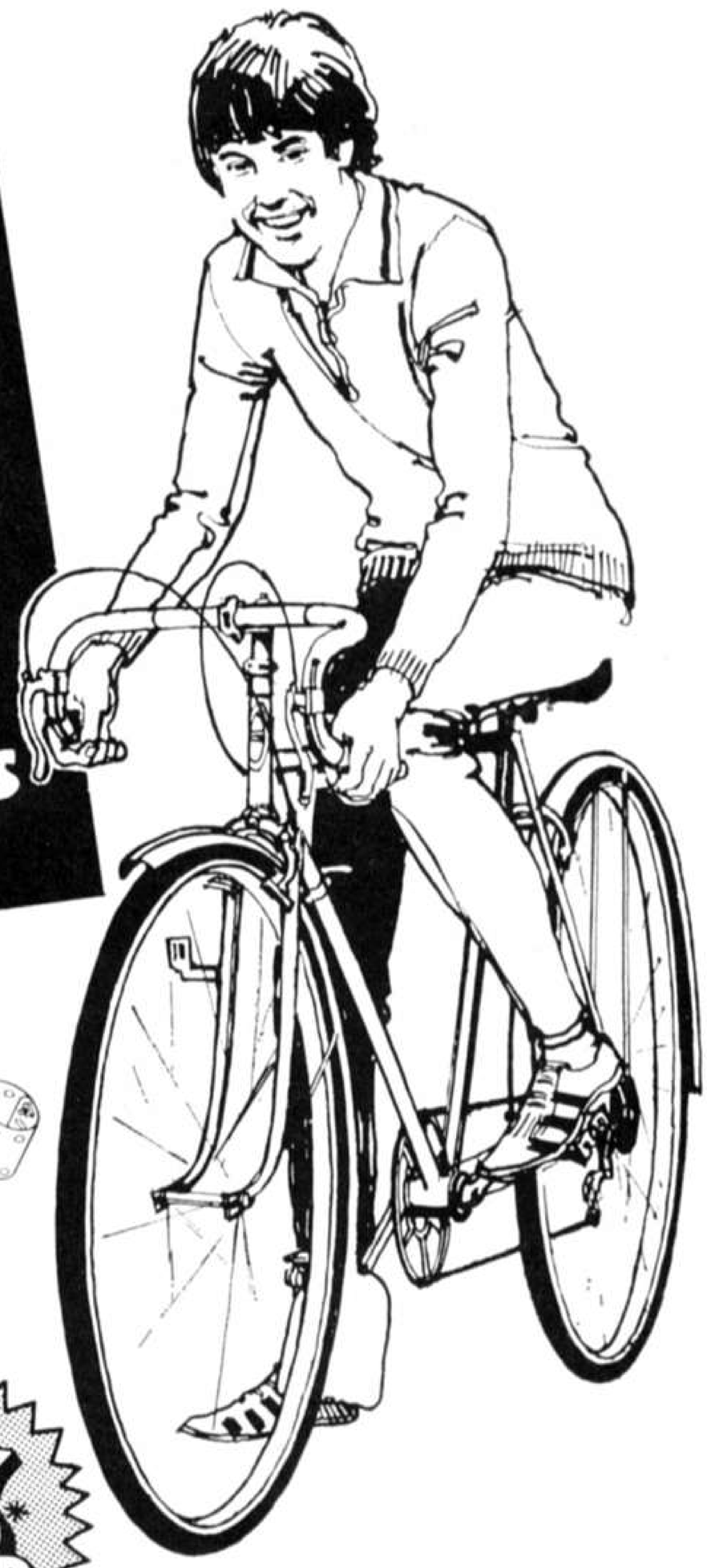

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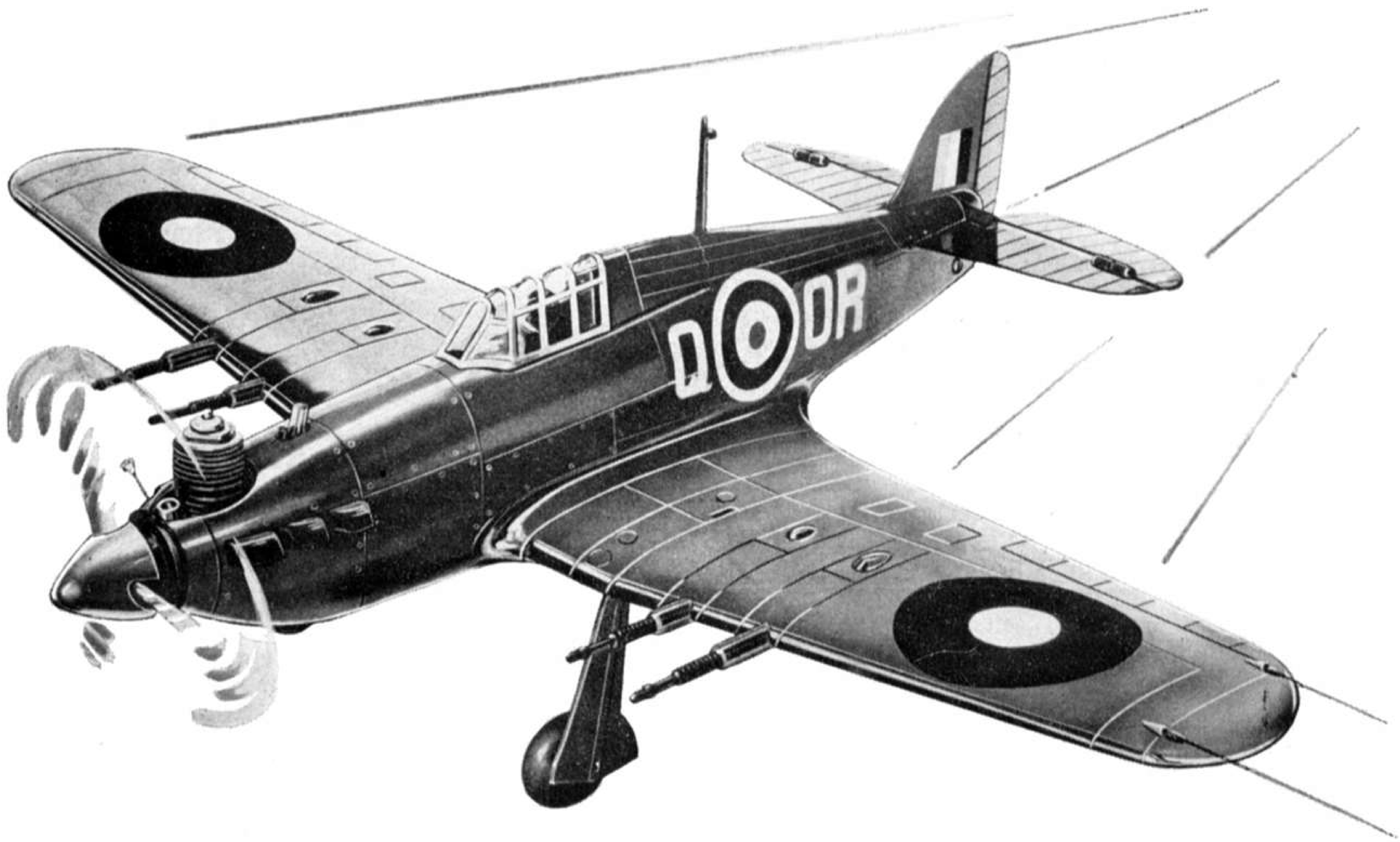

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ON THE EDITOR'S DESK

Just ending as this issue appears is the International Noise Abatement Congress, held at Dresden. Noise is a relatively recent phenomenon; of course there have always been noises, but the daily level of what we now encounter is many times that of even forty years ago, and it is now rightly regarded as a danger to health and pocket. Awareness in Britain has largely been brought about by the Noise Abatement Society, a voluntary and independent body formed by people who recognised the rising level of noise pollution as long ago as 1959 and felt strongly enough to do something about it.

To someone brought up next to a shipyard or boiler-making factory, concern about noise may seen incomprehensible, although there are no doubt some types of noise which upset them. New techniques of welding etc. have reduced the amount of riveting on, say, a ship under construction, but in any event the necessity for the rattle of riveting guns in understandable and thus their noise becomes more tolerable. So much noise is totally unnecessary, but so often reducing the output means someone spending a little money or a little time, and it will not be done unless the issue is forced, hence the need for an active pressure group such as the N.A.S. What they have achieved already has benefited us all—more power to them.

Sound is a complex thing to measure, but the following chart from the Noise Abatement Soicety indicates the principle of the scale.

The DECIBEL is the unit used to measure the intensity of a sound. The loudest sounds we may meet have an intensity of more than a million times the intensity of the faintest sound we can hear. A scale of Decibels takes this into account. It is a logarithmic scale and ensures that the proportional changes in the intensity shall be covered by the same number of units, thus a tenfold increase is represented by a change of 10 Decibels.

The following table gives a rough guide of the Decibel level of typical sounds.

Intensity	Equivalent Decibels	Typical Sounds
100 000 000 000 000 000 000	200	Noise Weapon
10 000 000 000 000 000 000	190	
1 000 000 000 000 000 000	180	Lethal Level
100 000 000 000 000 000	170	
10 000 000 000 000 000	160	
1 000 000 000 000 000	150	Sound at speech frequencies can burn the skin.
100 000 000 000 000	140	
10 000 000 000 000	130	Jet engine at 100 ft. Air raid siren. Pneumatic riveter. Hydraulic press at 3 ft.
1 000 000 000 000	120	*Threshold of pain* 1 billion times greater than the least audible sound. Jet aircraft at 500 ft. Inside boiler factory.
100 000 000 000	110	Motor horn at 20 ft. Pop group at 4 ft. Power mower at 4 ft. Train whistle at 50 ft.
10 000 000 000	100	Food blender at 2 ft. Inside train compartment when door is slammed. Lorry which passed M.O.T. test of 92 decibels at 25 ft. measured in narrow street at 12 ft. (the furthest distance to which a pedestrian can retreat.)
1 000 000 000	90	Heavy truck. Automatic lathe. Underground train.
100 000 000	80	*Danger Level.* Inside small car. Noisy office. Alarm clock.
10 000 000	70	Busy Street. Large shop. Building noise.
1 000 000	60	Normal conversation at 3 ft.
100 000	50	Quiet street. Inside average home.
10 000	40	Quiet office. Quiet conversation. Residential area at night.
1 000	30	Tick of watch. Rustle of paper. Whisper.
100	20	Quiet country lane.
10	10	Leaves rustling in the wind.
1	1	Threshold of hearing.

Preservation

The story of the successful Bluebell line in this issue leads us to mention the latest of the Preservation Societies. This time the target is the 10 mile Swanage–Wareham branch line in Dorset, which is some distance from any other preservation scheme, and being in an important holiday area, should stand a very good chance of success if sufficient initial support can be rallied. Anyone who is interested in helping to reopen the line, or who can help with the loan of photographs etc. for publicity for the project, is requested to write to Andrew Goltz, Swanage Railway Society, 44 Whitehill Lane, Birmingham 29.

Meanwhile . . .

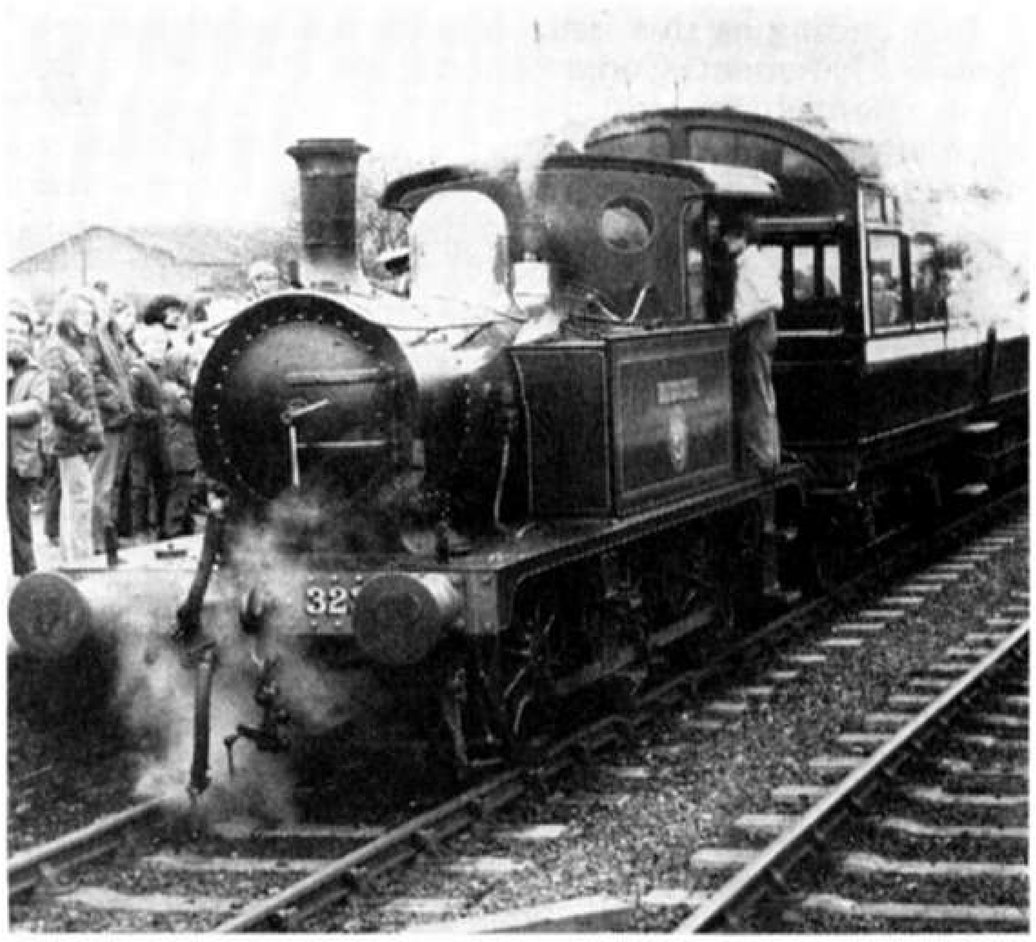
Those intrepid Army types with their two Range Rovers got through the swamps mentioned in our last issue and were due to set out on May 12th on the final leg of their Trans-Americas journey. Quite a long leg, too—7,000 miles from Bogota through Colombia, Ecuador, Peru, Bolivia, Chile, and Argentina, arriving at Tierra del Fuego around mid-June. That their 7,000 miles from Alaska to Panama took about a month, and the last leg of the same distance is due to take about the same, while the relatively short length of the Darien Isthmus took four months, is some indication of the difficulties encountered.

Ear defenders produced by the Noise Abatement Society make this young man impervious to his sister's shrieks. They look as though they're both enjoying it, anyway!

SUCCESS STORY

TWELVE YEARS OF STEAM ON THE BLUEBELL RAILWAY

by S. Goodger



1972 SAW THE twelfth anniversary of the world famous Bluebell Railway, for it was on the 7th August 1960 that the official re-opening of the line took place.

Twelve years ago, in the face of considerable ridicule, a group of enthusiasts who were determined to preserve for posterity some of the grandeur, and excitement of the 19th century steam locomotives, opened up a public service on five miles of track between Sheffield Park and Horsted Keynes in Sussex.

The single line is situated in the heart of the Sussex Weald, between Lewes and East Grinstead, the nearest large town to the line being Haywards Heath. Trains run from the headquarters of the line at Sheffield Park through unspoilt country-side to Horsted Keynes and back again.

The origin of the name "Bluebell Railway" is interesting. It is said that the name came about because the train used to travel so slowly that you could get out on to the line, pick bluebells, which grow profusely here, and have time to catch the train up again!

The full length of the line used to run from East Grinstead to Lewes and was opened in 1882, most of it single track, although part was double track. The station buildings were in a lavish style, which was popular at this time, and large goods yards were laid out to take the trade in timber, milk, and cattle, which was the line's mainstay; with the increase in road transport, this trade decreased to nothing.

It was in 1955 that the line was first closed without ceremony, because it happened in the middle of a national rail strike, but it was discovered that the closure was illegal until the original act of Parliament was repealed. So the British Transport Commission was forced to re-open the line in August 1955, and heavy losses were incurred. Closure finally came about in March 1958.

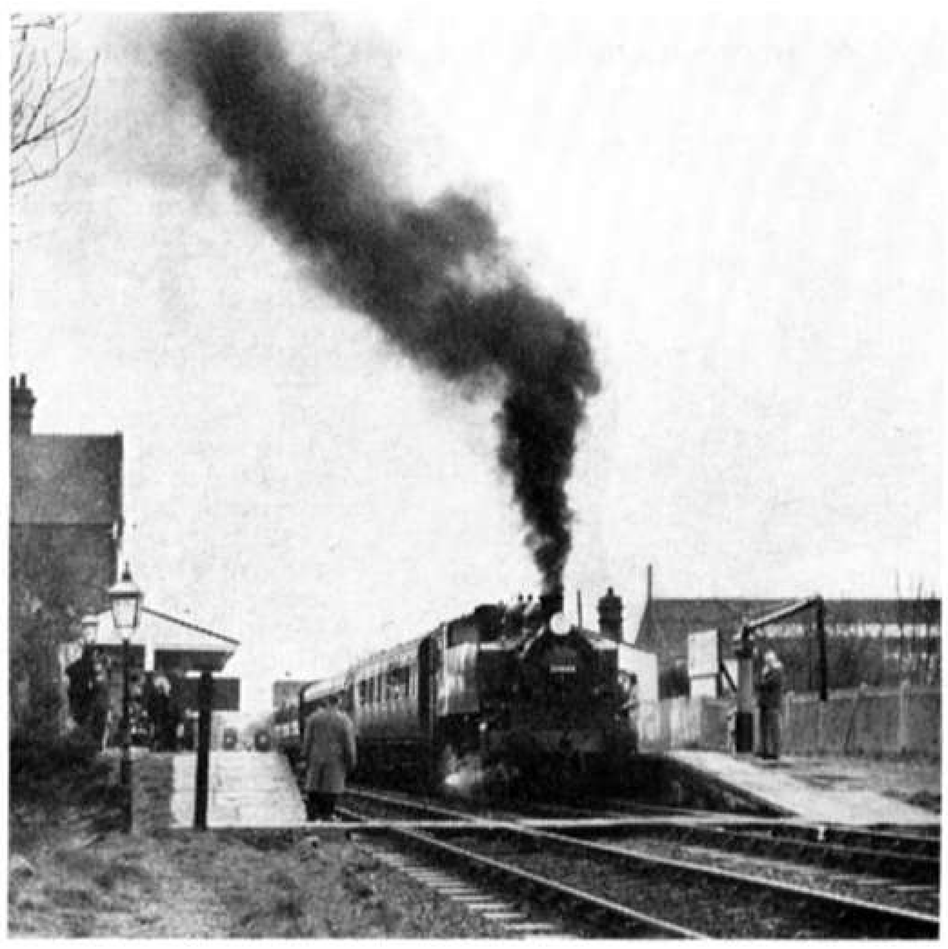
With the publicity the opening and closing of the line had brought, much interest had been aroused, and a committee was formed to negotiate the purchase of the line from British Railways.

Eventually, after much discussion, the Bluebell Railway Preservation Society, as it was then called, was given three months to raise £34,000 to purchase the freehold of the line from Sheffield Park to just short of Horsted Keynes Station.

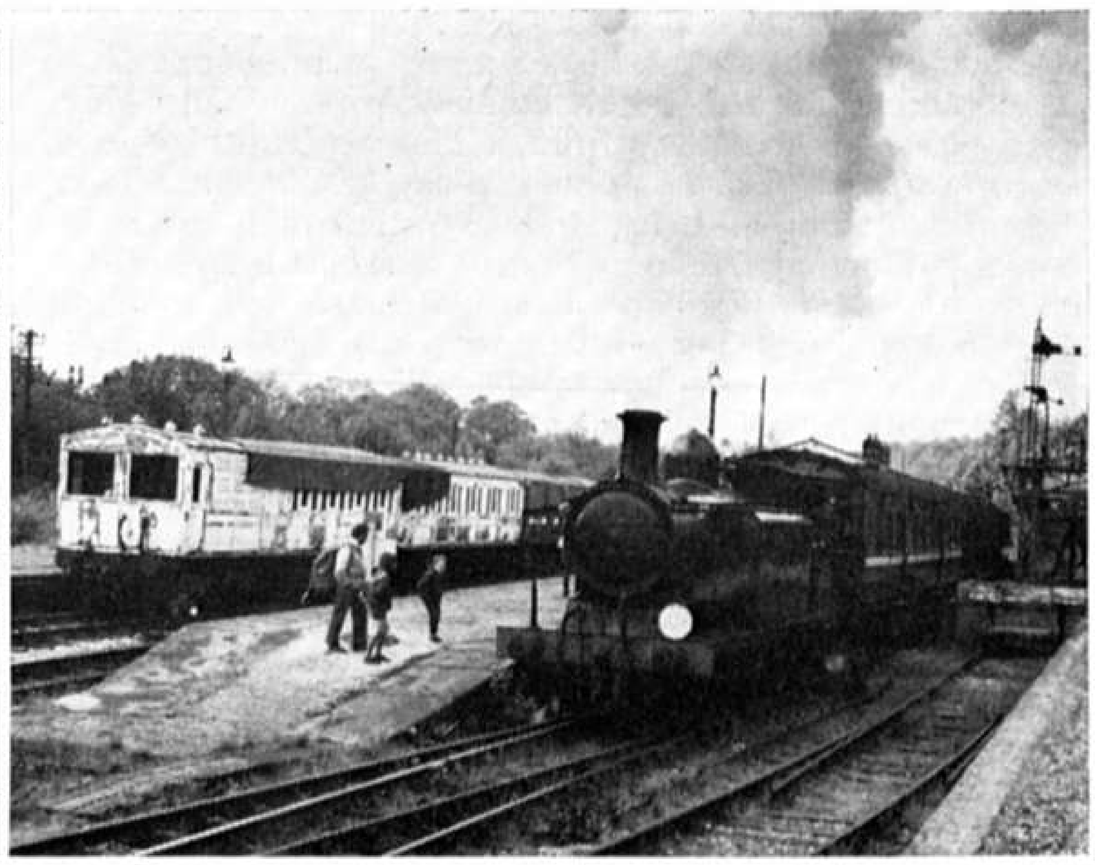
The challenge was taken up, and on 9th July, 1960, the Ministry of Transport inspected the line, and the final light railway order was granted on July 27th. Before the order was granted, a lot of work had been done on cleaning the line and re-painting station buildings etc. Two locomotives were purchased, *Stepney* and *Bluebell*, as well as two coaches.

The line was opened to passengers in August, and by the end of October, with the line being opened only at

Above, engine number 323, *Bluebell*, engaged in shunting duties at Sheffield Park. Below, 30064 moves out of Sheffield Park Station, Easter Sunday 1972, with a full train.

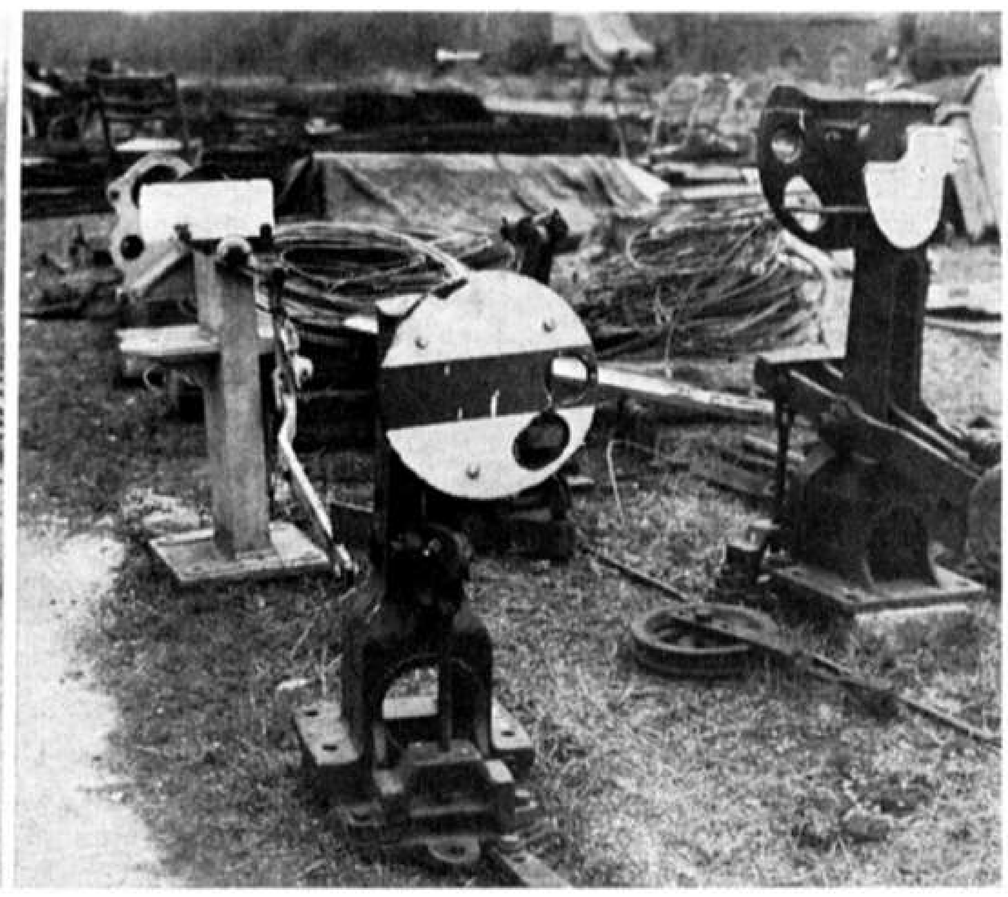


Engine number 27; only eight of this type of engine were built, for the South Eastern and Chatham Railway in 1908



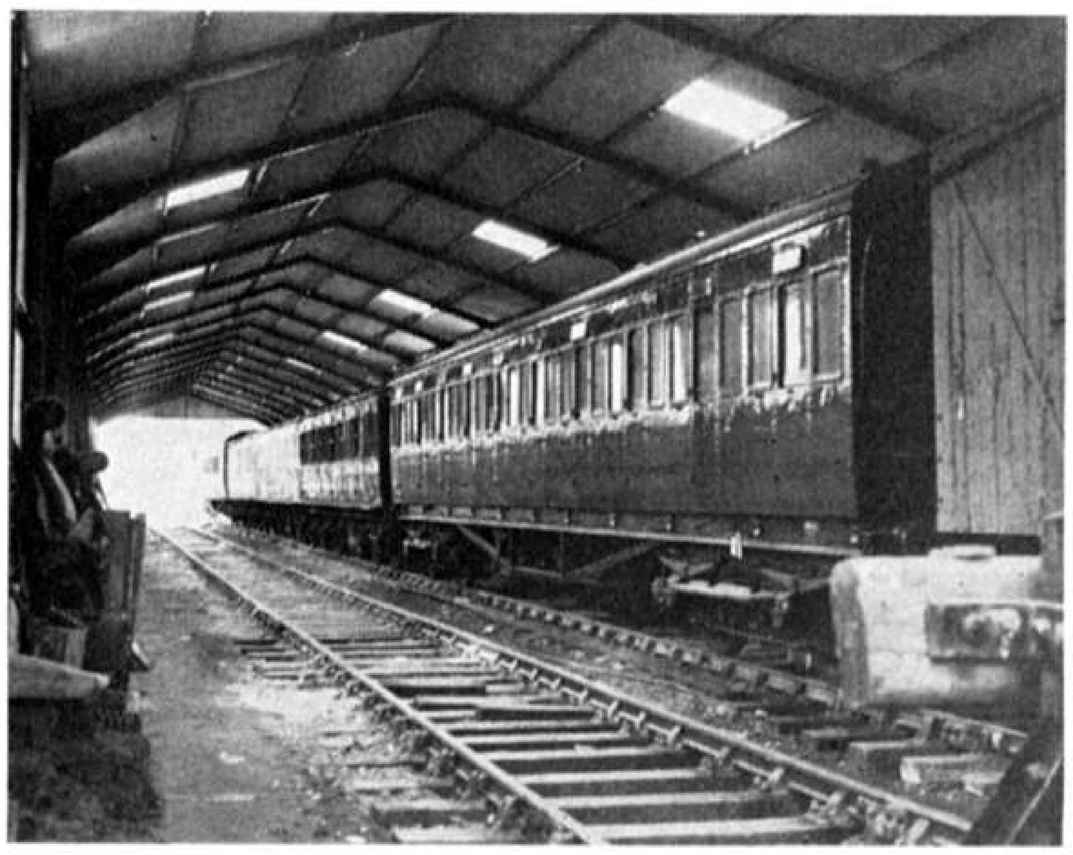
Birch Grove makes her way out of Horsted Keynes station. Coaches waiting repair can be seen in the background.

Members at work on the track at Horsted Keynes.

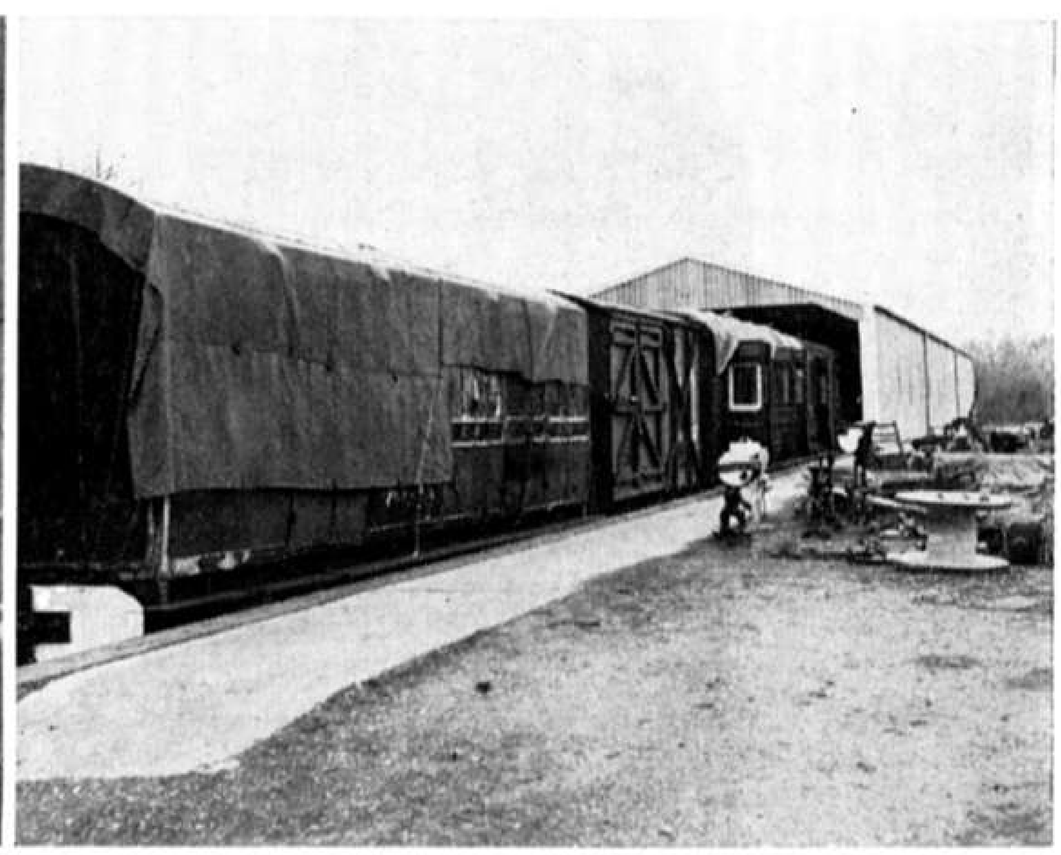


Signal equipment waiting installation at the signal department's Headquarters at Horsted Keynes.

The interior of the new carriage sheds at Horsted Keynes Station.



Outside the new carriage sheds at Horsted Keynes station, opened in March 1971.



weekends, over 15,000 passengers had been carried.

During the following winter many maintenance jobs were carried out and a new engine, *Primrose*, and four more coaches were acquired. The highlight of the season came on the last operating day in October, when a train hauled by all three engines owned by the railway entered Horsted Keynes Station. (Previously trains halted at Bluebell halt just short of the station, making double ended working with the two engines necessary).

The next two years saw more rolling stock added to the growing number that the society owned, and many special trains ran to the railway which was still linked to the British Rail system. One in 1962, *The Blue-Belle*, ran from London Bridge with 300 passengers including Doctor, now Lord, Beeching.

In 1964 it was decided to close the "spur" from Horsted Keynes to Haywards Heath, and take up other lines which connected with the railway, despite the extra traffic which the Bluebell Railway had brought. The contract for the removal of the lines was put out. The contractors did not have an engine of their own, but hired one from the Bluebell, and this was brought back to Sheffield Park by road on a low loader after the work had been finished, as now all links with the outside British Rail System had been severed.

The 1965 season saw the railway going from strength to strength, with 200,000 passengers being carried, and the railway operating at weekends throughout the year, but the five-year lease that British Railways had granted was running out and it was decided to purchase the line outright. Negotiations dragged out until a price of £43,000 was agreed, with payments being made in two parts of £23,000, and the balance of £20,000 in quarterly payments. The contracts were exchanged in October 1968.

With this battle now won, the society could now devote itself to its main task of restoring and maintaining the growing fleet of engines, and coaches that it owned. During 1968 an anonymous donor expressed a wish to donate a locomotive to the railway, and after a nation-wide search, for with the withdrawal of steam from British Railways, engines were becoming very scarce, a standard class 4 number 75027 was chosen and delivered to the line in January 1969, together with some rolling stock.

The tenth anniversary of the line was marked in 1970 with special celebration trains in August, and at this time a tenth anniversary appeal was launched to raise money for the erection of carriage sheds at the former goods yards at Horsted Keynes. This was necessary as the rolling stock was suffering from the effects of weather damage, and there was no under-cover area to work on the carriages. Stock was moved into the sheds in March 1971.

The band of enthusiasts that first met in 1959 would hardly have dared dream that in the season of 1971 380,000 passengers would travel on the trains, paying £28,000.

Looking to the future, the society hopes to build a new engine works at Sheffield Park, for some of these grand old ladies of steam are now beginning to feel their age, and extensive overhauls are needed. The whole operation to build the sheds would require track alterations, and other work at very considerable expense,

Above, pride of the railway, an ex British Rail Standard Class 4 locomotive number 75027, given to the Bluebell railway by the generosity of an anonymous donor. Below left, Sheffield Park Station, the Headquarters of the Bluebell Railway. Below right, some of the old and forgotten advertisements of another age which decorate the walls of the stations.

and this would have to be phased over a few years. Repairs also have to be carried out to both the stations and alterations made to the track at Horsted Keynes to make it more suitable for terminal working.

At Sheffield Park Station there has been established a museum, which any visitor to the railway should not miss. Any member of the public can become a member of "The Bluebell Railway Preservation Society", and you should enquire at the stations or write to the Membership secretary at Sheffield Park Station, near Uckfield Sussex.

Thirteen trains are run in each direction on peak summer Sundays and Bank Holidays; on other Saturdays and Sundays nine. During the week, three or four, the same number on week-days and winter Saturdays and Sundays. A goods train will also operate as a attraction on some peak weekends.

The railway is operated by voluntary staff recruited from members of the Society, except for five full time staff, a General Manager, three staff to maintain the locomotives, and one the track; he used to carry out the same job on the same length of track when British Rail worked it. The drivers on the Bluebell line are all skilled men, some being retired, or ex-British Rail. Track and equipment are maintained at Ministry of Transport standards, and are subject to a Ministry inspection, like any other line.

Any visitor to the line will soon realise what inspired E. V. Lucus to write the following words. "My heart leaps up when I behold a single railway line, for then I know the countryside is almost wholly mine". And thanks to the band of enthusiasts in Sussex many people will be able to enjoy the experience of a journey by steam for many years to come.

Among the Model-Builders

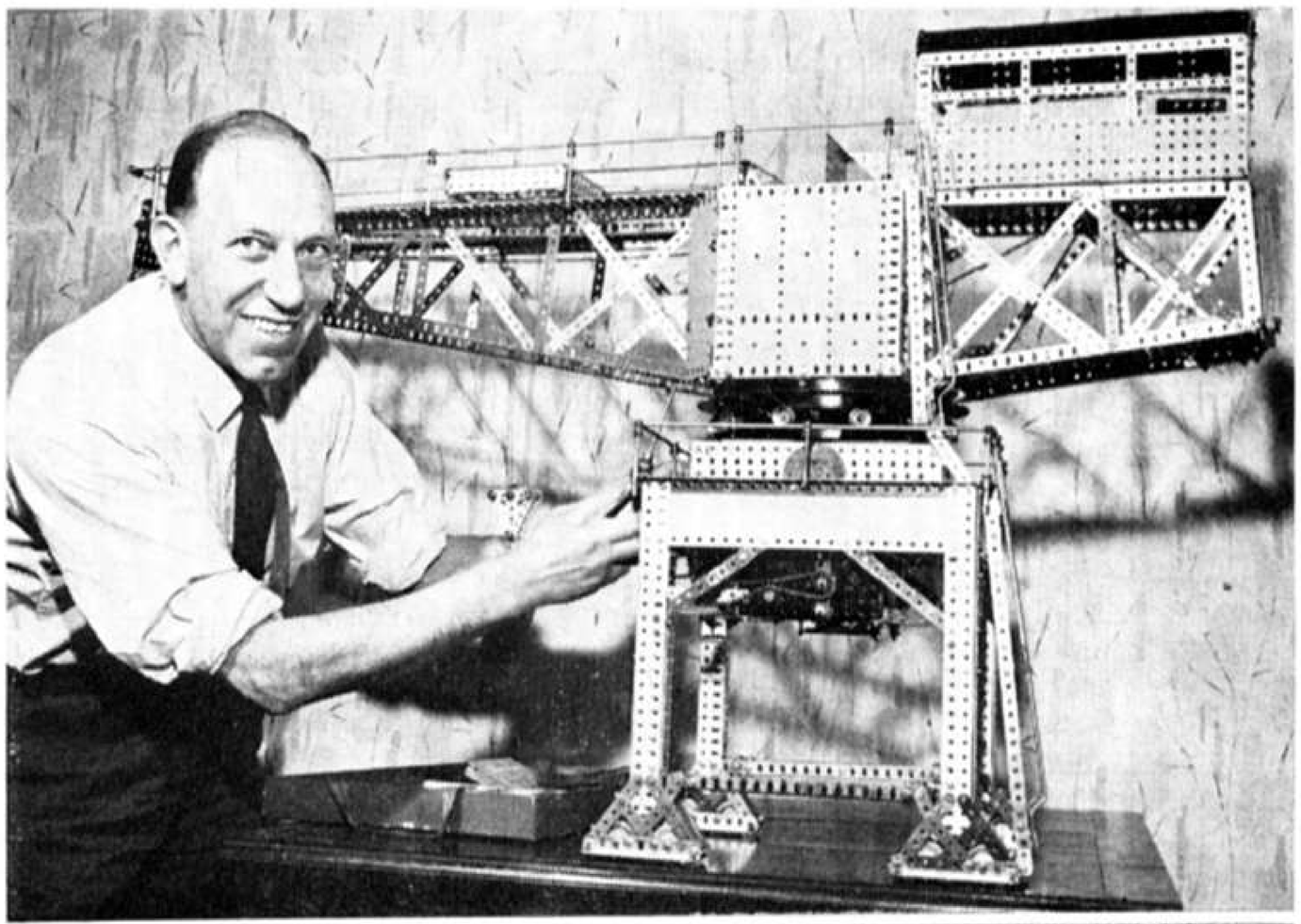
with 'Spanner'

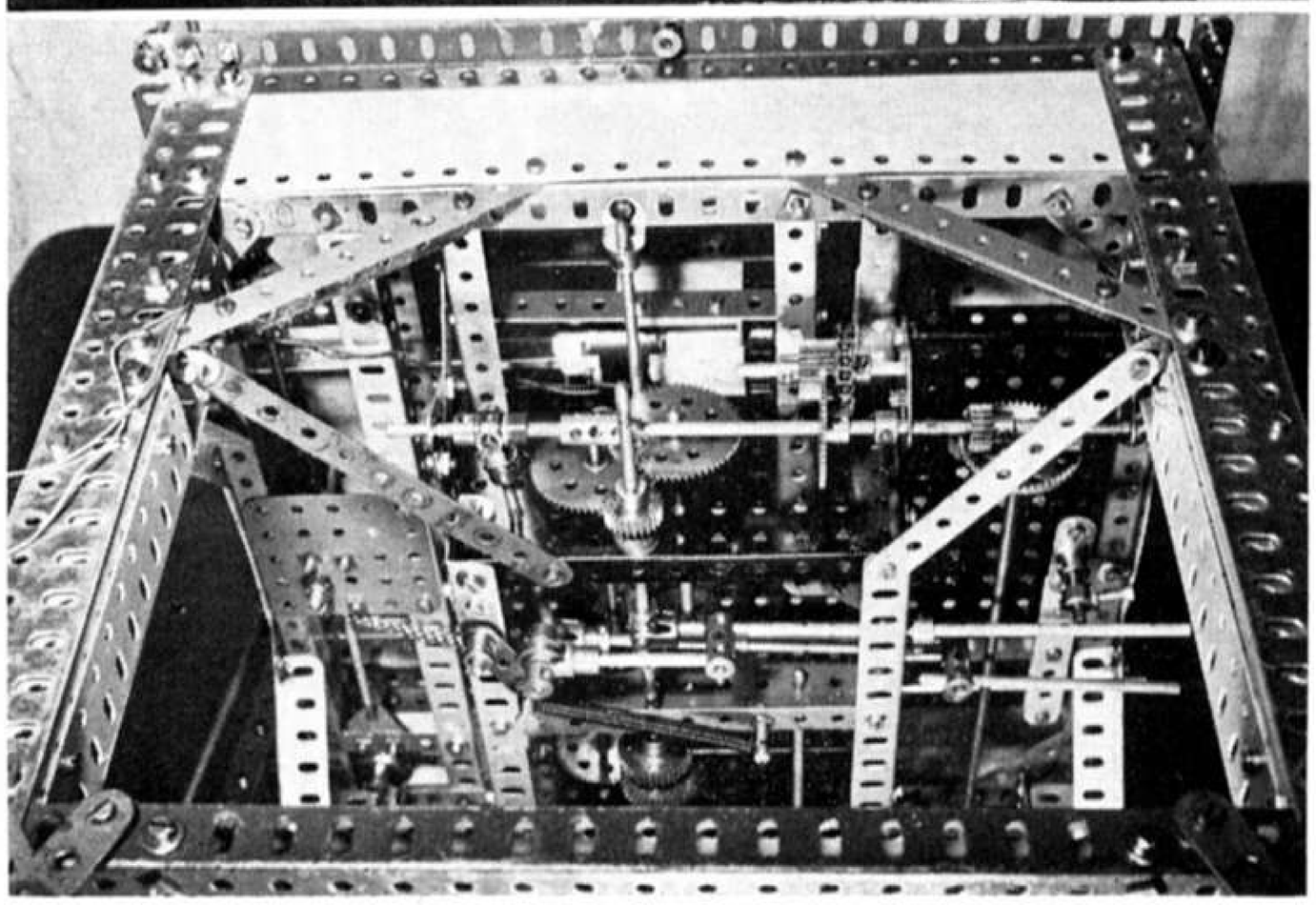
A Look at Hammerheads

LONG-STANDING (I nearly said ageing!) Meccano modellers will remember that most famous of all Meccano models—the Giant Block-setting, or "hammer head" Crane which was featured in a Super Model Leaflet published before the last World War. An artist's impression of a similar model was also illustrated on the front covers of Instructions Manuals and on the lids of Meccano Outfit boxes for many years, with the result that a Giant Hammerhead came to signify the ultimate dream of the Meccano enthusiast. It was the ambition of countless numbers of modellers to eventually collect enough parts together to "build the model on the cover".

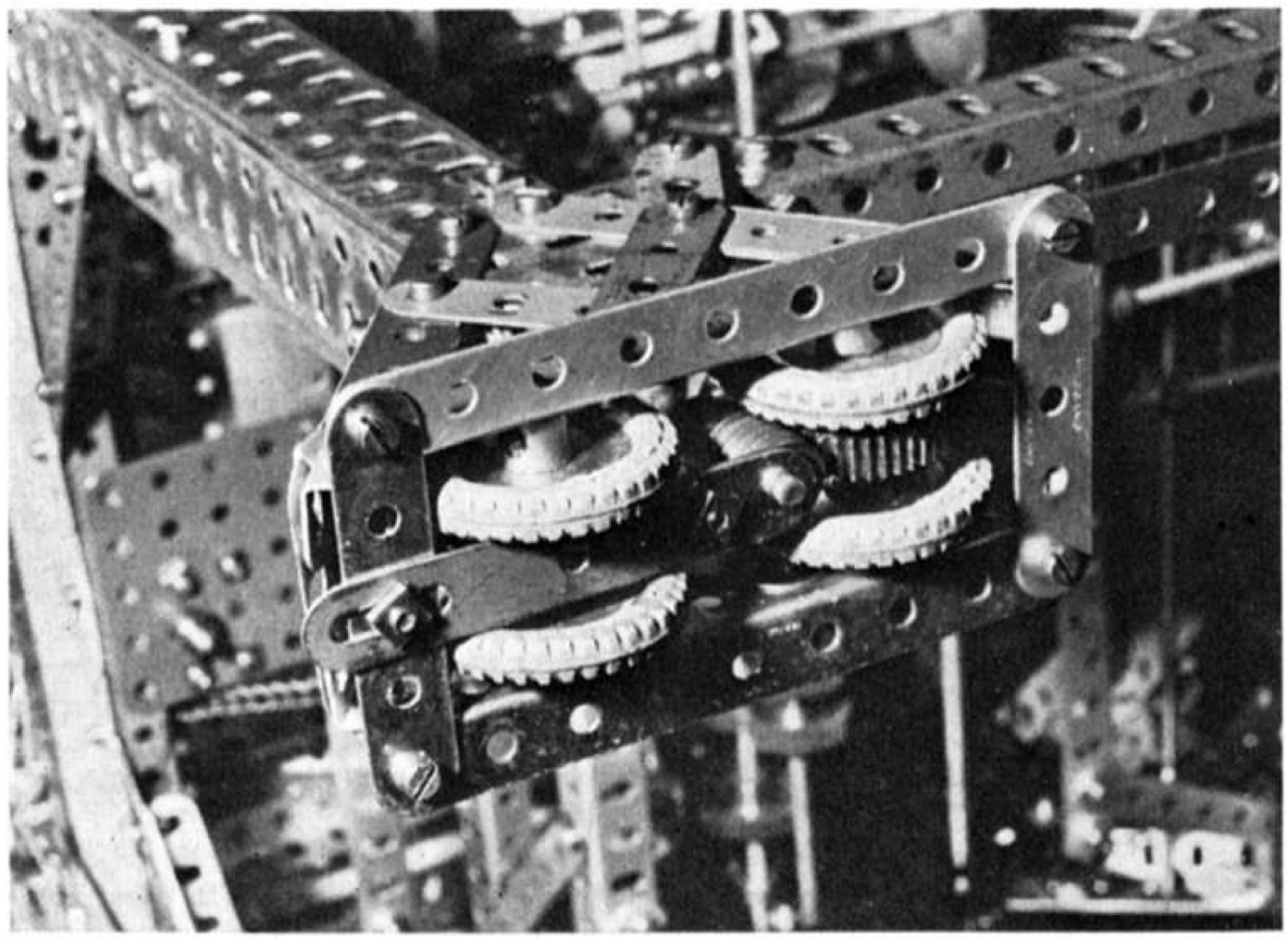
Unfortunately, the original Super Model Leaflet has been out of print now for 30 years and the cover picture was changed nearly 20 years ago, but plenty of modellers still carry their secret ambition with them—so much so that Leaflet No. 7 in the current series of No. 10 Set Leaflets is among the most requested instructional items available. This Leaflet also features a large Block-setting Crane, but one which is somewhat less complex than the original item. In the past year or two, however, this already high interest in hammerheads has risen even more, the reason undoubtedly being the introduction of the Large-toothed Quadrant, No. 167a, and its driving Pinion, No. 167c, in late 1970. It doesn't need me to tell you that these parts are ideal for large-scale models of the type in question and there hasn't been anything to compare with them since the discontinuation of the old Geared Roller Bearing with the last War.

Anyway, with the general interest in hammerheads in mind, I am taking the opportunity of featuring here three readers' models which





Top, Mr. Stan Evans of Bebington, Wirral, at work on his modified No. 10 Outfit hammerhead crane. Right, this close-up view, looking into the underside of the supporting tower, gives a good idea of the initial drive system and the control linkages included in Mr. Evans' model.



A close-up view of one of the model's "feet" showing the driven wheels. Note the use of a straightened-out Formed Slotted Strip, overlaid by a Fishplate, to obtain correct meshing between the Worm and 1 in. Gear.

have come to my attention in recent months. In my opinion they are top-quality constructions and even a glance at their photographs is enough to explain why such models have aroused ambitions in Meccano hearts for so long.

Wirral Wonder

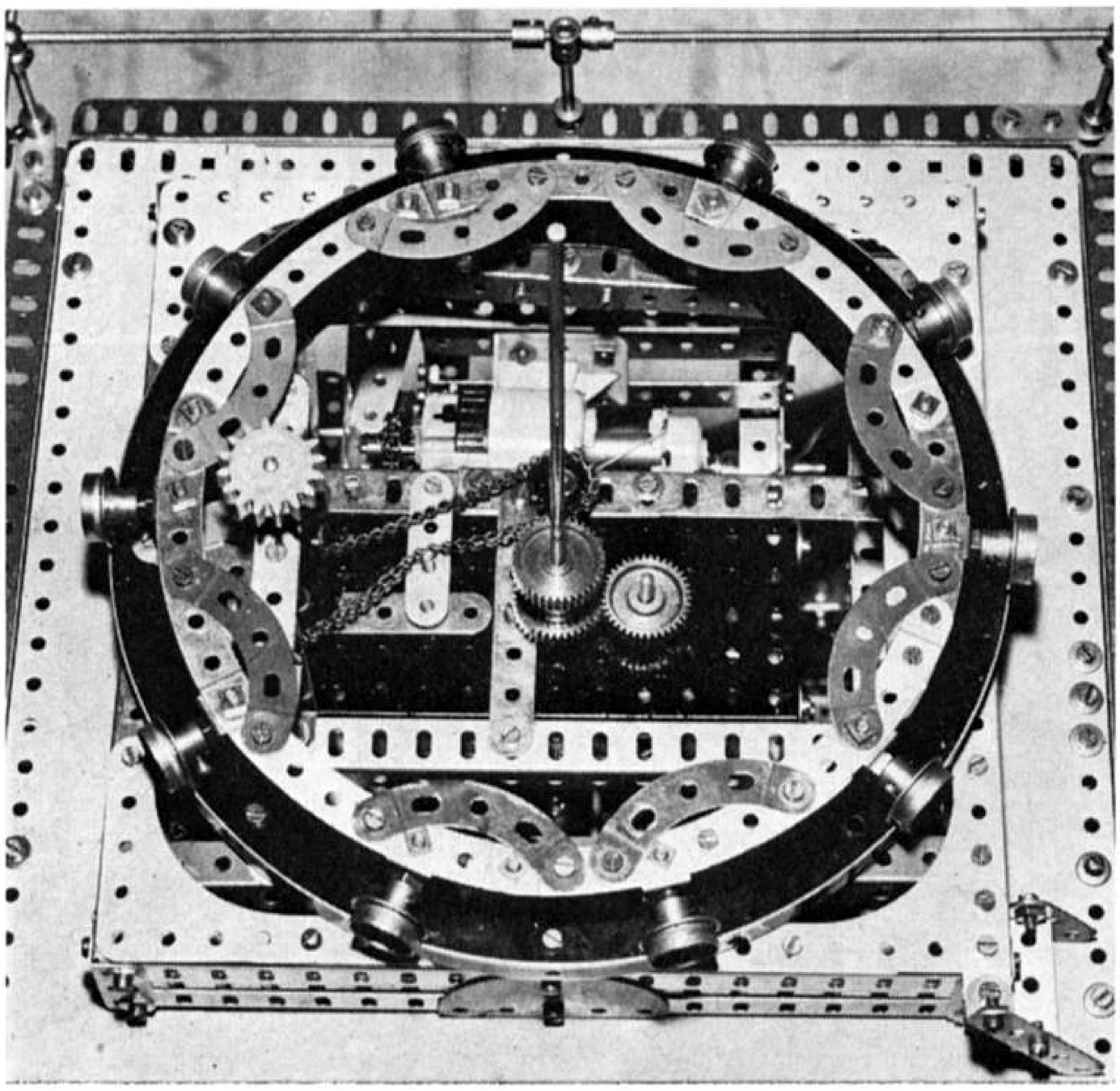
First in line is the wonderful work of Mr. Stan Evans of Bebington, on the Wirral Peninsula in Cheshire. As can be seen, I have covered it in considerable detail, this being possible, not because of favouritism, but simply because Bebington is in striking distance of the office. We went to see it and were able to take the accompanying photographs ourselves, thus making things easier all round. If the photographs are ours, however, the following concise notes are Mr. Evans' own work—and I must say I couldn't have put things better myself!

"The model", says Mr. Evans, "is based on the Block-setting Crane featured in current Model Leaflet No. 7, the principle differences being in the method of drive an control and in a more solid construction. In the Leaflet model, all controls are located in the boom, which clearly makes it rather awkward to operate, so I located all controls and drives in the supporting tower.

"The boom is mounted on ten ¾ in. Flanged Wheels running between two Flanged Rings, with the new large-toothed Quadrants sandwiched between them and another Flanged Ring. The wheel carrier is made up from eight 4 in. Curved Strips arranged in a circle with a diameter which clears the rings and large-toothed Pinion shaft. The stub axles are Threaded Pins fixed by Angle Brackets as tightly as possible.

"Drive to rotate the boom is taken to the inside of the Quadrants by Chain and Worm from the gearbox below, drive being engaged by Dog Clutch. In the centre of the tower is an 11½ in. Rod, mounted vertically, which centralises the boom and takes the drive to the Trolley. Free to rotate on this Rod is a Socket Coupling with 1 in. Gears fixed at each end. The lower 1 in. Gear meshes with another 1 in. Gear driven from the Gearbox, while the top 1 in. Gear meshes with a 1 in. Gear in the boom. This arrangement forms a planetary gear and provides two independent drives to the boom irrespective of its position, one drive controlling the load hook and the other the gantry trolley. The hook drum-drive is located in the rear of the cab and is driven by chain from a 1½ in. Contrate and 25-teeth Pinion on a vertical Rod offset from the centre Rod by the necessary three holes. The centre Rod takes the drive to the trolley by a 1½ in. Contrate and 19-teeth Pinion, thence by Chain and Cord along the boom.

"Drive to the vertical Rods in the centre is by ¾ in. Bevels from the horizontal Rods, one end of each Rod having a 60-teeth Gear fitted.



A high view of Mr. Evans' model, with jib removed, looking down into the supporting tower. Note the simple planetary gear arrangement which takes two drives up to the jib.

These Rods are spaced three holes apart and the Gears are offset from each other. Three holes below is a sliding Rod with a 25-teeth Pinion which lies between the two 60-teeth Gears. Thus, on moving the gear lever, one or the other 60-teeth Gears is engaged. A reverse drive is included, this simply consisting of a Contrate and two 19-teeth Pinions.

"A brake is attached to the hook drive, this being automatically released and applied when the drive is engaged and disengaged."

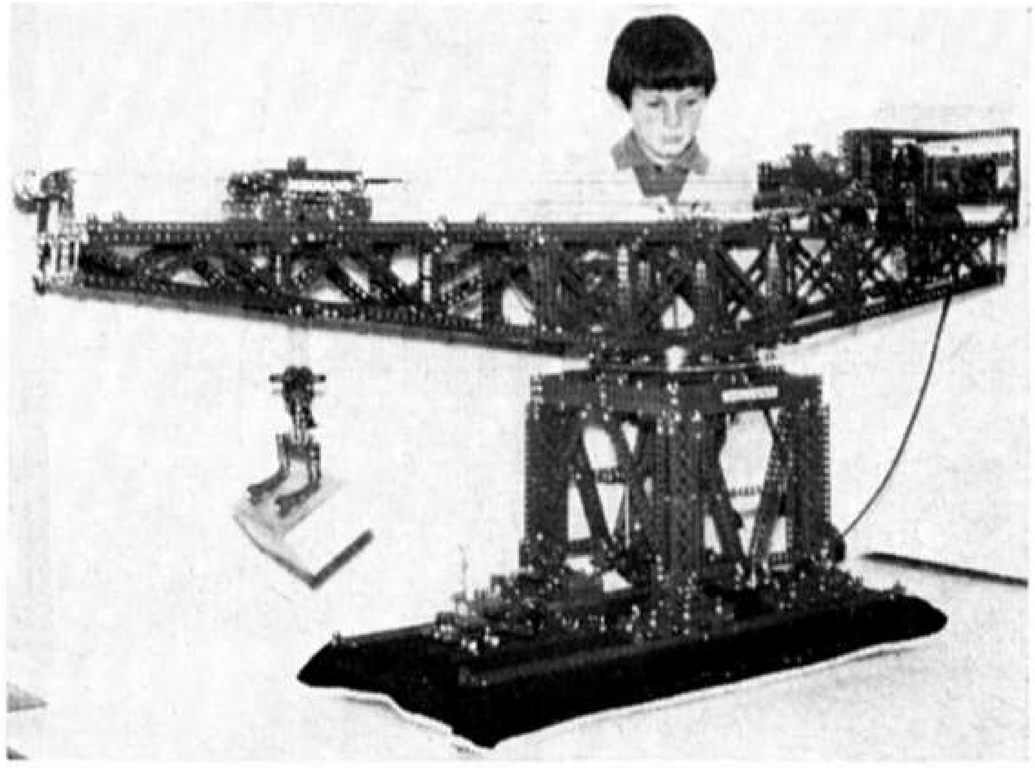
"Construction of the boom is quite straightforward, although the tower is rather difficult because of lack of space to manipulate screwdriver and spanner. As with most hobbies, however, patience will result in success!"

Having seen the model, I can confirm that patience certainly did meet with success! Congratulations, Stan.

Australian Giant

For our second hammerhead we jump the odd 11,000 miles or so to Australia where we find Mr. B. W. Pickersgill of Morphett Vale, South Australia. His outstanding model—pictured here with Cameron Theiley, a young enthusiast from Adelaide—is the classic Block-setting Crane featured in the pre-war Super Model Leaflet No. 4 and, as I have no information to the contrary, I am assuming it has been built to the original specifications. I think everybody will agree that the photo shows just how magnificent a model it is.

Mr. Pickersgill, by the way, is one of those valuable and much-appreciated modellers who greatly assist the hobby by placing their work before the eyes of the public. This particular model, for instance, was loaned to Messrs. Ponsford, Newman and Benson Limited, Australian Agents for Meccano, for display at a Hobbies Exhibition in a large Adelaide departmental store and I have no doubt that it attracted a great deal of deserving interest. I cannot stress strongly enough the tremendous value that publicity of this sort is to the hobby. It shows members of the public how much can be achieved with Meccano; it illustrates the amazing versatility of the medium and generally proves the excellence of what, after all, is a truly excellent system. Equally important, it shows that Meccano is as much alive today as it always has been and that Meccano model-building continues unabated as an active and rewarding hobby.



Perhaps the most famous of all advanced Meccano models—the Giant-Block setting Crane featured in pre-war Super Model Leaflet No. 4. This example was built by Mr. B. W. Pickersgill of Morphett Vale, South Australia and is pictured here with Cameron Theiley of Adelaide, Australia.

Teeside Topper

Pep talk over! Now for our third and final hammerhead which comes from Mr. J. B. Foster of Billingham on Teeside. As a study of the photograph will show, this also is based on the current Outfit 10 Leaflet No. 7, although, as Mr. Forster himself says, "My model is quite a lot different from the original in that I have used a lot more gears, etc. For instance, the original has only two travelling wheels that are driven by the Motor, whereas mine has eight, running on rails. The drive is taken from the tower by Bevel Gears, Pinions and Contrates to the bogie wheels.

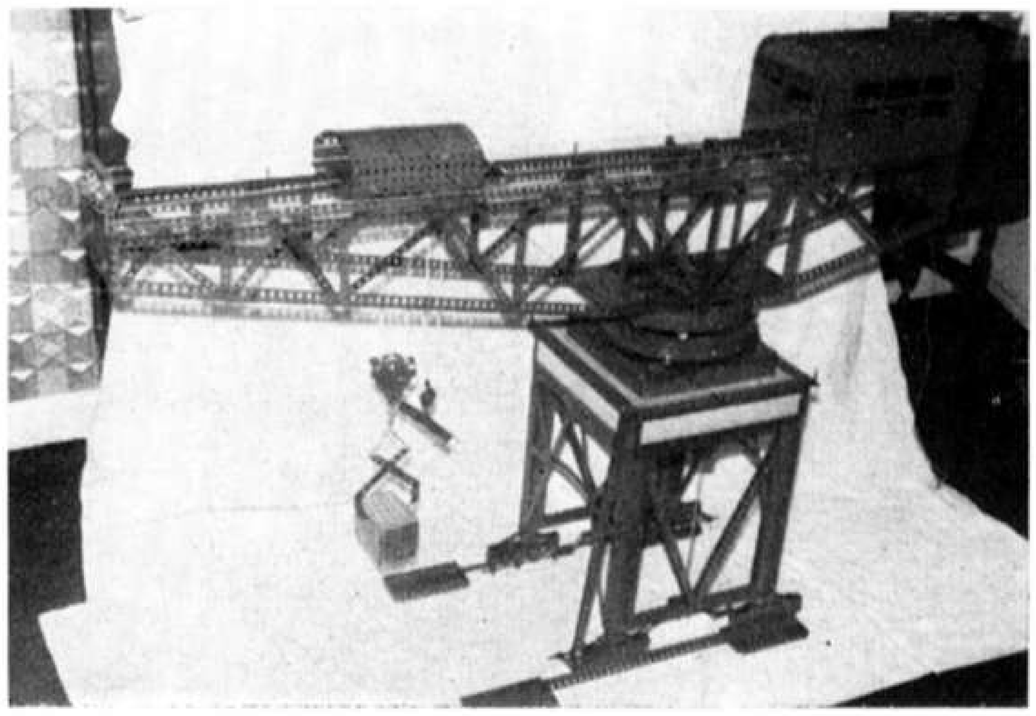
"Furthermore", he says, "My model has a five-movement gearbox which provides drive for the following operations: travelling, slewing, bogie-travel and drive to a large pulley block, with block-setting tackle, and also to a small pulley block. This last is shown in the photograph holding an original, but now obsolete Channel Segment, Part No. 119".

Mr. Forster also mentions that his model includes the new-Large-toothed Quadrants and in fact, I understand he built this particular model to try out the new parts on a subject that really fitted them. The model is undoubtedly an ideal test-bed for this purpose, as well as being a worthwile Meccano subject in its own right.

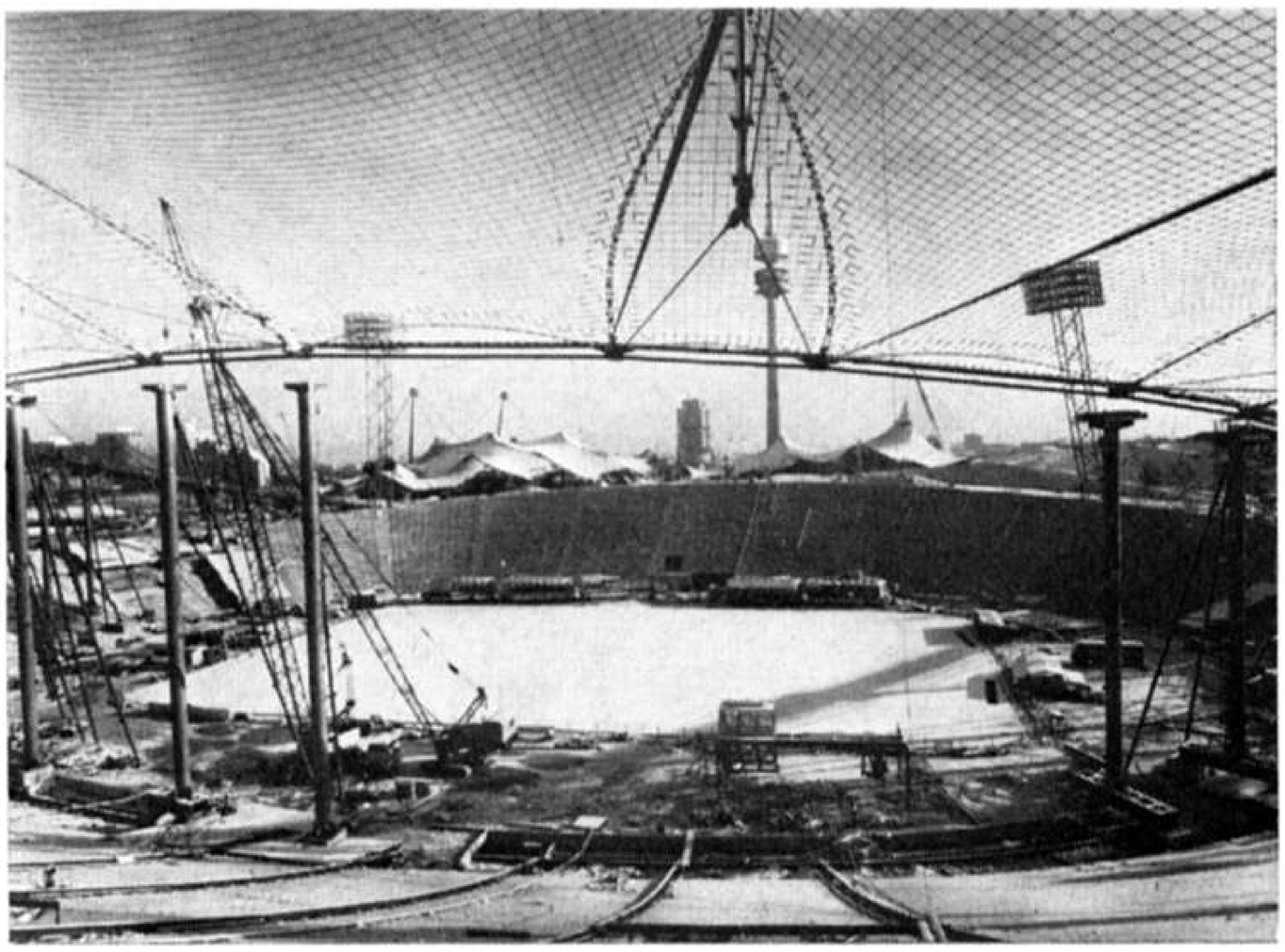
Meccano Club News

Before signing off, I would like to pop back to Australia for a moment to say "Hello" to the members of the Meccano Club attached to the White Hills Technical School, Bendigo, Victoria. Unfortunately, I do not have much information on the Club at the moment, but I understand from Club Leader Mr. Walter Ashburn that, with some 40 hard-working and enthusiastic members, it is an extremely active organisation indeed. The Club entered a float in the Bendigo Easter Procession and I hope to be able to include a photograph of this in a future issue. In the meantime I would like to welcome all members and offer best wishes on behalf, both of Meccano Magazine and Meccano (1971) Limited. You will find the hobby interesting and absorbing, gentlemen!

(Continued on page 344)



The work of Mr. J. B. Forster of Billingham, Teeside, this hammerhead is also based on current No. 10 Set Leaflet No. 7, but with a number of interesting modifications.



GETTING READY FOR THE GAMES

By P. M. Smith

WHEN the Olympic Flame is lit in Munich on August 12th, 1972, as a visible sign of the beginning of the XXth Olympiad, it will bring to a fitting conclusion a project which began in Rome on April 26th, 1966. This was the day the Olympic Committee gave the city of Munich the responsibility of organising the Games.

Obviously, a great deal of planning was necessary, and much of it was done by computer. There was a shock in store for the authorities at first though, when the computer made 1976 the earliest date for the completion of all work for the 1972 Olympics! Fortunately, this was the result of "illogical connections", and since that first scare, preparations have continued smoothly. In all, 15,000 workers from 18 countries have set to work on one area of Munich, and have dug, built, planted and transformed it into a 'new' Munich with 4,750 trees, 27 miles of road, 32 bridges, a lake, a new railway station and underground line, and a 960 foot Television Tower.

The 'new' Munich is symbolised by the Olympic Stadium on the edge of the city. Here will take place the opening and closing ceremonies, the athletic events (except the Marathon and 50 Kilometre Walk) and some equestrian events. For the athletic events, there are eight 400 metre running tracks, ten tracks for sprinting events, two high jump pits, one area for the long and triple jump, and for the field events a plexiglass cupola can be stretched over the throwing area to keep the competitors dry.

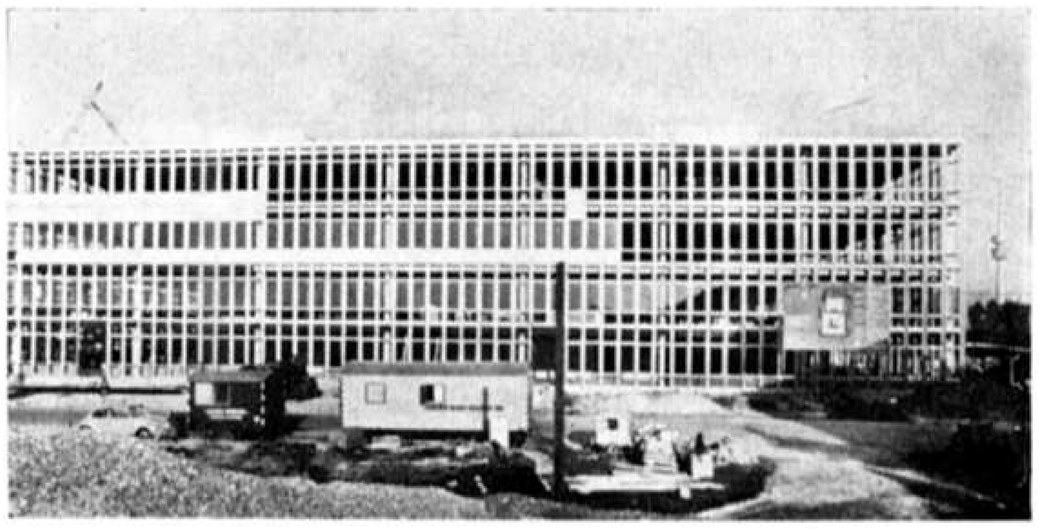
It is the translucent roof over the Stadium that is one of the boldest feats of engineering and design. It is a steel network covered with large squares of glass-like plastic, held by masts and pulled taut in every direction by steel cables as thick as a man's arm. Yet its gentle curving shape looks light and elegant despite the 3,400 tons it weighs. Because of its unique shape, unknown stresses and strains resulting from wind pressure, rain and snow had to be worked out. A computer was used to solve systems of mathematical equations with no fewer than 10,500 unknown quantities. The roof covers a total area of 90,000 square yards, and under it there will be room for 64,000 people. It will shelter them from strong sunshine too, for it has a slight grey-brown tinge to it, but contrasts for television shots will still be possible. Even when the Games are over, people will benefit from this structure, because the information obtained during construction has benefited all building designs involving cables.

When not actually competing, the 12,000 sportsmen and women will be accommodated with their attendants in the Olympic Village, which was sold two years before the Games begin! A private firm bought the accommodation, which they are leasing to the Games Committee and which will be offered for sale to private individuals immediately the Games are finished.

Construction of the four and a half thousand apartments has been speeded up by the use of prefabricated

Above, Olympic Stadium holding 80,000 spectators. It was already finished in the rough in July 1970. Left, the Olympic television tower stands over the grounds at 960 feet. It will transmit to over 100 countries, many via relay satellites.

Press Centre—About 4,000 journalists will work here during the Games. The 4-storeyed building is equipped with studios, 40 darkrooms and a central laboratory. Furthermore it houses 46 teleprinters, 90 telephones, and a picture transmission centre as well as typewriters with 144 different key-boards.



concrete units, even for interior sections. The bathroom units, for example, look like huge cabin trunks, but they contain a shower, wash basin and W.C., and are delivered to the site complete, walls, ceilings, floors and doors, ready for immediate installation.

Within the Village will be the usual medical centre with all facilities of a modern hospital, an information centre, and various service shops. A complete entertainment area will provide a theatre, international club, music, dancing, radio, television, and a cinema with simultaneous translation equipment for five languages.

Transportation from the village to the stadia will be provided by 400 mini-buses, 100 cars and 80 coaches, and the sailing competitors, whose events are being held at Kiel, 900 kilometres away, will be flown there by special plane.

In the Dining Rooms, menus printed in 5 languages (German, English, French, Russian and Spanish) will provide a wide variety of food. It has already been estimated that over 187,000 kilograms of meat and poultry, 26,000 kilograms of fish, over one million eggs, 756,000 portions of yoghurt, 106,700 litres of orange juice, and 64,500 litres of milk will be eaten and drunk during the Games.

The red carpet has already been laid for the competitors at Munich. It consists of a synthetic material called Rekortan, which covers 467,480 square feet of the Olympic Stadia. This is the actual running track on which the races will be held, and it has several advantages over a normal athletic track. It is less affected by weather, easier to look after, resistant to spikes, and very elastic. Because of this elasticity, better performances can be expected, especially from runners. Since the surface gives slightly and then tightens up again after every step, an athlete can take longer steps using the same energy, thus finishing a race quicker.

To cope with this expectation of faster times, at least two independent timing systems will be employed in all sports, so that a race does not have to be re-run because the photo-finishing equipment, for example, broke down.

For the first time in the Olympic Games, athletic events will not be timed by hand. In Munich, places and times will be ascertained by photo-finish film cameras, which can produce a $3\frac{1}{2}$ in. $\times$ $4\frac{3}{4}$ in. picture of the finish in twenty seconds for a short race, whilst for a longer event, a 130 foot film is ready for projection 45 seconds later. A time scale reproduced at the same instant enables results to be obtained to within three thousandths of a second.

Timing for swimming events will be done by means of an electronic contact. This is closed when a swimmer applies a pressure of at least 40 grammes to the touch finish strips installed at either end of the pool. At the same time, the swimmers' times and placings appear on the scoreboard.

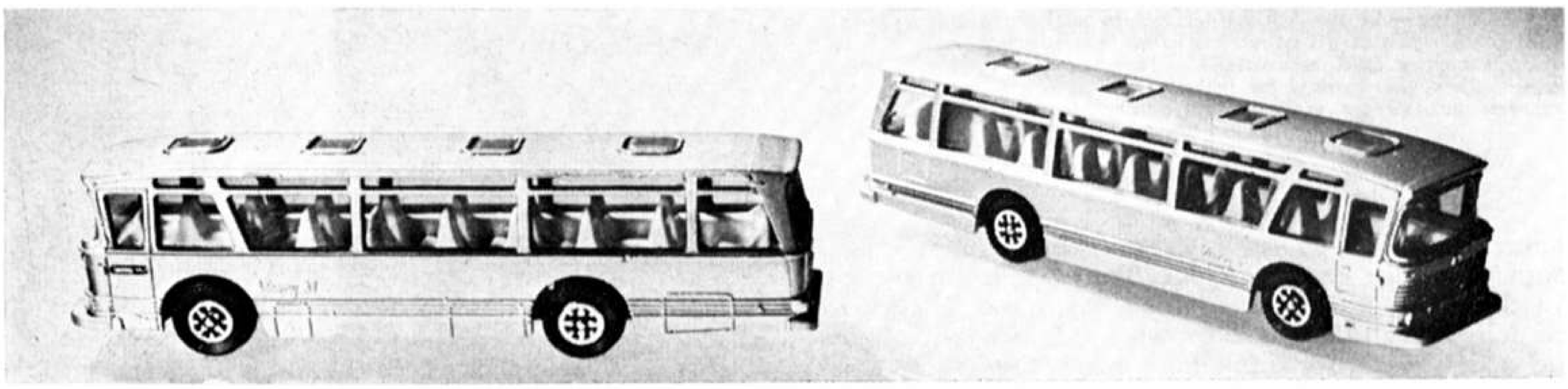
Results of races will be flashed on to two giant scoreboards in the Olympic Stadium. Each measures 60 $\times$ 40 feet, weighs 30 tons, and contains 24,000 bulbs. Within less than a tenth of a second after the results are 'given' to the electronic data processing machine, the information will appear on the board, and the entire contents of the board can, if necessary, be changed twelve times every second. It is said that such a score board could never be wrong, but if the wrong bulb did light up it would be eliminated so fast that the eyes of the spectators would not register the correction.

During the Marathon, the situation every five kilometres will be signalled to the scoreboard in the stadium, which will then light up and show a sketch of the route, with the positions and placings of the leading competitors.

For those not lucky enough to go to Munich, 4,000 journalists and their assistants will provide press, radio and television coverage to over a hundred countries throughout the world. The journalists will use 4,000 telephone lines, and for television a hundred cameras will provide the pictures. The television pictures will be relayed from the sports stadia to a T.V. centre at the Olympic Tower. Continental and inter-continental transmissions will be made from the Television Tower and by relay satellites orbiting the earth at a distance of 22,500 miles.

Past Olympic stars will receive a special commemoration at Munich this year, for their names have been given to the 22 streets, squares and bridges within the Olympic Park. The Central Square has been named after Baron Pierre de Coubertin, founder of the 'modern' Olympics, but for British visitors, the name to look for is that of a competitor who tragically is no longer with us, silver medallist in the Mexico Olympics, the late Lillian Board.

The sports hall and the swimming stadium are only a few yards away from each other in the Olympic Park. The two main competition sites will be connected by the show piece of the Olympic skyline, the canopy roof. The Olympic Village is in the background with space for 12,000 athletes and team officials.



GOING COACHING

DINKY TOY NEWS
By CHRIS JELLEY

PROBABLY the most dedicated—and certainly the most vocal—group of die-cast model enthusiasts in the country are the bus collectors. Meccano constantly receive requests for new Dinky Toy buses, the most constructive of these usually coming from members of the Model Bus Federation, a nationwide organisation of enthusiasts which is unique in being the only organised body associates with any branch of die-cast modelling (although members are not actually limited to die-casts, alone).

Strangely enough, Dinky Toy sales figures do not put any specific bus at the top of the "best-sellers" list, but buses (and coaches) as a general group have always been extremely popular. Perhaps more important, they have sold consistently well over long periods and for this reason I am particularly pleased to introduce newly released Dinky Toy No. 296, Duple Viceroy 37 Luxury Coach. I have no doubt it will be well received.

Seeing the model for the first time, there are two things that immediately strike the Dinky Toy student. First is the appealing crispness and fine detail of the body casting, coupled with the absence of those "gimmicks" which tend to distort the scale lines of a model. In fact, this Dinky is quite a simple production by current toy standards, consisting of a beautifully-detailed one-piece body casting on a pressed-steel baseplate fitted with four Speedwheels. Inside, full seating is of course provided together with a pale amber window/skylight moulding which really gives a superb effect. Overall finish is in a beautiful metallic blue gloss.

Great attention has been paid to body detail which even runs to the registration number being included in the casting. The number in question is MCM 1K which I personally found particularly interesting as my own car carries an MCM (Birkenhead) registration—perhaps the designers have been peeping!

Casting detail, then, is one thing that strikes the viewer at first sight of the model. The other thing is the size of the model. Anyone familiar with the Dinky Toy range will see that the Duple Viceroy is somewhat smaller than might be expected when compared with, say, the Single Deck Bus and it *is* smaller—for the simple reason that it is produced to the smaller scale of 1:99. Mind you, it should not be compared with the other models in the range because each Dinky Toy is produced as a separate subject in its own right and there is no guarantee that any model will necessarily conform to the scale of another model. In practice, of course, many models are made to the same, or near-similar scale, but the matter of scale nonetheless remains a point of lesser importance when new toys are being designed. The scale of this particular model results in an approximate overall length of 4⅝ in. which, besides making it a very worthwhile toy on its own, also makes it suitable for use with a number of model railway layouts, particularly those of TT gauge. In a model railway context, the scale may not be exact, but the model would certainly not look out of place on a suitable layout. On or off a layout, though, it has an irresistible charm.

Turning from the Dinky Toy, now, it is interesting to look at the real Viceroy for a moment. This is a luxury vehicle with coachwork built by Duple Coachbuilders Ltd. of Blackpool—one of the foremost coachbuilding companies in Great Britain—and, inside, it sports all that is best in modern luxury coaches. As the manufacturers rightly claim, "Heating, ventilating, flooring, fluorescent lighting, all make use of the very latest design ideas and the all foam-rubber seating is comfortable to a degree surpassing even the highest previous Duple standards." Duple's standards have always been high, therefore you can imagine how good the Viceroy is to travel in!

Duple produce the coach in a 53-seat and 51-seat version, the latter built on to a number of different chassis. The seating in the Dinky Toy is representative only, and not to scale, but the model generally is based on the 51-seater, as built on to a Leyland Leopard 11m chassis. This chassis is powered by the Leyland 680 motor—a massive 11.1 litre, 6-cylinder diesel engine which develops a healthy power

output of 175 B.H.P. at 2,200 r.p.m. Drive is to the rear wheels through a 4-speed "pneumo-cyclic" (something to do with air!) gearbox which is independently mounted on the chassis, i.e., not secured directly to the engine.

British Leyland are perhaps best known in this country for the cars they produce, but they are also among the world's finest manufacturers of "heavy" vehicles. Thus, with a combination of a Duple-built coach on a Leyland chassis, the Viceroy 37 represents the best of both worlds!

Helicopter Kit

Released with the Dinky Viceroy is No. 1040 Sea King Helicopter Kit—the latest in the Dinky Kit series of build-them-yourself Dinky Toys. This, of course, is the standard Dinky Sea King Helicopter, only in kit form with the parts unpainted, although they are specially treated ready for painting. All the components required to build up into the helicopter are included, together with the electric motor for driving the main rotor, all the aircraft marking transfers and even a sample phial of paint. No adhesive is required and the model can be assembled and taken apart again as often as you like. When built and painted it is a real metal Dinky Toy, just like the ready-made model, although the little Apollo capsule sold with the finished Dinky is not included in the Kit. A very good buy!

POCKET MECCANO

Grand "Make a Model" Contest for 1972

FOLLOWING the fantastic success of last year's Pocket Meccano competition, Meccano (1971) Limited are repeating the contest this year—and it's now open for entries! Three fabulous Raleigh bikes are being offered as the major prizes, with 30 No. 5 Meccano Sets going to the runners-up, so there are plenty of prizes to be won. Now is the time to start building.

As existing Set owners will know, Pocket Meccano is a small, but complete "miniature "Meccano Set which contains a carefully-chosen selection of standard Meccano parts. Although comparatively few in number, however, these parts can be used to build an amazing variety of fascinating little models and, equally important, the models can be built almost anywhere in any spare moment because the Set is small enough to be easily carried in a jacket pocket. Plans for 25 suggested models are included with each Set, but these represent only a tiny number of possibilities—more than 750 models were entered in the last competition! (Some examples appear elsewhere in this issue.)

Conditions of Entry

The competition is open only to U.K. residents who buy a 39p Pocket Meccano Set during the competition period and who are aged 15 or under on the competition closing date. Special Entry Forms for the competition are available from all Meccano dealers and each individual entry *must* be accompanied by a correctly completed Entry Form. This Form *must* be signed or stamped by the dealer from whom the Pocket Meccano Set has been purchased to prove that the purchase has in fact been made. All entries submitted automatically become the copyright of Meccano (1971) Ltd., although appropriate entries will be returned in due course if accompanied by a Stamped Addressed Envelope. Families of Meccano (1971) Ltd. employees and of the Company's Advertising Agents are not eligible for entry.

How to Enter

For this competition, the prospective entrant must build a model *to his (or her) own design* from the parts contained in a Pocket Meccano Set. The model must be self-designed and not just a copy of a model in the Set Instructions Leaflet. The model may of course be based on the same type of full-size original, but cannot be an exact copy of an already-published Meccano reproduction.

Having designed and built the model, the entrant must send a drawing or photograph of it, together with the official Entry Form, to POCKET MECCANO CONTEST MECCANO (1971) LTD., BINNS ROAD, LIVERPOOL L13 1DA. There is a space on the Entry Form in which the model can be drawn, but if photographs or additional drawings are supplied, these will be accepted and should be clipped to the Entry Form to ensure that they do not become lost. It is a good idea to write your name, address and age on the back of each additional drawing or photograph sent.

Judging

Entries will be judged in three age groups—up to 8 years old, aged 9–12 years and aged 13–15 years. In each group, the overall winner will receive a bicycle, while the 10 runners-up will each receive a No. 5 Meccano Set. The bike for the first group is a Raleigh Tomahawk, with a Raleigh Chopper for the second group and a Raleigh Olympus Sports for the third, senior group. The prizes will be awarded to those competitors who, in the opinion of the judges, build the most original and ingenious models in their age groups and the judges' decisions are final. No correspondence can be entered into and money cannot be given in place of prizes.

In the event of a tie, the prize will go to the entrant who the judges feel gives the best explanation, in not more than 25 words, of why he likes Pocket Meccano. A space for the answer is included on the Entry Form.

All valid entries will be carefully examined by the judges, but proof of posting cannot be accepted as proof of receipt and no responsibility can be accepted by Meccano for entries lost, delayed or damaged before or after receipt.

Closing Date

The 1972 Pocket Meccano Competition closes on 31ST AUGUST, 1972 and no entries received after that date can be accepted. The winners will be announced in the November issue of Meccano Magazine, but all successful entrants will be notified in writing before the Magazine appears.

Publication Bonus

As with last year's competition, interesting models entered in this contest might subsequently be described in Meccano Magazine. Such models will not necessarily be drawn from among the prize-winners only and the builders of all those chosen—prize-winners, or not—will receive a publication fee as an extra "bonus". Happy building!

King of the Ice Floes

The mighty polar bear

by E. R. YARHAM

SUCH is the power of the mighty polar bear that a swipe from a giant paw could do serious damage even to a helicopter flying too low. Not surprising then that up till modern times it was the undisputed monarch of the northern ice. Eskimos trailed it with dogs and spears but this was hazardous hunting. The polar bear was only dethroned when its pursuers acquired firearms.

Even then the polar bear stood a fair chance of survival, but now aircraft and motorized sledges are menacing its remotest haunts. Its survival has become a matter of grave concern to zoologists and conservationists. Informed opinion indicates that total world population is 12,000 or less and approximately one-ninth of these are being killed annually, over and above natural losses. So if the polar bear is to be saved from extinction, rigorous international restriction on killing will have to be enforced to protect it.

Despite man's overwhelming advantage in weapons the polar bear still enjoys enormous prestige and its power inspires respect from all those who have dealings with it. The variants of the names given it all reflect its majestic status. Among them are Ice Bear, Sea Bear, Ice Tiger and Ice King. The polar bear has a legendary status among northern peoples. "He is God's Dog", whisper the Lapps. They also call him "The old man in the fur cloak", fearing to use his proper name as this would anger him. "He has twelve men's strength and eleven men's wit", declared the Norsemen of the sagas, and and their poets spoke of the bear as the White Sea Deer, the Whale's Bane, the Seal's Dread, the Rider of the Icebergs, and the Sailor of the Floe.

The animal is found across the whole of the North American continent from Alaska in the west to Baffin Island in the east, in Greenland, in the Norwegian Arctic and the Soviet Arctic. In 1969 the Russians reported finding the biggest polar bear colony in the world in Wrangel and Herald islands in the eastern Arctic. There were about 200 lairs. It frequents the pack ice off the west and east coasts of Greenland and strangers are occasionally brought by drifting ice floes to Iceland. The southern limit of the polar bear's wide distribution is the edge of the drift ice. As for the northern limit one might say there is none, for the first thing the lookout of the nuclear submarine "Skate" saw when it surfaced near the North Pole was a polar bear ambling away!

The bear carries out considerable migrations, not always voluntary. The ice (as suggested above) has a considerable say in the matter from time to time. The animal primarily haunts the broken Arctic pack ice and is found in greatest numbers along the southern edge of the pack. It dislikes large expanses of open water or unbroken sea ice. Movements of the pack determine the bear's distribution and movements to a large degree.

Polar bears are carried southward with the pack in spring and summer. In August and September when the ice starts to break up they generally come ashore and make their way north. At this season they may be found in considerable numbers along coasts where the sea ice has been brought by the winds, tides and currents. One August two Eskimos counted 180 polar bears along the east coast of Southampton Island, in the entrance to Hudson Bay. The animals usually follow the coastline when travelling ashore but they do not hesitate to cross considerable stretches of land.

Although so widely dispersed, polar bears are not easy to come upon. More than one explorer has failed to find a bear. That very experienced traveller, Vilhjalmur Stefansson, recorded that it was only on his second Arctic expedition that he encountered one. Father Roger Buliard, the priest-missionary who wriote a classic of Eskimo life, says: "Nanuk (this is the Eskimo name for the polar bear) is a mysterious fellow. At certain times, and I cannot tell why, he seems to disappear. No one sees a polar bear, or his tracks or droppings. Then, one day, out of nowhere waddles Nanuk, right in front of your dogs.

"Sometimes he is alone, sometimes he has a comrade or two with him. Hunters have reported seeing as many as ten bears together. In that case the wise Inuk (Eskimo) steps politely and discreetly aside, without asking Nanuk for an interview. There will always be another time . . . less crowded". Such close acquaintance over the centuries has led the Eskimo to pay deference to the bear's courage and intelligence: "Nanuk is almost an Inuk. He is the nearest to man".

There is evidence that the polar bear has a keen sense of humour. It certainly relishes play as much as an otter. Just as the latter enjoys sliding down banks into the water, so the bear revels in tobogganing down snow slopes. An empty oil drum amuses him like a toy does a child, and there is little hope for a sled if he gets hold of it. He is irrepressibly inquisitive—disaster invariably follows if Nanuk comes across a turned up-boat, for he smashes it with a blow of his enormous paw to find out what is underneath.

Such curiosity was certainly uppermost in the mind of a polar bear (the incident took place in 1968) which was carried close to a Canadian Coast Guard cutter by the floe on which he happened to be. The bear paid a visit which seemed to be in the nature of a shopping expedition. He was thrown a carton full of molasses, which he spread all over the ice and himself, some jam, salt pork, two salami sausages, one apple, which he did not like, and a whole jar of peanut butter which he licked

out in one mouthful. He was disdainful of bread and potatoes, but took very kindly to chocolate bars, and stuck his head in a porthole, looking for more.

When he had exhausted the Coast Guards' hospitality he went over to a smaller ship, where he was fed steak, and then climbed on board in search of more. This was alarming as he weighed an estimated 800 lbs., and judging from scars he was a fighting male, The crew turned the hoses on him to make him clear off, only to find that he absolutely loved it, and lifted his paws in the air to get the jet under his arm pits. Finally they had to fire a rocket rather close to him before he would sheer off.

A friendly bear right enough, but stories have often been told of the "ferocity" of the polar bear. These seem to vary from individual to individual and also from season to season. In summer most bears are rather timid and try to avoid contact with man, but in winter they seem to be more aggressive. They may have gained a reputation for savagery partly from the action of bears that have drifted down from far northern regions. These have had no previous contact with man and hence have no reason to fear him. Possibly it is bears such as these which occasionally stalk and attempt to kill native hunters when they are out on the ice.

A female with cubs will fight valiantly if she thinks they are in danger. During the mating season a male will smash or fell anything in his way. Buliard holds the polar bear in high regard, and says once Nanuk has decided to make a fight of it he will never give way. To quote: "Actually he is neither ferocious nor malicious, and seldom attacks a man unless he thinks he has good reason. He is quite intelligent, and often decides to run for it instead of putting up a fight, but never because he is afraid. It is just that, having estimated the situation, he has decided that this is a time to rely on speed rather than courage".

Except for the grizzly the polar bear is the largest of the bear tribe. It may measure up to 11 ft. from nose to the tip of the tail, and a length of 13 ft. has been recorded. As for weight, a fat bear is one of 1000 lb. An average female is 700 lb., and males vary from 700 lb. to 1400 lb., although here again larger ones have been logged. The biggest is reputed to have been 1600 lb. Standing on all fours the average polar bear measures 50 in. in height to the shoulder; reared on his hind legs, as a bear often is, he may tower eight to nine feet.

Architecturally speaking the polar bear is a long, loosely-knit creature with enormous power in his shoulders and forepaws. The weasel-like head is mounted on an almost abnormally long neck; the nose is black or blue, and except for this the black eyes, nose, claws and foot-pads, the colour is basically white or creamy white. The hair (not fur) is long and shaggy on the flanks and gradually assumes a yellowish tinge about the legs and underparts as summer approaches. The toes are partially webbed and the huge flat feet serve the dual purpose of paddle and snowshoe. The soles are set with bristles to facilitate walking on ice. A polar bear can gallop at a fair pace, notwithstanding its clumsy appearance. But the bear's best gait is a trotting stride, and if he is not too full after gorging (one of his weak points), he can keep this up all day long, and a young lean bear in good fettle will leave a disappointed hunter 30 to 40 miles from home.

Notwithstanding this agility on land, the polar bear is just as much at home in the water, as the name Sea Bear infers. It is as a swimmer that the bear excels, and despite its size it dives with astonishing agility. And where any other animal of similar ponderousness would be forced to swim vigorously just to keep afloat, Nanuk can lie almost motionless. The characteristics that isolate him from the cold are those that give him this amazing buoyancy—air spaces in the hair, oil glands in the skin, and a thick layer of fat beneath all that.

The polar bear swims rather slowly, using only the forefeet and legs to propel itself. The back limbs are trailed behind. The bear may swim with the muzzle extended, but when the water is rough the muzzle and eyes are submerged and it lifts the head only from time to time to breathe. A polar bear feels more secure on ice or in the water than on land, and almost invariably heads for the sea when disturbed by man. A bear has been sighted at sea 25 miles from the nearest land.

Polar bears are polygamous and females are believed to be mature at three to four years, and breed every second or third year. The peak of the month long mating season falls about mid-April. During the autumn, October to November, the pregnant female seeks a place to den. This is generally in a deep drift or crevice in the heavy, more stable ice of the more permanent pack along the beach, where the ice comes ashore early in the autumn, or on the lee side of a hill. She excavates the den with an entrance of some two and a half feet, and a passage leading to the birth chamber. This is surprisingly roomy, big enough for three men to sit upright in it. The temperature remains around freezing point, even though outside there may be 60–70 degrees of frost, She does not eat during this period of 120–140 days, and much of it is probably spent asleep, but she wakes instantly if disturbed.

The cubs, usually two in number, but occasionally one or three, are born from late November to early January. They are hairless, helpless and blind at birth. The female continues to suckle them through the long arctic night. They weigh less than two pounds at birth, and with nothing to do but drink and sleep, they grow fat at their parent's expense till the returning sun ushers them into the outer world. In late March or April the female leaves the den with her cubs, which by this time are about two feet long, weigh 20 lbs., and are covered with hair.

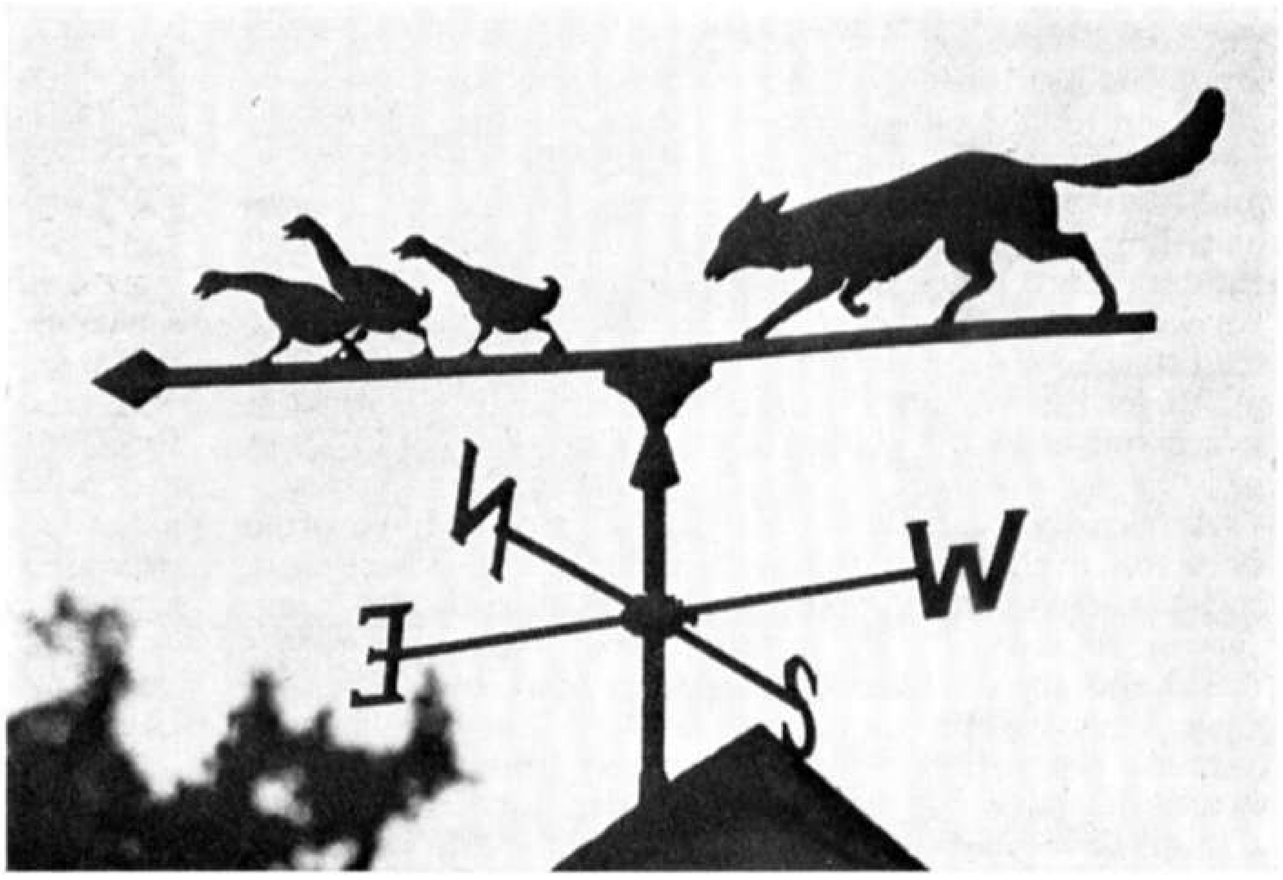
So they begin their lifetime of wandering. The female leads the cubs directly to the coast and sea ice if she has denned on land. The Eskimos call these youngsters "Ah-tik-tok", meaning "Those that go down to the sea". The yearling cubs may stay with their mother during the second summer, by which time

(Please turn to page 335)

Opposite page, left, a mother polar bear lifts a paw ready to take a swipe at the helicopter from which the picture was taken, and, opposite right, a pair of bears traversing ice pans. Right, a bear takes to the water to get away from a helicopter on a joint Canadian/U.S. mission. *(U.S. Coastguard photos.)*

Weathercocks and Weathervanes

by E. V. Malone



"O weathercock on the village spire,
With your golden features all on fire.
Tell me, what can you see from your perch
Above there over the tower of the Church?"
(Longfellow)

The weathercock which turns sedately on its lofty perch on many church steeples is more than an ornament on an instrument for indicating the direction of the wind. It has, in fact, a history all its own. The figure of the farmyard bird was chosen by the Church authorities in the sixth century—in the time of St. Augustine, first Archbishop of Canterbury—when scriptural truths were being taught by means of symbols. In view of the cockerel's association with St. Peter's betrayal of Our Lord, it was deemed appropriate to place its likeness on high to stress on all and sundry the frailty of human nature.

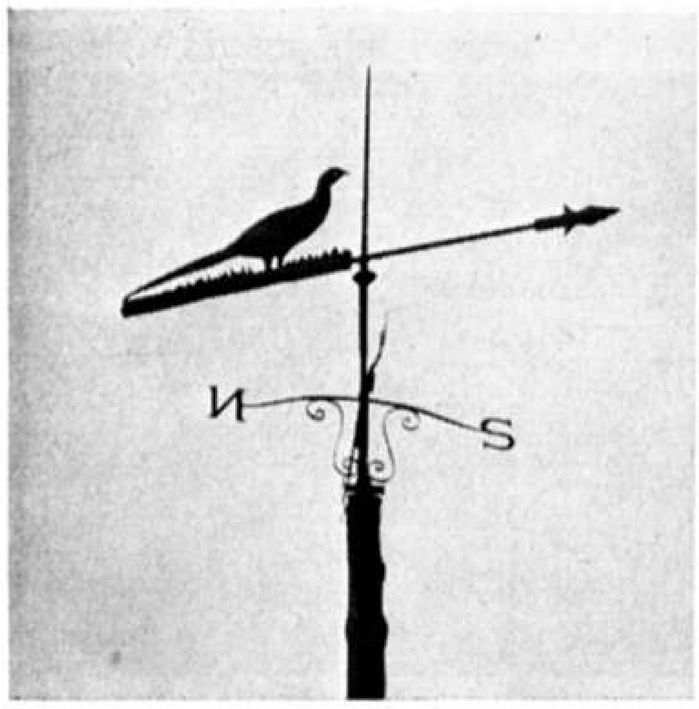
However, no explanation can be offered to elucidate why the cockerel was made to move instead of being kept rigidly fixed. Yet it may be suggested that it was important to the farming community to know what kind of weather might be expected, and a weathercock was of great assistance. It is more likely, nevertheless, that the cock was made mobile in order to demonstrate to the local inhabitants that the vigilance of their clergy was extended in every direction.

The custom has been followed down the centuries almost as a tradition, although not now strictly observed by the church architects in an age when we have only to switch on the radio or television or glance at a newspaper to learn of the vagaries of the wind. The weathercocks that have survived, especially those in London, designed by such architects as Sir Christopher Wren and Inigo Jones, may be classified as historic relics and provide plenty of interest for us to-day. Interesting also are the weathervanes, carrying a wide range of other designs, which have been erected not only on churches but on other public and private buildings throughout Britain to create a veritable picture gallery in the sky.

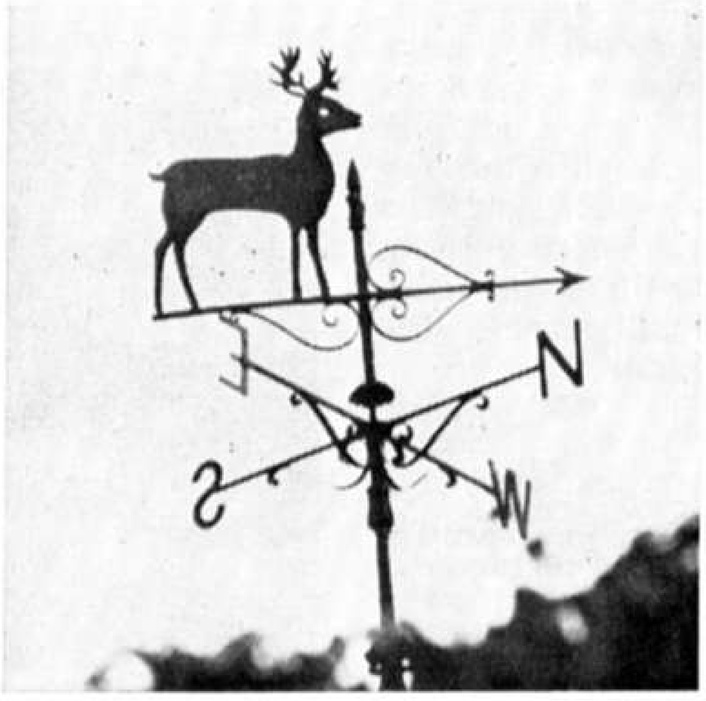
One of the former category is the "trumpeting cock" of the parish church of Ottery St. Mary, Devon which can be *heard* as well as seen. It is believed to have been made in the fourteenth century by order of John de Grandisson, Bishop of Exeter. Measuring 2 ft. 3 ins. from beak-tip to tail-tip, it is fitted with two trumpet-like tubes through the body, each with a tongue so as to produce in high winds a syren-like note similar to crowing. According to the villagers, the weather can be foretold by noting the direction in which the cockerel is facing and then listening to the pitch of the crowing sound. With the aid of binoculars it is possible to see several bullet-holes in the body which were probably made by the troopers of General Fairfax who were quartered in the church in 1654.

Our importance as a sea-faring nation is commemorated by the variety of designs of boats on weathervanes For example, there is on Astor House, overlooking the Victoria Embankment in London, a model of the galleon in which Christopher Columbus undertook his voyages of discovery. This beautiful instrument disappeared in the bombing of the metropolis in World

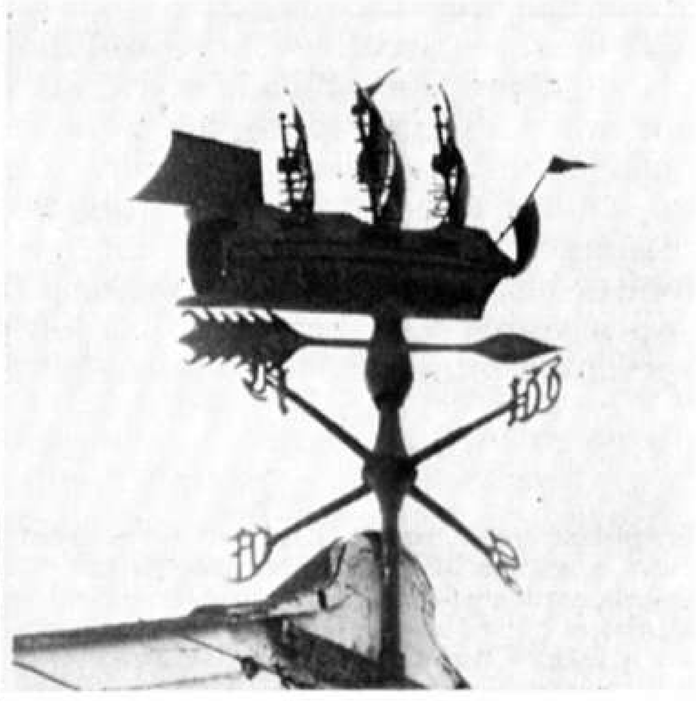
Country sports are common



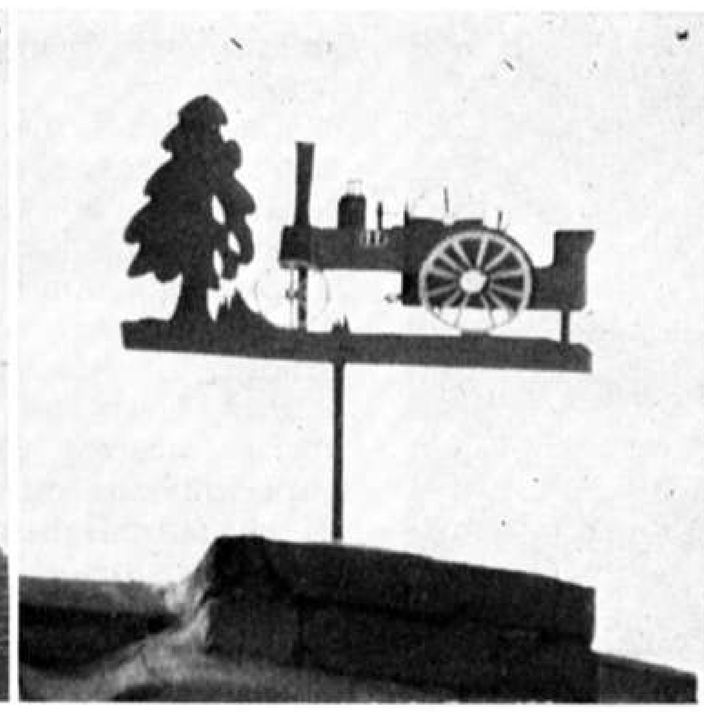
An elaborate Suffolk vane



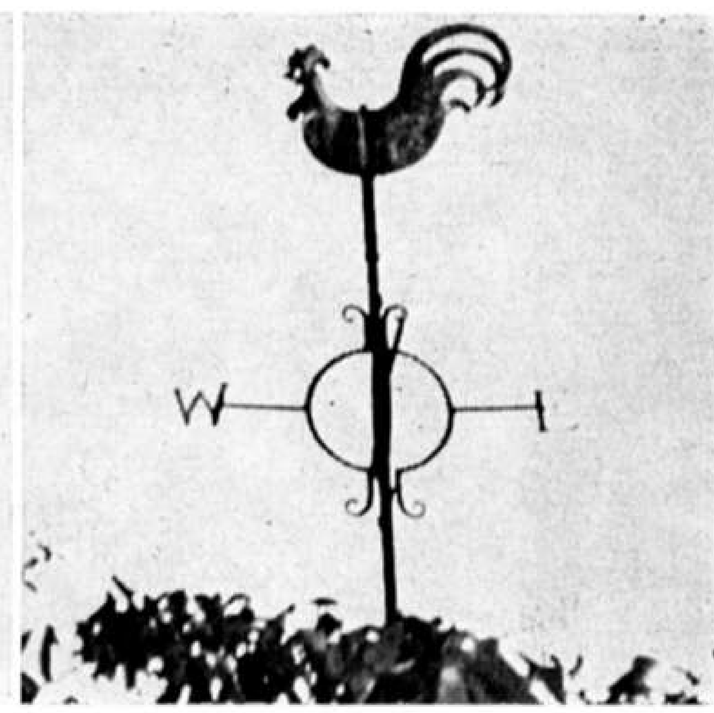
Ships are frequently used



An unusual dragon version



A traction engine vane



The cock at Alfriston

War II but was re-erected after the cessation of hostilities. The fact that it was made, in the middle of the last century, by a sailor who had served in Uncle Sam's navy accounts for its American style.

Transport on land is represented also by, among others, the penny-farthing bicycle above a garage at Soham, Cambridgeshire, and the old-fashioned railway-engine at Birkenhead, Cheshire, which presents a better outline for catching the fleeting wind than its modern streamlined counterpart.

Some weathervane adornments are unique, as is Father Time removing the bails at Lord's Cricket Ground headquarters of the popular summer game; and the violin surmounting the church at Great Ponton, Lincolnshire. This latter commemorates a poor strolling fiddler whom the villagers treated generously on his visits. After emigrating to the U.S.A. he returned there a rich man and paid for the re-building of the church tower; as a reminder the inhabitants erected the vane.

Do you know that Sir Thomas Gresham, founder of the Royal Exchange, London, adopted as his badge the grasshopper, a likeness of which can be seen above that building? He was, in fact, a foundling, and was saved from death by exposure only because the chirping of a grasshopper drew attention to the spot where he had been left in a field. His finders adopted him, and on growing up and becoming rich, he selected the insect for his coat of arms.

Be that as it may, this insect has no monopoly of living creatures depicted on vanes. Birds (apart from the cockerel) and animals are well represented either with human beings usually engaged in a field sport (hunting, shooting, etc.), or as a purely natural history subject. Fish occur regularly also. It is interesting to note that a fish adorns the steeple of Filey church, Yorkshire, and at harvest thanksgiving services fish are brought by the congregation instead of the customary fruit and vegetables.

If you are looking for humour, you will find it in abundance on these meteorological devices. As just a few examples, I can recall seeing a cat playing with a mouse in Cheshire, an angry bull chasing a man over a gate at Dartmouth, and in a slightly different "vane" Eve plucking the forbidden fruit in Sussex!

Due to the wind and rain which constantly buffet the weathercocks and vanes on their exposed sites, it is essential to make them from a strong metal, such as copper, brass or zinc. As for the cockerel, a large predominant tail is an essential feature of a good outline, although some tails are so sweeping as to make it look like a peacock. They range, however, from simple shapes of metal no thicker than $\frac{1}{8}$ in. to "formed cocks", in the steeplejack's language, consisting of two sheets hammered into the form of the complete profile, after which the plumage, comb and wattles are added in relief. When the various parts are brazed together, the instrument is secured to the vane rod by means of lugs, and is often mounted on a glass ball-race which allows ease of movement and is also non-corrosive.

In making the figure for a weathervane, on the other hand, detail of line and balance are essential. Another requirement is that most of the outline should be behind the pivot so that the vane holds accurately into the wind. Making the cut-outs presents a considerable problem, even in this age of mass-production when large quantities can be stamped out by machinery. When cut singly from copper or zinc sheeting by fret-saw or hacksaw, or drilled and filed to shape afterwards, the resulting silhouette can be reinforced by welding steel struts to the important points of bearing.

Some clergymen have virtually a head for heights, as it is not unknown for some of them to scale the church steeple to install the finished product, as did the Dean of Llandaff the 195 ft. steeple of his cathedral, watched by the Archbishop of Wales, in July, 1955.

KING OF THE ICE FLOES

(*Continued from page 333*)

they are half-grown and weigh between 200 lb. and 400 lb. When she mates again she drives them away or leaves them behind to fend for themselves. As for length of life, a female lived 35 years in captivity, had her first cub at six years, and in all gave birth to 12 cubs, all in alternate years.

A polar bear is largely carnivorous, more so than most bear species, although when it comes ashore it will eat kelp, and even sedges and grasses. Its chief food is the ubiquitous ringed seal, which is stalked when it lies basking on the sea ice. Although bears prey on walrus calves they are chary of attacking adults. An Eskimo while travelling by dog-team counted 42 polar bears in the vicinity of a stranded whale.

STAMPS FOR HEALTH

BY JAMES A. MACKAY

FROM time to time stamps are issued, under the auspices of the United Nations, to draw attention to important problems facing mankind. This year the activities of the World Health Organisation have been highlighted by stamps produced in many countries in honour of World Health Day, 7th April. On that date special stamps were released to focus attention on the work of WHO in the field of heart surgery. Previously the stamps honouring WHO have tended to concentrate on the work of this organisation in the underdeveloped countries of the world. This year, however, it is the work done in the more advanced countries which is receiving attention, for it is one of those ironies of nature that heart diseases are more prevalent in the so-called civilised countries.

Today heart diseases represent the most serious challenge to man's survival. In cardiovascular diseases, the World Health Organisation is conducting and co-ordinating research on the causes, development and prevention of arteriosclerosis, coronary heart disease, stroke, arterial hypertension, rheumatic fever, heart failure associated with lung diseases and heart diseases of unknown origin. To understand the functions of the heart and blood in relation to each other, to be aware of the limits of mental and physical stress, to recognize the benefits of exercise and the need to control excesses in eating and smoking habits will enable the sufferer from a poor heart or blood condition to take all reasonable precautions to prevent a worse condition or to take whatever steps are necessary to effect a cure. Public awareness goes a long way towards promoting good health, and stamps are playing a vital part in this campaign.

The United Nations has produced two stamps, one in French (Swiss franc 0.80) and the other in English (15 cents), for sale at the UN post offices in Geneva and New York respectively. Both stamps were designed by the Australian artist, George Hamori, who adapted Leonardo da Vinci's 'Proportions of Man' (circa 1509), now in the Academy of Fine Arts in Venice. The stamps were printed by Setelipaino of Finland in five colours.

The Irish Republic released 2½p and 12p stamps on the same day inscribed in Gaelic 'Do chroi do shlainte'—Your heart is your health. The design, by Louis Brocquy, incorporates the image of a beating heart. The background treatment is influenced by Irish Megalithic art, which Dr. Brocquy studied at Newgrange, Co. Meath, thirty years ago.

East Germany issued a 35 pfennig stamp on 4th April featuring the staff and serpent of Aesculapius superimposed on the UN emblem. Round the sides of the stamp is the motto Gesundheit, Leistungsfähigkeit, Lebensfreude—Health, Efficiency and Joy of Living. Only two Commonwealth countries have produced stamps for this occasion, both in the Mediterranean area. Cyprus issued 15 and 50 mils stamps on 11th April with a symbolic design, while Malta released 2d, 10d and 2s 6d stamps depicting a human heart, on 20th March. Malta, incidentally, is now the only country which still clings to the old shillings and pence currency. A stamp with a related theme, however, is the 8c in the series issued by Pitcairn Island on 4th April to celebrate the 25th anniversary of the South Pacific Commission. The design, by Jennifer Toombs, shows a group of young and elderly islanders, symbolising medical welfare, and is based on a sketch which she painted during her stay on Pitcairn some years ago.

For my money the best design in the World Health series is that produced by Austria for a 4 schilling stamp publicising World Heart Month released on 11th April. The design, by Professor Adalbert Pilch, shows a heart patient, in the early stages of treatment, lying in bed with a formidable machine nearby. Its name is equally formidable—a mobile myocardial infarctation care unit. These units monitor the heart-beats and rhythms of the patient and provide constant supervision until the patient can be taken into hospital. In Austria such units are still on trial, but it is planned to equip the Viennese ambulance service with the necessary devices and remedies so as to ensure the early treatment of myocardial infarctation. At the same time the Austrian authorities are building up the number of intensive care units for heart patients.

According to WHO calculations a highly civilised country ought to have an intensive care ward, with eight to ten units, for every 250,000 of the population. To this end ORF (the Austrian radio and television service) sponsored a campaign last year with the slogan 'Stop Heart Failure' and raised the money to launch the intensive care programme. The Austrian government is also spending vast sums on the after care of heart patinets and is setting up a number of rehabilitation centres.

Health and medicine form one of the largest themes in stamp collecting today. The medical philatelist is well catered for, in the publications of the American Topical Association, P.O. Box 1062, Milwaukee, Wisconsin 53201, U.S.A. The Association has produced several books on the subject, containing check lists and background information on various aspects of health on stamps. They include the series of five volumes on Medical Pharmacy Philately (published at $19.95 the set), which deal with *Medical History in Philately*, *Drugs and Pharmacy on Stamps*, *Private Die Proprietary Medicine Stamps*, *Pharmaceutical Fiscal Stamps* and *Medical Stamps*. Listings and information are kept up to date by supplements in *Topical Time*, the journal of the Association.

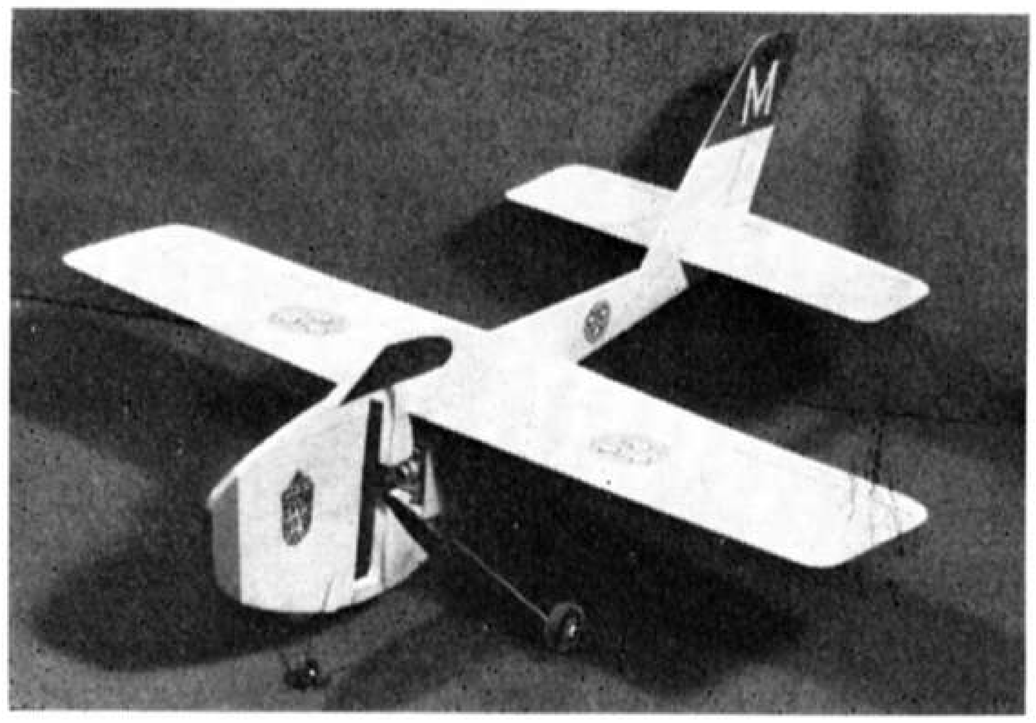
A simple semi-scale

SAAB J29F

for electric R.T.P. flying

By

RAY MALMSTROM



A FLYING model that is different and out-of-the-rut, as it were, always has an excitement all its own. The idea of flying a *jet*-type model round-the-pole (R.T.P.) indoors seemed to offer just such a different flying thrill. Unfortunately the excellent Jetex jet-type motors have a limited power duration that makes them impractical for flights of any considerable length, time-wise. After a lot of hard thinking and 'sweat-of-the-brow' we came up with the idea of this little easy-to-build, electric powered model based on Sweden's formidable SAAB J29F fighter of the 1950's. We located the propeller in a slot cut in the conveniently "barrel like" fuselage, so that in flight the 'prop' is lost and the model has all the appearance of a jet job. The model features simple all-sheet construction and is designed for flying in a relatively small space. (No hangars or halls needed for this job!). It flies fast and steady on lines from 6–12 ft. in length, so your youth hut, clubroom, classroom or even a fairly large lounge (move those chairs, and mind the telly, chaps!) can be your aerodrome.

Details of the electric wiring and pylon used for flying this exciting type of model appeared in "Meccano Magazine" June 1971.

So what is stopping us cutting up some sheet balsa and joining the "jet-set"?

Commence construction by joining a length of *medium* grade balsa sheet $\frac{3}{16} \times 13 \times 3$ in. to a piece $\frac{3}{16} \times 13 \times 1\frac{1}{4}$ in. When dry trace the fuselage shape on to the sheet. Sketch 1. Using a sharp pointed balsa knife or razor blade, cut out the fuselage shape and the propeller and motor opening. Trace piece A on to $\frac{1}{32}$ in. plywood and cut out. Cement ply piece A in position on left (port) side of fuselage shape. Drill a $\frac{1}{16}$ in. diam. hole through which will pass one of the leads from the electric motor. Sketch 1. Cut four pieces B from $\frac{3}{16}$ in. sheet and firmly cement in position top and bottom of the motor cut-out, and on both sides of the fuselage. Sketch 2. Bend the nose wheel leg wire from 20 s.w.g. wire and cement into the nose slot. Lock in position with pieces C cut from $\frac{1}{32}$ in. ply. Put a small plastic wheel on to the axle and retain with a small soldered washer. Bend the main undercarriage wire from 18 s.w.g. wire and cement into rear slot, locking with $\frac{1}{32}$ in. ply pieces D. Cut two wheels from $\frac{1}{4}$ in. thick balsa sheet, and sandpaper to shape. Reinforce the centre holes with small discs of $\frac{1}{32}$ in. ply To prevent the wheels from sliding up the undercarriage legs push on small pieces of plastic electrical tubing from which the inner wire has been removed. See front view drawing. Slip wheels on axles and retain with small washers soldered on. Cut the tailplane and fin from $\frac{1}{16}$ in. sheet. Sandpaper the tailplane to the section shown on the plan side view, and round-off the edges of the fin, using very fine grade sandpaper. Cement the fin to the tailplane, (noting the fin slot) after you have cemented the tailplane to the rear end of the fuselage. Sketch 2. Check that the tailplane is at right angles to the fuselage and that the fin is vertical.

The power for your SAAB J29F comes from a Riko "Rocket" electric motor (obtainable from your model shop at £1.55). The best propeller for this motor is a Cox 0.010 3 in dia. $\times$ $1\frac{1}{4}$ in. pitch plastic propeller (also obtainable from your model shop price 25p.) Incidentally if your local dealer cannot supply you, contact Henry J. Nicholls and Son Ltd., 308 Holloway Road, London N.7. The propeller is fitted to the driving shaft of your motor by means of a short length of $\frac{1}{8}$ in. outside diameter brass tubing, as shown in Sketch 3. The brass tubing is fastened to the motor driving shaft with Araldite or Britfix epoxy adhesive. Do not use balsa cement. The propeller is then pushed on to the other end of the tubing, again using epoxy adhesive to lock it to the brass tubing. Check that it is not out-of-true when the motor turns over. By the way, epoxy adhesives usually take about 2–3 days to really harden, unless you use one of the special fast-setting types. The motor propeller unit can now be slipped into position in the motor cut-out. Check that it is accurately lined up and is a tight fit. The motor is now locked in position by cementing $\frac{1}{32}$ in. ply pieces E to either side. Thread one of the motor leads through the hole already drilled for it, as shown in the front and side views, and in sketch 4. You can now round-off all the square edges of the fuselage using fine grade sandpaper.

Take a tracing of the left-hand (port) wing panel direct from the plan and trace on to $\frac{3}{32}$ in. sheet. Reverse your tracing on the centre line for the right-hand (starboard) panel. Cut the wing out and sand to the correct section. The wing is simply pushed through the wing slot, checking that it is at right angles to the fuselage, and well cemented in place. The leads already on your Riko Rocket will need to be lengthened with wire of the same gauge soldered to them. (Plastic covered wire of the required gauge is easily and cheaply obtainable from a radio dealer). The leads are then taken along the right-hand under-surface of the wing and two miniature radio plugs are soldered to the ends. Check that the miniature radio plugs you use fit the ones at the end of the leads from your pylon. The plugs are held in place at the wing-tip by Evo-Stik, or a small piece of thin silk well cemented. The leads are held to the undersurface of the wing with either small patches of silk or nylon, or even Sellotape, which proves quite satisfactory. Drill a small hole at the wing tip (check the plan and make sure it is in the exact position shown)

EMBLEM OF
FLYGFLOTTILJ.3.
SWEDISH ROYAL
AIR FORCE

BLACK TISSUE
DOPED ON

BALANCE POINT

CUT F
4-OF

FUSELAGE AND
MOTOR CUT-OUT
IN HEAVY LINE

WING SLOT

BLUE

B

RIKO
ROCKET

A

B

SHEET JOIN LINE

COX T.D. PROP.
3"D × 1/4"P.

1/32" PLY
DISC

CUT-
OUT

C
2-OFF

D
2-OFF

E 2-OFF
1/32" PLY

1/32" PLY

LIGHTWEIGHT PLASTIC
NOSEWHEEL

1/8" O.D. BRASS TUBE

MINIATURE
R.C. PLUGS

SKETCH.4.

LEADING EDGE

SKETCH.3.

TIP
WEIGHT

B

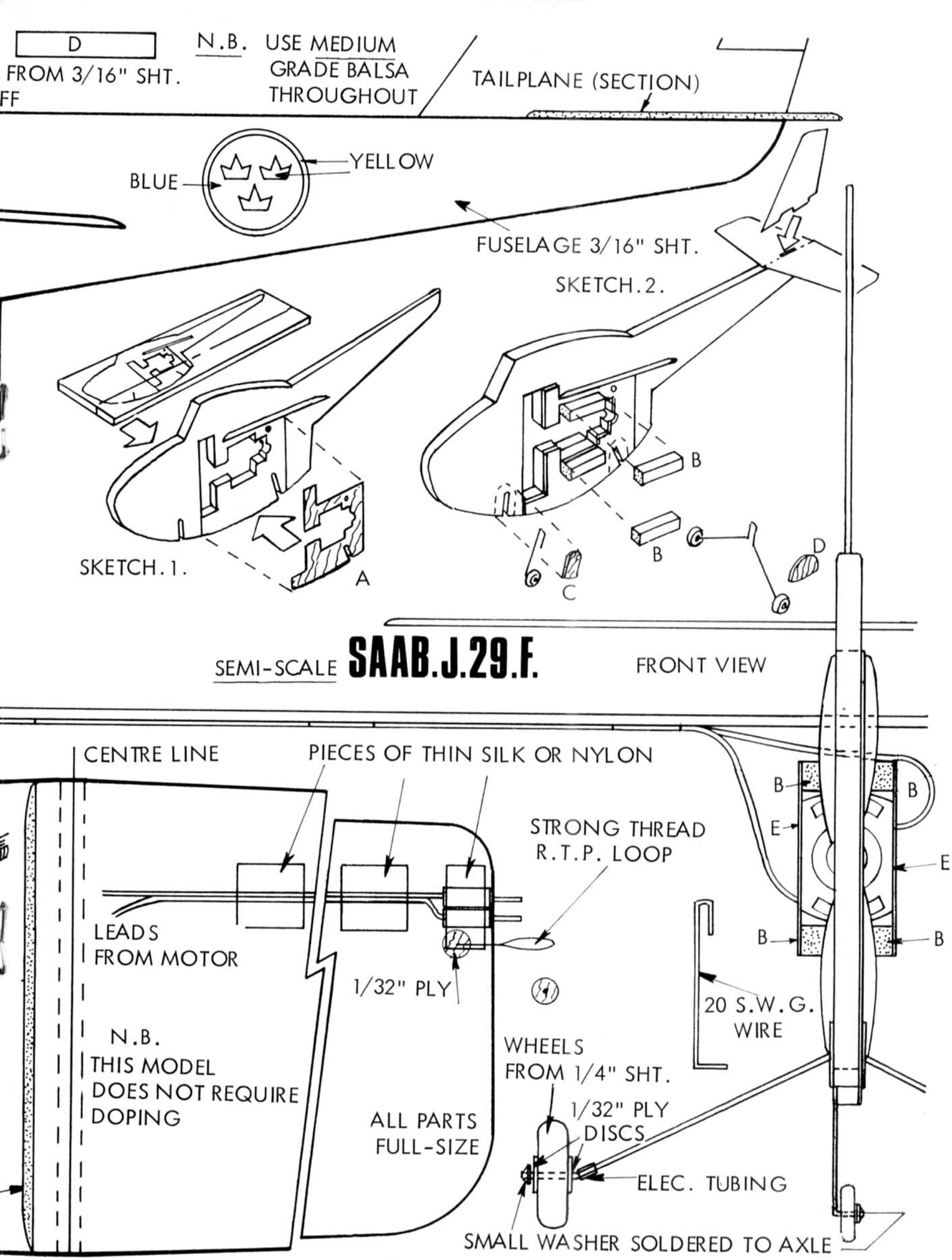
B

MOTOR-PROPELLER
ASSEMBLY

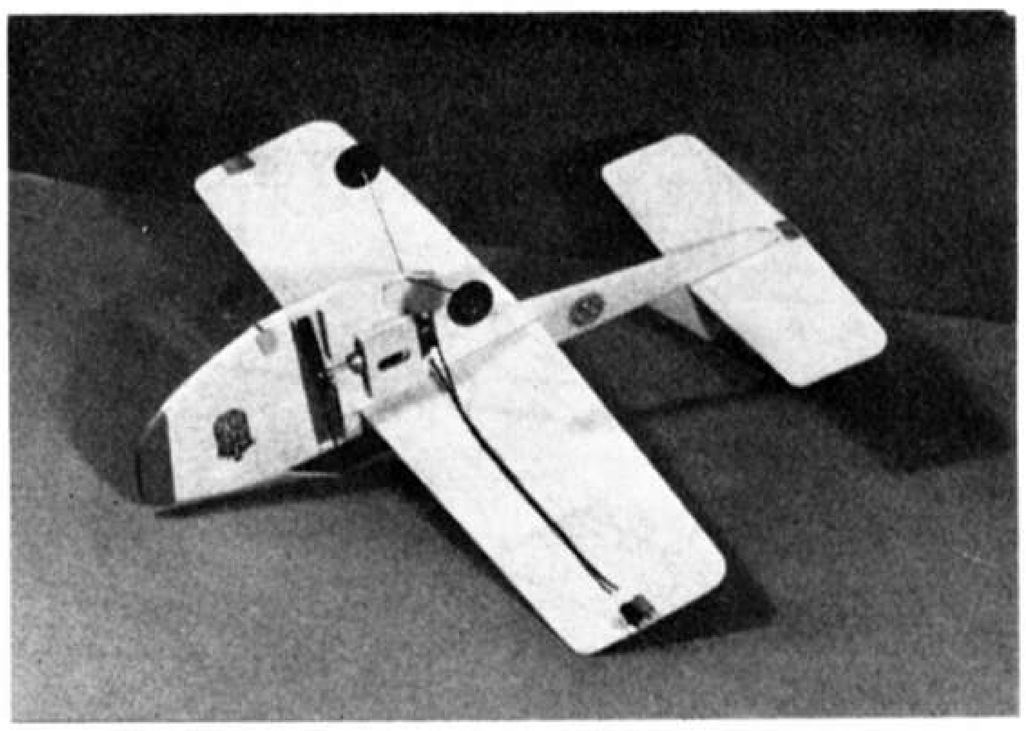
E

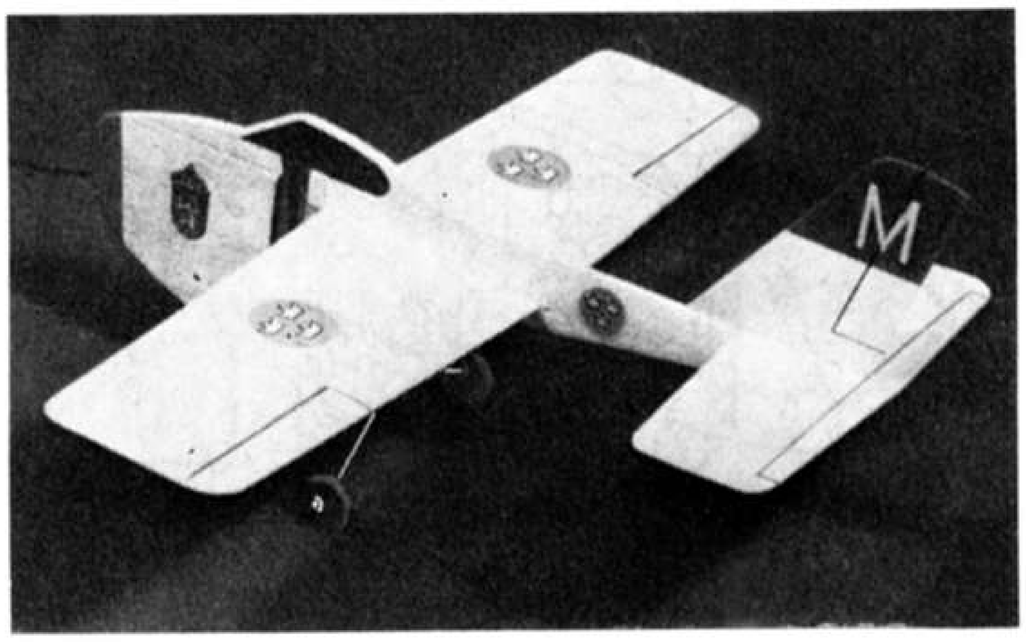
BALL POINT PEN

WING 3/32" SHT.
SAND TO SECTION


D
FROM 3/16" SHT.
FF
N.B. USE MEDIUM GRADE BALSA THROUGHOUT
TAILPLANE (SECTION)
YELLOW
BLUE
FUSELAGE 3/16" SHT.
SKETCH. 2.
SKETCH. 1.
A
B
B
C
D
SEMI-SCALE SAAB.J.29.F.
FRONT VIEW
CENTRE LINE
PIECES OF THIN SILK OR NYLON
STRONG THREAD R.T.P. LOOP
B
B
E
E
B
B
LEADS FROM MOTOR
1/32" PLY
20 S.W.G. WIRE
N.B. THIS MODEL DOES NOT REQUIRE DOPING
WHEELS FROM 1/4" SHT.
1/32" PLY DISCS
ALL PARTS FULL-SIZE
ELEC. TUBING
SMALL WASHER SOLDERED TO AXLE

Simple, but very effective and safe in flight is Ray's cute Saab. Such electric models can be flown outdoors in calm weather, given a reasonable surface for take-off.





and reinforce the hole with a small piece of $\frac{1}{32}$ in. ply. Pass a piece of strong thin thread through the hole and tie a loop as shown. Sketch 5. Cut a small piece of sheet lead or neatly folded piece of empty cement tube and Evo-stik this weight to the *opposite* wing tip. Sketch 5.

As your SAAB J29F is to be flown indoors there is no need to dope it. The Swedish Royal Air Force insignia on our own model was painted on thin paper, with poster paints, cut out and cemented in position. The colour bands at the nose and the top of the fin can be put on using thick poster colour or with oil-pastels (a small box from any art shop). If you use the oil pastels just put them on thickly, then rub off the excess pastel with a soft rag and there you are. They are a very efficient and colourful way of decorating balsa models. Use Sellotape for masking to give neat lines The squadron letter M on the fin was painted in thick poster colour. Elevator, aileron lines etc. were added using a ruler and a black ball point pen. The cabin is two pieces of black tissue doped in position. Incidentally, if you really fancy your artistic ability with a paint brush and would like to add the squadron symbol on the nose, shown on the plan, and on our original SAAB J29F featured in the photos, here are the colours. The shield is blue, the winged heraldic beast is yellow. The four Tudor-type roses white, the interior of the crown red, with yellow base and cross. This emblem was worn on the SAAB J29F's of Flygflottily (Sqdn) 3 of the Swedish Royal Air Force, when these fighters were based at Malmen, Linkoping, Sweden. (No extra charge for all this info!).

All that remains to be done is to carefully balance your model. Sketch G. Do this by pushing a pin into the balance point, as indicated on the plan. Tie a thread to the pin and see that your model hangs level. Ours needed a tiny piece of lead fastened with Evo-stik to the extreme rear edge of the tailplane. However, as balsa wood varies in density (and weight) your SAAB J29F may not need any weight. Also we had to carefully warp *up* the rear edge of the tailplane in order to obtain extra height when flying. Your first test flight will reveal if this will be necessary.

Well, that's it! Runway clear? Then let's roll. We know you are going to get a real thrill when you open up the motor and your SAAB J29F gathers speed for take-off. Airborne she looks great, and landings are safe and sure on the tricycle undercarriage. Lots of good flying to you.

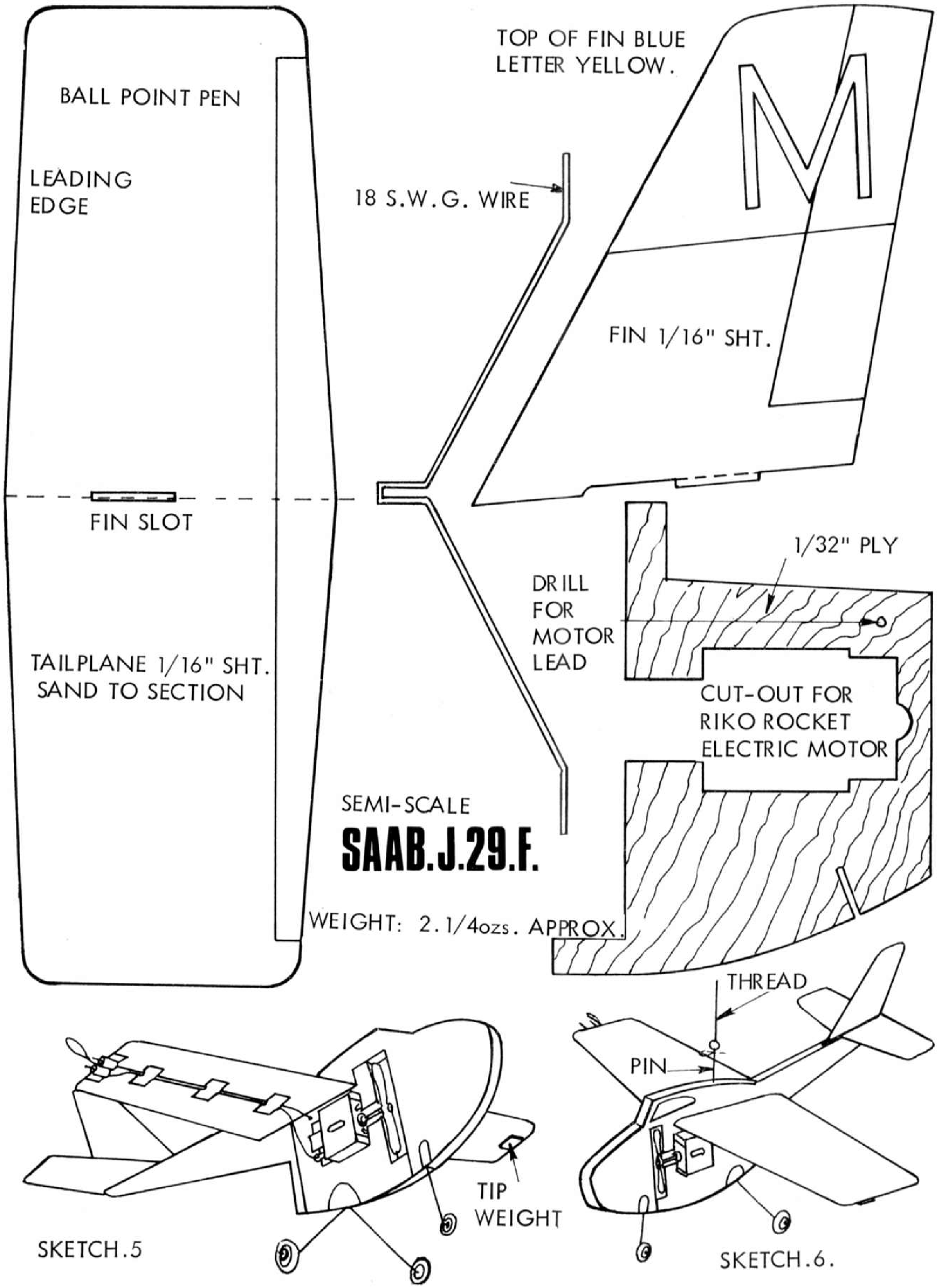
CHAIRLIFT (*Contd. from page 345*)

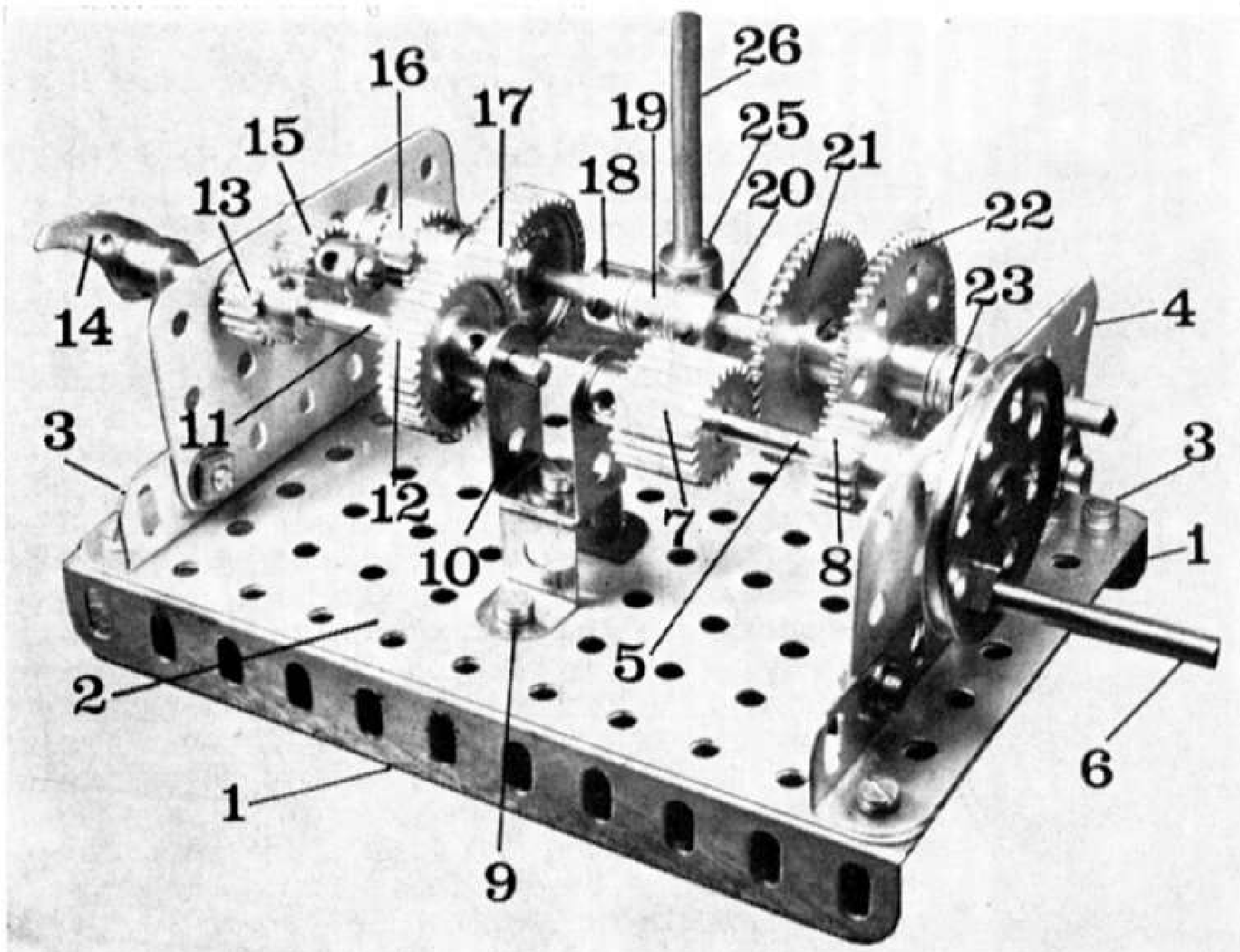
1 × ½ Reversed Angle Bracket is secured. A 2½ in. Strip 59 is bolted to the spare lug of this Bracket, a 1 × 1 in. Angle Bracket 60 being secured in turn to the upper end of this Strip. Note that the lower fixture in the last case is made, not by a Bolt, but by a Long Threaded Pin, on the shank of which are mounted an electrical 1 in. Bush Wheel 61, a free-running ½ in. Pulley without boss and an 8-hole Bush Wheel 62. The cupola is mounted in position with the ½ in. Pulley running on the rail provided by the earlier-mentioned Flat Girders. Angle Bracket 60 is then connected by a short length of Cord to the cord running around 6 in. Pulleys 18 and 19.

Last of all, we have the cupola loading platform which is built up from a 4½ × 2½ in. Flat Plate 63 secured by Rod Sockets at the corners to four 1½ × ½ in. Double Angle Strips 64. The inner Double Angle Strips are bolted, along with two 2½ in. Strips 65, to appropriate compound girder 1, the free ends of Strips 65 being fixed to the spare lugs of the outer Double Angle Strips. The securing Bolts in the latter case also fix a 4½ in. Angle Girder 66 between the Double Angle Strips. Another Rod Socket 67 is secured to Plate 63 in the position shown, then suitable short Rods are fixed in all the Rod Sockets, Handrail Couplings or Short Couplings being fixed on the top of these to carry the horizontal handrails. The outer rail is supplied by a 5 in. Rod 68 and the end rail by a 2 in. Screwed Rod, with a short rail on the loading side coming from a 1½ in. Rod. A set of access steps is provided by two 1½ × ½ in. Double Angle Strips, bolted between two 3 in. Narrow Strips 69 which are attached to Plate 63 by Angle Brackets. Finally, handrails for these steps are supplied by two further 3 in. Narrow Strips connected to Strips 69 by two 2½ in. Narrow Strips 70. And that's it!

PARTS REQUIRED

7—1a	2—16	1—50	4—103g
2—2	1—16a	2—51	8—111c
14—3	1—17	1—52a	1—111d
16—5	5—18a	4—53	6—115a
6—6	2—18b	17—59	1—120b
15—6a	2—19c	1—62	7—124
8—7	2—21	1—62b	2—133
4—7a	4—22	3—63d	2—133a
6—8	6—23	4—72	2—136
10—8a	6—24	2—73	2—136a
2—8b	5—26	6—80a	1—155
5—9	1—26b	1—81	6—162a
2—9a	2—27a	1—89a	5—179
3—9b	1—29	1—94	1—186b
2—9d	2—31	1—95	1—186e
2—9f	2—32	1—96a	6—187d
11—12	320—37a	3—99a	2—188
6—12b	288—37b	2—103	6—196
1—15	80—38	6—103b	2—197
4—15a	13—48	2—103d	2—235
2—15b	2—48b	1—103f	2—235a
6—518	1—6-ratio Motor with Gearbox		


BALL POINT PEN
LEADING EDGE
FIN SLOT
TAILPLANE 1/16" SHT.
SAND TO SECTION
TOP OF FIN BLUE
LETTER YELLOW.
M
18 S.W.G. WIRE
FIN 1/16" SHT.
1/32" PLY
DRILL FOR MOTOR LEAD
CUT-OUT FOR RIKO ROCKET ELECTRIC MOTOR
SEMI-SCALE
SAAB.J.29.F.
WEIGHT: 2.1/4ozs. APPROX.
THREAD
PIN
TIP WEIGHT
SKETCH.5
SKETCH.6.



MECCANO PARTS AND HOW TO USE THEM

By B. N. LOVE

Part 7
Making Gears Work

EXPERIENCED Meccano constructors take most of the standard gear arrangements for granted, but we all have to learn the basic forms at some stage and it is with the younger reader in mind that the first mechanism described is done so at some length. Since we are all familiar with the motor car as common transport these days, its gearbox is a convenient starting point and Fig. 1 shows a very elementary type which is simple to construct, but which will show the novice precisely what is happening. For the purposes of our discussion, the car engine is taken for granted and is replaced in the model by a hand-wheel.

There are three shafts common to most car gear-boxes, known as the input shaft, the layshaft and the output shaft, and these are made from standard Meccano Axle Rods in the mechanism of Fig. 1. Each shaft has a special job to do and this will become clearer as construction proceeds.

Start by building the baseplate from a 5½ × 3½ in. Flat Plate 2 bolted to two 5½ in. Angle Girders 1 and reinforced by two 3½ in. Angle Girders 3 to form a rigid platform. (Note how we are continually using Girders and Plates in basic construction.) Bearings for the gearbox shafts are provided by 3 × 1½ in. Flat Plates 4 bolted *inside* the slotted flanges of the 3½ in. Angle Girders to give maximum adjustment of height when aligning the shafts. It is important that the input shaft 5 and the output shaft 11 are in line and at this stage the pedestal bearing which supports these shafts in the middle of the gearbox should be fitted. This is made from a Double Bent Strip 9 and a 1 × ½ in. Double Bracket 10 bolted together as shown. Washers are placed on the Bolt holding these two parts to give a tight grip and to prevent the Double Bracket from turning out of line. Before finally tightening up the pedestal bearing, pass a long Meccano Rod through the end plates and the pedestal bearing and adjust the alignment so that the Rod is reasonably free to revolve in all four holes.

For the input shaft take a 2½ in. Rod and fix a 1½ in. Pulley to its outer end. This Pulley is fitted with a Long Threaded Pin 6, Part No. 115a, to form the hand wheel. Slide a Washer on to the Rod and pass it through the second top hole of the right-hand end plate, then slip on a 19-teeth Pinion 8 and a 25-teeth Pinion with a ½ in. face, Part No. 25a, and finish with a second Washer. Now tighten Pinion 8 with enough adjustment from the end plate to make a smooth-running bearing without too much end play and do the same for Pinion 7. Spin the input shaft to see that it is running nicely and then make up the output shaft 11. This is a 3 in. Rod carrying a 1 in. Gear Wheel 12 and a 19-teeth Pinion 13. Both gears are secured to rod 11 and spaced with one Washer at each end between the left-hand end plates and the centre pedestal bearing. A Pawl with Boss 14, Part No. 147a, is fixed to the end of the output shaft to act as a rotation indicator when studying the completed gearbox. Again, test the shaft for free-running, without excessive slop. In the next hole immediately to the rear of Pinion 12, a second 19-teeth Pinion 15 is freely mounted on a ¾ in. Bolt, lock-nutted to the end plate. This Pinion remains in constant mesh with Pinion 13 and is the only gear in the box not fitted with a Grub Screw. Its purpose is to act as a reversing gear.

The long shaft at the rear of the gearbox is known as the layshaft and, by contrast with the other two shafts, it is deliberately given end play to allow the set of gears fixed on it to be slid bodily left or right across the gearbox by the gear-change lever 26. A 6½ in. Rod is required and this is passed through the right-hand end plate in the top row of holes, three holes in from the rear. Parts required for the lay-shaft operation should be slipped on to the 6½ in. Rod in the following order. First, four Washers 23, to act as spacers, followed by a 57-teeth Gear Wheel 22 and a 50-teeth Gear wheel 21. These are followed by three Collars, with Washers between them, placed approximately in the centres of the layshaft, all Grub Screws being left slack for the moment. Finally, a 1 in. Gear Wheel 17, a 19-teeth Pinion 16 and four more Washers are slipped over the end of the lay-shaft before it is pushed through the corresponding hole in the left-hand end plate. Gear Wheel 22 can then be locked to the 6½ in. Rod so that, when it is pushed to the right,

about 1 in. of Rod overhangs the right-hand end plate. In this position, Gear Wheel 22 will mesh with Pinion 8 on the input shaft.

Keep the layshaft in this position and then set Gear 21 so that it clears Pinion 7 on its right-hand side by about $\frac{1}{8}$ in. Lock Gear 21 in place and then slide the layshaft to the left, bringing Gear 22 out of mesh with Pinion 8 and, after a slight further movement, bringing Gear 21 into mesh with Pinion 7. The 1 in. Gear Wheel 17 can now be set to mesh with its partner, Gear 12, and it must remain in mesh while either Gear 21 or 22 is engaged. However, it must also be set so that, when there is further movement to the left by the layshaft, Gear 17 must come out of mesh before Pinion 16 engages with Pinion 15 for the reverse drive. These last two gears require critical spacing and some experimenting with their positions is necessary together with the number of packing Washers used at either end of the layshaft.

It remains only to install the gear-change lever and this requires care plus a fine-bladed electrician's screwdriver. Any suitable Axle Rod may act as a gear lever and this carries a Collar 25. Before fitting the Collar, its standard Grub Screw is removed and the longer $\frac{7}{32}$ in. Grub Screw, Part No. 69b, is fitted in its place, but screwed right through the tapped bore by means of the fine screwdriver until the Grub Screw shows on the far side of Collar 25. It is then offered up to the tapped hole of Collar 19 and screwed in a few turns until both Collars each have a portion of the long Grub Screw which forms a pivot joint between them. The original Grub Screw of Collar 25 is then inserted from the rear of the gearbox to lock the change lever in place. No other fixing is required as the lower end of the gear lever rests in a hole in the baseplate. Two other Collars, 18 and 20, are locked to the layshaft to keep Collar 19 in position. A movement of the gear lever will now move the layshaft to left or right.

Now we can study the gearbox motion. Going back to the input shaft 5, this is assumed to be revolving while the engine is running. By sliding the gear lever to its extreme right, Pinion 8 will be engaged by Gear 22 to give a 3:1 step-down ratio. This would be known as first gear. The layshaft will then turn in the opposite direction to that of the input shaft. At the same time, Gears 17 and 12 are in mesh so that the layshaft motion is passed on to the output shaft 11 which will then be turning in the same direction as the input shaft, but three times slower. This is conveniently observed by watching the Pawl 14 when the hand wheel on the input shaft is turned.

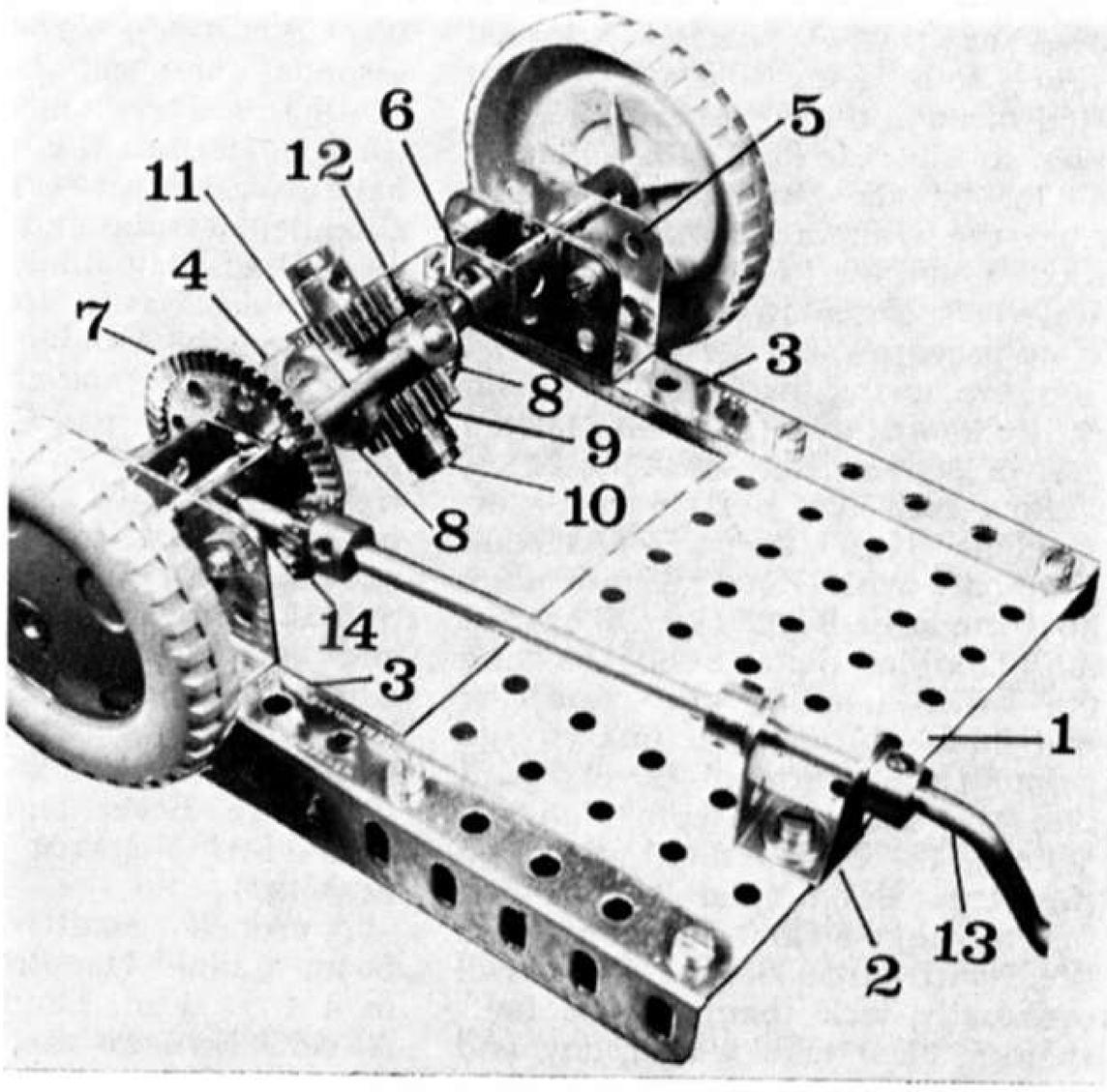
A slight movement of the gear lever to the left will disengage Gear 22 from Pinion 8, thus disconnecting the engine drive to the lay shaft. This position is known as neutral. A further slight movement to the left will bring Gear 21 into mesh with the broad-face Pinion 7, giving a 2:1 step-down ratio, known as second gear. This time the layshaft is turning at one-half of the speed of the input shaft and, again, its motion is passed to output shaft 11 by Gears 17 and 12 which are still in mesh. A final movement of the gear lever to its extreme left will take Gears 17 and 12 out of mesh. Gear 21 will still be in mesh with long-face Pinion 7 so that the layshaft will continue to rotate at half input speed, in the opposite direction. At the same time, Pinion 16 engages with Pinion 15 which is in constant mesh with Pinion 13. The result is that the output shaft 11 is now running at half the speed of the input shaft 5, but in the reverse direction, as will be plainly shown by the movement of Pawl 14.

It must be emphasised that the two-speed forward-and-reverse gearbox illustrated is a very elementary design to show the principles of the mechanics involved in changing the speed of coupled shafts and reversing them. Modern car gearboxes are very sophisticated and, generally speaking, the gears inside the box are never moved out of mesh. Instead, they are fitted with driving 'dogs' which virtually lock or unlock the gears on to their respective shafts. However, the model is simple to build and most instructive in operation. As an extension of the exercise, the reader might add a 15-teeth Pinion to the input shaft and a corresponding 60-teeth Gear Wheel to the layshaft to produce a three-speed gearbox.

Differential Gear

Our second mechanism is shown in Fig. 2 and represents a working model of the differential gear fitted to car driving axles. Even experienced Meccano modellers have difficulty in adjusting differential gears to run smoothly, but there have been several excellent designs published in Meccano Magazine over the years. Most of them employ some kind of box cover over the differential gears themselves so that it is not always easy to observe the gears in motion and this is essential to the visual understanding of the differential gear.

Any simple Meccano model fitted with a pair of road wheels on a "solid" axle will just not turn corners. Some arrangement is essential to allow one wheel to travel faster than the other when cornering and the real problem is to make



Heading picture opposite is Fig. 1, a car-type gear-box. Fig. 2, on the right, demonstrates how a differential gear arangement works.

sure that the engine is still driving the wheels even though one is going faster than the other. When a moving object like a vehicle changes direction, such as in cornering, it requires additional power to cope with the forces set up in opposition to its change of direction. This is catered for by selecting a lower gear when cornering, but we must still get drive to the road wheels. Once again, it is much easier to build a working model and to examine its motion than it is to discuss or describe it theoretically, so instructions are given here for making the model differential shown in Fig. 2.

Start by bolting a pair of 5½ in. Angle Girders 3 to a 4½ in. × 2½ in. Flat Plate 1 to form a base. A 4½ in. Angle Girder 4 braces the frame at the rear behind the differential gear. An essential part of the car differential is a split axle divided into what are known as half-shafts. In a full-size vehicle these are supported in bearings carried in an axle tube of stout construction running right across the car between the suspension, and with a differential casing enclosing the gears in the centre. So that we may dispense with this casing and observe all of the gears in motion, however, the half-shafts in the model—which are 2½ in. Rods—are carried in bearings on either side made from a Channel Bearing 5 reinforced by a Double Bent Strip 6. This gives each half-shaft a three-point support and raises the Road Wheels off the ground for demonstration purposes.

The gears themselves are assembled as follows: Attach a Road Wheel to a 2½ in. Rod and pass the Rod through the Channel Bearing 5, seen to the rear in Fig. 2. Place a Collar on the Rod as it emerges from the Double Bent Strip 6 and then mount a 25-teeth Contrate Wheel 8 close up to the Collar. Now prepare the large Bevel Wheel 7 by removing its Set Screw and fitting it with two ⅛ in. Bolts 11 in a pair of diametrically opposite holes, locking each long Bolt in place with a single Nut. Prepare a second half-shaft with Road Wheel, then hold the large Bevel Gear 7 against the Double Bent Strip forming the other bearing and pass the half-shaft through, letting it go through the centre of Bevel 7 and into the second 25-teeth Contrate Wheel 8. Note that, although the large Bevel Gear has no Set Screw, the two Contrate Gears 8 are fitted with Grub Screws which will eventually lock them to the half-shafts. Now take a Coupling and place it between the two Contrate Gears 8 so that the inner ends of the half-shafts may be entered part way into the long bore of the Coupling. At this stage, the Contrate Gears may be fixed in place, temporarily, by their Grub Screws, just to hold things in position ready for the next stage.

Mount two 25-teeth Pinions 9 on Pivot Bolts 10 and screw them in a few turns into the centre tapped bores of the Coupling. Two collars 12 are now required and these are screwed for a few turns on to the ends of the 1⅛ in. Bolts sticking out from Bevel 7. Now take a 1½ in. Rod and pass it through Collar 8, shown in Fig. 2, through the smooth bore in the centre of the Coupling and then through the Collar on the second long Bolt hidden from view below the differential. Now screw up the two Pivot Bolts carrying the 25-teeth Pinions 9 and these will lock the 1½ in. Axle Rod in place. Do not attempt to secure the Collars 8 by means of a Grub Screw as they will then tend to bind Bevel Gear 7 when it turns freely on the half-shaft. By leaving the Collars 8 "loose" like this, they provide the necessary turning motion to the differential Pinions carrier with sufficient "give" to prevent binding and they cannot become uncsrewed, despite their not being screwed up tight, or fitted with Grub Screws. This "slack" is deliberately introduced to help smooth running.

It will be necessary at this stage to do some adjusting so that the teeth of the Contrate Gears mesh nicely, but not tightly, with those of Pinions 9. Careful packing with Washers is essential and all bearing points should receive attention. See that the bosses on the Road Wheels have a Washer between them and the Channel Bearings and that the Collar on the half-shaft shown to the rear in Fig. 2 also has a Washer between itself and the Double Bent Strip 6. This particular half-shaft can be set up first and its Contrate Gear locked in place to allow just the right amount of half-shaft to fit into the central Coupling. Careful packing with Washers is also required between the boss of Bevel 7 and its adjacent Contrate Gear. Check that the long Bolts are firmly lock-nutted to the large Bevel and that there is a Washer between the large Bevel and the Double Bent Strip against which it is bearing.

A propellor shaft is provided by a 5 in. Crank Handle 13 mounted in a 1 × ½ in. Double Bracket 2. A side hole in the Double Bent Strip alongside the large Bevel provides a suitable bearing for the small Bevel Gear 14 which should then mesh smoothly with the larger one. If there is any stiffness in the differential gears, check the central Coupling; better still, check it before you put it in for trueness of tapped and cross-bored holes.

Provided that all is running smoothly, it will now be possible to observe the differential in motion Turn the propeller shaft 13 and watch the Road Wheels. They should both turn at the same speed. Keep turning the propeller shaft and put a slight drag on one wheel with a light touch of the finger and notice that the other wheel turns faster. Repeat these trials and this time watch the 25-teeth Pinions 9. When both Road Wheels are running at the same speed, the Pinions will be carried round in space but will not actually spin on their own Pivot Bolts. When there is a difference in speed, however, the "differential" movement of the Pinions begins to show and they will be seen to turn on their own Pivot Bolts.

Hold the propeller shaft still and turn one Road Wheel. It comes as a surprise to many (including adults) to see that the other wheel turns at the same speed but in the *opposite* direction and the differential movement of the Pinions 9 is clearly seen. Finally, turn both Road Wheels at the same speed in the same direction and note the speed of the propeller shaft. Now stop one wheel and turn the other. This will double the speed of the propeller shaft. By turning the model upside down it will perform its "tricks" very well on carpet or similar flooring.

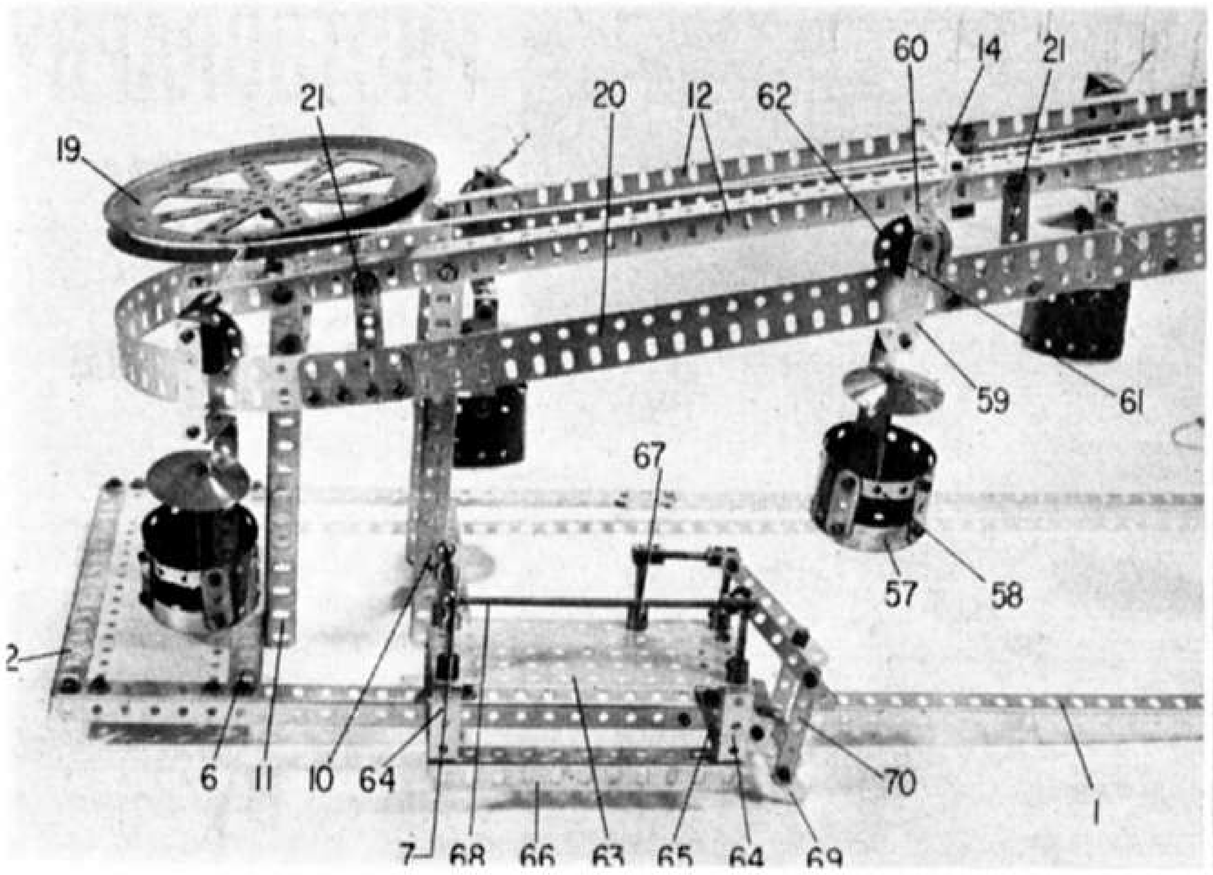
A little thought will show that any of the three shafts in a differential may be used as an input or output shaft to great advantage in various mechanisms requiring differential movement.

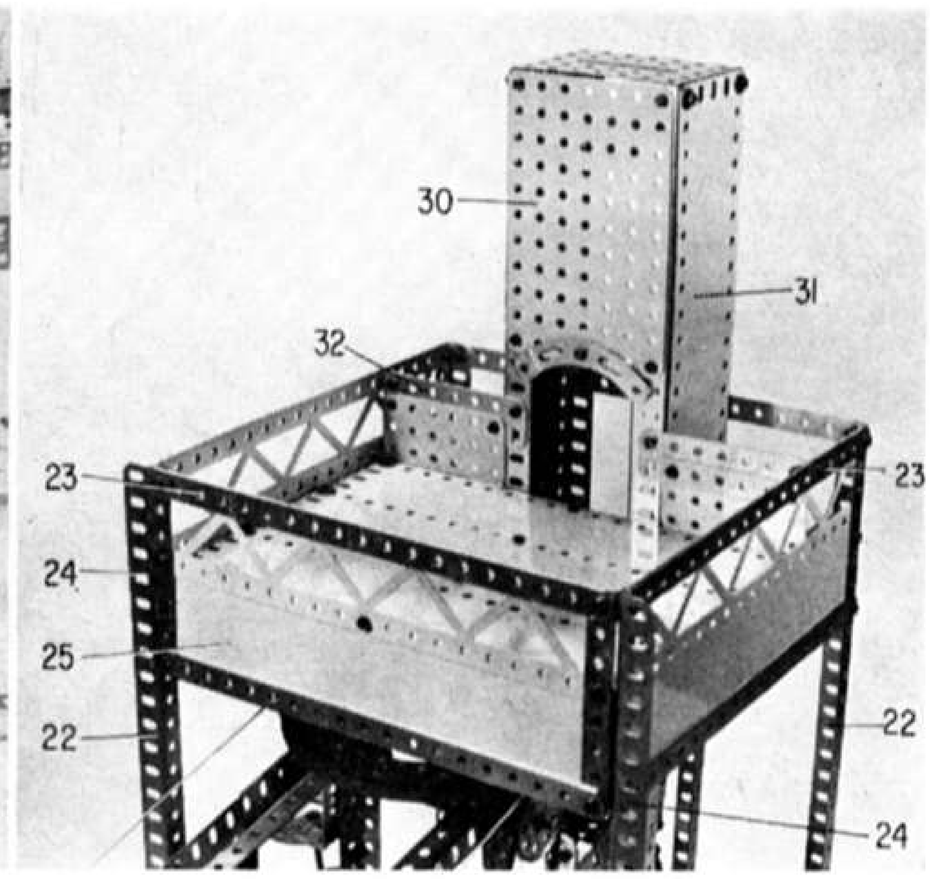
MODEL BUILDERS

(continued from page 327)

Postscript

In the May issue we featured an illustration of a magnificent veteran car model, based on a 1904 Singer and built by Mr. Cyril Potter of Chatham, Kent. As I said at the time, I have no details of the model, but I have since been advised that it is fully described in one of the GMM Super Model Leaflets, privately produced by the Meccanoman's Club, 248 Woolwich Road, Abbey Wood, London, SE2 0DW. The Leaflet in question is No. 15 in the series and it might well be of interest to advanced builders.





AUTOMATIC CHAIRLIFT

Above, the top of the taller tower in the model.
Left, a close-up view of the lower tower, showing the cupola loading platform.

Part Two of a description of a fine continual-running model ideal for displays and exhibitions. By 'Spanner'

We come next to the drive system. As already mentioned, the model was originally designed for unattended dealer display work and, as such, incorporates an automatic reversing mechanism controlling continuous operation of the lift. This mechanism is actually a "standard" unit which has been used for many years by the Model-building Department of Meccano and it has also been featured in Meccano Magazine in the past. However, for the benefit of readers unfamiliar with its construction, it consists of two 3½ × 2½ in. Flanged Plates 38, connected by two 2½ × 2½ in. Flat Plates 39. Journalled in the Flanged Plates is a 4½ in. Rod held in place by a Collar outside the Plates and carrying, inside, a ½ in. Pinion, a Worm 41 and a 1 in. Gear 42. The Pinion meshes with an "idler" ½ in. Pinion 43, revolving free on a 1⅛ in. Bolt secured in the nearby Flanged Plate. A 2 in. Sprocket Wheel 44 is fixed on the end of the Rod.

Running parallel to the first Rod is a second 4½ in. Rod, free to slide in its bearings and carrying a ½ in. Pinion 45, a Collar and a 1 in. Gear 46 inside the plates and a ½ × ¾ in. face Pinion 47 on the end of the Rod. The Pinion and 1 in. Gear should be so arranged that, as the Rod slides, Gears 42 and 46 mesh together, or Pinions 43 and 45 do so–*alternately*. The two sets of gears must never mesh at the same time and there should be a short neutral period between the change-over. A third parallel 4½ in. Rod carries a ¾ in. Contrate 48 and a 57-teeth Gear 49, the latter outside the Plates and in constant mesh with wide-faced Pinion 47.

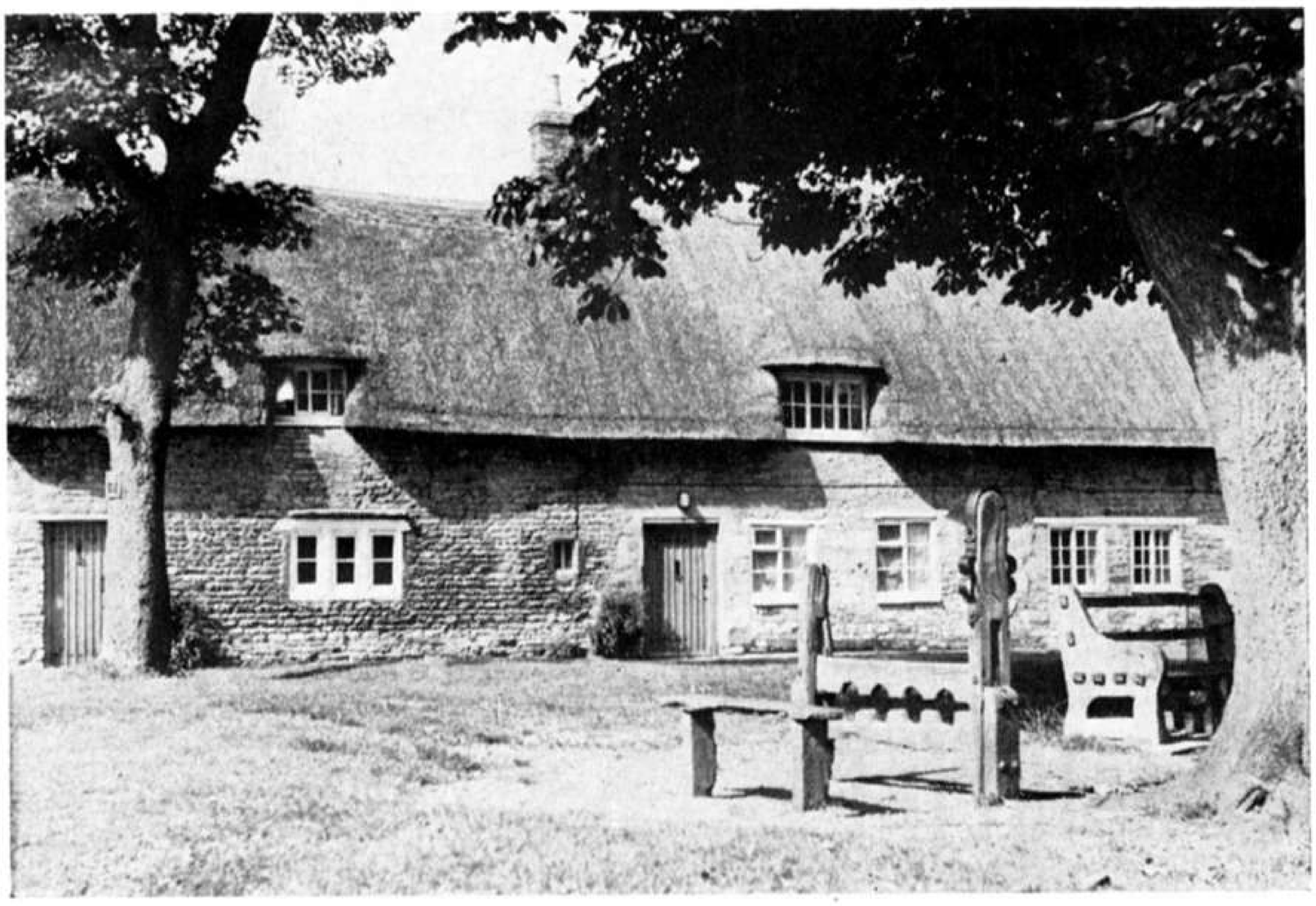
Now bolted to the inside of one Plate 40 is a Double Arm Crank, the boss coinciding with the centre hole in the Plate and two corresponding 1½ in. Strips being bolted to the outside of the Plate to provide an extended mount for a 1½ in. Rod held in the boss of the Crank. Running free on this Rod, but held in place by a Collar, is a 57-teeth Gear, suitably packed with Washers to mesh with the underside of Worm 41. Pivotally attached to the outside face of this Gear is a Slide Piece carrying a 3½ in. Strip 50. The upper end of this Strip is tightly fixed to, but spaced by Collars from a Crank 51 mounted loose on a 2 in. Rod held in another Crank. This Crank is bolted to four 2½ in. Strips, fixed one on top of the other to nearby Plate 40 to provide a really strong support. Held by Nuts in the centre hole of strip 50 is a ½ in. Bolt, the head of which engages between the boss of Gear 46 and the adjacent Collar to actuate movement of the carrying Rod for changing gear. The completed unit is bolted to two 2½ in. Angle Girders 53, one secured to Angle Girder 3 and the other to the Flat Girder bolted to Flat Plate 28.

For display purposes, the original model was powered by a special mains motor, but, for our purposes, this is replaced by a 3–12 volt Motor with Gearbox (set in the 16:1 ratio) which is bolted to a 3½ × 2½ in. Flanged Plate secured to Angle Girders 8. A 1 in. Pulley 54 and a ¾ in. Sprocket Wheel are fixed on the output shaft of the motor, the Pulley being connected by a 20 in. Driving Band to Pulley 16 and the Sprocket by Chain to Sprocket Wheel 44. In mesh with Contrate 48 is a ½ in. Pinion 55 on the end of a 4½ in. Rod journalled in nearby Plate 40 and in a 3½ in. Strip bolted between rear Girders 29. A 1 in. Pulley 56, fixed on the other end of the Rod, is connected by a 10 in. Driving Band to Pulley 36 to complete the drive system.

Coming to the travelling cupolas, each of these consists of a Boiler End 57, to which a 5½ × 1½ in. Plastic Plate is bolted, the ends of the Plate being edged by 1½ in. Strips. As can be seen, a space remains between the ends of the Plate to represent the entrance, a safety bar being provided by a shaped 2½ in. Narrow Strip 58, bolted between the upper corners of the Plate.

Held by Nuts in the centre of the Boiler End is a 3 in. Screwed Rod, on the upper end of which a Conical Disc is held by further Nuts. The supporting arm is a 3½ in. Strip bolted to the Boiler End and Plate and to the top of which a

(*please turn to page 340*)



PHOTOGRAPHY IS EASY

PART NINE

By Peter Wilkes

Discovering Colour Films

IN the past, colour work, in the eyes of the enthusiastic amateur photographer, was very much for the person whose only requirement, from his camera, was a simple "snap-shot" to act as a permanent reminder of a person or place. And the reason for this outlook was easy to see. To the man accustomed to using his camera as a creative tool, to film stock that varied in speed from the very slow, fine grain emulsions suitable for landscape and exhibition work, to the fast and ultra fast that permitted the camera to participate among the fastest of action and in conditions that, in some circumstances, amounted to nearly total darkness, colour films, available as they were in only the slowest of emulsions, suitable for photography under the most perfect conditions, were, in his mind, unsuitable for serious photography.

Today, thanks both to the film maker, and to the specialised laboratories that undertake the processing of colour, colour photography is not only the equal of black and white but, because of its ability to record scenes in all the glory of their original colour, superior.

No longer is the amateur restricted in his choice of emulsions, indeed, today, the choice can appear, to the beginner, overwhelming.

Uprating Speed

Not only are emulsions in speeds from 64 ASA to 160 ASA available in Reversal stock but, through the medium of home processing or by taking advantage of the facilities available from a number of the laboratories who have geared their work, not only to the requirements of the professional, but those of the serious amateur, the speed of Kodak's High Speed Ektachrome, for one example, can be uprated four times, from its original 160 ASA to 640 ASA, providing, of course that when the film is forwarded for processing, the laboratory are given details of the speed rating given to the film by the user.

However, before going into details of these fast and super fast films and their use, it must be understood that some Reversal stock is sold at prices that include processing by the manufacturers, while the prices of others are only for the film. In these cases the buyer can either process the stock himself, send it to the makers for processing, or have it done by one of the many laboratories that cater for such needs, and it is these that will deal with a film that has been "upgraded" beyond the makers' speed figures.

By using this "upgrading" of speed of a film such as Kodak's High Speed Ektachrome, with its recommended rating of 160 ASA, colour work stands, in relation to film stock available, on an equal footing to black and white, with no subject beyond the scope of the camera.

Although, if the speed of the film is pushed into the realms of the fantastic, such as rating the 160 ASA stock at 2,000 ASA, loss of some of its colour quality is inevitable, to "push" the film to 320 or 640 ASA will give a colour rendering that is hard to distinguish from that obtained when the user confines himself to the makers' recommendations.

It must be pointed out that no point is gained by trying to "push" those colour films that lie in the slower speed range, for no benefit is obtained by doubling the exposure rating of an 80 ASA film to 160 ASA, when film stock, rated at that speed, is available from the manufacturers, nor should different exposures on the same film be rated at different speeds because, in the case of roll films, and it is these that most amateurs are concerned with, the complete roll of film receives the same handling at the processing station, and hence, if a different rating had been given to

different "shots" on that roll, some would inevitably receive wrong handling in the course of the "development" of the film with their consequential ruin.

Home Developing

Yet, as wide as the road open to the colour photographer is, when he realises the capabilities of the film stock available, possibly the greatest thrill to the convert to colour is derived when he sees, in his first "home processed" Reversal stock, the wonderful world that is colour appearing before his eyes.

Contrary to the widely held belief, home processing of Reversal colour presents no real difficulties and, in fact, has in its favour four vital advantages.

Providing a sufficient number of films are available for processing at one time, to use the full capacity of the chemicals before oxidisation sets in, a considerable cash saving can be made, and not only can the results be seen immediately but one avoids postal delays which so frequently occur when films are sent away for processing, and completely eliminates any possibility of loss or damage to the film. And finally, it is possible, when you are fully acquainted with the system, to influence the results and colour balance in a creative way.

Basically, the "development" of a Reversal colour film follows a pattern clearly laid down in the maker's instructions as supplied with the kit of chemicals, but the steps, taken to their fundamentals, are simple indeed.

After loading the film into a developing tank, it is given a "first developer" to produce the "negative" image. After a wash and "stop" bath to cut the action of the first developer at the precise time, the "negatives" are then given what is called the "reversal exposure".

This, in effect, consists of "exposing" those parts of the film not affected in the original taking of the picture and, in some cases, such as the Ferraniacolour Kit, is done by taking the film from the tank, while still fitted on the spool, exposing it for a period of about three minutes to the light from a "photoflood" bulb, while, with the new Ektachrome process, the "reversal exposure" is effected chemically during the processing.

After this comes the "colour development" stage and then, using the bleach supplied with the kit, the "negative" part of the image is bleached away, leaving transparencies that depict, in glorious colour, the hues and tones that so excited the eye in the original scene.

The only critical part of processing is in temperature control and, on the instruction sheet with the kit will be found the temperatures and tolerances for each stage. An accurate thermometer is an essential, as is a bowl which, filled with water to the required temperature, is of sufficient size to take the bottles containing the various chemicals to stabilize them before they are poured into the developing tank.

Naturally nothing is gained by using the processing kit of one manufacturer for the film stock of another. Indeed, staying with one make of film and chemicals until you fully understand both can prove of immense value. For, in the case of the Ferraniacolour system, a variation in the first development times gives the user control over the results in the form of a colour shift in the balance of the film. For those who prefer a warmer tone to their transparencies, a slight increase in the time of the first developer will give just that result, with reverse giving slightly colder tones in the transparency.

Control of the first developer time also affects the speed rating of the film and, in the case of High Speed Ektachrome, an increase of two minutes in the first developer will double the effective film speed to 320 ASA, while about five minutes will give a four-fold increase in its ASA rating. It is in such experiments that the home colour processor comes into his own, gaining full control over the medium of the film.

Colour Negatives

While no mention has been made of colour negative material, the home developing of such film is as simple a matter as processing a black and white film, but the subject of colour printing, with the use of correction filters under the enlarger lens to give the required colour balance in the final print, is, although widely carried out among amateur photographers, beyond the scope of an article such as this. But, to those who, after an excursion into the world of colour through reversal stock, feel the need to extend into colour printing, many books are available that cover the subject, from the very beginning, in a thorough and practical manner.

Opposite page, a scene such as this with the stocks and whipping post against a background of thatched cottages provides a picture even in black and white, but such a subject demonstrates to the full the true colour that colour can give to photography.

Right, on an overcast day, and when rapid shutter speed is wanted to stop action and yet adequate depth of focus, the uprating of a film such as High Speed Ektachrome can bring subjects such as this into the realms of colour photography with ease and simplicity.

An early production L-410 Turbolet aircraft in the insignia of SLOV-AIR.

AIR NEWS By J. W. R. TAYLOR

Czech Mini-Liner for Aeroflot

Good news for Czechoslovakia's highly-competent aircraft industry is that the Soviet airline Aeroflot has chosen the Let L-410 Turbolet as its next local service airliner. The size of the order has not been announced; nor have the Russians said whether the L-410 will take the place of the 14/15 passenger Beriev Be-30 which had been developed by their own aircraft industry for this job. But the Let factory at Kunovice is likely to be kept busy for a long time, as Aeroflot is by far the world's biggest airline, with hundreds of older transports that must be replaced during the next few years.

The illustration here shows one of the first production L-410s, which entered service last year with the Czechoslovakian internal operator Slov-Air. Powered by two 736 h.p. M-601 turboprop engines, it can carry a crew of two and from 15 to 19 passengers at a cruising speed of 227–236 m.p.h. Maximum range is 807 miles, and a full load of passengers or 4,075 lb. of cargo can be carried on 124-mile stage lengths. Low-pressure tyres enable the mini-airliner to use airfields with grass runways, and it can take off and climb to a height of 50 ft. in less than 600 yards.

Design of the L-410 began in 1966, and the prototype (OK-YKE) flew for the first time on April 16, 1969, powered by two 715 h.p. Canadian-built Pratt & Whitney PT6A-27 turboprops. These engines are still available in production aircraft if the customer would prefer them, but locally-designed M-601 engines are standard. Seats are three-abreast in the unpressurised cabin, which has a maximum width of 6 ft. 3½ in. and height of 5 ft. 5¼ in. at the centre. Wing span is 57 ft. 4¼ in., length 44 ft. 7¾ in. and maximum loaded weight 11,905 lb.

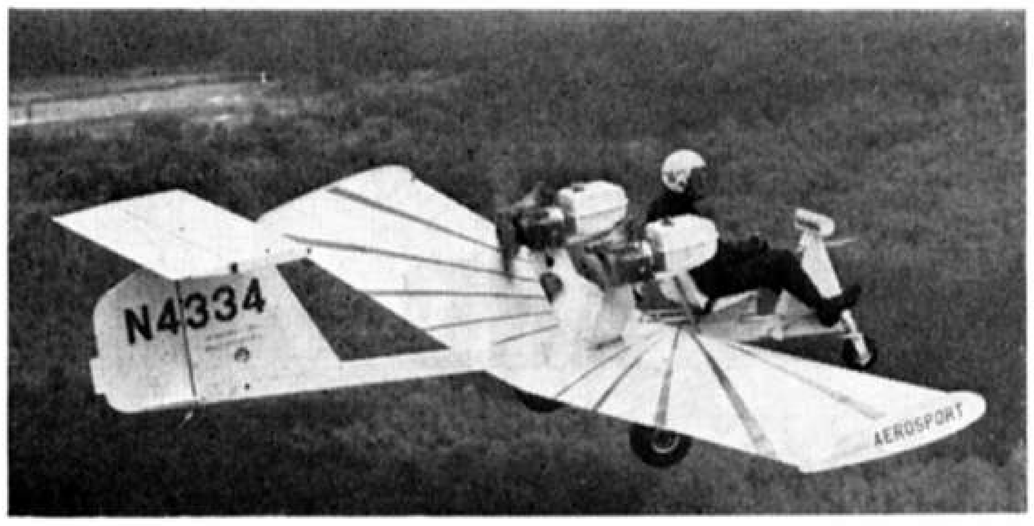
This is not the first Let aeroplane to have entered large-scale service with Aeroflot. Some years ago, the little 4/5-seat L-200 Morava was bought for air taxi use, and more than 1,000 of these aircraft were built eventually at Kunovice.

Teen-age Project

Esko and Ari Hietanen, the two young Finns in the picture on this page, will never claim that their HEA-23B single-seat home-built lightplane is one of the world's most handsome aircraft. However, it flies safely and well, which represents quite an achievement as they began to design it when they were only 13 and 15 years old respectively, in 1959.

They started building the aircraft, without any professional help, in the Spring of the following year. It was a big task, and both men were in their twenties by the time OH-XEA was ready for its first flight, on August 13, 1968. It was taken up for the first time by a

Below, the Hietanen brothers with their HEA-23B. Right, the HEA-23B in flight.



Above and right, the Rail in flight showing the precarious position in which the pilot sits.

professional pilot named Eero Juurikkala, and was quickly pronounced as being suitable for use by less experienced persons.

The HEA-23B is a true ultra-light, weighing only 881 lb. fully loaded, with pilot and 11 gallons of fuel—sufficient for 248 miles of flying. The engine is a 65 h.p. Continental, giving a top speed of 75 m.p.h.; stalling speed is a gentle 34 m.p.h. The wings span 26 ft. 3 in. and the HEA-23B is 19 ft. 5½ in. long. Construction is mixed, with plywood-covered wooden wings and tailplane, and fabric covered steel-tube fuselage and fin.

Meet the Rail

After seeing films like *Those Magnificent Men in their Flying Machines*, or reading books about the pioneers and their stick-and-string aeroplanes, many people felt that all the fun has gone out of flying. They find little excitement or satisfaction when cruising along, in armchair comfort, in a 550 m.p.h. jet, and long for the days of open cockpits and goggles.

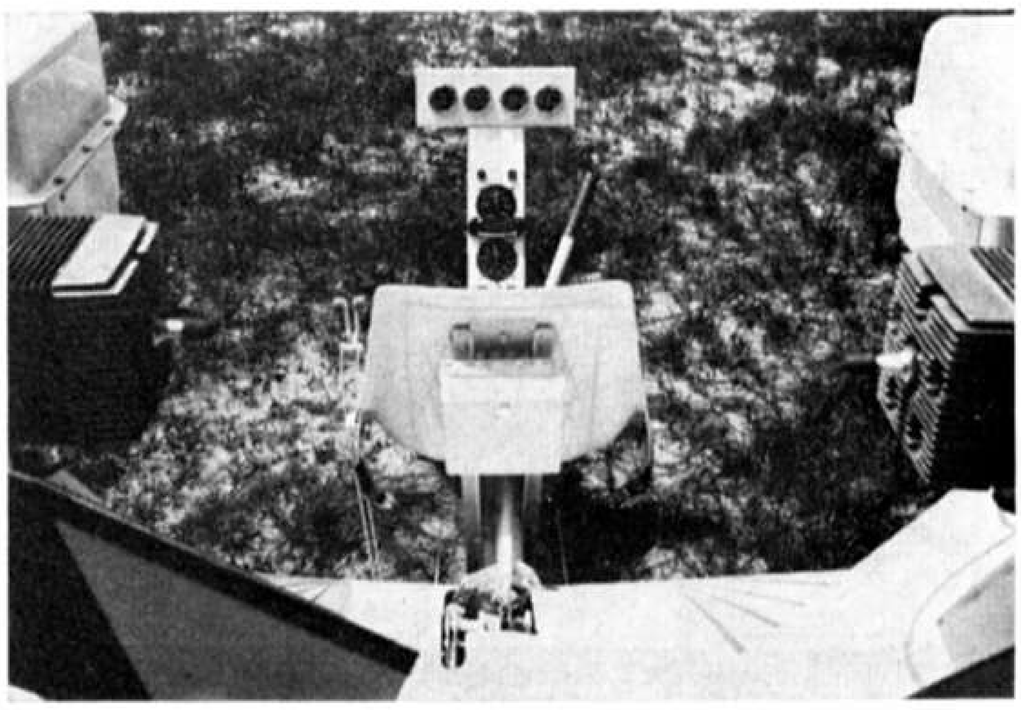
These were the kind of people who Harris Woods of Holly Springs, North Carolina, had in mind when he designed and built the prototype Rail. Never has an aeroplane been better named. Although all-metal, for strength and lightness, this "minimum" single-seater is so simple that literally anyone can build it. The fuselage comprises no more than a single aluminium extruded boom. This is the "rail" which carries the plank-like wings and T-tail, both made of light-gauge aluminium for the simplest and most rapid construction known to modern technology. The pilot has an open seat forward of the wings, with conventional joystick and rudder bar controls and toe-brakes. The main wheels of the tricycle undercarriage are carried on aluminium spring legs, and the power plant consists of two 25 h.p. twin-cylinder Aerosport 600 engines, modified from well-proven Snowmobile power plants and driving 40 in. wooden pusher propellers. Weight of each engine is a mere 55 lb.

Aerosport Inc., who market plans and kits of parts for amateurs to assemble, say that the Rail is easy to build, safe to fly and less noisy than a Piper Cub. It has been thoroughly stressed and test-flown by experts, and nobody is likely to challenge the claim that it offers an exciting form of flying. Of course, it is not intended for aerobatics, but what other aeroplane could be built in under four months, working about three hours each evening and eight hours each week-end, and then flown by any average pilot with twenty hours solo in his log-book?

The Rail can be put together in a two-car garage. Ready-to-fly it spans 23 ft. 3½ in., is 15 ft. 9 in. long and weighs 440 lb. Take-off weight, with pilot and fuel, is 700 lb., at which it needs a take-off run of only 230 ft. and will then climb at 900 ft. per minute. Maximum speed is 90 m.p.h., range 100 miles at 66 m.p.h. and service ceiling 12,000 ft. for anyone brave enough to sit

(*continued on page* 357)

Below, Aerosport Rail with Mr. Woods earlier well-known Woody Pusher. Right, the somewhat sparse instrument panel of the Rail.



THE DESIGN AND CONSTRUCTION OF BRIDGES

Part Six in the series by Terence Wise deals with Early Cantilever Bridges

BASICALLY a cantilever may be said to be any beam or girder which projects beyond its support and carries a load on this projecting arm. It may carry the load distributed evenly along the length of the arm, or as a concentrated weight at the extreme end; in cantilever bridges the weight is usually carried in both ways. In brief this is the cantilever principle, which was used in ancient times for bridging with the aid of corbelling for support, but in more modern times it developed from the observance of the stresses exerted on continuous girder bridges.

Take for example a continuous girder bridge with four supports. Such a bridge would be subjected to two kinds of stress along its length. A beam supported at each end will sag in the middle, as shown in Fig. 1A, but a beam overhanging its support will bend in the reverse direction—Fig. 1B. Therefore the stresses in a continuous girder bridge would cause the stresses as shown in an exaggerated manner by Fig. 2. Here the girder A–J rests on four supports, and the sections B–D and F–H are bent like cantilevers, while the sections A–B, D–F and H–J sag like beams supported at each end. The points B, D, F and H, where these stresses meet, are called the points of contrary flexure. The length D–F, functioning as a beam supported at each end, transfers its load to the points D and F, where it is carried upon the projecting arms of the lengths C–D and F–G. It is therefore possible to estimate the load these two cantilever sections will have to carry at their extreme ends, in addition to the load distributed along their own length. At these points D and F there is therefore no bending stress at all and the load could be carried just as safely if the length D–F were made an independent or detached girder—a typical three span cantilever bridge in fact.

In the design of a cantilever bridge, however, the points of contrary flexure are determined before erection by hingeing the suspended span at predetermined points. These points may be located anywhere from the centre E to the limits C and G, so that the suspended span can be of any length, provided it is less than the total distance between C and G. An alternative to this method of construction is to locate these points or hinges at B and H so that the structure then consists of a rigid girder, B–H, projecting beyond the supports C and G at each end, and carrying on these projecting arms the independent girders A–B and H–J, whose outer ends would rest on the abutments. In either of these designs the bending stresses at the centre of the span C–G are far less than they would be in a continuous girder bridge and cantilever construction is therefore lighter.

The tension and compression stresses of the members, and the whole principle of the cantilever system, is perhaps most easily explained by Fig. 3. Here the chairs are the piers, the two boys sitting on them are the towers, and each boy helps to support a centre strut carrying a third (smaller) boy. His weight is counter-balanced by the anchors (A) on the extreme ends. Fig. 4 shows this principle transposed on to a corresponding design for a cantilever bridge.

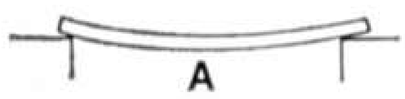


Fig 1

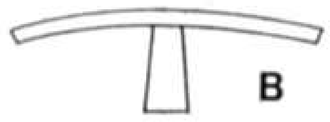


Fig 2

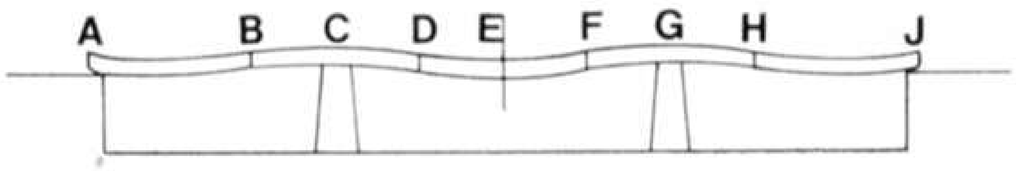
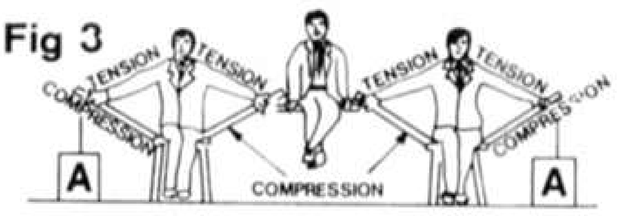


Fig 3



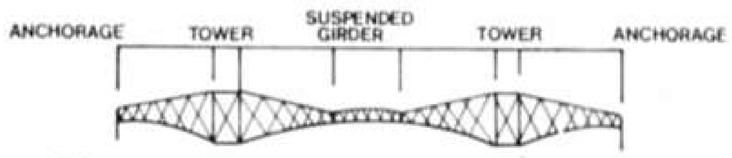


Fig 4

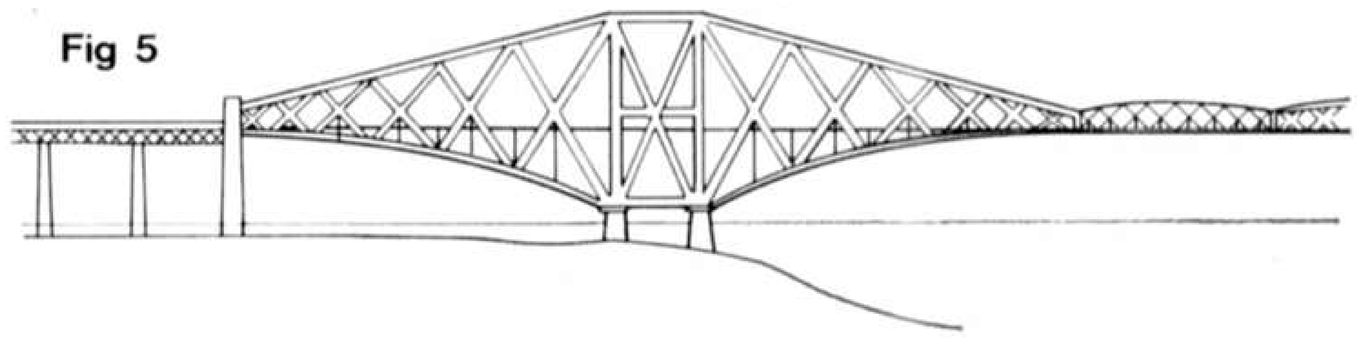


Fig 5

The term cantilever is derived from cant and lever, an inclined or projecting lever, and only came into use in 1883. Prior to this date the type of construction was known as a Gerber bridge, after the German engineer Heinrich Gerber who in 1867 built the first cantilever bridge at Hassfurt am Main with a span of 425 feet. The first use of the cantilever principle in America was the Kentucky River viaduct, built by C. Shaler Smith in 1876 with three spans of 375 feet each, but it was not until 1883, when C. C. Schneider built the railway bridge over the rapids of Niagara with a cantilever span of 495 feet, that the term cantilever was actually used.

The cantilever offers many advantages for the bridging of very wide openings, especially where construction takes place over a deep chasm or navigational channel, since no staging is needed once the main towers have been built. It is usually employed for bridges of three spans because it is particularly well adapted to this design, but there is a limit of around 3,000 feet for its length and the effect of wind on large bridges of this kind is very serious. In the Firth of Forth Railway bridge, the first and greatest of the British cantilever bridges, as much as 47% of all steel used was for the purpose of resisting stresses set up by the wind. Expansion on the other hand presents no problem, being allowed for in the suspended span which is hinged to one cantilever and left free to move upon the other.

The Firth of Forth Railway bridge is one of the most famous examples of the cantilever design. In its day it had the longest cantilever span in the world and was considered a great triumph of engineering. Designed by Fowler and Baker, the bridge was begun in 1882 and completed in 1889, employing a force of 4,500 men, of whom 57 were killed in accidents. Fig. 5 shows the South Queensferry pier end of the bridge with viaduct approach, tower and cantilever arms and centre span. The components for the bridge were all manufactured in large workshops built on the Queensferry shore, within sight of the bridge. The parts were carefully marked to facilitate erection, scraped, wire brushed, then coated with hot linseed oil and a layer of red lead. After erection the parts were painted with a second coat of red lead, followed by two coats of oxide of iron paint. The principal members were made up in tubular form from riveted plates and the insides of these were painted with one coat of red lead and two of white. 50,000 tons of steel were used in the construction of the superstructure alone.

After the founding of the piers the three huge towers, each 360 feet high and 145 feet wide, were built and the cantilever arms were built outwards from them by the use of platforms which were moved forward on the arms as work progressed. When the cantilevers were completed the two connecting spans were lifted into position, using the ends of the cantilever arms, to form two clear spans of 1,710 feet each, 150 feet above high water level. These smaller suspended truss spans are each 350 feet long. The total length of the bridge, not counting the approach viaducts, is 5,350 feet.

The Forth Railway bridge has been followed by many others of similar design over the years, the most notable of which is that at Quebec, (Fig. 6). This bridge links the major railway systems of the area, crossing the St Lawrence at Cap Rouge, nine miles above the city. Initially it was built to carry two railway tracks, two tram ways, two ordinary vehicle lanes and footways: the total width of the deck is 90 feet. From the river banks two 500 foot long arms, anchored to the shores, were erected to join up with the two towers, which were built on piers in the shallow water near the bank. Each of these towers is 400 feet high. The cantilever arms were then built outwards from these towers to a length of 562 ft. 6 in. and the centre span of 675 feet continued to be built outwards from these arms to a meeting point in the middle. This meant that at one stage there was as much as 800 feet of span unsupported. The total span when completed was 1,800 feet, the largest single cantilever span in the world. Total length of the bridge is 3,239 feet, so that although it exceeds the Forth bridge span by 90 feet it is shorter in overall length. The bridge was begun in 1899 but suffered two collapses during construction, costing 84 lives, and was not finally completed until 1917.

Nowadays the suspension bridge has replaced the cantilever for very long spans, and other designs are now used for bridges of under 1,000 feet, but over the years examples of the cantilever bridge have continued to be built:- the Oakland bridge in California with a span of 1,400 feet, built in 1936; the Howrah bridge in West Bengal, finished in 1946 with a 1,500 foot span and a deck 100 feet in width; and the Greater New Orleans bridge of 1958 with a span of 1,757 feet.

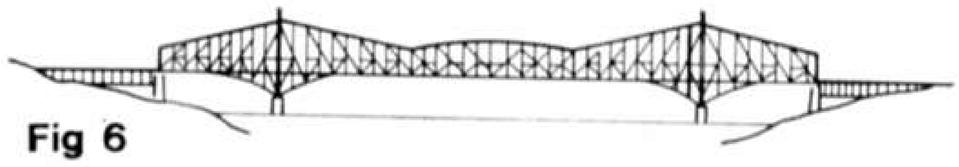
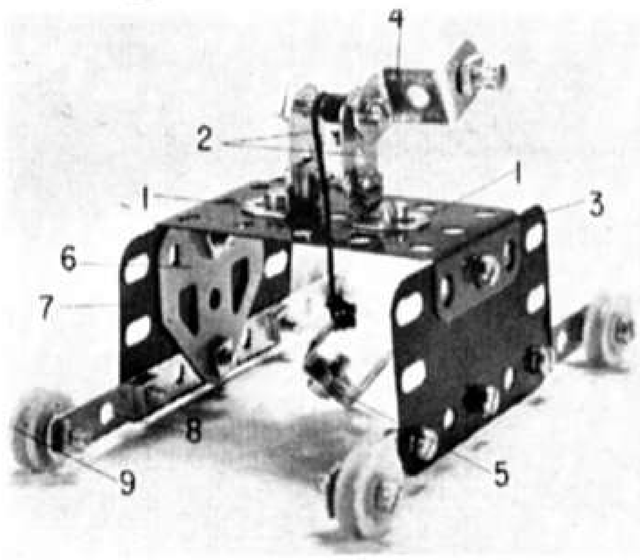
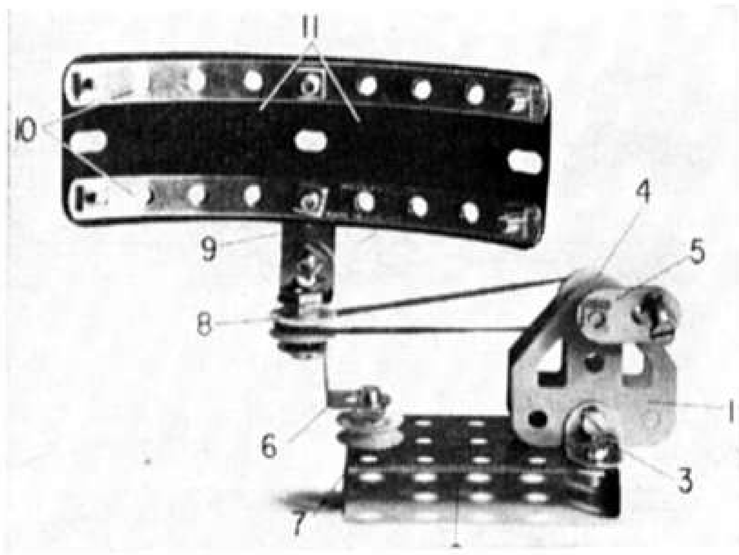


Fig 6

Opposite page, the famous Howrah cantilever bridge over the Hooghly River between Calcutta and Howrah. Right, London's Tower Bridge is an example of the cantilever bridge applied to movable bridges, each 'leaf' of the bridge being a 'beam or girder which projects beyond its support'.





MORE FROM POCKET MECCANO

TO continue our series of interesting models entered in last year's Pocket Meccano Competition, I feature here three more ingenious productions, two of which were prize-winners, and one which was not. It was an extremely difficult task selecting these particular examples, as there were so many excellent models to choose from, but they were finally picked because they are all well-built and appealing reproductions, based on three totally different subjects. I hope you like them.

Radar Scanning Aerial

Congratulations go to 13 year-old J. C. Steventon of Upminster, Essex, for our first model—an imaginative Radar Scanning Aerial which actually revolves, controlled by a small crank connected to the Scanner by an elastic band. Two Flat Trunnions 1 are mounted vertically on a $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flanged Plate 2 by means of two $\frac{1}{2} \times \frac{1}{2}$ in. Angle Brackets 3, the securing Bolts for which pass through the centre base holes of the Trunnion, and the rear corner hole of the Flanged Plate. A $\frac{1}{2}$ in. Pulley 4 carrying an elastic band is secured between two Nuts on a $\frac{3}{4}$ in. Bolt passing through the apex holes of the Trunnions, then a Fishplate 5 is locked by a further two Nuts on the end of the Bolt. A $\frac{1}{2}$ in. Bolt is secured in the other hole of the Fishplate to complete the "driving" assembly.

In constructing the scanning aerial unit, a $\frac{1}{2}$ in. Reversed Angle Bracket 6 is locked by two Nuts on another $\frac{1}{2}$ in. Bolt. A $\frac{1}{2}$ in. Pulley 7 is added, then the Bolt is fixed in the end row centre hole of Flanged Plate 2, as shown. Another $\frac{1}{2}$ in. Pulley 8 is tightly fixed by two Nuts, one each side, on a $\frac{1}{2}$ in. Bolt free to turn in the upper lug of the Reversed Angle Bracket. An ordinary Angle Bracket is locked on the upper end of the Bolt shank, a Fishplate 9 being bolted to the vertical lug of this Bracket, then the scanner itself is finally produced. This consists of two $4\frac{1}{2}$ in. Narrow Strips 10, curved slightly and bolted to two $2\frac{1}{2} \times 1\frac{1}{2}$ in. Plastic Plates 11, overlapped one hole. When completed, it is bolted to Fishplate 9. The elastic band looped round Pulley 4 is of course looped round Pulley 8 to complete the drive.

PARTS REQUIRED

2—10	26—37a	1—111	2—126a
4—12	11—37b	1—111a	2—194
4—23	1—51	1—125	2—235d

Gantry Crane

Our second offering is another working model in the shape of a Gantry Crane designed by G. R. Laming 'Middle Herrington' Sunderland. To build it, two Angle Brackets 1, each extended upwards by a Fishplate 2, are bolted to a $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flanged Plate 3. Lock-nutted in the circular holes of the Fishplates is a $\frac{3}{4}$ in. Bolt which turns freely, controlled by a $\frac{1}{2}$ in. Reversed Angle Bracket 4 tightly fixed on the Bolt. A handle is supplied by an ordinary Bolt locked by two Nuts in the spare lug of the Reversed Angle Bracket. The $\frac{3}{4}$ in. Bolt, of course, serves as the hoisting winch and a length of Cord is therefore tied to the Bolt shank. From here it is threaded through the centre hole of Plate 3 and tied to a "hook" 5, built up from two Angle Bracket bolted together.

Each leg of the Gantry consists of a Flat Trunnion 6 and a $2\frac{1}{2} \times 1\frac{1}{2}$ in. Plastic Plate 7, bolted to one or other flange of Plate 3. Tightly fixed to the lower edge of Plate 7 and to the apex hole of the Flat Trunnion is a $4\frac{1}{2}$ in. Narrow Strip 8, in the end holes of which $\frac{1}{2}$ in. Bolts are held by Nuts. A $\frac{1}{2}$ in. Pulley 9 revolves on the shank of each of these Bolts to act as the travelling wheel and to complete the model.

PARTS REQUIRED

2—10	26—37a	1—111	2—126a
4—12	14—37b	4—111a	2—194
4—23	1—51	1—125	2—235d

Push-chair

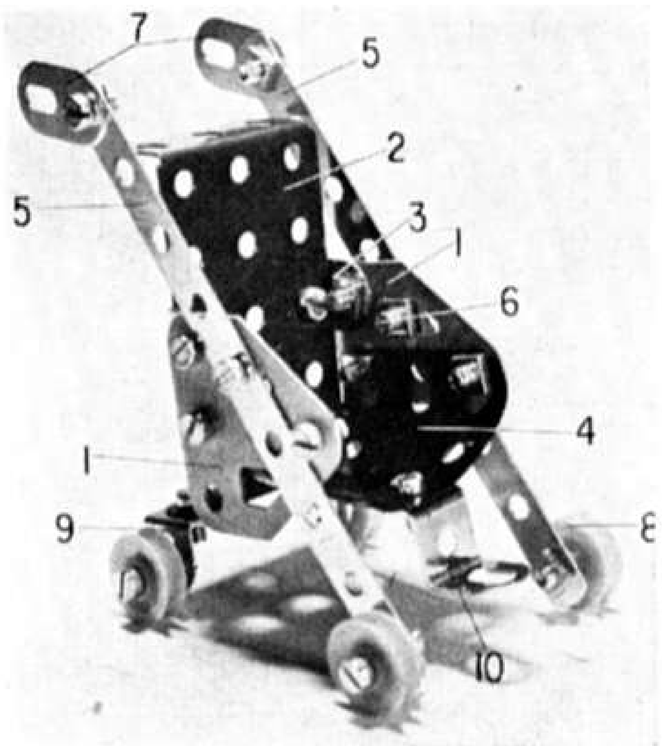
Finally, we have an excellent little representation of a Pushchair, which is the pleasing work of 13-year-old Andrew Bell of Churchlawton, Stoke-on-Trent, Staffs.

Two Flat Trunnions 1 are attached one to either side of a $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flanged Plate 2, by means of an Angle Bracket 3, in the position shown. A $2\frac{1}{2} \times 1\frac{1}{2}$ in. Plastic Plate 4, formed into a "seat" shape, is then bolted between, and along the "centre-line" of the Flat Trunnions, this obviously serving as the seat. A $4\frac{1}{2}$ in. Narrow Strip 5 is attached to the outside of each Trunnion by one Bolt which passes through the centre hole of the Narrow Strip and the upper, large wedge-shaped hole in the Trunnion. To the top end of each of these Narrow Strips, a Fishplate 7 is bolted to provide handles, while a $\frac{1}{2}$ in. Bolt carrying a $\frac{1}{2}$ in. Pulley 8 (serving as one of the front wheels) is locked in the lowest hole of the Strip. The rear wheels are also supplied by $\frac{1}{2}$ in. Pulleys on $\frac{1}{2}$ in. Bolts, these fixed in two Angle Brackets 9 bolted to the lower flange of Plate 2.

Last of all, a $\frac{1}{2}$ in. Reversed Angle Bracket 10 is bolted through the front centre hole of Plastic Plate 4 to finally complete the model—and a fine little model it is too!

PARTS REQUIRED

4—12	21—37a	1—51	2—126a
4—23	15—37b	4—111a	1—194
		1—125	2—235d



Top, the revolving Radar Scanner won a No. 5 Meccano Set for 13 year-old J. C. Steventon. Not a prize-winner in the Competition, but still an appealing working model, is the little Gantry Crane designed by G. R. Laming. Left, fully deserving of the prize it won is this captivating Pushchair by Andrew Bell.

REPORT OF THE 10th MEETING OF THE

MIDLANDS MECCANO GUILD

by the Secretary

DESPITE a casualty list of 14 members, absent through sickness or because of previous commitments, the 10th Meeting of the Midlands Meccano Guild was once again a successful turnout. A warm, dry day greeted the members as they approached Shakespeare country on Saturday, March 25, in a wide variety of transport ranging from light vans to minibuses. By 2 p.m., the models they carried were set up in the St. John's Ambulance Hall in Stratford-upon-Avon and, in no time at all, the gallant band of volunteer wives had the first brew of tea handed round.

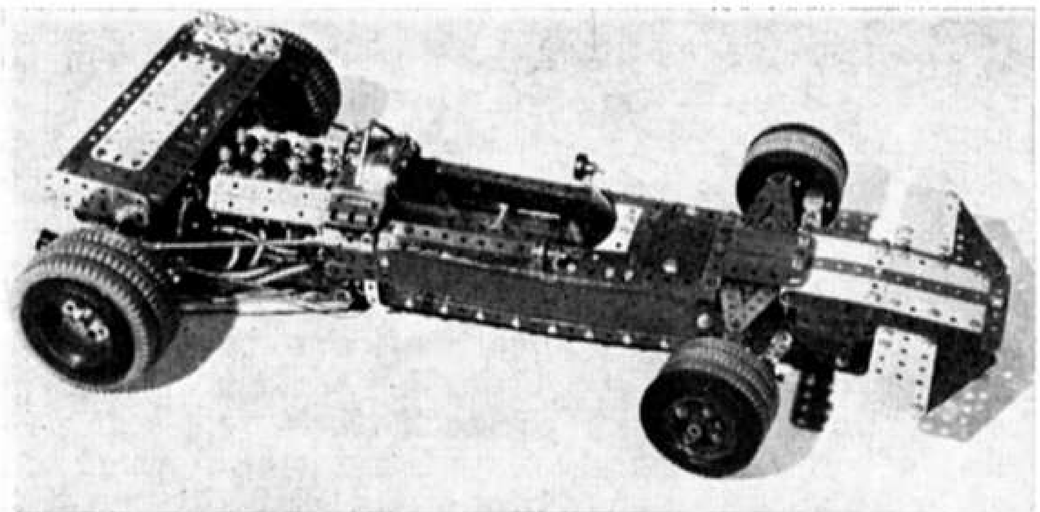
Shortly after this welcome refreshment the Meeting proper began with a short address from the Secretary who demonstrated a recent genuine Chinese "Meccano" set—a remarkable copy in silver, yellow and blue—and then went on to show some further small items of recent manufacture for the enthusiast. This was followed by a series of demonstration talks by individual members who described their models from the platform, each member being limited to ten minutes' talk. David Guillaume, of Alcester, started the ball rolling by showing part of an automated industrial processing plant which went through a sequence of dipping parts by a vertical and horizontal conveyor mechanism. The section displayed was of module construction so that sub-sections could be easily serviced and demonstrated, Motors with Gearbox being used for the sequencing and operational movements.

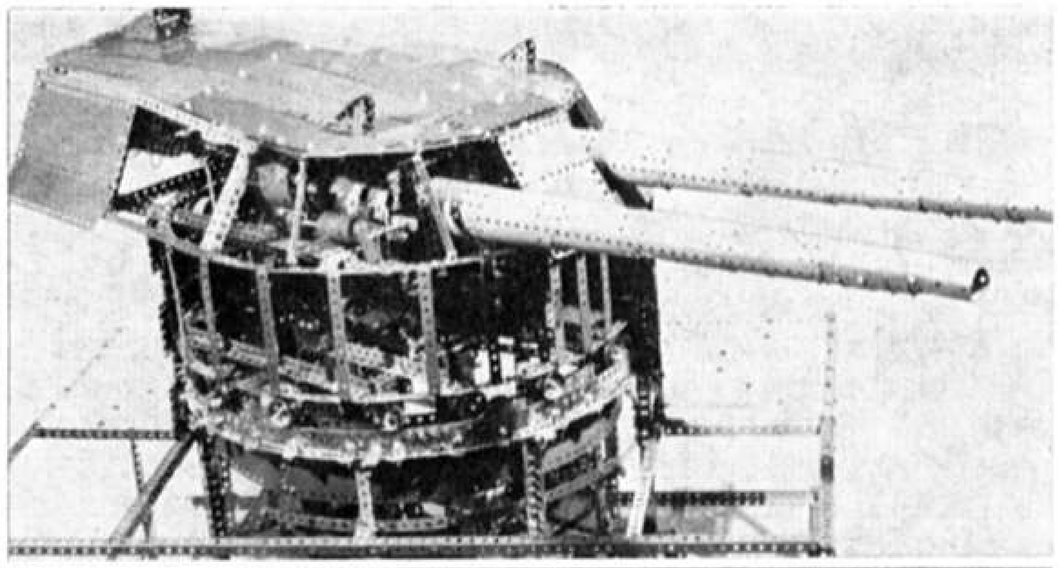
Transport models were again a prominent feature of the meeting and Peter Dixon of Stourbridge showed his excellent Formula 1 Grand Prix racing car. Almost 2 feet long, Peter's car was a prototype incorporating the main features of a modern car including a well moulded body form and cockpit, wishbone suspension and flexible steering geometry, as well as aerofoils front and rear, fully operative foot pedals on clutch, accelerator and disc brakes, and a very neat compact six-speed gear box of all-Pinion design. This was the first advanced model which Peter had ever designed and he made a first-class job of it.

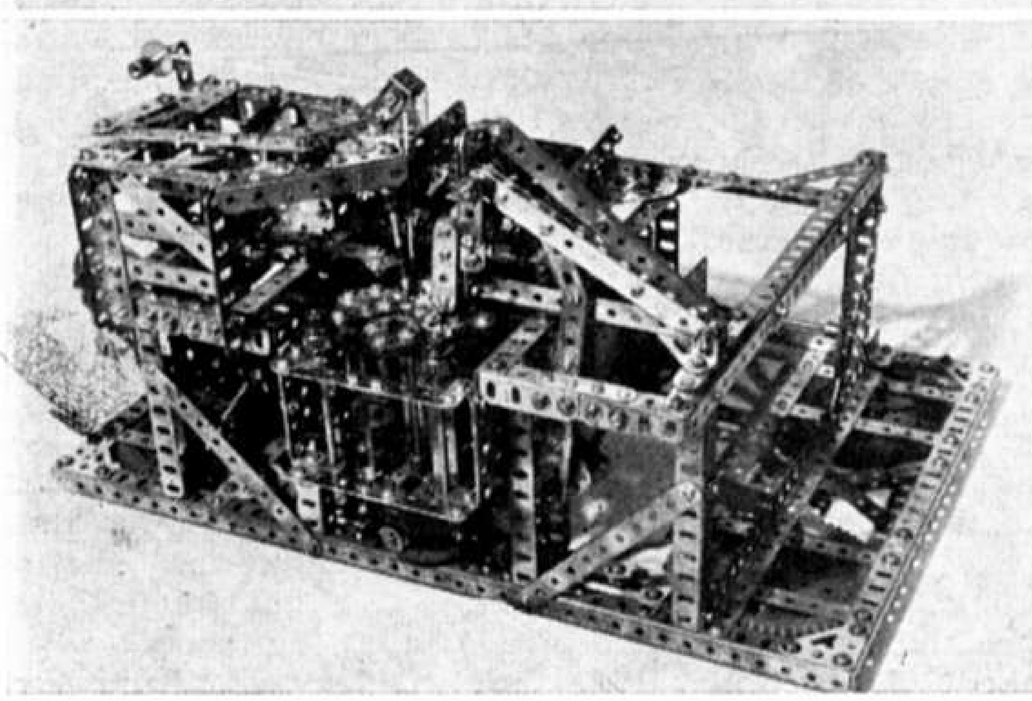
Peter was followed by a veteran in vehicle modelling, Brian Edwards of Bedford, who demonstrated a very neat vintage Morgan three-wheeler car complete with outboard twin-cylinder motor-cycle engine and transmission. Prototype two-speed gearbox, clutch and parallel bar steering geometry were included. Front mudguards and headlamps swivelled authentically with the steering and the suspension—coil spring at the front, twin cantilever leaf springs at the rear—performed in a realistic manner. As usual, detail was excellent in Brian's model.

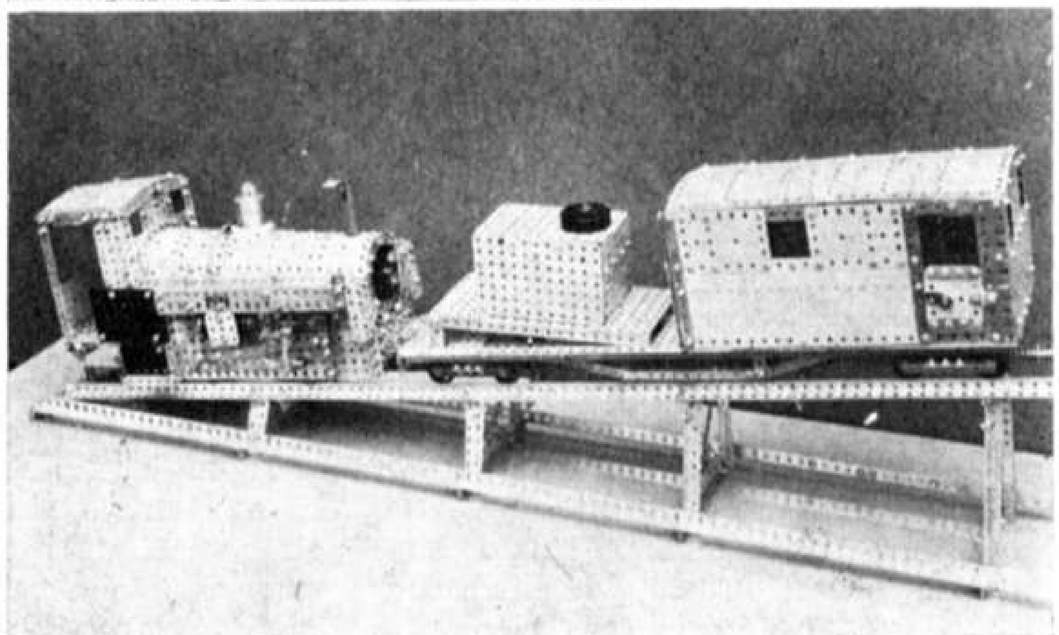
A novelty item was provided by Mike Nicholls (a brand new Guild member and self-confessed novice!) in the form of a "Sawing a Woman in Half" sideshow. The fiendish magician, with remarkable likeness to Alf Garnett, rolled his head and politely raised his hat as he cut through his victim who also rolled her head and both feet at the same time! Mike also showed a modernised version of a pre-war Watts

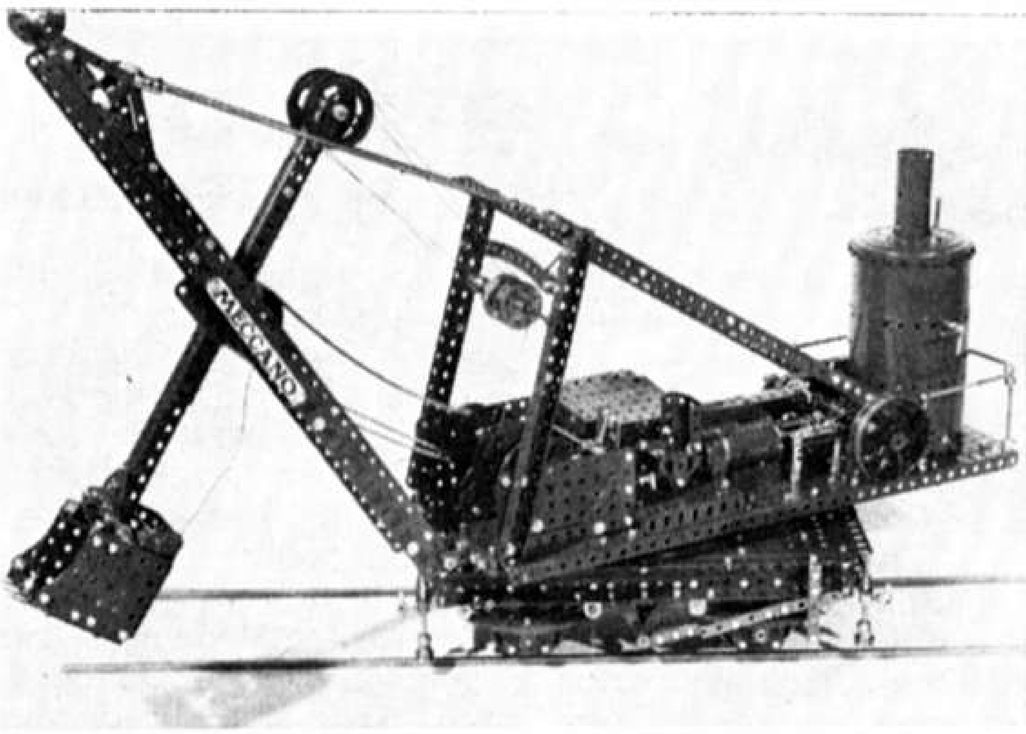
Below, reading clockwise, a Formula 1 Grand Prix racer by Peter Dixon. The model is complete with working 6-speed gearbox, clutch, differential and many other features. One of the two "king-size" models on show—a 16 in. gun-turret of 1914 vintage modelled by Tony Homden. The Snowdonian Rack Railway by Stephen Lacey with water-tank truck and luggage van. The valve gear and angle of tilt of the boiler are as per the original. The President's Prize-winner—an elegant high-speed French Knitting Machine by Phil Ashworth. The tip of a standard crochet hook is the only non-Meccano part required!

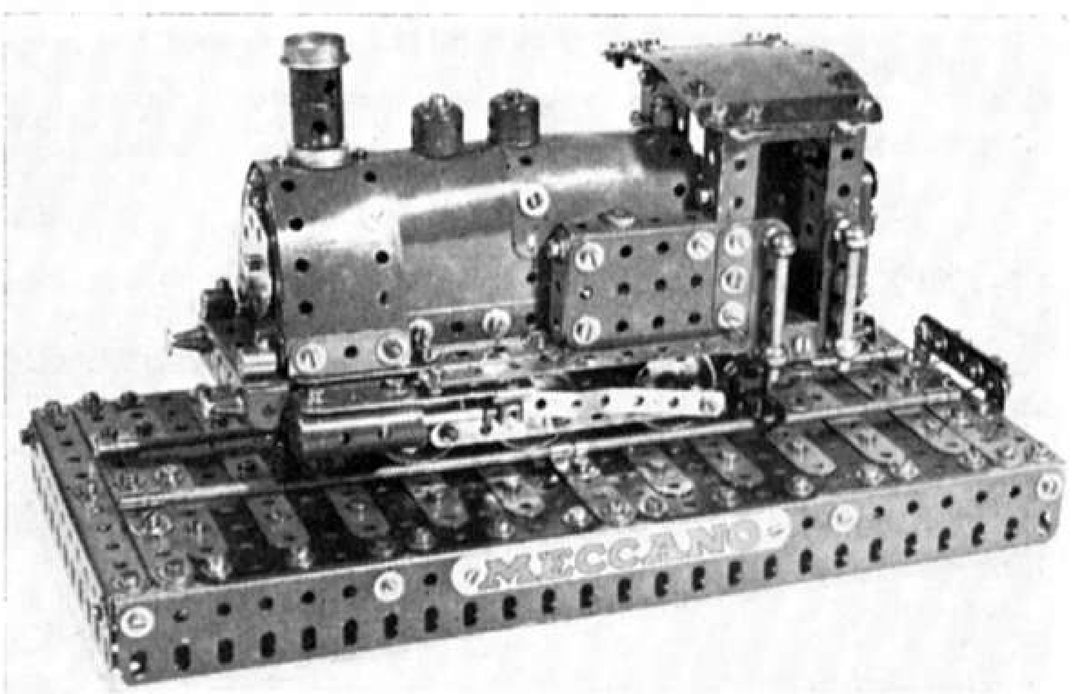


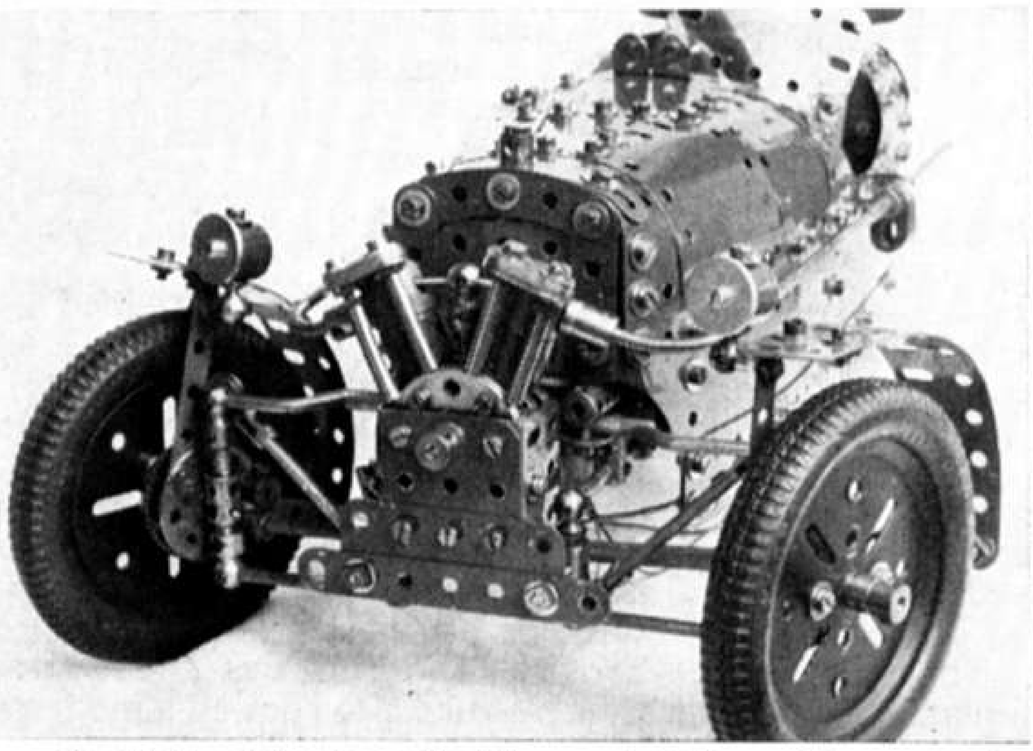


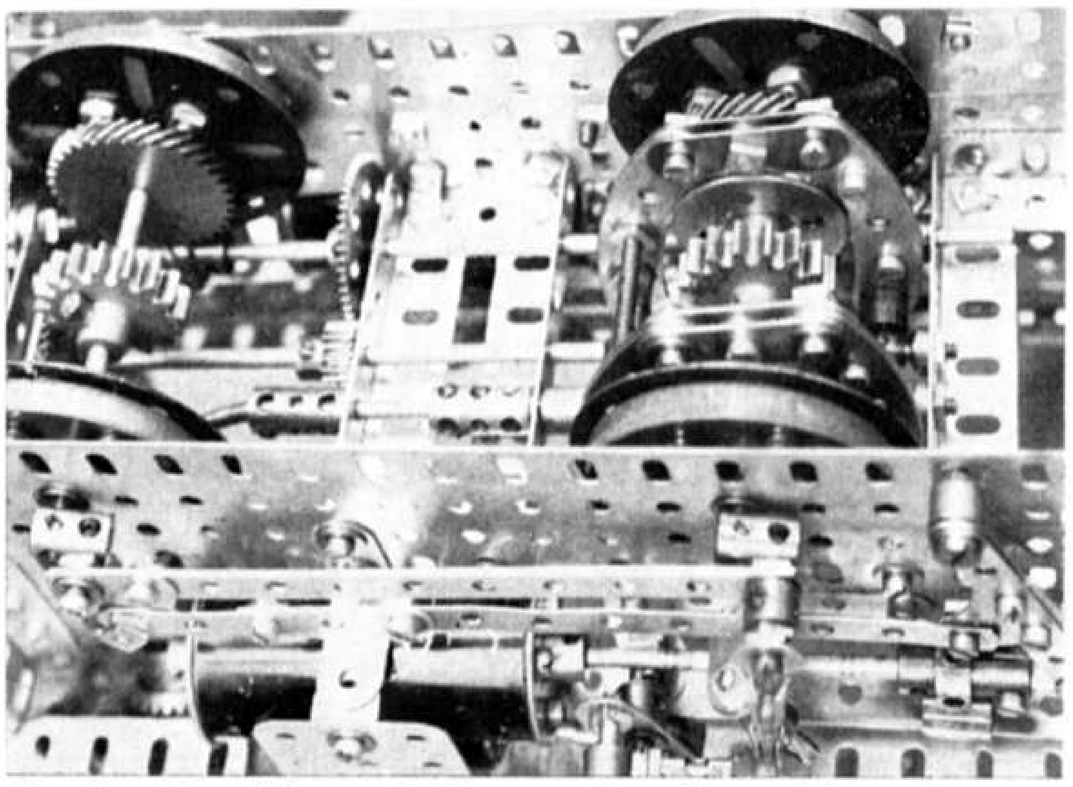












Top left, a "freelance" rail-mounted Steam Excavator by Jim Gamble. The model has excellent lines with motions controlled through gear linkages from realistic steam engine detailing. Top right, a neat 0-6-0 Tank Locomotive reproduced by Bob Faulkner. Bottom left, speedster of a different age! A vintage Morgan Three-Wheeler by Brian Edwards, including authentic suspension and steering geometry with 2-speed gearbox. Bottom right, an underside view of Stephen Lacey's rack locomotive showing the novel use of a large-toothed Quadrant Pinion to grip the made-up centre rack between the rails.

Beam Engine and explained how he had overcome some of the early imperfections common to such models. Jim Gamble then brought his first-class freelance railway excavator up to the platform. This model was beautifully detailed with a fully "riveted" boiler (concealing a Motor-with-Gearbox which supplied all movements!), steam motion with valve gear, flywheel etc. and a four-movement gearbox supplying drive to travelling, slewing, bucket racking and jib luffing. A fully-sprung railway truck base was provided and a novel turntable to Jim's design incorporated a "spider" made from a Circular Girder carrying ½ in. Pulleys which ran between roller races comprising 6 in. dia. Pulleys. The excavator was beautifully built in the advanced manner of the modern supermodel.

Clive Hine had two excellent models on show, one being a six-car fairground ride on undulating tracks which ran throughout the meeting accompanied by piped fairground organ music. His second model was an automated Coles self-propelled crane where steering, road travelling, hoist, slew and luffing were controlled by a drum-switch operating relays made from Meccano Electrical Coils and Brass Strips. By contrast, the next model, exhibited by Len Wright of E. Brough, Yorkshire, was one of the two "King-size" models on display. Len had made a replica of the giant Lorry-Mounted Crane, designed by Eric Taylor for a previous Guild Meeting. Len had managed to improve the wheel arrangement by using a heavier gauge of large-diameter tyre (available on certain ash-trays), but otherwise this was an exact copy of Eric's original model in a slightly different colour-scheme.

Last of the platform demonstrations was given by Phil Ashworth of Hull. Phil is noted for his sophisticated models, modular construction and total surprises! This time he astonished the Guild once again by showing a French Knitting machine in answer to the President's prize challenge made some two years previously. The machine was completely automatic and had mechanical linkages throughout. The "cotton reel" and four "panel pins", common to childhood days when French knitting was done on such homely items with the aid of a pin, were replaced in the Meccano model by a hollow drum based on spaced Gear Rings with four Keyway rods mounted vertically in the centre. The drum is indexed through 90 deg. for each stitch by a gear train and a dipping mechanism, fitted with the tip of a crochet hook (the only non-Meccano part permitted within the rules for the President's prize), picked up a loop at each oscillation, synchronised with the 90 deg. turn of the knitting drum. A high speed spinner, also synchronised, fed the wool yarn from a storage reel via a tensioning device, the business end of the spinner being a Cord Anchoring Spring, the tiny loop of which proved ideal as a feed for looping after the stitch was completed. The machine was hand-operated with a motorised alternative and, in either model, the machine knitted faultlessly to give Phil the prize which his brilliant

analysis of the motions richly deserved. On receiving his prize later in the meeting, in the best spirit of the Guild, Phil handed over his cheque to the St. John Ambulance Brigade Chairman.

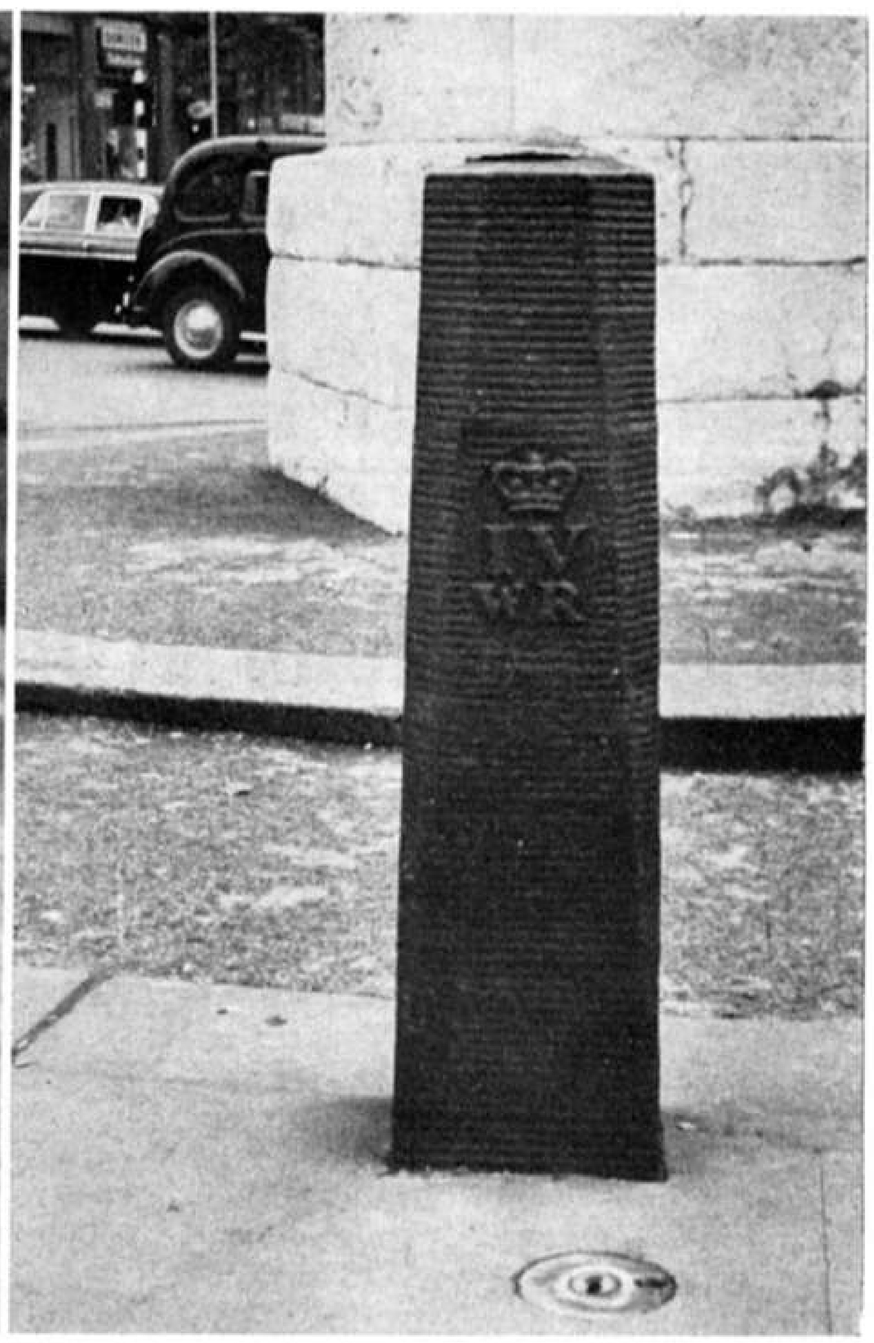
At this stage the assembly moved down to the far end of the hall to see the last of the demonstrations. This was the other King-size model of giant proportions in the shape of a 16 in. gun turret of the Queen Elizabeth Battleship type, dating back to 1914. Tony Homden had built this amazing model which was complete through several decks from the magazines and cordite rooms to the actual turret itself. A dozen electric motors were required to operate the multiple movements which included shell hoisting, shell and cordite ramming, breech locking, elevation, recoil and turret slewing on a massive 24-roller turntable. This latter item had taxed Tony's skill extensively in producing a perfectly smooth, circular path for the heavy turret to revolve on when powered by standard motors. Any model which can survive a 100 mile van journey on its side and still perform is a credit to any enthusiast! The model was complete with dummy cordite bags and a magazine filled with wooden shells to scale size, turned, says Tony, on a Meccano lathe, specially built for the job. His model, together with the other excellent demonstrations from other members, earned well-deserved applause.

Tea break was taken at 4.30 p.m. when the Guild tucked in to a delicious spread put out by the kitchen "staff". They were thanked by the President on behalf of the Guild. A short business meeting took place at 5.15 p.m. when new members were enrolled, the prize for the French Knitting Machine was presented and the date of the next meeting fixed. Members were then free to roam among the many other models on display round the side of the hall and to discuss points with other enthusiasts. This is a most valuable opportunity for exchanging ideas. Meccano parts were on sale at attractive prices and the camera was set up to record the models on show. The meeting closed at 8 p.m. and was voted another success.

Footnote

Peter Matthews, Secretary of the Holy Trinity Club, is going to South Africa and will be handing over leadership to Tony Homden. A statement will be issued after their next meeting.

STILL SERVING



Have you looked closely at old bollards in your town or city?

By E. HARPER

EVERY year more and more ancient landmarks disappear from our roads. Among the most frequent casualties are some of the old bollards which for centuries have silently guarded pedestrian lives.

As soon as wheeled transport, whether man powered or horse-powered, reached proportions that endangered the lives of those walking, some form of bulwark was needed. At first, probably stout timber was used, to be replaced by stronger, more lasting bollards, made of other material, many of which still stand in our towns today.

After the Napoleonic Wars, the Admiralty found itself with a quantity of obsolete cannon cluttering up the dockyards. Similarly the Army had a store of obsolete guns. Someone had the excellent idea that these old cannon could be used at strategic points to protect the public and in due course they were erected on pavement edges and around public buildings.

An early engraving by Inigo Jones of Covent Garden shows neat rows of cannon-bollards protecting the open space before the building. Bollards such as those drawn by Jones can still be seen in the area to this day.

A genuine 6-pounder sawn-off cannon can be seen in Upper Thames Street behind Cannon Street station.

The church of Allhallows the Less which stood here

Often people grow up taking a cannon barrel, used to protect a corner of a building or to restrict entry to an alleyway, for granted, and are amazed when one day they suddenly notice that it is (or was) a cannon.

was destroyed by the Great Fire of London but, despite the blitz, an old bollard still marks the spot where parishioners could walk in safety in days gone by.

Architects were quick to use the basic cannon shape in designing more ornamental bollards. Regency workers in cast-iron produced obelisk like bollards complete with crown and Royal cypher marked on them.

Around King Charles I's statue in Whitehall, bollards of William IV's reign still protect the King from the rush of modern traffic. The Royal Parks also contain many examples made in the reigns of George III, George IV and William IV.

Naturally the chief requisite of a bollard is unobtrusive strength. Granite was sometimes used, but proved less effective than cannons and cast iron. Today cement bollards are the fashion. Certainly these are easily made, durable and effective, though less attractive than the original old cannon-bollards.

Many of the latter are worth closer observation. One bearing the inscription "Clink 1812" is a connection with Clink Street which gave us our phrase 'to be in clink'. A Bishop once has a private prison known as Clink in the area and the name and street are in existence today, although warehouses have been built where once the prison stood.

We are unconsciously pleased to walk in safety behind these old bollards. Before they are swept away, give them the notice they deserve. They have served Britain well at sea and now, ashore, form one more link with our past.

Meccano Globe-Trotter Contest - Your Last Chance!

WITH the interest surrounding the launch of the new Pocket Meccano Competition, there might be a tendency to forget the Meccano Globe-Trotter Contest. Thanks to the fact that this issue of the M.M., although labelled July, actually appears at the beginning of June, we have time to remind readers that the Globe-Trotter Contest does not close until 30th June. You still have a chance to win a trip for two to almost anywhere in the world, or one of the 50 runners-up prizes of a No. 5 Meccano Set, or the equivalent in Meccano parts.

The Competition is open to any U.K. resident aged 16, or under. All you have to do is think of somewhere in the world you would like to visit, then build a model associated with that place out of Meccano. Anything appropriate will do such as the Brooklyn Bridge for New York, a Hydrofoil for the Carribbean, and so on. The only stipulation is that the chosen place must be on or near a B.O.A.C. air route as the winner will be flown out there in style on a B.O.A.C. Earthshrinker Jet—staying in luxury accommodation with all expenses paid!

The model itself must be built out of Meccano parts, although non-Meccano "incidental extras" may be used provided they represent only minor constructional features which cannot otherwise be reproduced using standard Meccano parts. No limit—maximum or minimum—is placed on the number of parts which may be used, or the number of entries, submitted, but judging will be based on realism, inventiveness and ingenuity so that a small well-built model will stand just as much chance of success as a giant complicated structure.

How to Enter

Having built the model, send a photograph (or photographs) of it, together with an official Entry Form and brief description, to Globe-Trotter Competition, Meccano (1971) Ltd., Binns Road, Liverpool L13 1DA. Under no circumstances may the actual model be sent, although it should be available for inspection in the event of the builder winning a prize. Where more than one entry is submitted, each individual entry must be accompanied by a separate Entry Form.

Entry Forms are available from Meccano dealers only, and, *before a form is supplied, entrants must have purchased or had purchased for them, Meccano goods to a minimum value of 39p.* The Form must be stamped or signed by the dealer concerned to confirm the purchase has been made. Full conditions for entry are printed on the Entry Form and all competitors automatically agree to abide by these conditions when they enter the contest.

Hurry, as time is running out!

Reconnaissance Phantom FGR Mk. 2. of No. 54 Squadron.

AIR NEWS (*continued from page* 349)

on a rail more than two miles above the heads of lesser mortals!

Phantom Spy-Plane

No duty undertaken by military aircraft is more vital than reconnaissance. "Spy-planes" and satellites are in action every day, keeping a watchful eye on military preparations and activities throughout the world, photographing, probing electronically the radio and radar secrets of every nation, helping to prevent a surprise attack, or a military mistake that might precipitate a third world war.

Strategic reconnaissance systems of that kind are backed up by tactical recce aircraft like the RAF Phantom illustrated on this page. These are the aircraft which, once a war has started, have to find and identify targets for attack, and then check on the degree of damage inflicted by an attack. But the Phantom is so big and powerful that it can still pack a heavy load of weapons in addition to the cameras and other sensors needed for reconnaissance.

The lion badge painted on the nose of this particular Phantom reveals it as belonging to No. 54 Squadron of Air Support Command. The centre-line pod under the fuselage houses cameras and side-looking radar for all-weather use. Under the wings are four rocket packs, two Sidewinder air-to-air homing missiles and two long-range fuel tanks. The devices occupying the missile recesses under the front fuselage could be Sparrow missiles without their wings and tail-fins fitted, or still-secret electronic reconnaissance pods.

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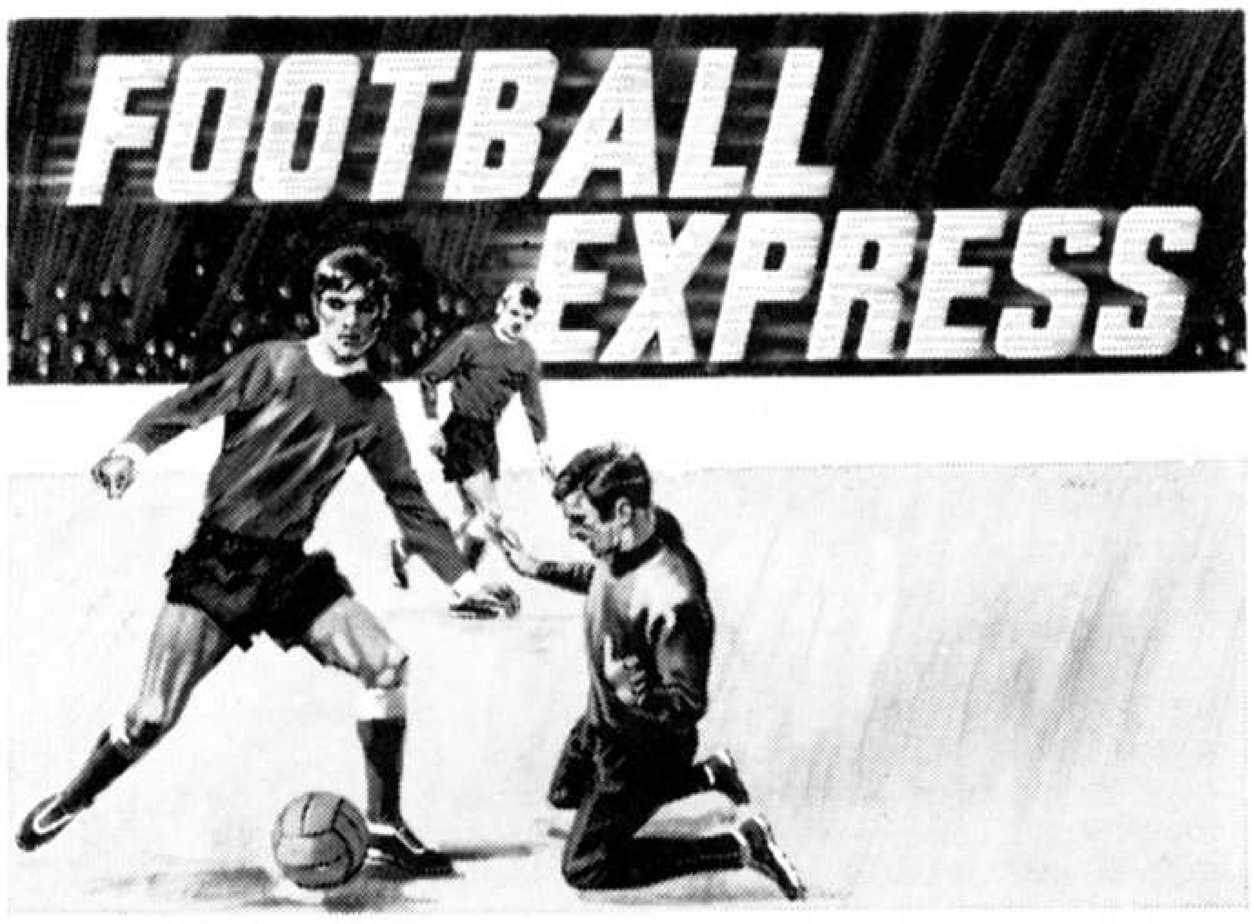

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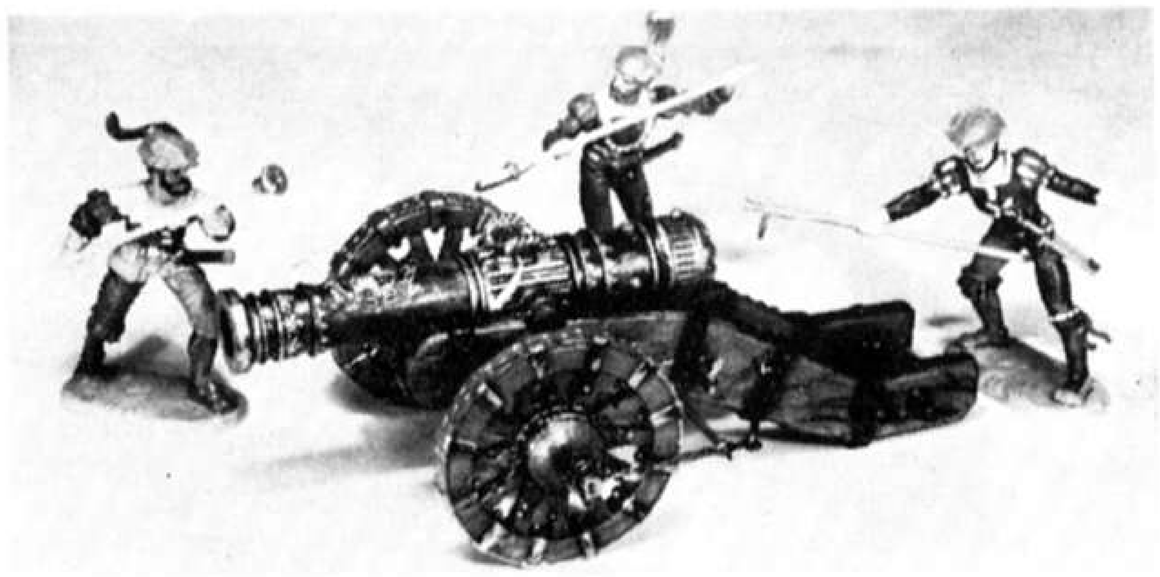


Military Modelling this month is again packed full with many interesting and varied topics that should be of great value and interest to beginners and experts alike.

Highlights will include "Miniature Navies", a survey of model ship collecting in 1/1200 scale and a fine plastic conversion article by American I.P.M.S. member, Bruce Hamilton, based on the Px Kpfw IV. Also there's a big feature on modelling figures in ceramics which should make an unusual and interesting variation, and "Battles Long Ago" by A. Hawkins.

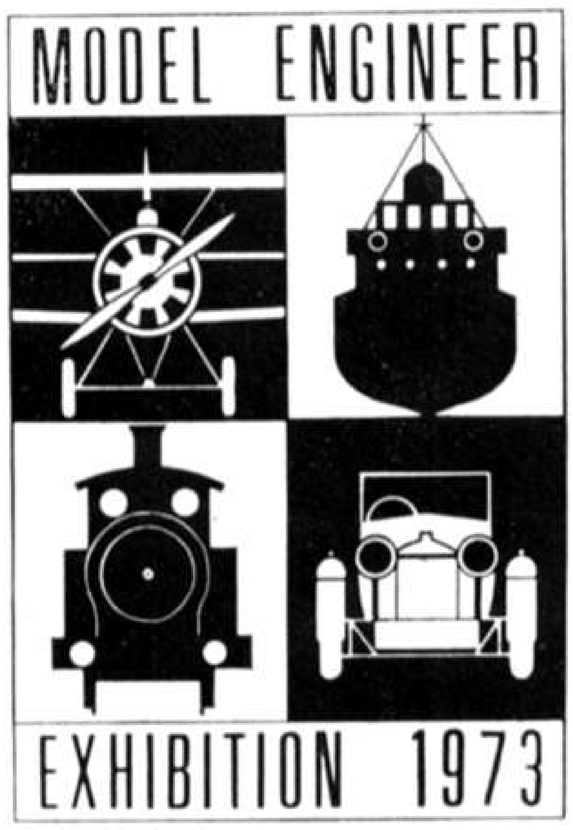
There's a photo report on a recent modelling competition in Plymouth and that feature that we unfortunately had to leave out from last month's issue, due to pressure on space in the magazine, on U.S. Helmet Markings from an American contributor which includes fine drawings for combat insignia together with the markings used to distinguish medical squads and military police.

Add to this all our regular features which include "The Funnies", "Uniforms and Colours of the British Army", "R.A.F. Colours and Markings", "Attenshun'" and "On Parade" (our usual regular trade and book review sections) and we think you will agree that it's well worth your while obtaining your copy early. It's on sale June 23rd in your book/model shops.

Military Modelling

ON SALE JUNE 23rd PRICE 15p

MODEL ENGINEER EXHIBITION MODEL ENGINEER EXHIBITION MODEL ENGINEER EXHIBITION



42nd Great Show! Model Engineer Exhibition

SEYMOUR HALL, LONDON, W.1.

2nd January — 13th January, 1973

Once again we have the indoor MARINA 98 ft long × 28 ft wide for demonstration of R/C boats. Super flying circle full width of the hall so immensely popular last year will be there again with even more spectacular flying.
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If you feel you can help please get in touch at once. Small models will be displayed under glass and all entries adequately stewarded.

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Price of admission at the door will be 30p adult, 15p child.
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TRADE STANDS

A number of proprietary exhibition layouts (of international calibre) will be on display. The model railway trade will be in strength offering a wide range of goods. Firms and manufacturers whose goods will be on sale and on display already include: Beatties of London; Chuffs; A. A. Hales Ltd; Studiolith; Traction Engine Enterprises; Plaistow Pictorial; M. & R. (Model Railways) Ltd.

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How to enter is simple—a club or an individual has only to drop us a line and send a photograph of the layout; if possible a rough sketch/plan and a note of dimensions and special features. We will visit layouts which seem likely to be of interest and make our choice from them.

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MODEL RAILWAYS comes out on August 11th and will contain a special Exhibition Souvenir Handbook and Guide Supplement and provide a grand enlarged number.

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Hours of Opening—The exhibition will be open on the 24th August 1972 at 10 a.m. and will continue through daily to 9 p.m. except Sundays when it will be closed, and will finish on Saturday, September 2nd at 7.0 p.m.
Prices of Admission—Price of admission at the door will be 30p adult, 15p child.
Reduced admission charges for pre-booking as under:—Single and small number pre-booking tickets available from these offices. Adult 25p, Child 12½p. Parties of more than 10: Adult 20p, Child 10p. Teachers i/c parties free—one per 10 in party.
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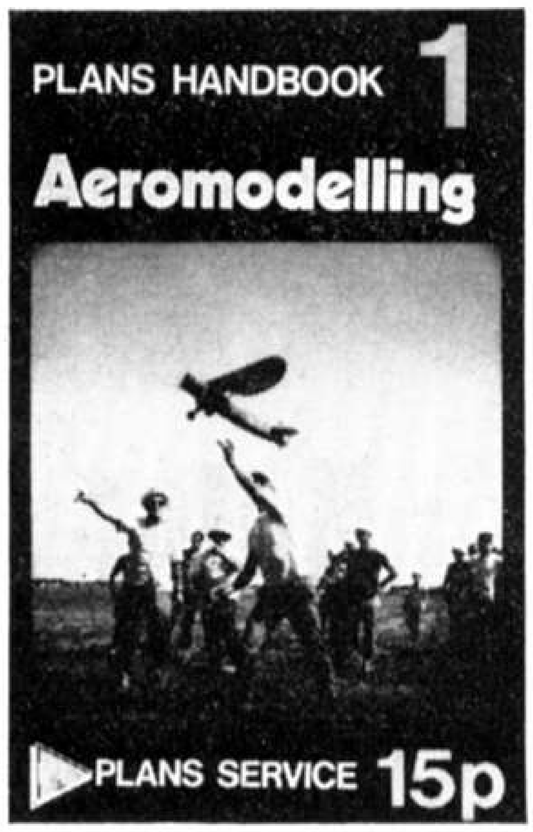

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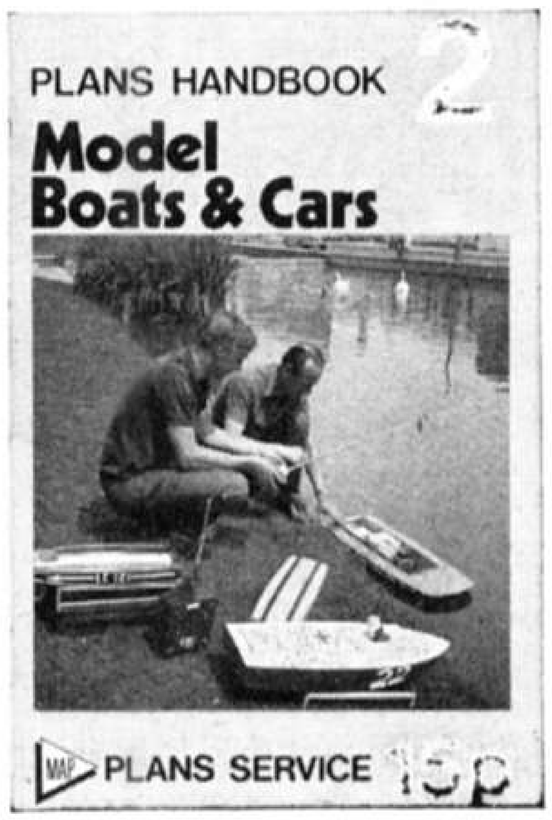

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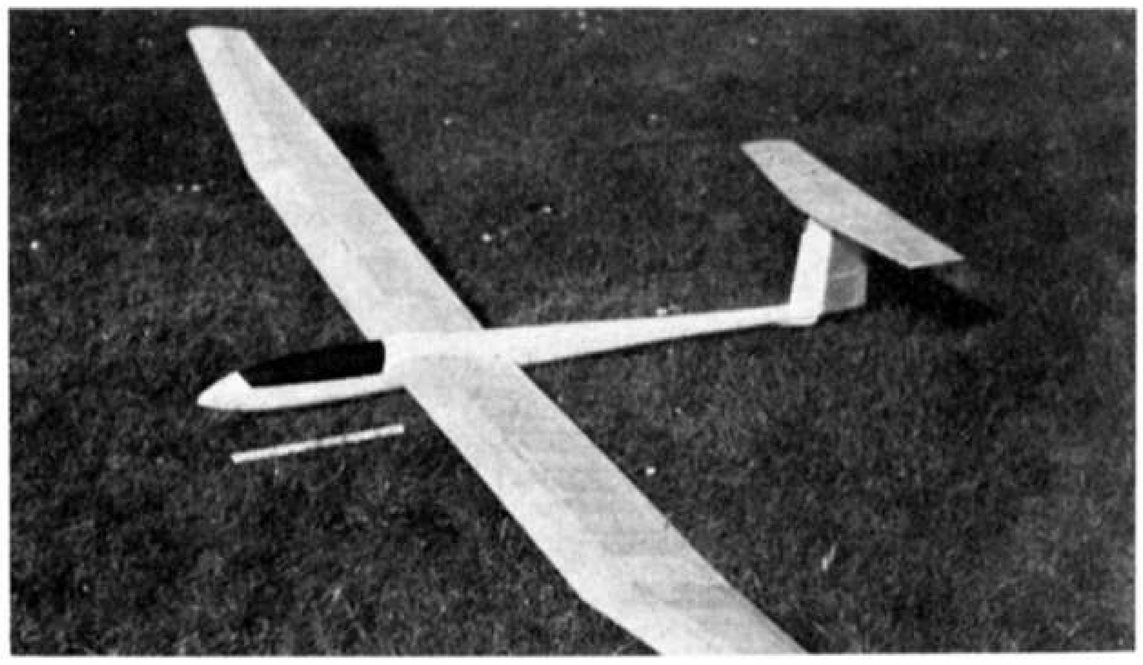

Radio controlled gliders are again a feature of Radio Control Models & Electronics July Issue, which continues our new regular monthly special interest column for glider enthusiasts, "Soaring Scene". More R/C glider interest can be found in the form of plans for Martin Garnett's elegant "T-Tail" slope and thermal soaring glider, *Stratus*. Also included in this issue will be a picture feature on the Esher R/C Symposium plus regular interest columns including *Test Report*, which this month analyses the Waltron Mini-2 system, and *Throttle Benders Union* for pylon race enthusiasts, who are owed a page or two.

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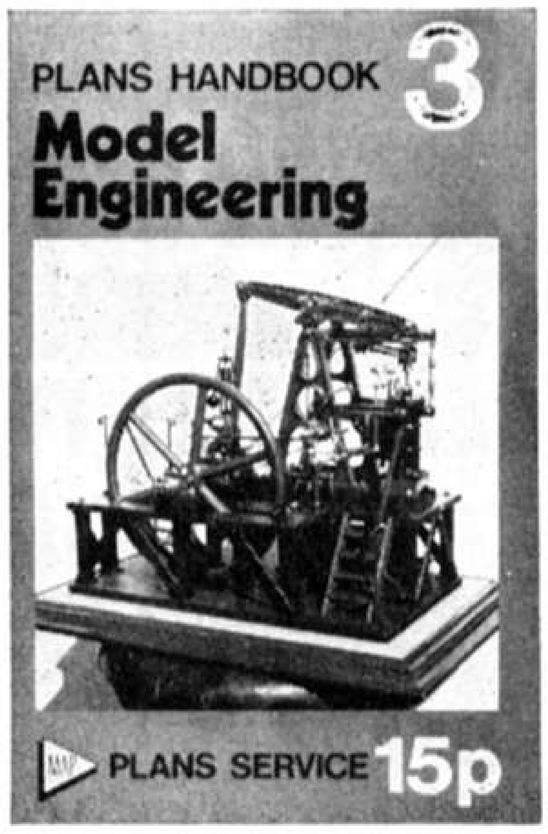

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5 M24 'General Chaffee' – 1944/50 (US); M4 'Sherman' 105mm Howitzer HVSS – 1944 (US); 10.5 cm PzFH 18 auf Pz II (SF) 'Wespe' 1942/44 (GE); Volkswagen Personenwagen, 3 versions 1940/45 (GE).

6 Cruiser tank 'Cromwell Mk IV' – 1943/45 (UK); Pz Kpfw IV J. – 1944/45 (GE); Sturmgeschuetz III D – 1941 (GE); Jeep with trailer and Jeep – 1942/45 (US).

7 Sherman VC (17-pdr) 'Firefly' 1944/45 (US/UK); M 41 155mm HMC 'Gorrila' – 1944/55 (US); Pz Kpfw III F – 1941/42 (GE); SU 85 Tank Destroyer – 1944 (SU).

8 'Jagdpanther' Sd Kfz 173 – 1944/45 (GE); Cruiser tank 'Comet Mk I' – 1944/45 (UK); T 28 Super heavy tank (double coverage) 1945 (US).

9 M 10 3" GMC 'Wolverine' 1942/43 (US); 8.8 cm FLAK 18 and Zg Kw 8-ton Sd Kfz 7 1934/44 (Double coverage) (GE); T14 Assault tank 1943 (US).

10 Carro Armato Tipo M13/40" 1940/42 (IT); 7.62 cm PAK 36 (r) auf Pz Kpfw 38(t) 'Marder III' Sd Kfz 139-1942 (CZ/GE); 15 cm F 'Lorraine' – 1942/43 (FR/GE); A7V Sturmpanzerwagen.

11 Pz Kpfw IV D – 1939/40 (GE); Medium tank T6 – 1941 (US); Light tank M22 – 1943 (US); Armoured Command Vehicle H.P. and L.P. (ALC) – 1944/45 (UK).

12 S. Pz Spaehwagen (8 rad) Sd Kfz 232 (FU) 1939-42 (GE); M 3A1 'General Stuart' III and IV – 1942 (US); Australian Cruiser Mk I 'Sentinel' – 1942 (A); Opel 3-ton Trucks 1937/49 (GE).

13 Pz Kpfw 'Tiger I' E (Double coverage) 1941/44 (GE); M 4A3E2 Sherman 'Jumbo' – 1944 (US); 17-pdr 'Challenger' Mk I – 1942/44 (UK).

14 Tank Mk IV – 1917/18 (UK); Canadian Cruiser 'Ram II' – 1942/43 (CA); 15 cm sFH auf GW III/IV 'Hummel' – 1942/45 (GE); VK 3001 (P) – Porsche type 100 'Leopard' 1939/41 (GE).

15 M 3 'General Lee Mk I' – 1941/42 (US); Armoured Car 'Daimler Mk I' 1941/44 (UK); T 82 105 mm HMC – 1942/43 (US); Pz Spaehwg. II 'Luchs' Sd Kfz 123 1942/43 (GE).

16 Light Tank Mk I – 1929/30 (UK); Pz Kpfw 'Panther' G. – 1944/45 (GE); Armoured Car 'AEC Mk I' – 1942/43 (UK); Infantry Tank Mk I – 1935/39 (UK).

17 Cruiser Mk I and Mk ICS (A9) – 1936/39 (UK); M 26 'General Pershing' – 1943/46 (US); Light Tank M 2A1 – 1938/41 (US); Pz Kpfw II F – 1940/44 (GE). 17-pdr SPC 'Archer' 1943/45

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18 (UK); Pz Kpfw 'E 100' – 1941/45 (Double Coverage) (GE); Light Tank M 2A4 – 1939/42 (US).

19 'Churchill Mk I' – 1940/41 (UK); Vickers MBT 'Vijayanta' 1963 (UK); Heavy Tank M 6 – 1940/41 (US); Armoured Car 'AMD Panhard et Levassor 178' (FR).

20 The German Panzerkampfwagen III – late models. Ausf L – 1941/42. Ausf M 1942/43; the 7.5 cm 'Sturmpanzer III' Ausf N 1941/42. Ausf M 1942/43; the 7.5 cm tank A 13 – A 13 Mk I/Cruiser tank Mk III (Reworked); A 13 Mk III and IICS/Cruiser tank Mk IV and Mk IVCS and A 13 Mk IVA-IVACS/Cruiser tank Mk IVA-Mk IVACS.

21 The German tank destroyer – 7.5cm PAK 40/2 auf Sfl. II 'Marder' 1942/43 early and late models based on the Panzerkampfwagen II chassis; British 'Tortoise' 1942/47; British light tank Mk. IA – with drawings of the A4E6, A4E7, A4E8, A4E9, A4E10; 1930/35 American Howitzer Motor Carriage T 3 based upon the Combat Car M 1, 1939.

22 American heavy 155mm Gun Motor Carriage M 12 'King Kong' with the GMC T6 prototype and 155mm GMC. M 12 production model; Cargo Carrier M30 and the T14 prototype. 1941/44; ISU 122 – 1944/45 Soviet Assault Gun Motor Carriage ISU 122 – D195 and A 25 5 versions. 1944/45.

23 Bundeswehr main battle tank – Kampfpanzer 'Leopard', Prototype I (Group A), Prototype II (Group A), Production Kampfpanzer 'Standard' – Leopard; Recovery and Engineer Vehicles, Bergepanzer 'Standard' and Pionerpanzer 'Standard' J962/70.

24 The World War I French Renault FT 17 Fighting tank that shaped the future development of AFV, in service from 1918 to 1945. This most important tank is given detailed coverage. Drawings include the Berliet turret, the normal riveted octagonal turret, with machine gun and 37mm cannon. Also includes version mounting the 75mm cannon. Drawings and text by Christian Henri Tavard. The well-known Italian Medium tank Carro Amato M 11/39 – 1939/41, which was the forerunner of the M 13 40.

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26 Panzerkampfwagen 'Panther' Ausf D and the Befehlspanzerwagen Ausf A in intricate detail plus the Churchills Mks III, IV and V with a special insert for this important Bellona Military Vehicle Print in the form of full 5-view 1/48th scale drawings of the Panthers, so permitting space for extra 1/48th scale Churchill views – Definitely a 'bonus' edition!

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