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SEPTEMBER 1970

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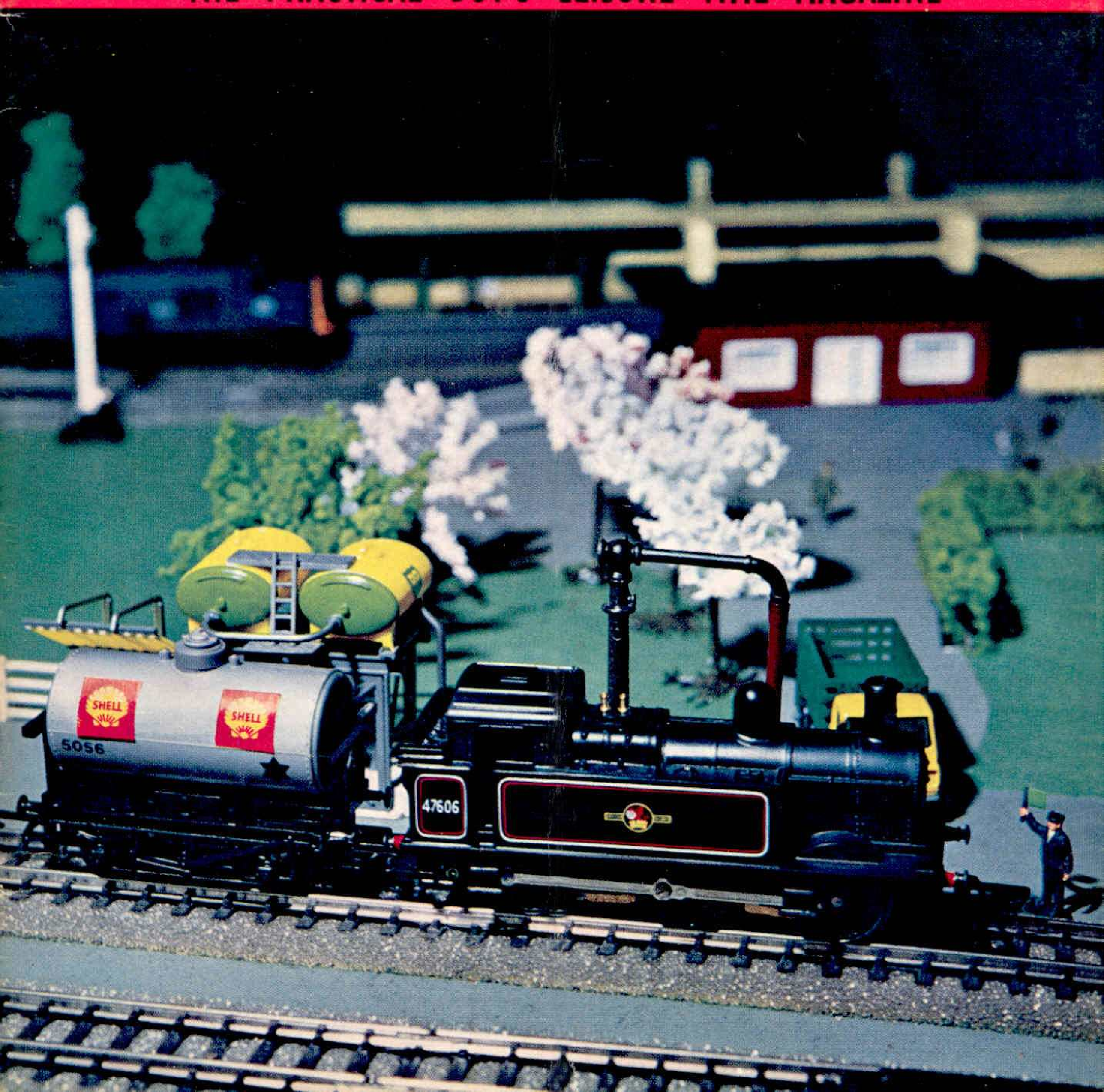

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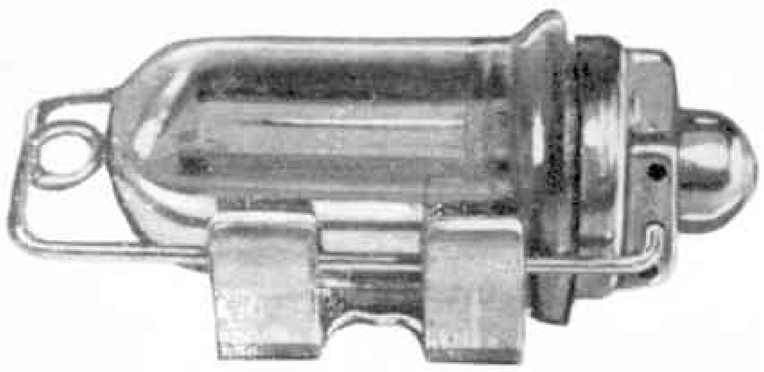

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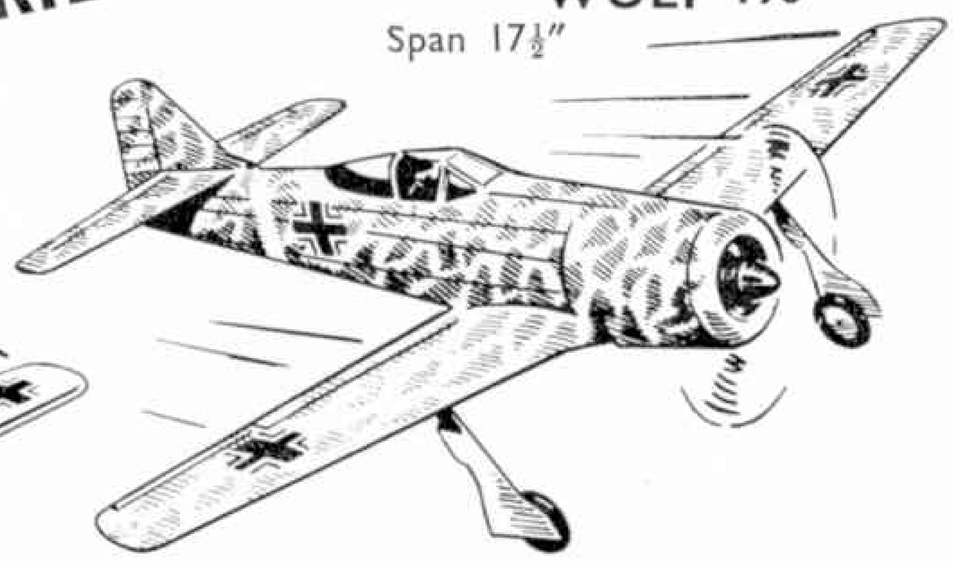

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MECCANO® Magazine

SEPTEMBER 1970 VOLUME 55 NUMBER 9

Meccano Magazine, founded 1916.

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MAP **HOBBY MAGAZINE**

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FRONT COVER

A scene on our Model Railway, the final article of which appears on page 497 of this issue. The locomotive is a " Hornby " 0-6-0 Class 3F Loco, pulling a " Hornby " Shell tanker. The lineside figure is one of the " Hornby " range also, as indeed is the signal box in the background.

The diesel fuel tanks and pump are a kit in the " Faller " range (reviewed in " Have You Seen ? " on page 515) and the realistic trees and hedges are also by Faller ! The truck parked behind the loco is one of the MATCHBOX range.

Even without the use of scenic flock, sawdust or plaster we think the final result rather attractive and reasonably realistic and hope readers will too.

NEXT MONTH

Our October issue of *Meccano Magazine* contains as always a wide selection of top-line features on a variety of subjects. " Sahara Safari " a new adventure series which starts on page 512 of this issue continues to describe the adventures of a group of students who crossed the Sahara Desert by Land Rover. On a completely different theme a new contributor to our pages, Edward Hodgkins tells how a modern matchmaking company works, and explains once and for all just *how* tree trunks are turned into tiny matches !

Meccano followers are well looked after, a Mechanical Excavator for the advanced modeller, plus a fork lift truck for the younger enthusiasts.

All the regulars appear; " Air News," " Battle," " Have You Seen ? " *plus* our story of the Editor's " Bug," but you'll have to buy the issue to find out more about that !

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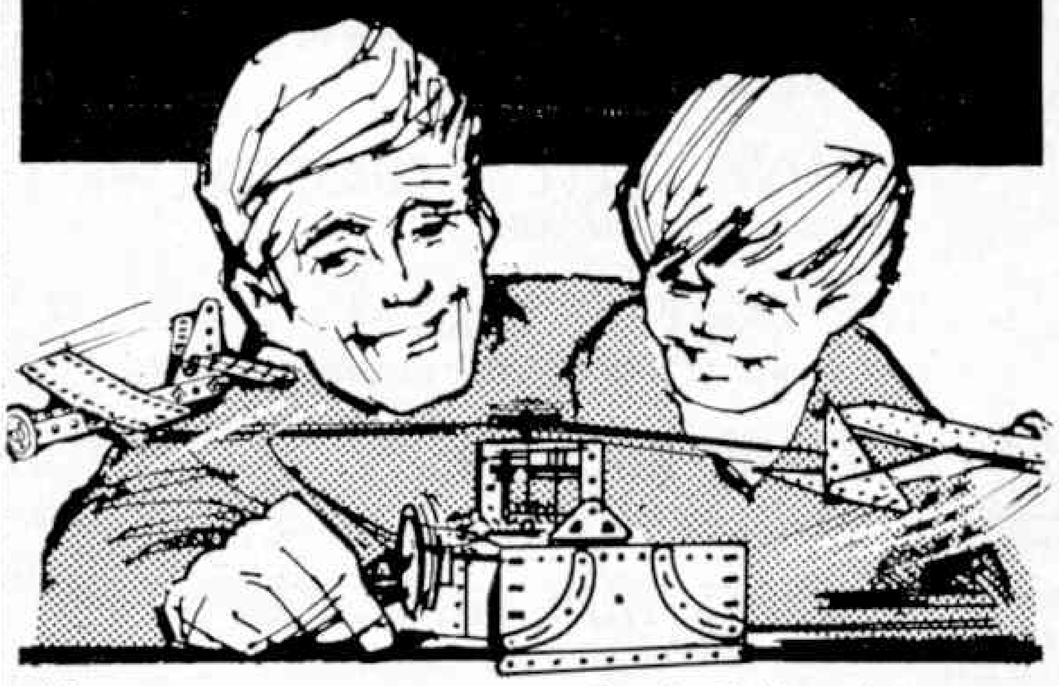

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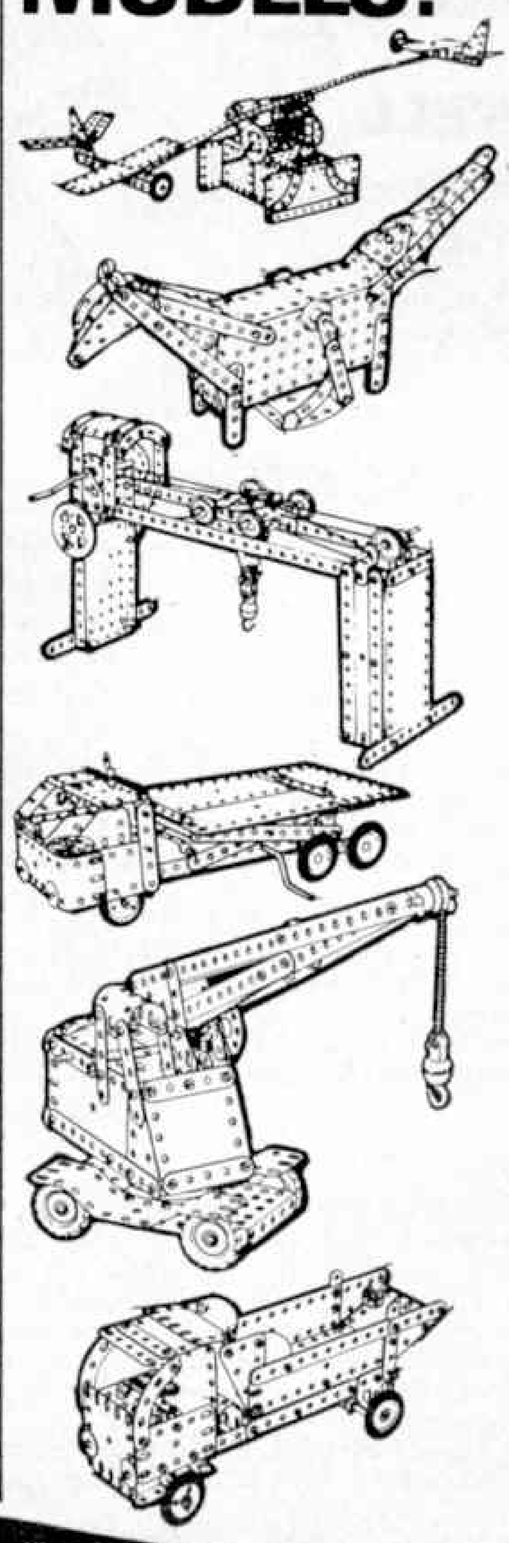

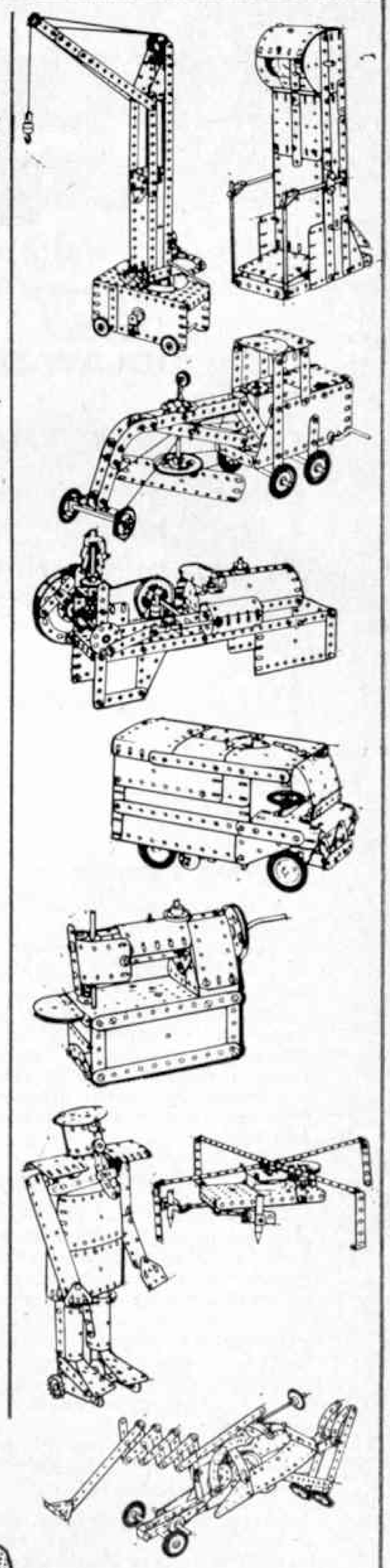

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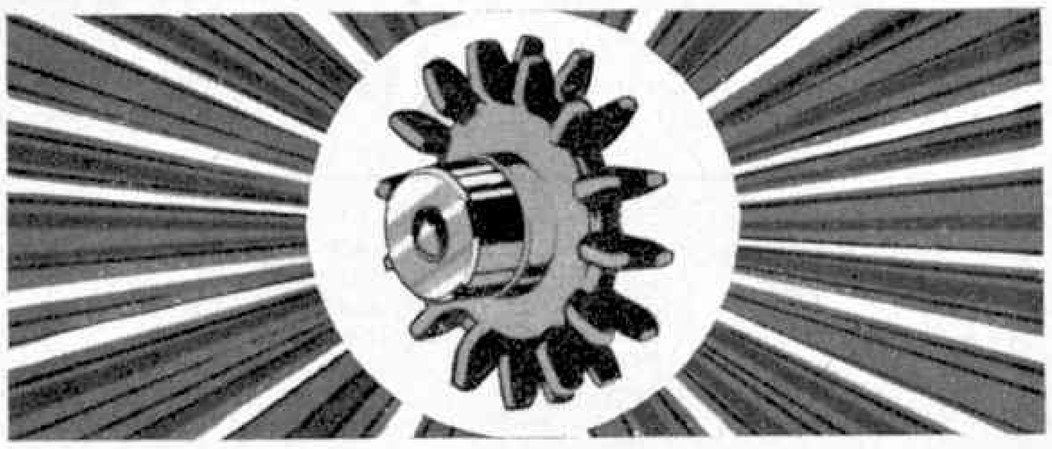
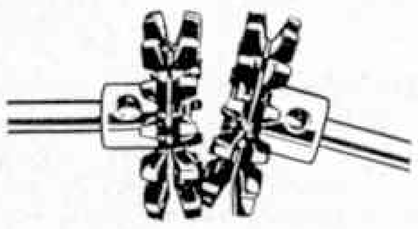
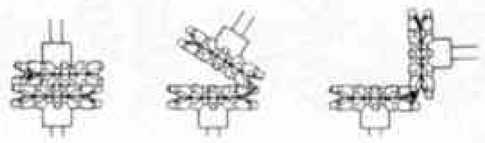
The Fantastic New Gear Wheel - No. 27f



AS A GEAR WHEEL

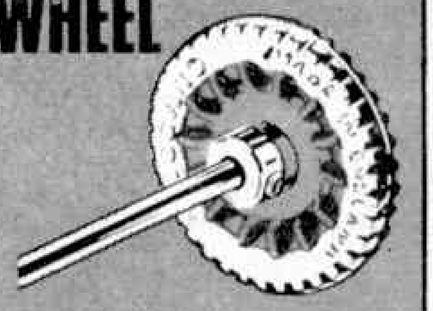


It will transmit drive at any angle



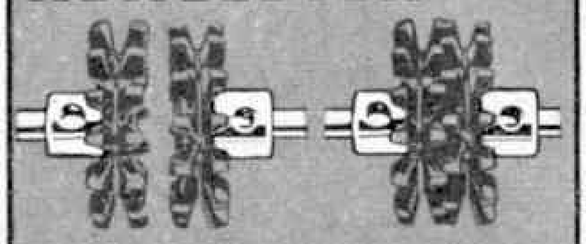
even up to 90°!

AS A ROAD WHEEL



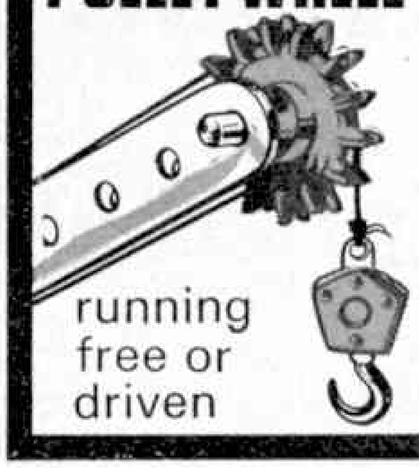
Fitted with a standard 1" tyre

AS A CLUTCH



face to face

AS A PULLEY WHEEL



running free or driven

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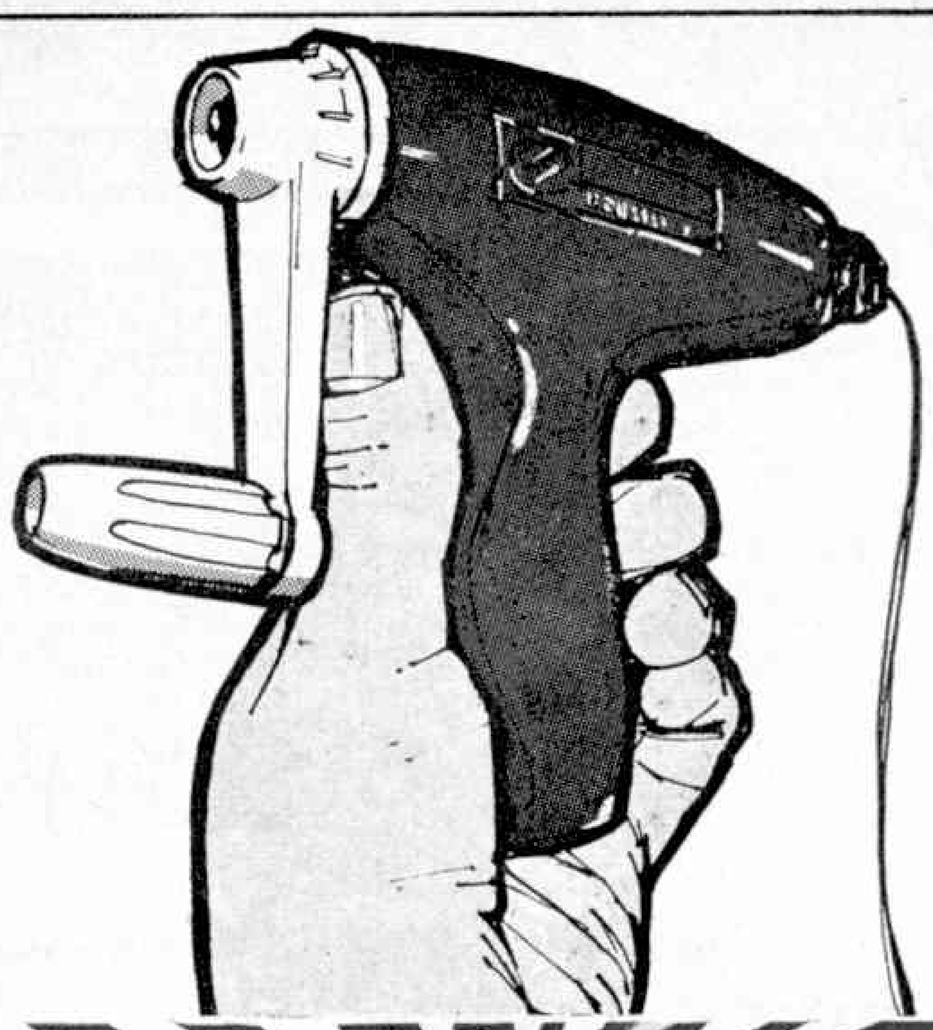

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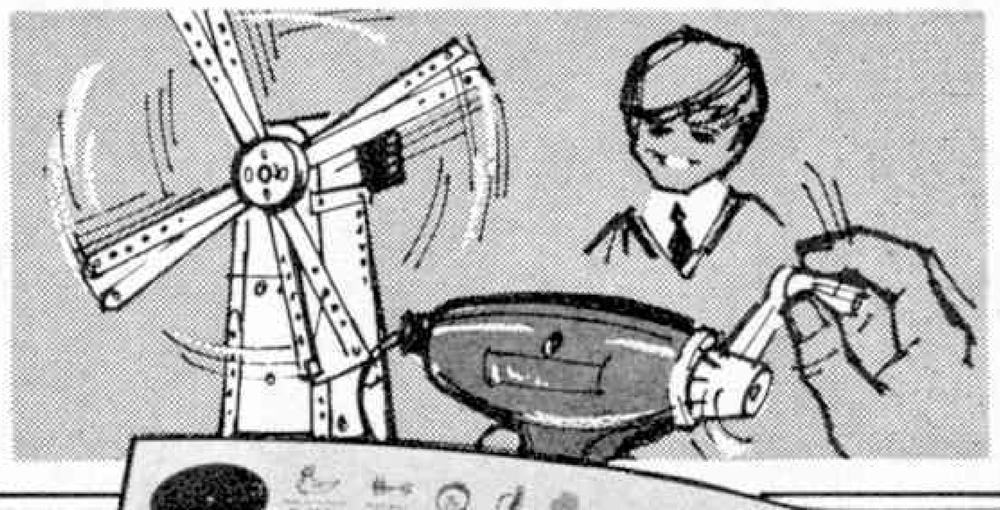

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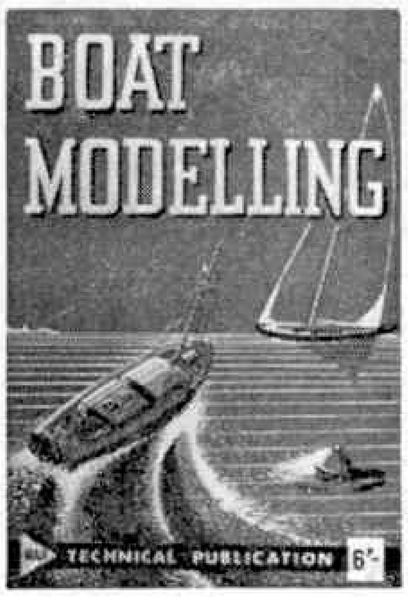
8½ x 5½ in. 96 pages. Text illustrated with 223 line drawings and 8 pages of art plates showing 50 photographs of models. **6/-**



21 SIMPLE ELECTRIC CAR RACING

With this book Vic Smeed has produced the ideal introduction to electrical cars—practical survey giving the facts of successful car and track construction in full detail and all based on personal experience. Anyone coming new to the hobby will find in its pages the answers to all the questions likely to arise in building cars and tracks from scratch; a great proportion of its content will also be invaluable to those who are content to buy commercial cars and track but who are anxious to get the very best out of their purchases.

7¼ x 4⅝ in. 104 pages. 65 photos. 37 line drawings. Cloth and board cover with attractive dust jacket. **10/6**

17 MODELLING THE CUTTY SARK

Covers building a 1/16 in.-1 ft. scale static model and includes all necessary drawings, together with many photographs and detailed instructions, plus notes on the ship herself.

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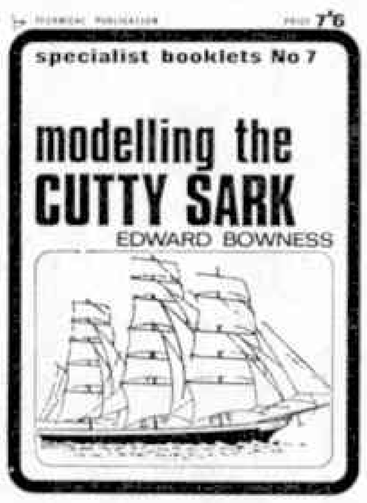

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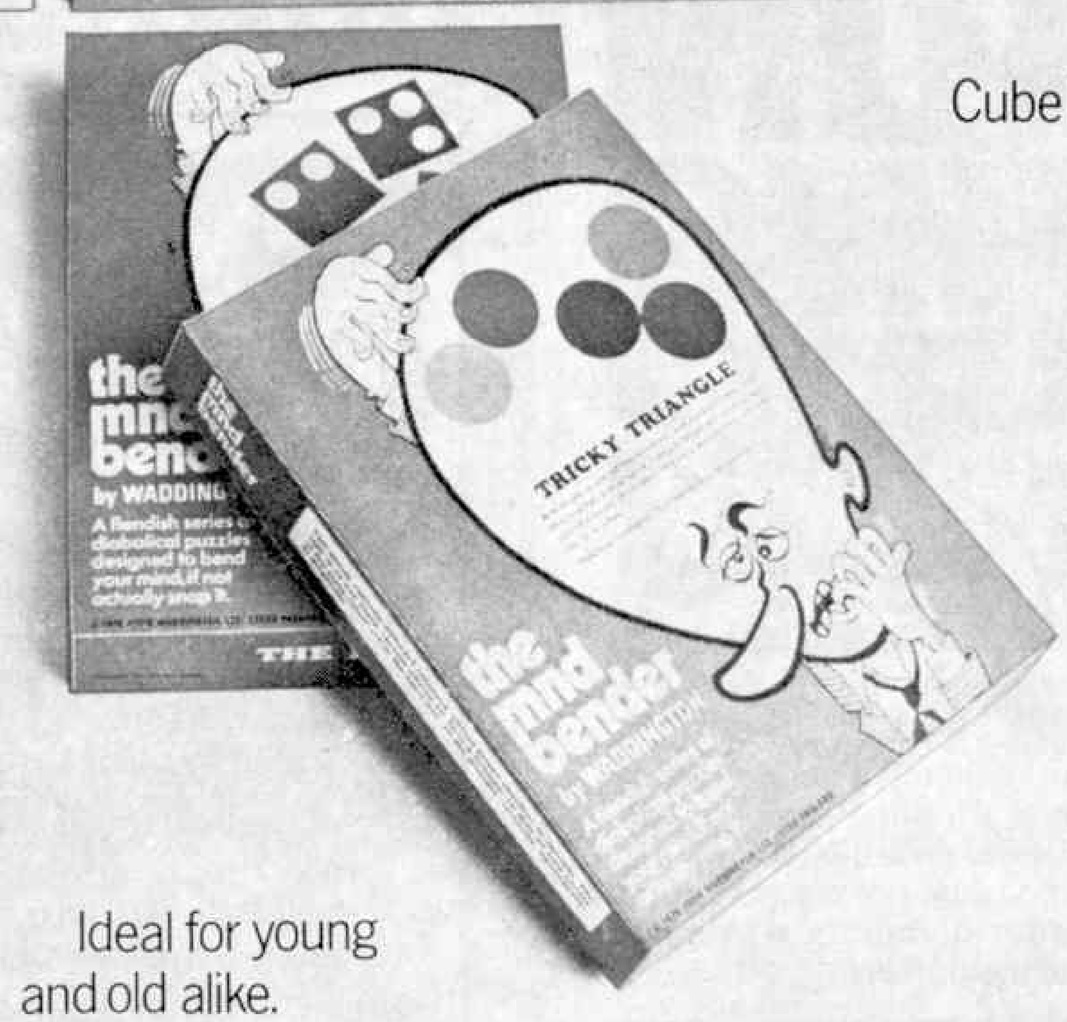

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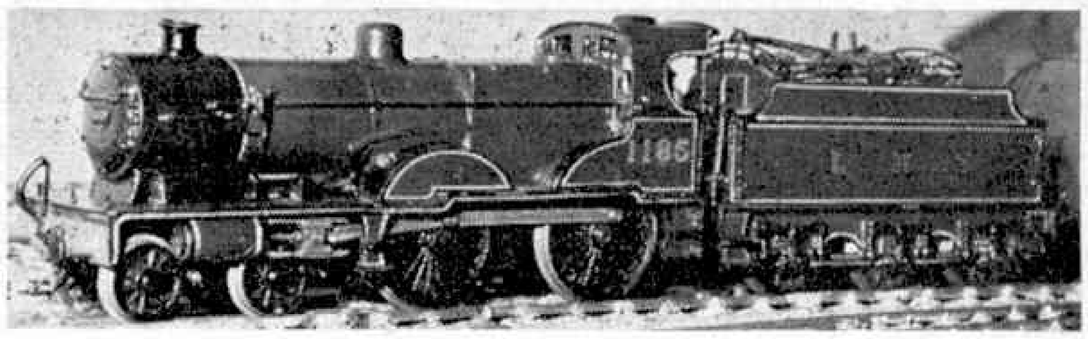
Model Railway News

September issue on sale 14th August



A scratch built L.M.S. locomotive stud described by Peter Gomm. Building L.N.E.R. teak-bodied stock from Plastikard by Teddy Francis. Scale drawings of Selsey Railway "Morous" by Les Darbyshire. Old Bing Trains and Hornby tinplate signal boxes. Prototype Track Plans Part 3 by Martin Waters. More on starting in Protofour. Plus all the regular features including Wagons of the Private Traders, Turntable, etc.

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Change of Company Name

For the last 12 years Heathkit products have been manufactured in the United Kingdom by Daystrom Ltd. in Gloucester. On July the 1st this year the company name changed to Heath (Gloucester) Ltd., a name which more clearly reflects the nature of their business. At present the company are also expanding their premises, and work is now in progess on a new 20,000 sq. ft. extension to the Gloucester factory.

50 Dinky Toys to be won every month !

As I promised in last month's issue of the mag' I have 50 Dinky Toys here at the office to be sent out *free* to every winner of our new competition.

The models have been generously supplied by Meccano Ltd. for the sole benefit of our readers. Rules for the competition are straightforward, and if you know your cars should present no problems. The winner will be the first 50 readers who correctly identify and inform me (on a postcard please or on the reply coupon provided) the name of the model shown in a simple silhouette drawing. This model will of course be the one we shall be giving away during that month. Full details of the current comp are given on page 517, and remember, the first 50 correct replies win the models !

A New Idea

If you've ever been stuck as to what to buy someone for their birthday or Christmas this could well be the perfect answer to what is often a rather tricky problem ! Toy Tokens Ltd. have just produced (funnily enough !) "Toy Tokens," rather similar to the book tokens which have been around for years. There are eight cards, all with attractive full-colour fronts at present available, and tokens of 10/- and £1 units can be purchased to complement them. From mid-June about a thousand toy shops and toy departments will be selling and accepting "Toy Tokens", and more shops and stores will be joining each day. Those in the scheme display the "Toy Tokens" symbol on the door or by the counter (three toy musical soldiers marching on a block, styled "Toy Tokens, sold and accepted here"). I'm sure a lot of people will welcome this idea, I know it's going to solve a lot of my problems this year !

Model Railway layout

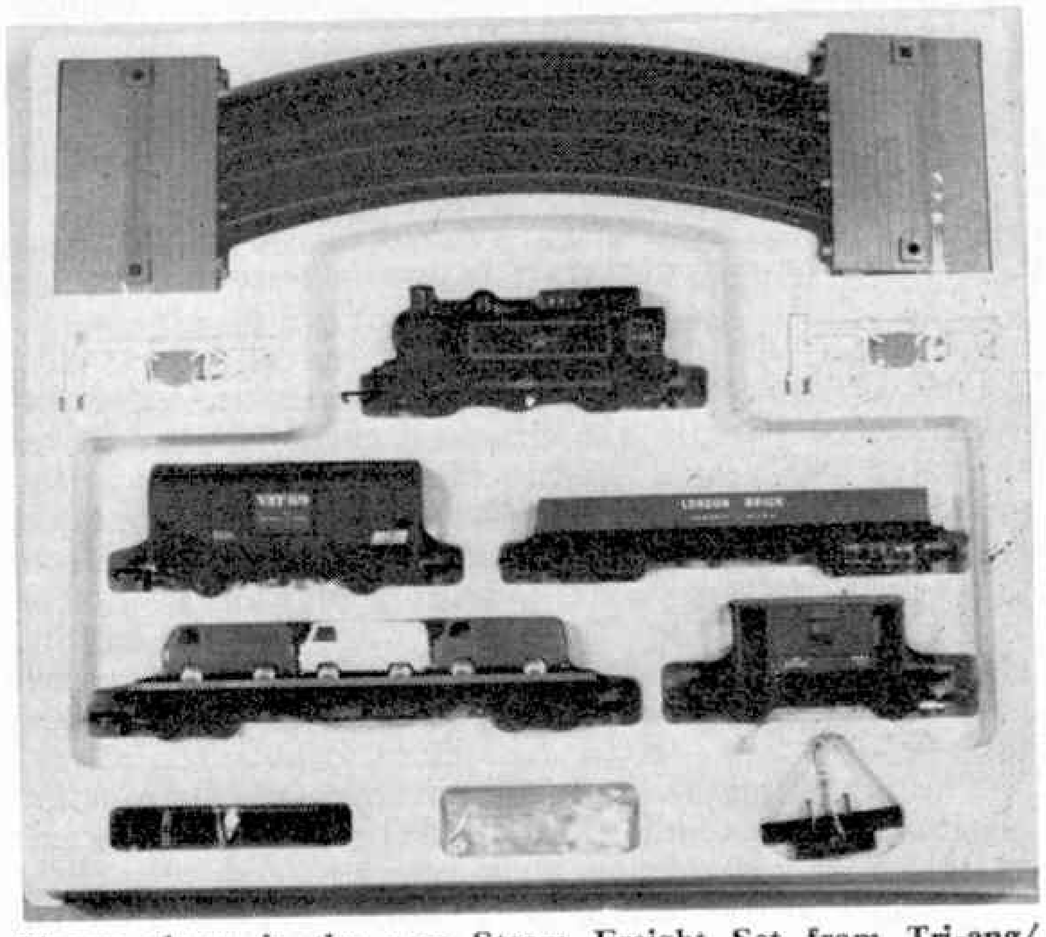
In the centre pages of this issue will be found the final instalment of our popular series on constructing a model railway layout. Regular readers will know that we've been using Tri-ang/Hornby equipment as a basis for the series, and just received at time of going to press is a brand new electric train set which would make an ideal basis for making a start on your own layout.

The set which costs £5 19s. 6d. is called "RS 601 Steam Freight Set" and it contains enough pieces to make rather an interesting, if small, layout. Contents are as follows: 8 curves of the new "System 6" track; 2 half straights; a level crossing; a "Vat 69" malt wagon; a London Brick Company bogie wagon; a Bogie Bolster "C" Wagon with three "Minic" Ford vans; a brake van; a Class 3F 0-6-0 Tank Loco (R525); an uncoupling ramp with warning sign, a power-feed clip, and finally a smoke-oil capsule for the loco. The complete set is attractively packaged in a moulded plastic box with a cardboard lid which has a transparent top.

Bug in the garage

For the last week I've had a strange bug lurking in my garage, rather a rare one in fact, and one which has caused quite a stir here in Hemel Hempstead. It was a bright orange in colour with a black tail and black patches on its sides, and of the non-deadly variety ! I'll be telling you more about it in next month's mag. illustrated with a suitable variety of close-up photographs and additional details.

If you find it all rather a puzzle, keep an eye open for next month's cover, not only will there be a two page feature on it, but we shall also have it in full colour on the front !



Shown above is the new Steam Freight Set from Tri-ang/Hornby in its attractive new packaging. It makes an ideal introductory outfit into the world of model railways.

Model Engineer Exhibition 1971

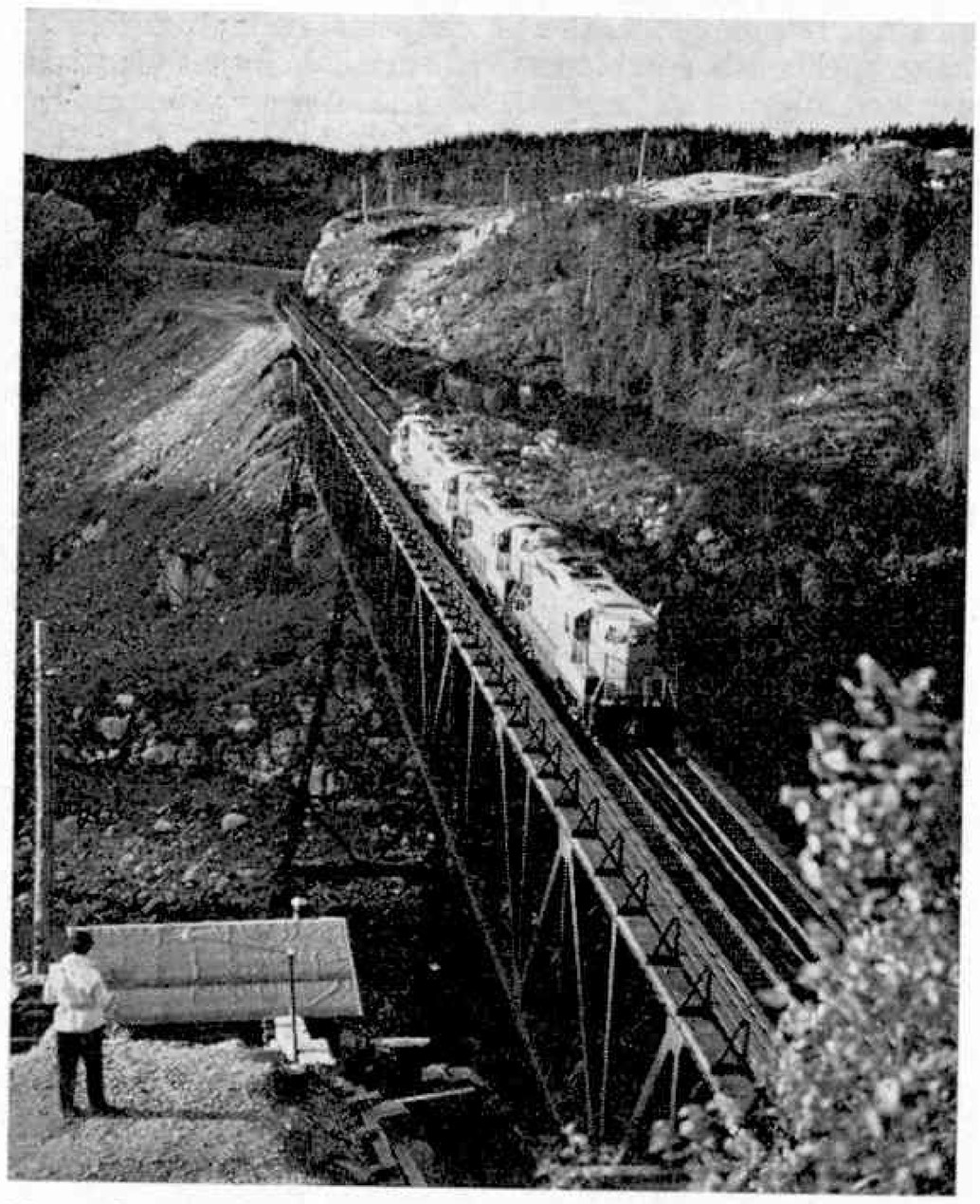
Although we are in the middle of summer, work is forging ahead on laying out the details for our 1971 exhibition due to be held next January. Our boating pool, introduced for the first time at the last one, will be back once again, as will the giant-size slot racing track. Futher details of actual exhibits and prizes etc. will follow in due course.

Binder Error

On the classified advertisement page of the July issue we inserted an ad describing our Meccano Magazine Binders. Unfortunately the ad stated that the binders would take 24 copies of the magazine, whereas in fact they do of course only hold 12. Our apologies for any inconvenience caused to readers for the mistake.

CANADA'S COAST-TO-COAST RAILWAYS

by W. H. Owens



Ore train crossing a viaduct on the Quebec North Shore & Labrador Railway—one of the "Railways to Resources" built to serve new mining projects in remote parts of Canada.

RAILWAYS HAVE PLAYED a tremendously important part in the development of Canada over the past 100 years. In the nineteenth century settlement and civilisation followed the railway builders who opened up this great country, east to west, from the Atlantic to the Pacific Ocean. Today the new lines, called 'Railways to Resources', are steadily rolling back Canada's northern, sub-arctic frontiers where vast mineral wealth is being exploited on an increasing scale.

The two major railway systems—the Canadian National and Canadian Pacific—are among the largest in the world. Together they provide over four-fifths of all the railway services in Canada. They also run fleets of inland and coastal vessels, ocean-going steamships, highway transport services and airlines over domestic and international routes.

Canadian Pacific's transcontinental "CANADIAN" en route through the Rockies, showing the Scenic Dome carriage.

In the far west is the Pacific Great Eastern Railway. This is owned by the Government of British Columbia and operates over an 800-mile route from North Vancouver up to Fort St. John and beyond. The recent extensions of this railway have opened up the interior of the province for mining and other industry on a large scale. At Vancouver the P.G.E.R. connects with other Canadian networks and also with the United States railways.

Railway building began in Canada as early as 1835 with the 14-mile Laprairie-St. Johns line near Montreal. But the most dramatic and exciting years in the country's railway history came nearly half a century later, when the first transcontinental track was driven westwards from Ontario, across the wild Prairie grasslands and through the barrier of the Rocky Mountains to the Pacific coast. This was one of the world's greatest feats of railway construction on a scale that had never been attempted before.

The Canadian Pacific Railway Company was formed in 1880 to link British Columbia to the rest of Canada. Nine years earlier this isolated Pacific province had joined the rest in the Canadian Confederation on condition that a transcontinental railway would be built. Expeditions were sent from England to find the most possible route through the Rockies.

Eventually an international syndicate signed a contract with the Canadian Government, and work on the railway started at many points simultaneously west of Ontario. Vast problems and difficulties faced the engineers in those remote, uninhabited parts of Canada nearly a century ago, and they had nothing like the technical resources and equipment which are available everywhere today.

Part of the section through the wilderness north of the Great Lakes was described by the engineer in charge as "two hundred miles of engineering impossibilities". In the Rocky Mountains the tasks were still more formidable, and would have daunted all but the bravest and most optimistic. Yet men came from many lands to pit their strength against the savage conditions; they blasted tunnels through the seemingly

impenetrable mountainsides and built bridges which, as one report put it, " hang in the air like mere spider webs of iron 300 feet or more above the rivers they span ".

At last, however, the impossible was accomplished. Late in the year 1885 the last spike was driven at Craigellachie, in the Eagle Pass of British Columbia—an act which proclaimed that Canada was finally united by a continuous ribbon of steel stretching for 3,000 miles from Montreal to the Pacific coast. On July 4th, 1886, the first transcontinental passenger train steamed triumphantly into Port Moody—the original western terminus—5½ days after leaving Montreal. Its five coaches were hauled by a steam locomotive of 4-4-0 type built in the C.P.R.'s own workshops. In the following year the line was extended along Burrard Inlet to Vancouver.

With the railway completed, thousands of British and European emigrants joined Canadian and American farmer-settlers on the trains which carried them west to the empty Prairies where, over the remaining years of the century, wheat was planted across these mid-west provinces which became the 'granary of the world'. The railway company laid a network of lines over which Canada's annual grain harvest is moved to the Great Lakes ports and to the east and west coasts for shipment overseas.

Grain is the most important single freight traffic handled by the Canadian railways. At Winnipeg, C.P.R. manages and operates the world's largest privately owned marshalling yard. This has more than 300 miles of track, and when the grain harvest is at its height as many as 7,000 loaded trucks pass through it daily.

Today the Canadian Pacific is a world-wide transport undertaking which operates a network totalling some 100,000 miles by land, sea and air. But although the company's passenger ships and aircraft encircle the earth, the heart of the whole vast enterprise is still the railway across Canada. One of North America's greatest 'name' trains is the C.P.R.'s streamlined " Canadian " which leaves Montreal daily for Vancouver. To travel from coast to coast, passengers spend three nights aboard the train, for example, departing from Montreal early on Monday afternoon and arriving at Vancouver on Thursday morning. A special feature of this transcontinental train are the two-tier Scenic Dome cars, allowing travellers to enjoy the thrilling views of the Rocky Mountains to the greatest advantage.

The other great network, Canadian National Railways, was not built as a separate system but came into being, in 1922, through the amalgamation of various Government-owned and private railway companies. It is the largest railway system in North America and the only one which operates in all Canada's ten provinces. Like the C.P.R., it runs a famous transcontinental passenger train, the " Super Continental ", over its own route between Montreal and Vancouver. C.N.R.'s latest 'Turbo' train, recently introduced on the Toronto-Montreal service, is the fastest inter-city train on the continent. It will cover the 335-mile run between the cities in a minute under four hours. The all-aluminium coaches are propelled by gas turbine engines with a potential top speed of 120 m.p.h.

While the C.P.R. and C.N.R. networks are highly competitive, especially where freight carrying is concerned, both organisations work together whenever it is in the public interest to do so. For example, they jointly operate a national telecommunications system which employs micro-wave, high-speed tele-type, telex, private wire networks and weather facsimile transmission. This provides rapid communications throughout Canada and the service connects with all parts of the world.

Aerial view of CNR's new Symington Hump freight yard near Winnipeg. Movements of rolling stock here is electronically controlled. Freight cars are pushed to crest of hump, uncoupled and roll under their own momentum into one of 62 classification tracks for speedy marshalling.

Over the past twenty years, Canadian National have opened many new branch lines to serve specific mining, logging and other industrial developments in remote parts of the country, particularly the Northland. With these 'Railways to Resources' the railway history of Canada is being repeated, since some of the earliest lines built in the middle of the last century were primarily for farming, forestry and other developments.

One of the most important of the new lines into the Canadian North is the Great Slave Lake Railway. Opened in 1966, this is the first railway ever to operate in the remote Northwest Territories and only the second to reach beyond the 60th parallel of latitude. The line runs for 430 miles through the frozen wilderness to a terminal on the southern shore of the Great Slave Lake. It was built to serve the new lead and zinc mines opened up around the lake and to carry ores away south to smelting plants in British Columbia. Since the railway opened, however, several logging and other developments have started up alongside the north-south track, and these will increase steadily in number in the coming years.

The first Canadian Pacific transcontinental passenger train is shown as it arrived at Port Moody, at the head of Burrard Inlet, linking Canada by rail for the first time. The engine, 371, was built in the Company's shops at Montreal, and had hauled trains from North Bend. A year later the rails were extended along Burrard Inlet to Vancouver.

THE STORY OF CORK

Trevor Holloway describes this strange and versatile bark

THE MORE WE STUDY the wonders of nature the more do we marvel at the infinite variety of raw materials it provides for the use of man—wool, cotton, timber, coal, oil, to name but a few. Without doubt many more will be discovered as time goes on. Cork is now such a familiar material that we may have lost sight of the fact that it is one of the most interesting of these 'natural gifts'. It is, in fact, a unique material and one which man cannot reproduce artificially, so wonderful is its structure.

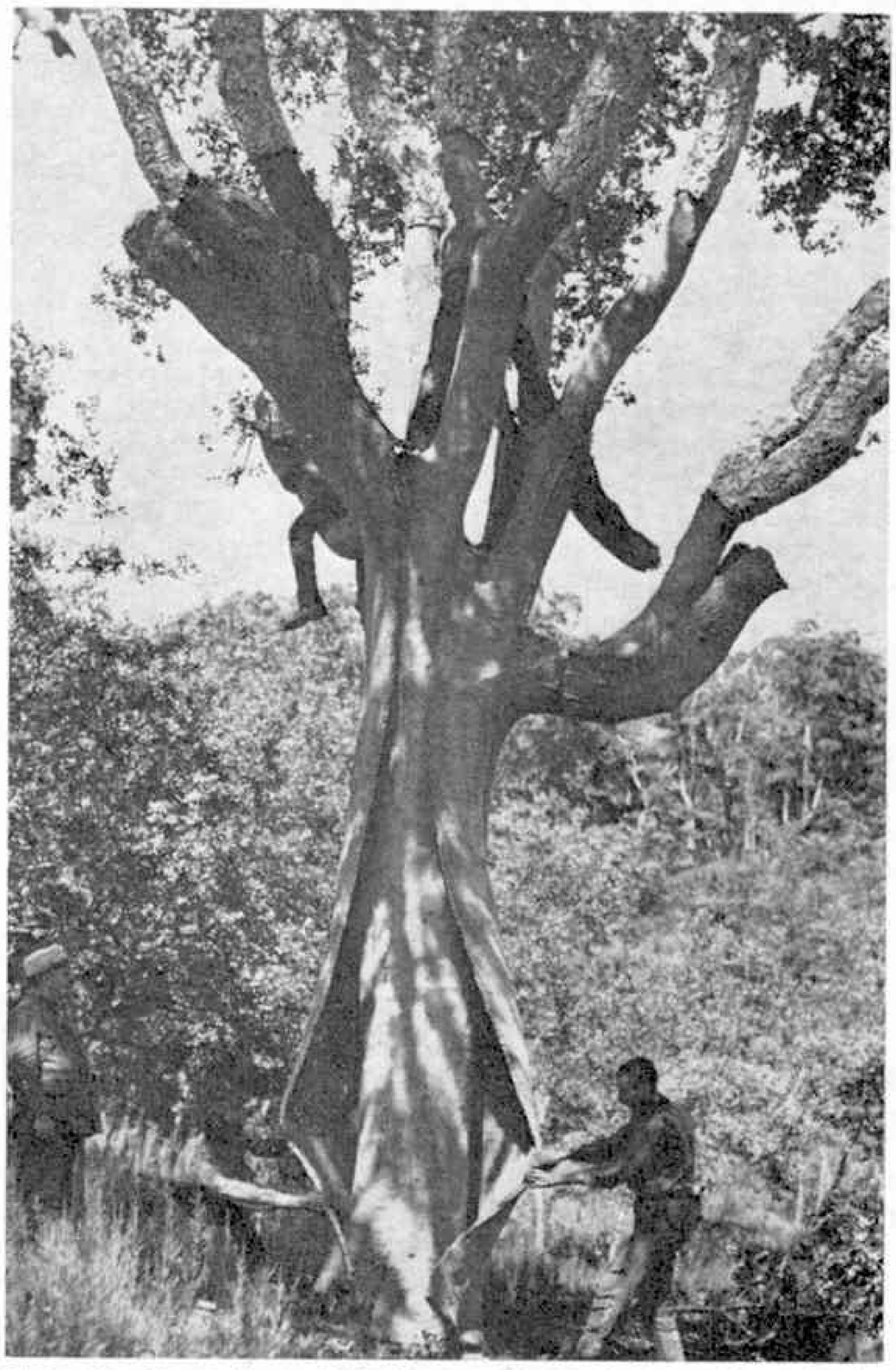
The first records of the use of cork are found in Greek writings that mention its use as fish-net floats. Since this time, cork has served mankind in innumerable ways and demand is increasing despite many advances in the field of plastics. Today, cork walks with us in our shoes, flies in our planes, and rides in our cars, ships and trains. It serves us in the home, at school, in industry; it plays with us in many games and has even found its way into outer space.

Cork is the product of two species of oak trees which grow in the Mediterranean area, but production is most intense in Portugal where the many large plantations yield about half the world's supply. The Cork Oak (*Quercus suber*) grows to a height of from 20 ft. to 60 ft., the trunk sometimes attaining a diameter of 4 ft.

If the bark is removed from any tree familiar to us—beech or pine, for example—that tree will die, for the bark contains the vascular bundles that nourish the tree. In the case of the Cork Oak, however, the outer layers of cork are simply a protective coat which may be removed without injuring the tree. Nevertheless, these outer layers must be removed with the greatest of care, for wherever the inner bark is damaged, no new cork will form.

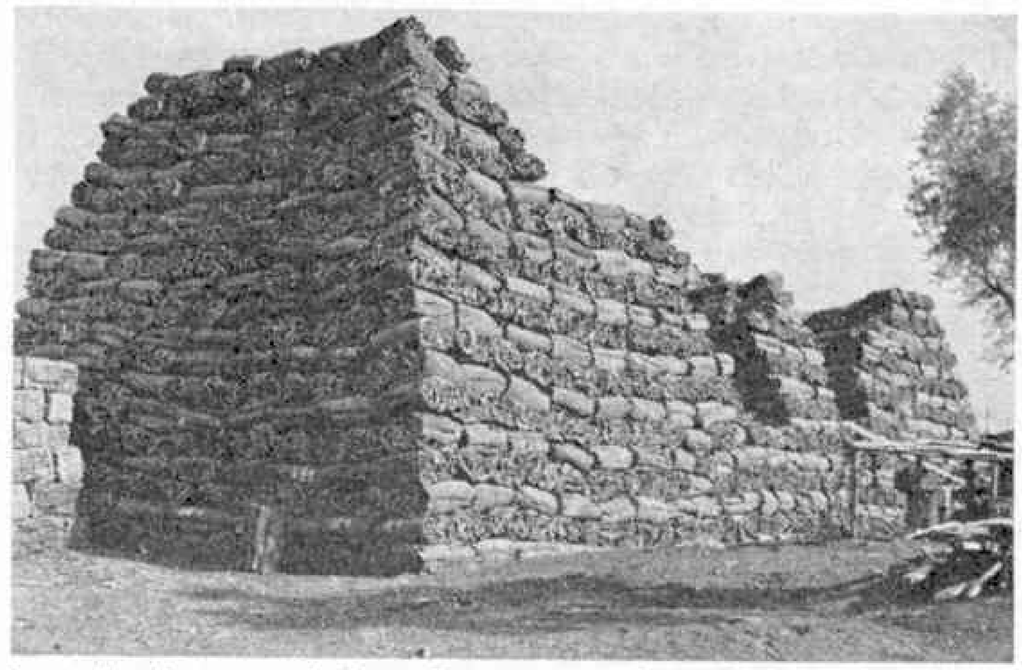
The laws in Portugal and other cork-growing countries ensure that trees are stripped only once in nine or ten years. A tree must be 20 years old before the first stripping takes place. Cork thickness of about one inch is obtained at the end of each nine-year interval.

Stripping is usually done in July or August. With a hatchet or sharp knife, a cut is made around the trunk near the base and another cut just below the branches. These two cuts are joined by a long cut down the trunk. Then, inserting the wedge-shaped ends of their hatchet handles, the workmen carefully prise the cork bark off.



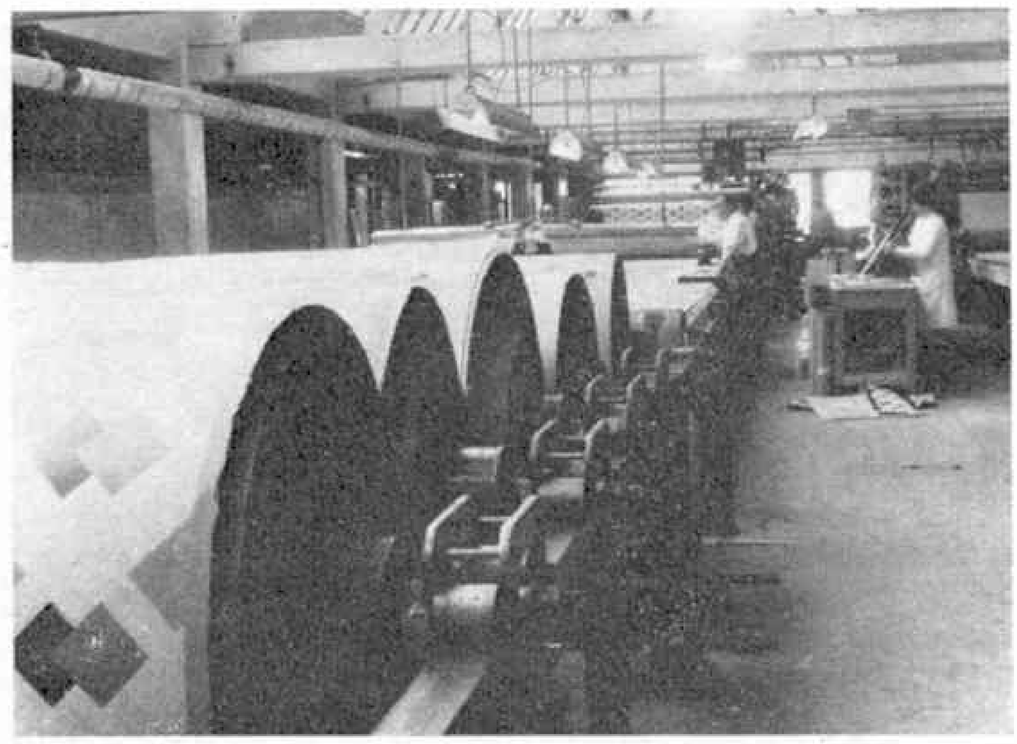
Stripping the cork must be done with great care, otherwise the quality of the next crop will suffer. An average mature tree will yield about 500 lb. of cork. Stripping is done every nine or ten years. *Photo by courtesy of British Technical Cork Products Ltd.*

The first crop is known as *virgin* cork. It is of poor quality and very furrowed. The second and subsequent strippings are known as *cultivated* cork. It is fairly smooth and generally superior in quality. After about



A stock of raw cork from Portuguese plantations stacked at the factory. It is waiting to be boiled in huge vats to remove the tannic acid and sap. It will then be packed in bales and shipped to many parts of the world. *Photo by courtesy of British Technical Cork Products Ltd.*

Trawlermen use giant cork floats to support their nets. Cork floats were used by fishermen in the days of ancient Rome. One of the valuable features of cork is that it will not absorb water. Until recently cork was the chief material for lifebelts. *Photo by courtesy of ESSO.*



Enormous quantities of powdered cork are used in the manufacture of linoleum. This is a view of the trimming and packing line. *Photo by courtesy of Barry Staines (Sales) Ltd.*

80 years quality begins to fall, but many trees are retained for 150 to 200 years, after which they are uprooted and replaced by young stock. A mature tree will yield 500 lb. or more of cork at one stripping.

After the cork is removed from the tree it is stacked in piles and left for a few days to dry. Later, it is boiled for an hour or two in huge vats which removes the sap and tannic acid, thereby increasing the elasticity of the cork; it also loosens the rough outer layer, which is carefully scraped off. Finally, the sheets of cork are strapped into large bales and despatched to the port for shipment.

As it is a natural material formed by a growing tree, cork is composed of cells—minute compartments each bounded by tough, waterproof and elastic walls. Every cubic centimetre of cork contains about 40 millions of these tiny cells !

The importance of cork arises from its elastic cellular structure which gives it properties unknown in other materials. It is absolutely impossible to produce such an elaborate structure artificially. Expanded polystyrene is an artificial cellular material, but the spaces are far larger than in cork.

The tiny cells contain nothing but air and this feature gives cork its extreme lightness (its specific gravity is about 0.2). When cork is squeezed, it is the air in the cells that is compressed, and the cork quickly returns to its normal volume when the pressure is released. For this reason, thick slabs of cork are often placed under heavy machinery to reduce noise and vibration. Similarly, precision machines can be cushioned against *incoming* vibrations.

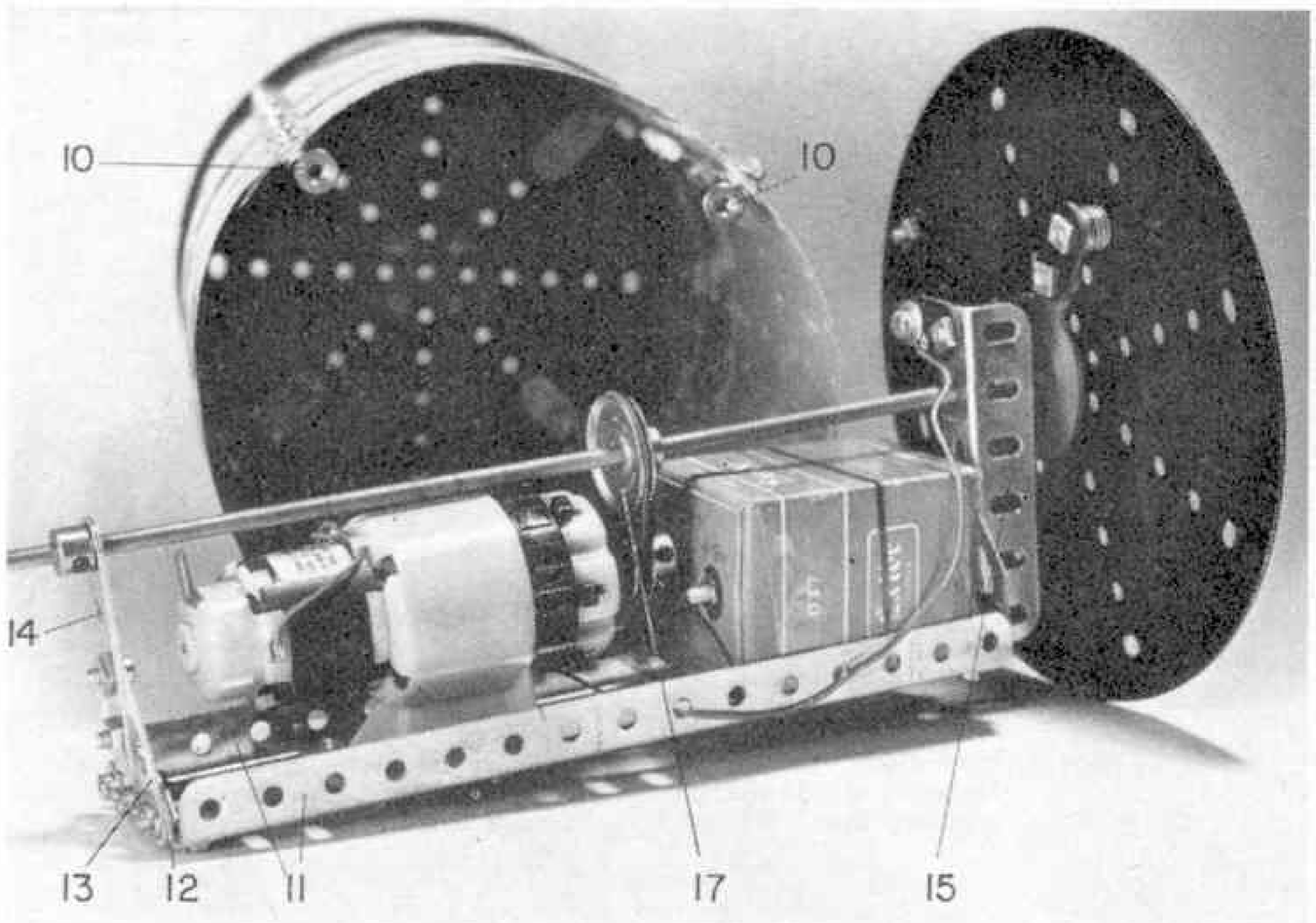
Cork cells are tightly packed and will not allow liquids or gasses to pass through. It is thus the ideal material for use as stoppers and for sealing joints. It is tasteless and does not affect even the most delicate wines. Organic liquids, such as benzene, ether or turps, for example, would very soon destroy stoppers made from ordinary rubber, whereas cork is very resistant to a wide range of chemicals.

Cork does not absorb water, hence its wide use in the making of life-buoys, life-jackets, etc. Another important use is as an insulator for heat or cold—it is, in fact, the next best thing to a vacuum.

Only about half the world's cork production, however, is used in its natural and original form. The other half is ground down to powder or granule form to make composition cork which can be pressed and moulded into floor-coverings and a great variety of shapes required by industry.

MECCANO MAGAZINES IN BOOK FORM

A limited number of bound volumes of the 1969 issues are now available from this office at £3 6s. including postage.

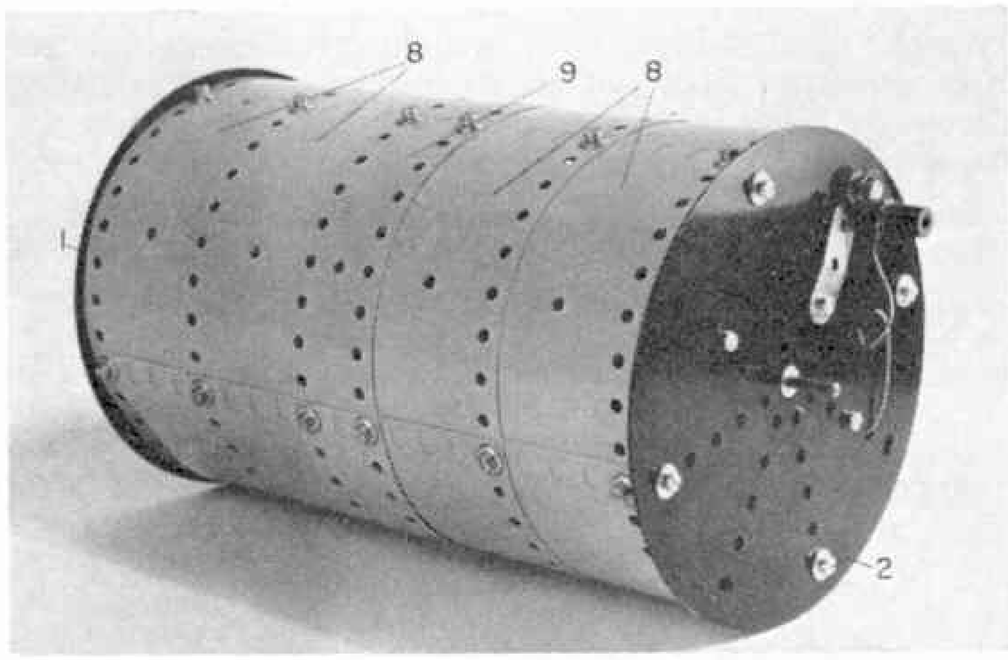


Power for the Roly-Poly comes from a Meccano 3-12 volt D.C. Motor with 6-ratio Gearbox carried on a tray inside the drum.

This strange device rolls along under its own power and 'Spanner' describes below how you can build yourself a . . .

ROLY-POLY

BROADLY SPEAKING (very broadly!) Meccano models can usually be grouped under two general headings: "Scale" and "Working". In the former group can be found anything—vehicles, engineering structures, machinery—based, within reasonable limits, on equipment found in real life. In the latter group go models which reproduce movements performed by real-life equipment, although they need not necessarily look like the real-life equipment, itself. There is, however, another lesser-known group and one which can be even more interesting than the first two—a classification which, for want of a better description, I call the "Fun" group. This contains models which have no known full-size counterpart, either in looks or movement, but which are—simply—great fun to build and operate.



An unusual model, packed with fun, is this "Roly-Poly" self-rolling drum designed and built by Mr. Ray Cook of Neston, Cheshire.

Featured here is a perfect example of a "fun" group model: a "Roly-Poly" or Self-rolling Drum, driven by a 3-12 volt D.C. Motor with 6-ratio Gearbox. It sounds an odd description, I know, but that's what it is—a drum that rolls along on its own! Full credit for the idea and the final working model goes to Mr. Ray Cook of Neston, Cheshire, a man worthy of special congratulations as he has had no previous experience with Meccano.

Construction of the model, as illustrated, is perfectly straightforward, but the actual drum does use a fair number of costly Flexible Plates. If these are not available, an ideal substitute drum can be supplied by an ordinary 7 pint beer can (empty!), obtainable anywhere.

Dealing first with the Meccano drum, however, the end cheeks of this are supplied by two 6 in. Circular Plate 1, and 2. Bolted to the outside centre of Plate 1 is an 8-hole Bush Wheel, while attached to the inside of Plate 2, but spaced from it by six Washers on the shank of each securing ½ in. Bolt are two Insulating Fishplates 3, positioned diametrically opposite each other, between which a Commutator 4 is fixed. The boss of this Commutator, pointing outwards, must line up with the centre hole in the Circular Plate. Another Insulating Fishplate 5 is lock-nutted to the outside of the Plate, being spaced from it by three Washers on the shank of the fixing Bolt, while an Insulating Spacer 6 is bolted to the free end of this Fishplate. When the Fishplate is turned on its Bolt, the head of the Bolt fixing the Spacer to the Fishplate should make contact with a 1½ in. Strip 7 also bolted to the outside of the Circular Plate. A length of insulated wire is taken from one terminal of the Commutator, is threaded through the Circular Plate and attached to the Spacer fixing Bolt.

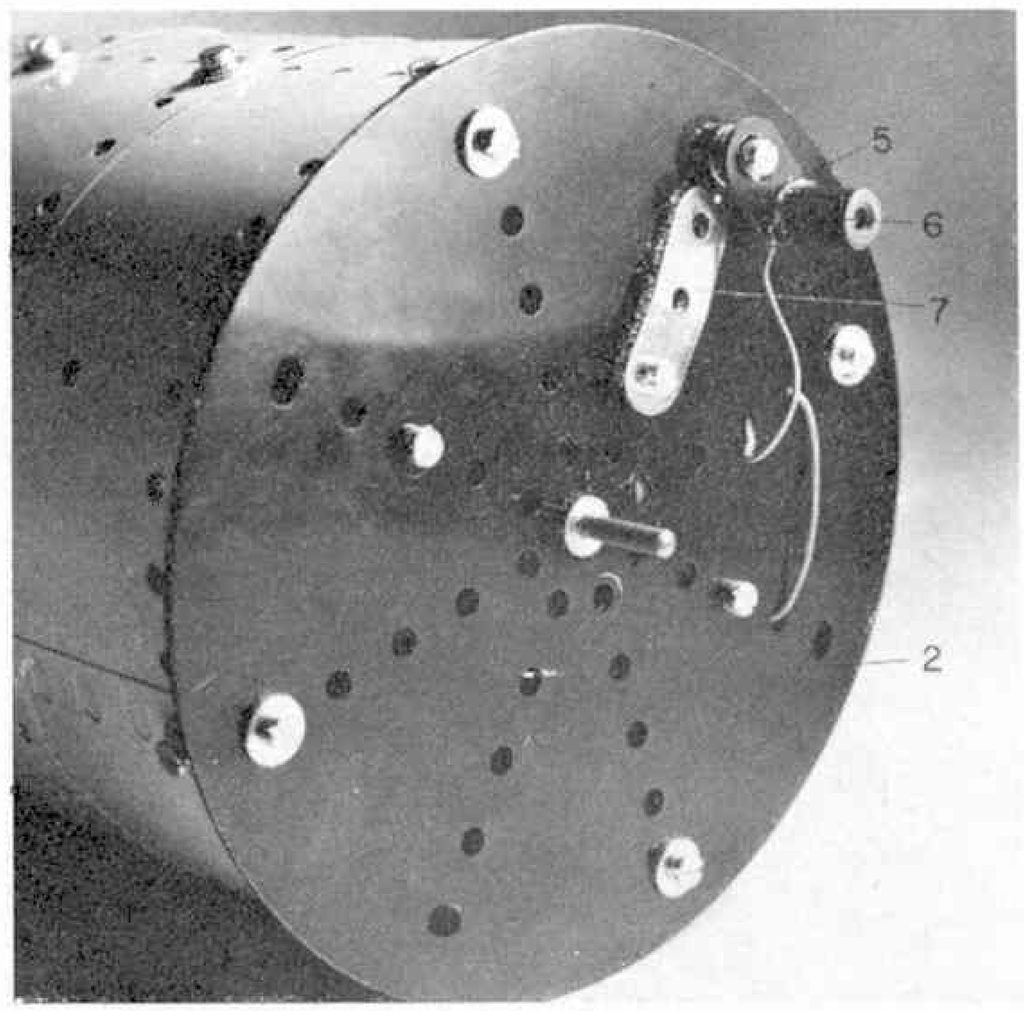
Now secured to the inside face of Circular Plate 1 are four 1 × 1 in. Angle Brackets, the free lug of each of which is extended by a 12½ in. Strip. Bolted to these Strips, as shown, to form the drum casing are sixteen 5½ × 2½ in. Flexible Plates 8 and four 5½ × 1½ in. Flexible Plates 9, all curved to shape and suitably overlapped. Note that the Bolts fixing the end set of Plates to the Strips are screwed, not into Nuts, but into the transverse bores of Threaded Bosses 10, care being taken to ensure that the longer section of each Boss points outwards. Each Boss is spaced from its Strip by a Washer.

The drive unit, carried inside the drum, is amazingly simple. A tray is built up from two 7½ in. Angle Girders 11 connected together at the ends by two 1½ in. Angle Girders 12, to the vertical flange of each of which a Flat Trunnion 13 is bolted. At one end of the tray, this Flat Trunnion is extended two holes upwards by two 2½ in. Strips 14, placed one on top of the other for strength, while at the other end, the Trunnion is extended three holes upwards by a 3 in. Angle Girder 15. Bolted to the top of this Angle Girder is an Insulating Fishplate, to the free end of which a 2 in. Wiper Arm 16 is fixed.

A 3-12 volt D.C. Motor with 6-ratio Gearbox is next bolted to Angle Girders 11, in the position shown. Mounted on the output shaft of this unit is a ½ in. Pulley with boss which is connected by a 2½ in. Driving Band to a 1 in. Pulley 17 fixed on an 11½ in. Rod held by Collars in Strips 14 and Angle Girder 15. It will be noticed that sufficient room remains on the tray for a suitable battery to drive the motor and we found, here, that an Exide DT7, or Ever Ready PP7, taped to Girders 12, was ideal both for size and power.

At this stage Commutator 4, with Circular Plate 2, is fixed on the 11½ in. Rod, close to, but not touching Angle Girder 15. Wiper Arm 16 is then bent round until it makes contact with the continuous-circuit section of the Commutator, after which the wiring should be completed. One of the motor leads is connected to the Bolt fixing Wiper Arm 16 to its Insulating Fishplates, while the other motor lead is connected to one terminal of the battery. The other battery terminal is earthed by connecting it to one of the tray Girders. The motor switch is left in a drive position.

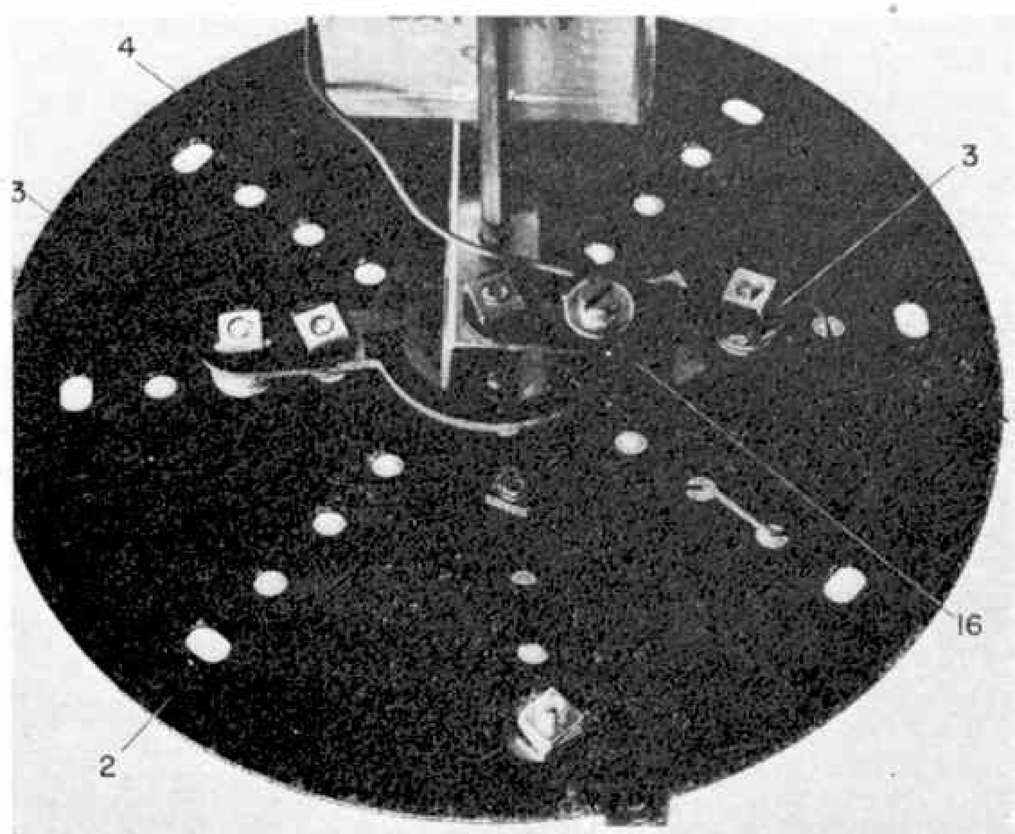
Finally, the completed drive assembly is mounted in place in the drum by fixing the appropriate end of the 11½ in. Rod in the boss of the Bush Wheel bolted to Circular Plate 1 and by bolting Circular Plate 2 to Threaded Bosses 10, using the longitudinal bores of the Bosses. Now, when the circuit is completed by means of the switch provided by Strip 7 and the Bolt securing Insulating Spacer 6, the drum should "magically" roll along under its own power! It will even negotiate substantial inclines, depending on the Gearbox ratio used.



A close-up view of one end plate of the drum showing the built-up control switch.

PARTS REQUIRED

4—1	1—13	56—38	1—186
2—5	1—22	2—59	4—189
1—6a	1—23a	4—64	16—192
2—8b	1—24	3—111a	3—513
1—9c	61—37a	2—126a	1—533
2—9f	64—37b	2—146	1—551
			1—564



The Commutator arrangement fixed to the inside of one end plate.

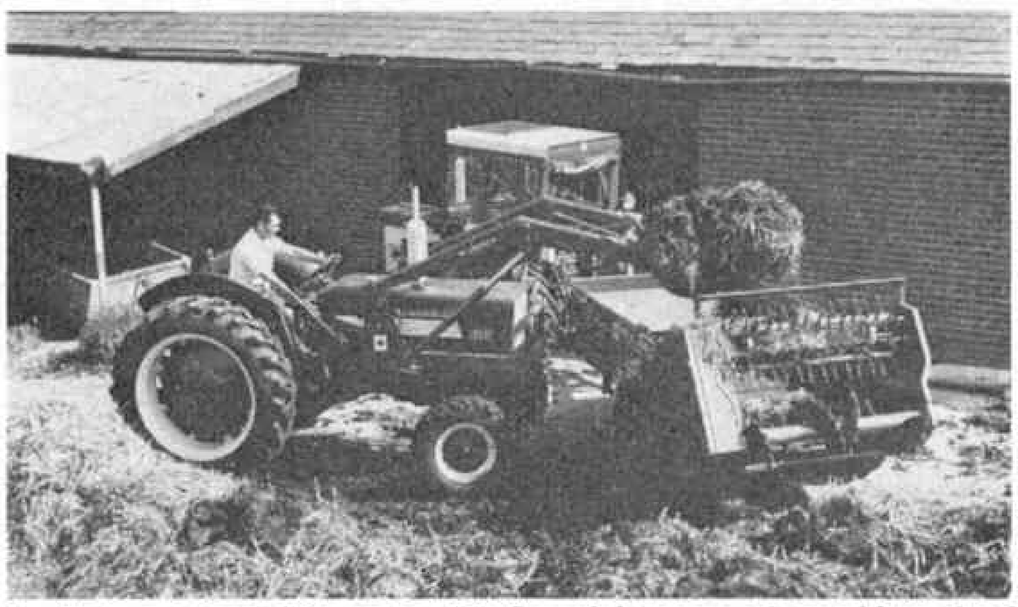
The big dig. A Ford Auto-Dig with powerful hydraulic digger at rear, hydraulic loader at the front.

MACHINES THAT MIMIC MAN . . . .

An interesting feature on farm and road construction machinery by Richard Lee

THE HUMAN HAND, BIOLOGISTS TELL US, has been one of the principal reasons behind the evolution of our higher intelligence. Because of the way our hands work we are able to use tools to help ourselves to do things that would be impossible if we had to use our fore-limbs simply for motion.

The human hand can scrape, carry, lift and place things with precision. Because of that we can do so much to improve our way of life. Now, of course, we make machines. Children watch machines at work —always interested in them but taking them so much for granted. But any of our great-great-grandfathers would have travelled hundreds of miles simply to see a road digger at work ! Although we are living in a time of the greatest historical value—for the future generations to come—it is easy to be almost blind today at the events of invention that surround us. In a hundred years time, who can doubt that the back numbers of this magazine of the twentieth century will stand as authentic historical documents of great importance.



An International Harvester McCormick team of machines load farmyard manure for mechanical spreading on the fields.

The human hand is still much in evidence, despite our technical understandings of our age. It is fascinating to see just how many machines have been designed *because* they so obviously copy the action of the hand of a man at work, using a simple hand tool. The only difference is that the steel fingers and hydraulic muscles of these machines turn the puny power of an average labourer into the effect of a docile and industrious giant of Goliath proportions !

For jobs which can be done with a digging, lifting, scraping and picking action, we have industrial tools that are replicas of the human forearm. Many are hinged and powered to give an 'elbow joint' effect, and terminate with a specialised 'hand' with either tines to simulate fingers, or a scoop which resembles a hand which is cupped.

The great engineering secret which had to be discovered to bring about this type of machine was the hydraulic ram which is able to act via oil pressure to modify the positions of the arms and fingers of the iron limbs of these machines. The rams are simply cylinders containing a piston rather like a cycle tyre pump. Inside the tractor there is a continuously working oil pump which maintains a supply of oil under great pressure which can be utilised as and when the operator desires. The oil that is being pumped under pressure is simply circulated via an overload relief valve if it is not taken off, so that no damage comes to the oil pump from continuous running. Naturally the overload relief valve cuts in at a known maximum pressure and this determines the lift capacity of the rams. Pressurised oil fed into the rams by a control lever which opens the ram valve allows the oil to run into the rams and push against the piston face

—and so thrust the highly polished piston shank out with great power. No oil leaks past the piston because the rams are fitted with high precision oil seals which cling perfectly to the plunger face. It is for this reason that this part of all hydraulic rams are so highly polished—to maintain a perfect fit for the internal oil seals and *not* to make the machine 'look smart'.

The key men involved in the development of 'human hand' machines have been the hydraulic oil system engineers. If oil escapes through leaks, the machine will have no 'muscles'. This type of engineering demands precision which will admit no tolerances. The pump must be able to maintain and hold pressure, the oil seals in the rams must be perfect too. The final problem is to make a way for the oil to reach the rams under pressure. This was achieved in the earlier machines by the use of welded pipes. All schoolboys who have done a little physics know that a fluid under pressure exerts the same pressure at all points where it is contained. A glance at illustrations of machines using modern hydraulic rams today show that many of the oil pipes are not of welded metal pipe at all, but are of rubberised flexible construction. The development of internally armoured flexible pipes now means that these tubes can carry the power-giving oil to rams which are themselves placed on moving parts. The pressure in the pipes is exactly the same as the pressure in the rams—and so the pipes have to be fantastically strong or they would simply burst and spurt oil.

On release of the ram, the oil runs back to the reservoir in the tractor and is not under anything like the same pressure for the return journey. After passing through a fine filter to remove any abrasive particles which it might have picked up, it is recirculated via the pump into the pressure system to be used over and over again.

Many of the rams are designed to be 'double-acting'. Oil may be directed into the ram either above or below the piston head. Selecting pressure in this way permits the operator to push or pull with a particular 'muscle' at will. This refinement now makes it possible to design a power arm that can repeat almost any action of the human on a grand scale. Mechanical shovels can dig earth and stone in quarries to lift a ton at a time. Often such lifting buckets are fitted with specially hardened steel tines on the leading edge to assist the scraping penetration of the shovel into the heap. How similar to the growth in nature of claws and finger nails!

McConnell's make a digging accessory which can be fitted to most tractors. The power arm is jointed at an 'elbow' and has a ram complex which enables the operator to dig a ditch and dispose of the spoil at each grab by slewing round completely in the raised position. Stability is kept by means of feet which press into the ground at the rear of the tractor. This particular model works from the tractor rear. Other types of power arm are fitted to work from the front of the tractor for shovelling earth or gravel.

Both front and rear mounted power arms may be used by farmers to speed up the gut-mauling job of tearing farm yard manure out of stock strawyards where cattle have been kept throughout the winter. With a steel fork on the power arm head, three or four hundredweights of manure can be loaded into a spreader with each work cycle.

Very often the operation of these machines calls for special thought. Where large quantities are being handled and the machine will be doing a fairly repetitive job for some hours the operator will try to formulate a 'work cycle' of operation which incorporates the least possible of wasted time. He will drive the machine into work, dig, lift, slew and discharge, return to drive into work again to repeat the process. In practice the way machines are positioned into their work can make a great deal of difference to the days output.

The McConnell Power Arm tears manure out of a stockyard—reaching over the yard gate with ease as it does so. Note the special grab is fitted with its own small ram via flexible pipes to operate hydraulically.

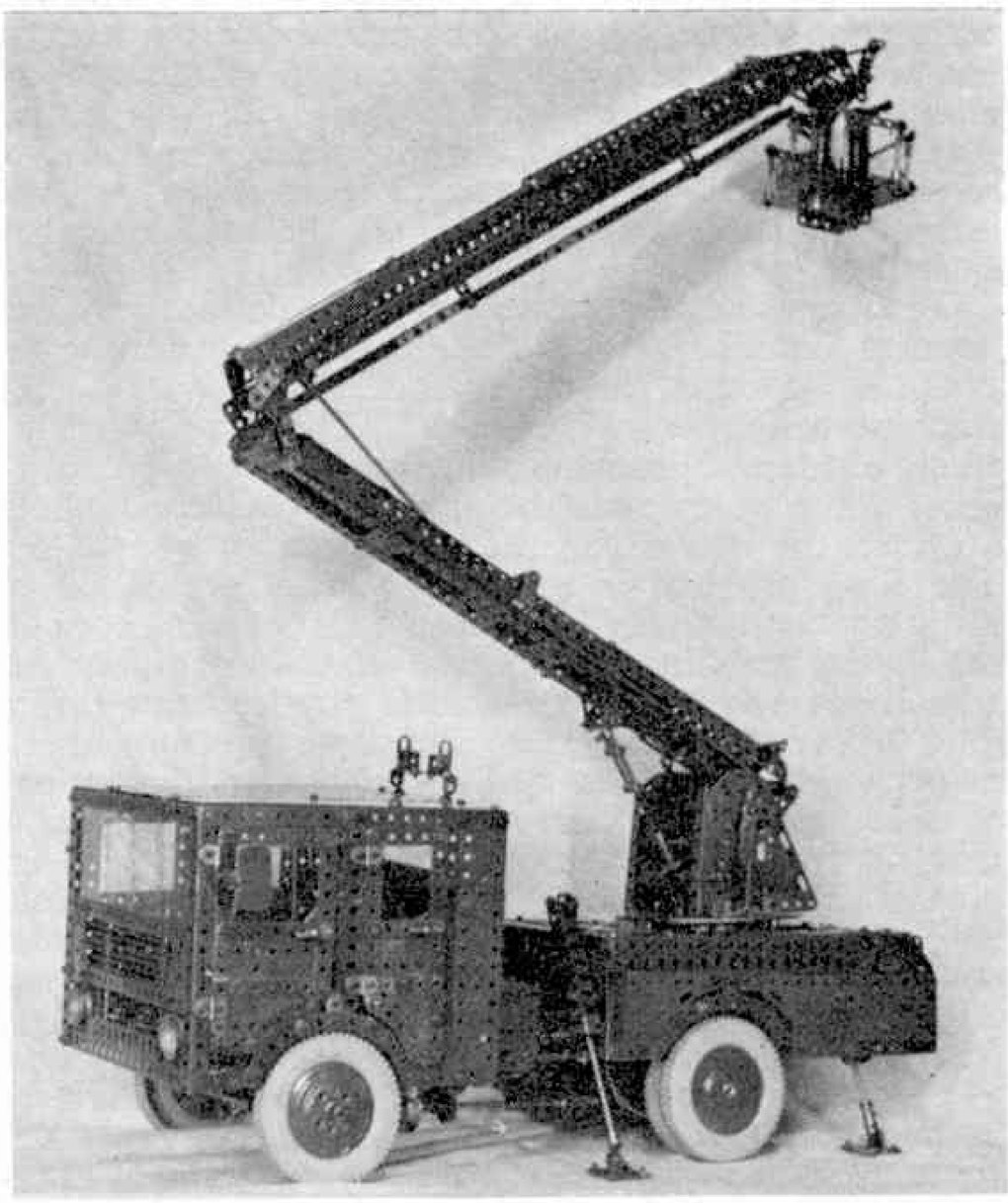
If you get the time to watch skilled operators on large industrial sites like motorways under construction you will see that they try to work to an economical routine as well as employing teamwork. In this way they all know what each other will be doing next without the need for separate instructions each time.

Watch the men who master mind the machines which have the strength of giants. Watch the steel hands and arms with muscles of oil and bones of iron. They are slaves that we have built to copy the way we work. By using them we can enjoy a better life and change the face of the Earth.

McConnell Power Arm digger makes a neat job of digging a new ditch for field drainage.

AMONG THE MODEL BUILDERS

with 'Spanner'



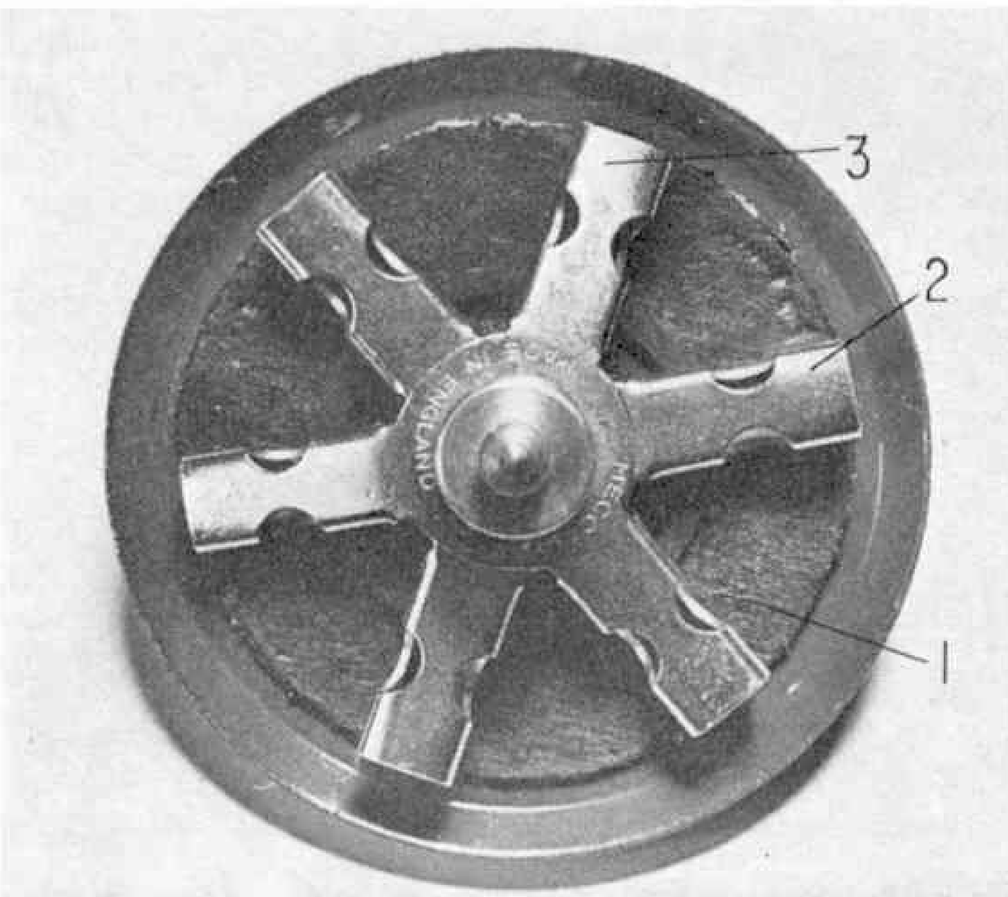
The excellent Simon Snorkel built by Mr. H. W. Henry of Strood, Rochester, Kent.

Internal Expanding Brake

OVER THE YEARS MANY EXCELLENT motor chassis mechanisms have been designed in Meccano, but unfortunately, few of these have been suitable for inclusion in the smaller types of Meccano models, particularly those models using 1 in. Pulleys with Motor Tyres as road wheels. Considering the size of most motor chassis mechanisms in relation to the small amount of space available in small models, this is understandable, yet it is hardly a consolation to anybody whose stock of parts prohibits the making of larger models. Mr. James Grady of Dundee, Scotland, however, is one modeller who has tackled the problem —and tackled it with success, having designed several mechanisms specifically with 1 in. Pulleys and Motor Tyres in mind. We have featured one or two of Mr. Grady's previous ideas already in these pages; now we present his latest offering—an Internal Expanding Brake small enough to be fitted to any straight-through axle that carries 1 in. Pulleys with Motor Tyres as road wheels.

Under operating conditions, the mounting would depend on the layout of the parent model, but for our purposes a framework is built up from two $5\frac{1}{2}$ in. Strips 1 connected together by three $3\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strips 2, 3 and 4, Double Angle Strips 2 and 3, being separated by a distance of three clear holes. Fixed by $\frac{3}{8}$ in. Bolts, one to each of these Double Angle Strips, are two Short Couplings 5, in the inner transverse bores of which two Centre Forks 6 are loosely mounted. Fixed on the end of each of these is a Collar, in one transverse tapped bore of which a Threaded Pin is secured, another Collar 7 being fixed on the upper end of this Threaded Pin.

Pivotally attached to both Collars 7 by Set Screws, but spaced from them by a Washer on the shank of each Set Screw, is a $2\frac{1}{2}$ in. Narrow Strip 8, the free end of which is pivotally attached to another Collar fixed on a $2\frac{1}{2}$ in. Rod 9. This Rod is secured part way in the longitudinal bore of a Coupling 10, mounted on a 4 in. Rod journalled in Strips 1, where it is held by Collars. Also journalled in Strips 1 are two $4\frac{1}{2}$ in. Rods, one at one end of the framework and the other so positioned that it passes between Short Couplings 5. This latter Rod is fitted with a $\frac{3}{4}$ in. Flanged Wheel 11, which fits over the forked ends of Centre Forks 6, both Rods also being fitted with 1 in. Pulleys carrying Motor Tyres, as shown. When Rod 9 is moved, the linkage causes Centre Forks 6 to revolve in Short Couplings 5, the ends of the Centre Forks thus making contact with the inside flanges of Flanged Wheel 11 to act as a brake.



A useful little idea from Mr. Grady is this built-up "Rostyle-type" wheel useful for G.T. and sports cars.

PARTS REQUIRED

2—2	4—22	7—59	2—111c
2—15a	6—37a	1—63	2—115
1—15b	9—37b	2—63d	4—142c
1—16a	3—38	2—65	1—235
1—20b	3—48b		

G.T. Wheels

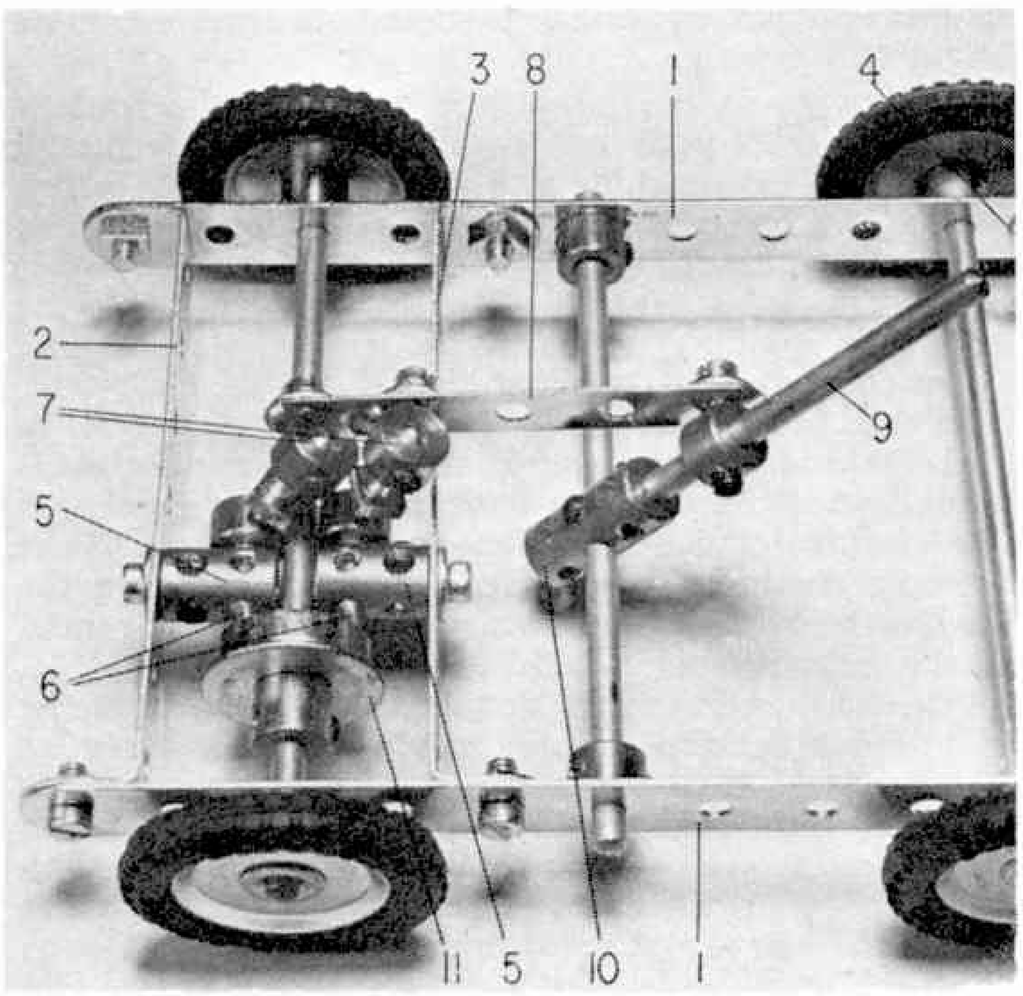
Still on wheels, but slightly larger examples this time, we have another quick idea supplied by Mr. Grady. "Many Meccano model-builders," he writes, "May have difficulty in building G.T. type wheels for their motor cars and I thought the enclosed idea might appeal to you." Mr. Grady was speaking of the Rostyle Wheels often fitted to sports and G.T. cars and his "enclosed idea" is illustrated in the accompanying photograph. It consists of a 2 in. Pulley with Motor Tyre which would, of course, be mounted on the axle of the model. Against the outside face of the Pulley is a disc of black paper or card 1, on top of which a 2½ in. Driving Band is centrally positioned, the two being held in place by a 3-way Rod and Strip Connector 2 and a 3-way Rod and Strip Connector with Boss 3, arranged as shown, the latter being fixed on the axle. The effect is quite realistic, as I think you will agree.

PARTS REQUIRED

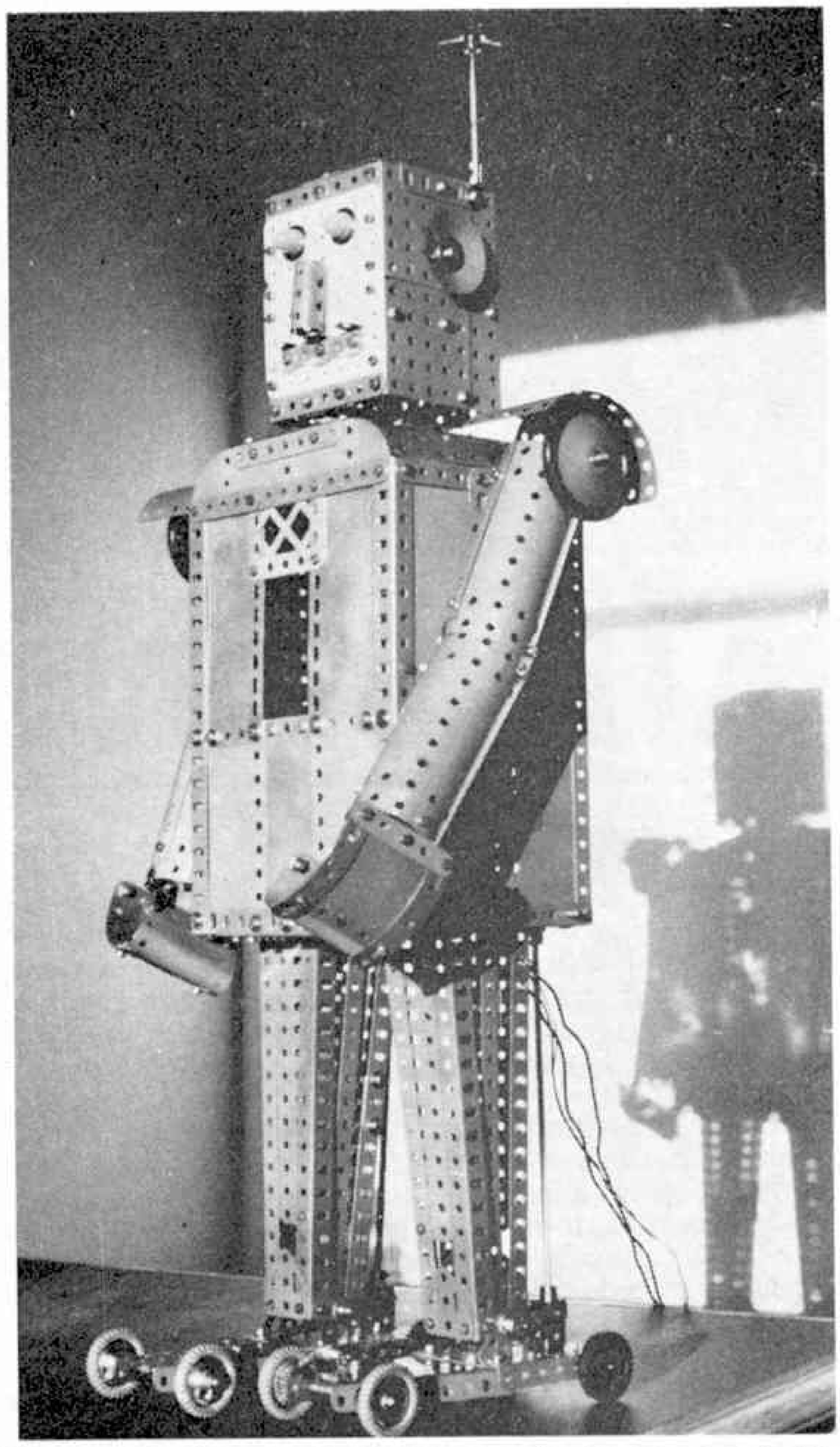
1—20a	1—142a	1—186	1—213a
1—1⅝ in. dia. disc of black card.			1—213b

From near and far

I propose to devote the rest of my space this month, not to detailed descriptions of gadgets and mechanisms, but to a general look at some of the interesting photographs which have been sent to me by readers from near and far. First in line is a model of a Simon



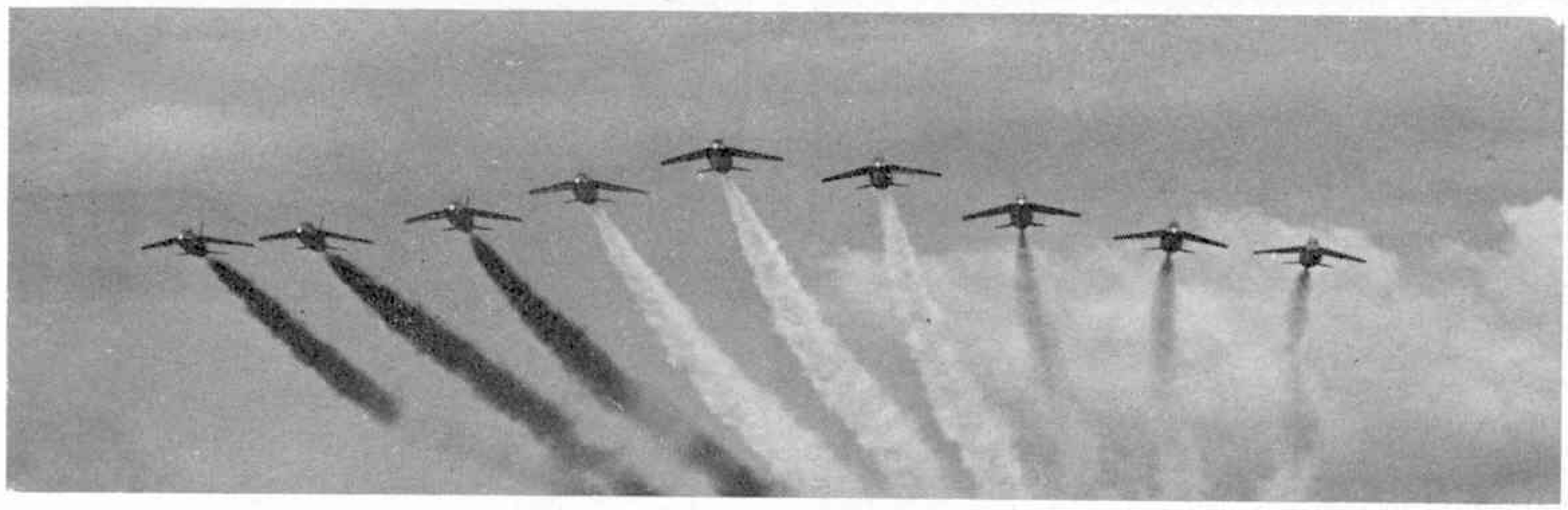
An interesting Internal Expanding Brake for use with models using 1 in. Pulleys and Motor Tyres as road wheels. The designer is James Grady of Dundee, Scotland.



The world-wide appeal of Meccano is illustrated by this working Robot designed and built by Mr. Carmelo Nizza Burgio of Concepcion, Chile, in South America.

Snorkel fire-fighting appliance built by Mr. H. W. Henry of Strood, Rochester, Kent. This is a highly detailed, fully-operational model, powered by a 24 volt electric motor driven through a 4-speed gearbox. With an overall length of 25 in. a width of 10 in. and a height, with boom extended, of 46 in., the model qualifies as "large," yet follows realistic proportions. The boom is driven by an auxilliary shaft from the gearbox and can be controlled either from the cab or from the boom cage. Working brakes are fitted front and rear, while a standard rear axle differential is also included. All in all—a first rate model.

Moving from Kent to Chile, in South America, we have a very good "freelance" Robot designed and built by Carmelo Nizza Burgio of Concepcion, Chile, who is a keen Meccano enthusiast and an avid reader of Meccano Magazine. Powered by an electric motor buried inside the model, the Robot walks and moves its hands, head, eyes and antenna. I can well believe that this is a highly impressive model to watch in operation, and I am particularly pleased to include the illustration, here, in view of the fact that it comes from a country from which we on Meccano Magazine do not hear very often. Many thanks Mr. Burgio!



AIR NEWS John W. R. Taylor

How to lead the " Red Arrows "

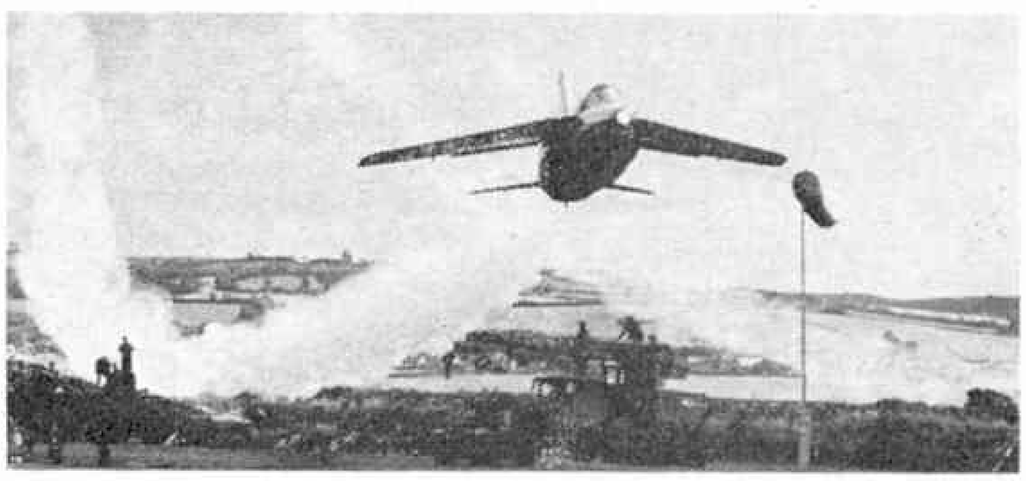
SEPTEMBER IS A BIG MONTH FOR AIR SHOWS, when the Royal Air Force demonstrates the unrivalled skill of its aricrew and the capabilities of its latest aircraft at Battle of Britain Day displays. Every second year, including 1970, there is also the big SBAC Flying Display and Exhibition at Farnborough.

The brightest stars of these displays are the " Red Arrows " a team of nine instructors from the R.A.F. Central Flying School piloting Gnat trainers. Their routine is so hair-raising and their flying so perfect that it is difficult to remember that these are not specially-trained " professional " aerobatic pilots, but men who spend most of their time doing the essential job of training others.

This helps to explain why the R.A.F. has always led the world in formation aerobatics, because it believes that its combat pilots, particularly those who fly fighters, must master the art if they are to fulfil their normal operational rôle.

Strangely enough, it all began at a time when our military aircraft were being swept from the sky. The date was January 1916, soon after the Germans had sent into action in France dozens of Fokker monoplanes—the world's first real fighter-planes, with a machine-gun synchronised to fire between the blades of their propellers.

Against such aircraft, the lumbering British reconnaissance biplane were almost defenceless. So, on January 14th, Royal Flying Corps Headquarters issued an order which said: " Until the R.F.C. is in possession of a machine as good as or better than the German Fokker it seems that a change in the tactics employed becomes necessary. It is hoped very shortly to obtain a machine which will be able successfully to engage the Fokkers. In the meantime it must be laid down as a hard and fast rule that a machine proceeding on reconnaissance must be escorted by at least three other fighting machines. . . . Flying in close formation must be practised by all pilots."



How low can you get ? " Solo " man of the " Red Arrows " in action.

There is, of course, an immense difference between a gaggle of World War I biplanes, shuffling along at 70 m.p.h., and the precise aerobatics of the " Red Arrows " in their almost-supersonic Gnats; but display flying is a logical development of the techniques that became essential for survival in 1916. The basic formation is built up around the leader's aircraft like a jig-saw—and calls for unwavering concentration, lightning reactions and a great deal of hard work from every member of the team before it can demonstrate the flawless patterns and smooth manoeuvres which so delight the crowds.

First move in the jig-saw is made by the leader's wing-man, who lines up his aircraft on a particular part of the lead machine and closes in to within a few feet of it. From that moment, the wing-man must follow within a split second the leader's smallest movements, making his aircraft virtually an extension of the leader's by juggling with throttle, rudder, elevator and aileron controls to maintain station.

To this basic pair, other aircraft are added, both to each side and in line astern, so that the formation is gradually built up. Each succeeding outside position demands greater concentration and effort to make the necessary changes in position and speed, because the pilot furthest from the formation leader is the man " at the end of the whip-lash ".

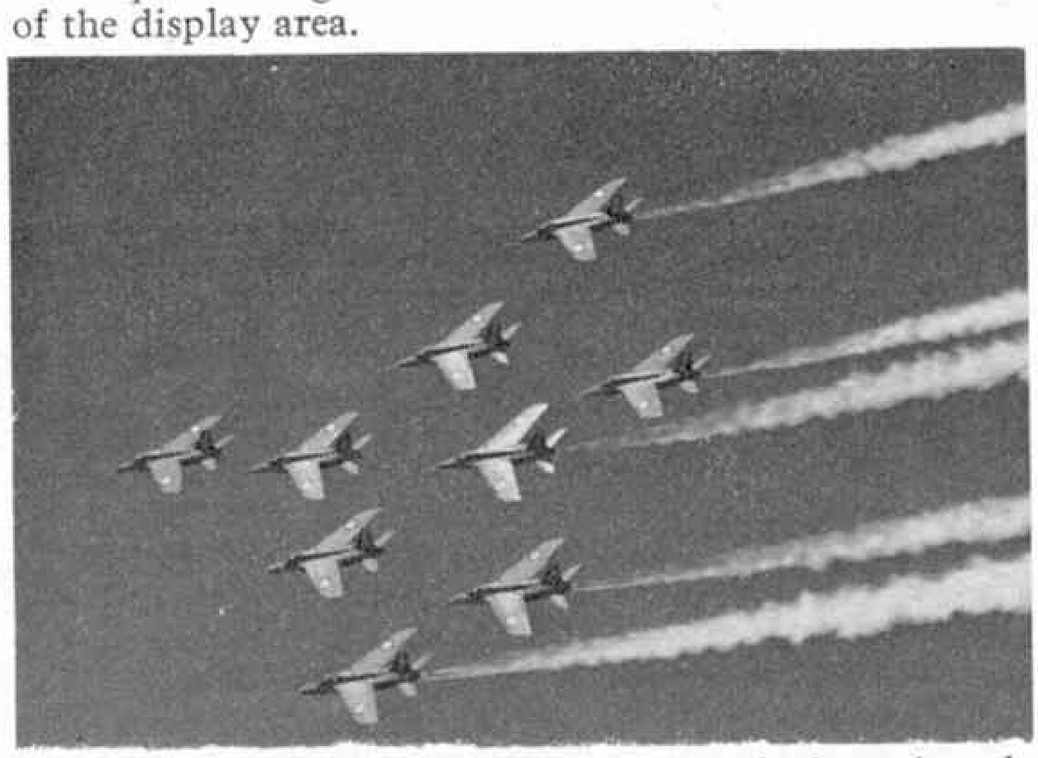
When the leader starts an aerobatic manoeuvre, he has to think for the team as a whole. No other pilot will ever look at his instruments during a display, so the leader must take them into each sequence at such a speed and height that the outside and inside men, who will be flying at different speeds in a turn, will always have a safe margin of speed and altitude.

For the team leader, such evolutions are rather like trying to fly a single large and cumbersome aircraft through fighter-type manoeuvres. His responsibility was emphasised a few years back, when the leader of a

European air force aerobatic team entered a particular manoeuvre at too low a height and crashed into the ground a fraction of a second before the other members of his formation, whose eyes were on his aircraft rather than on their surroudings. All were killed.

From the start of a display until its completion, there will be a great number of formation patterns and changes, possibly with solo synchronised aerobatics and periods of "smoke on and off". Each team member must memorise the sequences precisely; but he is in close radio contact with the leader who gives constant advice and instructions to the formation. Team members have to acknowledge every order that requires them to move to a new position, so the radio conversation needs extremely careful timing and control, with no place for wisecracks or unnecessary questions.

The work of the team leader starts long before the aircraft take off. He must assess the weather conditions and decide if the standard sequence needs to be changed to cope with local terrain and obstacles. In order not to disappoint the public, he can usually vary the programme to perform a flat, or rolling, display when the clouds are low; but once airborne he must always fly an agreed sequence smoothly and accurately, while positioning his manoeuvres within the confines of the display area.



A familiar sight to thousands of spectators at air shows throughout the country, the "Red Arrows" flying in formation.

The end product may look very frightening from the ground, especially when two Gnats approach at a closing speed of well over 1,000 m.p.h. from opposite ends of the runway and skim past each other in vertical banks a few feet apart. To the pilots it is just one more show, after which they will probably try to think up something even more startling for next year.

The Build-it-Yourself Bede

A high-performance four-seat aeroplane that home craftsmen can build with ordinary hand tools is now being marketed by Bede Aircraft Corporation of Cleveland, Ohio, U.S.A. They claim that this aircraft, the BD-4, which cruises at 170 m.p.h., can easily be put together by one man in three months of spare-time work at a cost of under £1,250, plus the engine. A similar aeroplane bought "off the shelf" might cost five times as much.

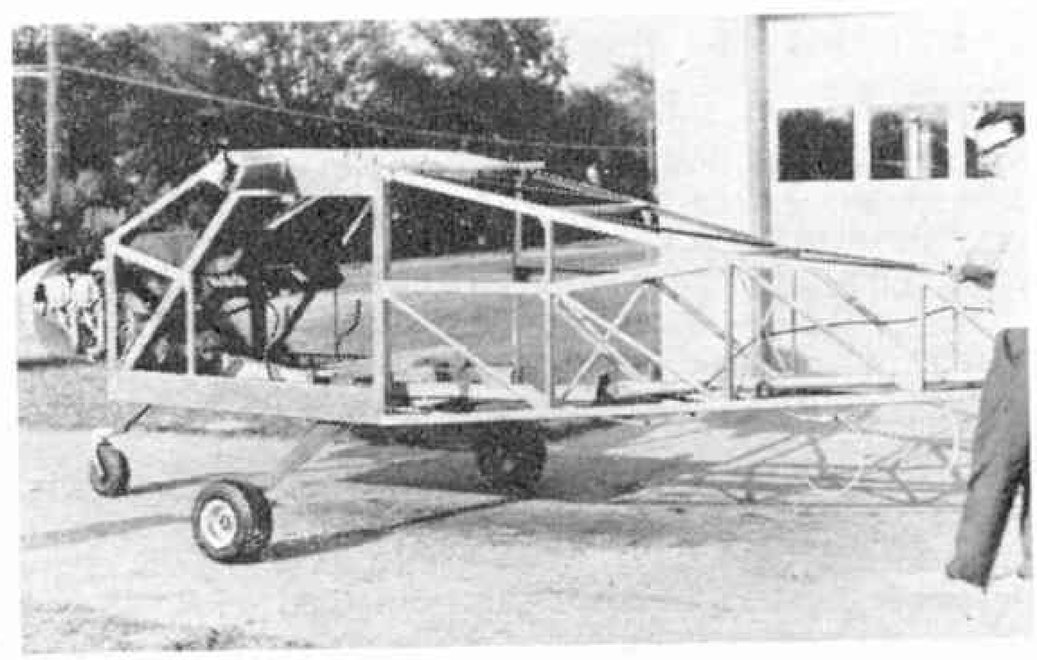
One of the keys to the BD-4's low cost and easy construction is its unique wing, which one man can assemble in a day. It is made up simply of a series of glass-fibre "panel-ribs" which are slid over a 6½ in. diameter tubular aluminium spar and secured by epoxy resin and clamps.

The prototype four-place BD-4, with a 160 HP Lycoming engine, climbs 1200 FPM and cruises better than 170 MPH at 75 per cent power.

The fuselage is almost as easy to assemble, as it is made up of aluminium angle sections bolted together, and can be constructed with little more than two wrenches and a quarter-inch electric drill. Yet the finished structure is very strong and exceptionally light in weight. In fact, the BD-4 exceeds all the official strength requirements for a fully-aerobatic aircraft when carrying two people. Even with a full load, it more than meets the official specifications in the Normal and Utility categories to which most production line aircraft are built.

For the full $2,940, a would-be owner-pilot can buy a complete airframe kit, including panel-ribs, spar, wheels, brakes, exhaust system with heater, soundproofing, upholstery, basic instruments, fixed-pitch propeller, spinner, and everything else, down to the last bolt, nut and washer. If he prefers, he can buy the materials in separate packages, ranging in price from $178 to $626. As Bede put it: "If he is long on enthusiasm but short on cash, he can purchase any one package, assemble it and move on to the next as his resources permit."

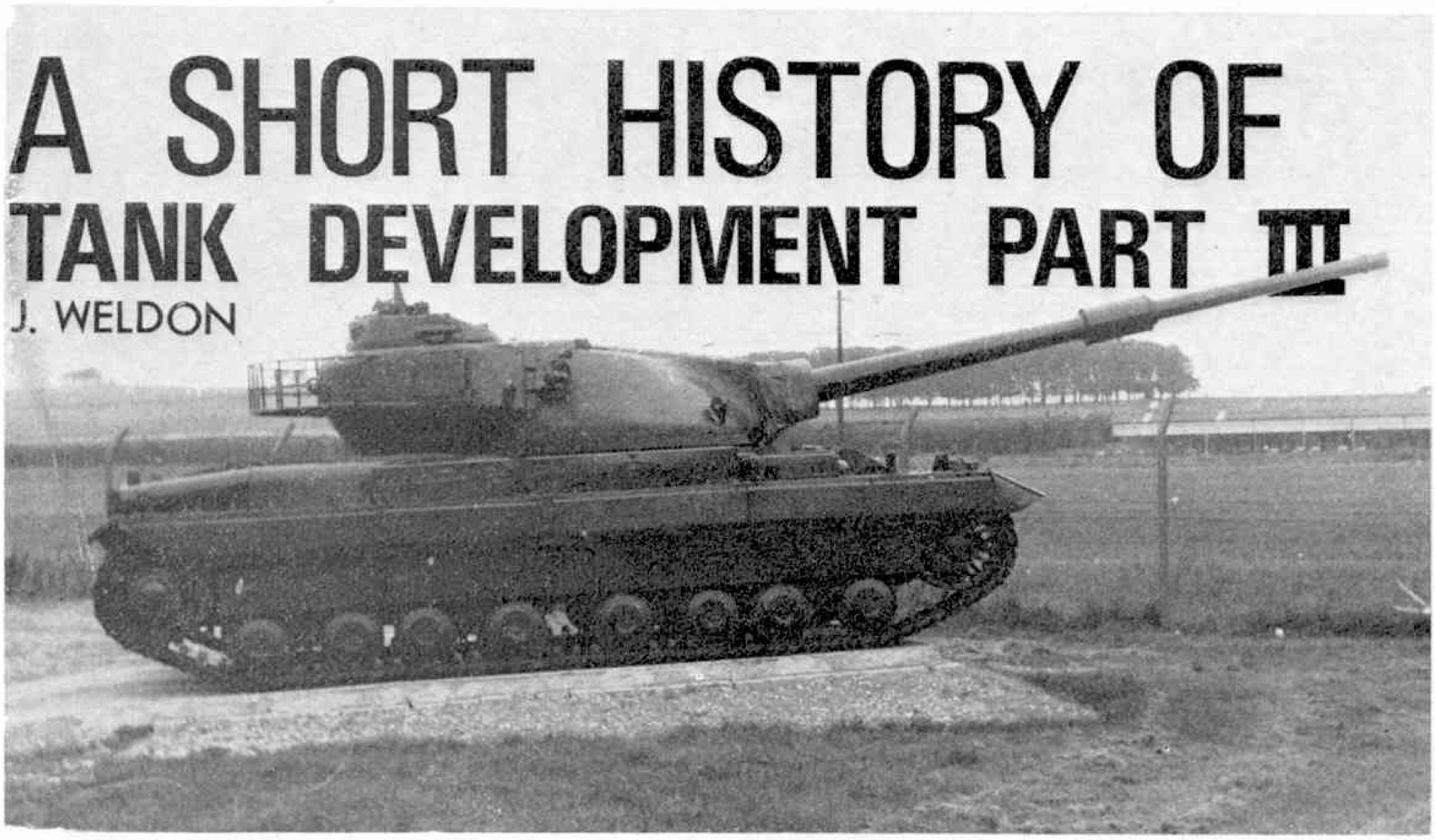
If cash is low, the constructor can fit a 108 h.p. Lycoming engine and leave out the rear seat, flying the BD-4 as a 156 m.p.h. two-seater until he can afford to convert it into a more powerful four-seater. Nor does it cost a fortune to hangar a BD-4, as the wings can be made to fold, enabling the aircraft to be towed home behind a car for storage in the family garage. Little wonder that the first 100 BD-4's were being built in the U.S.A. and Canada, plus others in Germany, South Africa, New Zealand, Australia, England and 25 other countries, within a year of the first flight of the prototype.



The BD-4's bolt-together fuselage is exceptionally light weight, fail-safe and can be constructed quickly and easily with hand tools.

A SHORT HISTORY OF TANK DEVELOPMENT PART III

J. WELDON



The British big-gun tank of 1950, the Conqueror. This was slow, well armoured with powerful armament, but excessively short-ranged and careful parking was needed for accurate fire.

CONCLUSION

TANKS IN THE NUCLEAR AGE

MOST OF US HAVE the habit of dating things by the Second World War. Collectors of die-cast cars, or railway models, for example, nearly always do this, as you can see in the MM's advertisement columns. Things are 'pre-war' or 'post war'. Yet really, a whole quarter of a century has passed since that war ended.

When last month I ended my description of the "Struggle for Survival" with the arrival of the Centurion. I reached a point where time has appeared to stand still for tanks. For the Centurion is still very much with us, outwardly almost unchanged, 25 years after it entered service. A whole quarter of the 20th. century! The Centurion, indeed, appears to be immortal, as does the even older Sherman in its A 4 E8 modification. Just imagine a tank of 1918 still in use in 1943! Why, the very idea is fantastic. Who on earth could find a use for it? Yes, indeed, time seems to have stood still, or at least slowed down, for tanks after 1945: there are still plenty of Centurions in the British and foreign armies, and Shermans were used in Sinai in 1967.

However, if we study tanks closely we soon find that in this period of no-change there are 3 distinct periods, during which important changes were made both to their insides and to their employment.

The first was the period of the Nuclear Umbrella. For several years after World War Two, armour took time off from the military scene in the West, for many people really believed that big armies of World War 2 type would never fight again! If an enemy looked nasty —a threat of an Atomic Bomb would make him behave himself. One result of this, was that the U.S.A. and Britain tended to go slow on the development of tanks.

Of these, there were two main types, the Main Battle Tank and the Big Gun Tank, based upon the Soviet T44 and the Josef Stalin 3, both of which were improvements of pre-war designs, the T34/8S and KV, respectively. Both led current trends in that they housed big armament under a markedly lower silhouette, and the Josef Stalin introduced the idea of a near-prone closed-down driving position. Their equivalents in the West were the British Centurion and big-gun Conqueror; the French ARL 44 and big-gun AMX50; the American M46/47/48 Patton and big-gun M103. The Centurion, Patton and ARL44 were all wartime designs: the M103 began its life as the war ended, the Conqueror in 1948, and the AMX 50 about the same time, and of them all, the ARL (Ateliers de Rueil) was the most 'dated', having the highest silhouette and somewhat old-fashioned tracks.

All the MBTs had guns of between 83.4 mm calibre (Centurion) and 90 mm (ARL): the big gun boys, between 100 mm (AMX50) and 122 mm (Stalin). These may seem very much of a muchness, but a difference of a few millimetre in gun calibre means a big difference in weight of missile: a tank gun of 83 mm calibre throws about 20 lb: one of 120 mm throws 50 lb. The weight has gone up almost a pound for every millimetre diameter increase. And when you get up above 20 lb, you begin to leave the point at which the missile is "quick-firing"; that is, built like a pistol round, bullet and cartridge all in one package. Just try heaving a few 30 lb weights around in a confined space, and you'll see that the modern tank gunner needs strong arms! Above, say, 90 mm calibre, the ammunition must be loaded in 2 parts—first the

projectile, then the cartridge that sends it off, and this slows down the rate of fire, which is one of the reasons why the Russians made their big-gun tank as low and inconspicuous as possible.

In fact, they scored markedly here, with both MBT and BGT. Their T44 weighed only 35 tons against the Centurion's 50; and their Stalin only 45 tons against the Conqueror's 65. Except for the French tanks, those of the West were proportionately down on range and speed—the Conqueror, whose Rolls Royce engine gobbled 4 gallons of petrol per mile, had fuel for only 30 miles! It also had to stop to let its gun fire, and if it didn't park itself on the level, the fire was not very accurate.

The French AMX 50 differed from all the other big boys in having a much more powerful engine —1000 bhp—which pushed it around at speeds of up to 32 mph and gave it a range of action greater than any of its allies or potential enemies. It also had an interesting turret made in 2 parts. The gun was fixed immovable in the upper part, and this upper turret was hung on trunnions in the lower part. Thus, to aim the gun, the lower turret was rotated to get the right direction, and the upper turret tilted to get the right range. It was most ingenious, and gave steady shooting, but some NATO authorities said it would be liable to jamming, and its inside wasn't roomy enough.

Well, these tanks all soldiered on until the Second World War was eleven years behind—they had minor improvements, and the NATO powers were remarking that Russia hadn't improved her tanks for many years, and the current Western ones were really the better models, when—zip—the Hungarians tried to break out of Soviet slavery, the Red Army was sent in to crush them, and it was revealed that the Communists had been secretly developing a whole new approach to warfare—including armoured vehicles.

They had redesigned their MBT to serve in 'local nuclear war', and now called it the T54. It now carried a cannon of 100 mm calibre, was adapted to night driving, had a lower silhouette (and a lie-down driving position), a sleek rounded turret, was supposedly resistant to nuclear flash, blast and fallout, but still weighed only 36 tons. You see, the Russians argued that 'nuclear' war and 'conventionial' war should be merged —the nuclear weapons being made small enough to use "locally". This meant that the armoured and all-mechanised formation must become the most important kind—in order to move and fight in nuclear-devastated zones. And in the foreseeable future, a nuclear shell would be made in, say 100 mm calibre—suitable for firing from a tank cannon!

NATO had to jump to catch up again. Conferences were called in order to decide quickly on a design for a NATO tank—but alas, the Western powers could not agree—France, for example, held out for fairly thin armour, with high speed and long range; while Britain said that speed was not so important as protection and gun power. There is something to be said for both. As the British argued, tanks will have to move mostly by night—so high speed is not so essential. They will lie in ambush through the day—so gun power is needed to reach everything in sight. In turn, this allows the power reserve to be used to carry extra armour.

Well—there was no agreement, and each of the major powers built its own tank. The Americans quickly produced the M60 modification to their existing Patton series, and thus were first on the commercial market—getting quite a few sales that way. The other powers designed from scratch, and by the early sixties the prototype Chieftain (Britain), AMX 30 (France),

Above : This is the German "nuclear age" Main Battle Tank of the late sixties. Note the sleek lines, the range finding and night navigation equipment and the "dustbin", fitted to enable the tank to deep-wade rivers etc.

Below : The "Chieftain" nuclear-age Main Battle Tank, which combined the armament of earlier big gun tanks with the dimensions and mobility of a main battle tank plus adaption to nuclear war. A very good protection against anti-tank weapons.

The French ARL 44, a little known tank of the years immediately after the end of World War Two.

The fast, well armoured French Big Gun Tank of 1950, the AMX 50. Note however the very high silhouette, and the complicated turret with cramped interior.

Standardpanzer Leopard (West Germany) were appearing, as well as the Swiss Panzer 62. And here, Britain got ahead, mounting the biggest cannon of the lot —the Conqueror's 122 mm—in a stabilised, target following mount, in a low vehicle of good shape, using the lie-down driving position. The American, French and German tanks used a British gun, bigger than the Russian one, but smaller than the Chieftain's. It was the latest gun developed for an improved Centurion.

And these are the tanks in service today! The Big Gun tank is a thing of the past, for the MBT now carries its gun, in a better mount, at a higher speed, suited to local nuclear war. The massive Conqueror now features as a rather expensive target on gunnery ranges—just imagine shooting at a target that cost £60,000 when new! I for one wouldn't dare hit it for fear of spoiling it. A few have survived in various army camps—to become monuments to modern armour. The Soviets are more careful with their old tanks. They hire them out to their satellites and allies like Egypt. A lot of Josef Stalins met a grim fate in the Arab-Israeli war of 1967. As for the nuclear age MBT, its inside resembles a space capsule with all its electronic and blind driving and target following equipment. One feels that if only the exhaust blast could be directed downwards, the Chieftain could be placed in orbit.

Now, what of the Light Tank? During both the periods I have described, the French and the Americans continued to build them. The Americans were not very inventive. Their M41 was not very light. For all practical purposes it was a T34 of 1939 rehashed with American refinements. Gun, weight, engine were the same, but armour was a lot poorer. It was difficult to see a role for this tank, except as a commercial, sold to banana republics for internal security.

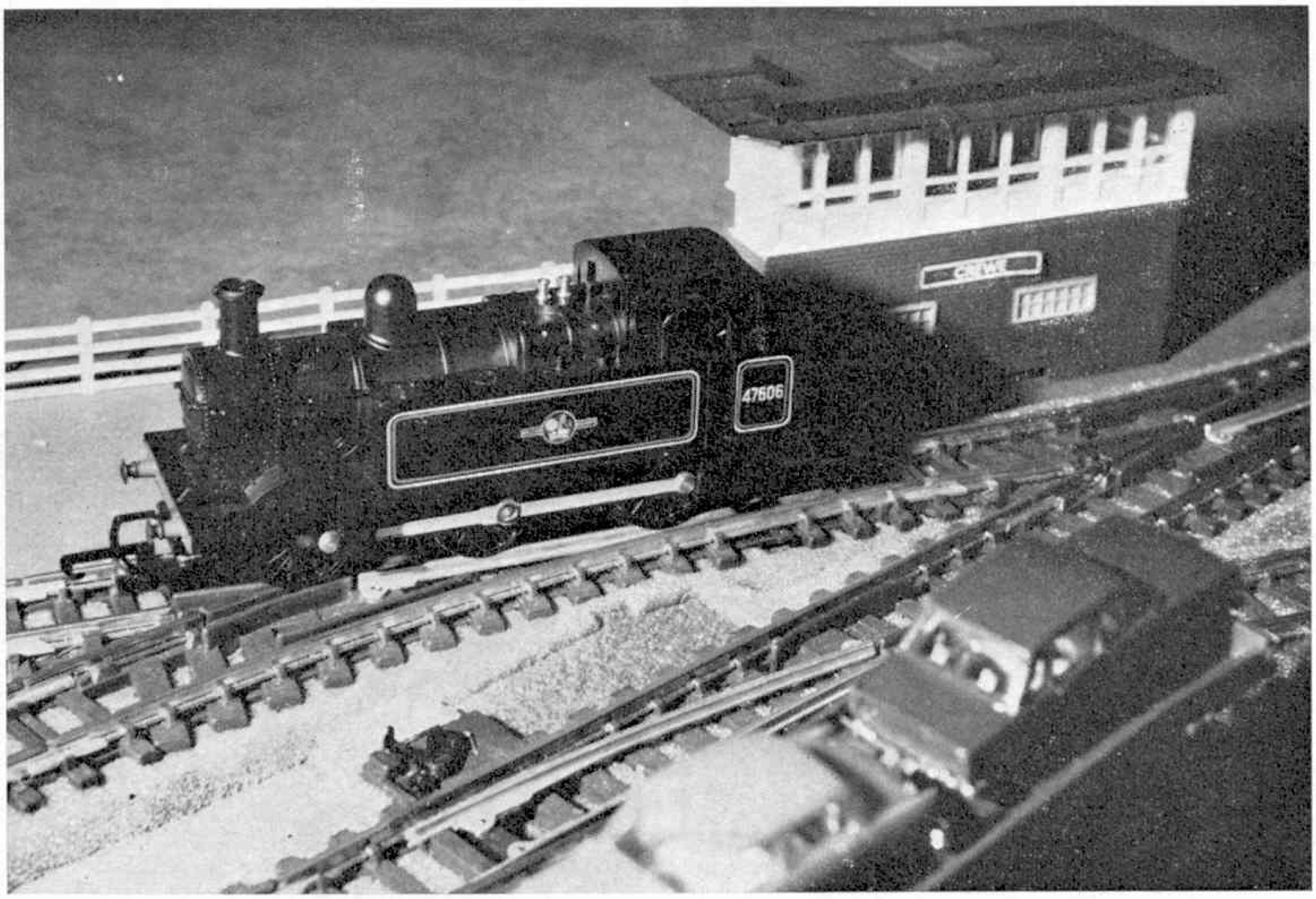
The French had also marketed a commercial 'light'. They got this on the market within three years of World War Two ending, and it sold well, for it carried a 75 mm gun while weighing only 14 tons. It was air-portable, and its chassis could be adapted to a number of roles—troop carrier, command vehicle, almost any type of self-propelled gun. As a tank it is now well out of date—although it fought in the 1967 Arab-Israeli war—but it is still a very good general-purpose chassis.

Obviously, a well thought out air-portable light tank might have been very useful to Britain and the USA in the various 'brush-fire' wars that have broken out over the last 25 years. But no such tank was available, the M41 not being an airborne type. When the trouble in Cyprus hit the headlines, a British Member of Parliament demanded that "our heaviest tanks be sent to Cyprus". How foolish! There was no work for the Conqueror there! But a fast airborne light tank would have been very useful—and there was no such vehicle. Which brings us to the third development phase.

In the mid-fifties the American Aircraft Armament had built a fast 18 tonner, armed with a 76.2 mm cannon mounted in an unusual way. However, it was a complex machine, the power reserve was not great, and the gun was of limited uses.

A better design came in the early 'sixties—the M551 Sheridan—a bit bigger, but lighter (made mostly of aluminium alloy), more powerful engine, and a much more useful gun of very large calibre, which fires everything from ordinary shells to guided missiles, and may have a nuclear potential. And it can be dropped by parachute, and motor straight into action. Its only drawbacks are said to be a rather high silhouette, and a smokey exhaust which can betray its movements. Britain has followed suit with this class of vehicle, and the aluminium Scorpion, very like the Sheridan, is under test. A tank long overdue!

Continued on page 514



Travelling slowly into the goods yard is the Hornby Class 3F Tank Locomotive. In the foreground is the Cortic Articulated car carrier (R666) complete with a load of no less than 16 cars. The ' Crewe ' signal box is also by Hornby (R145).

BUILDING A MODEL RAILWAY

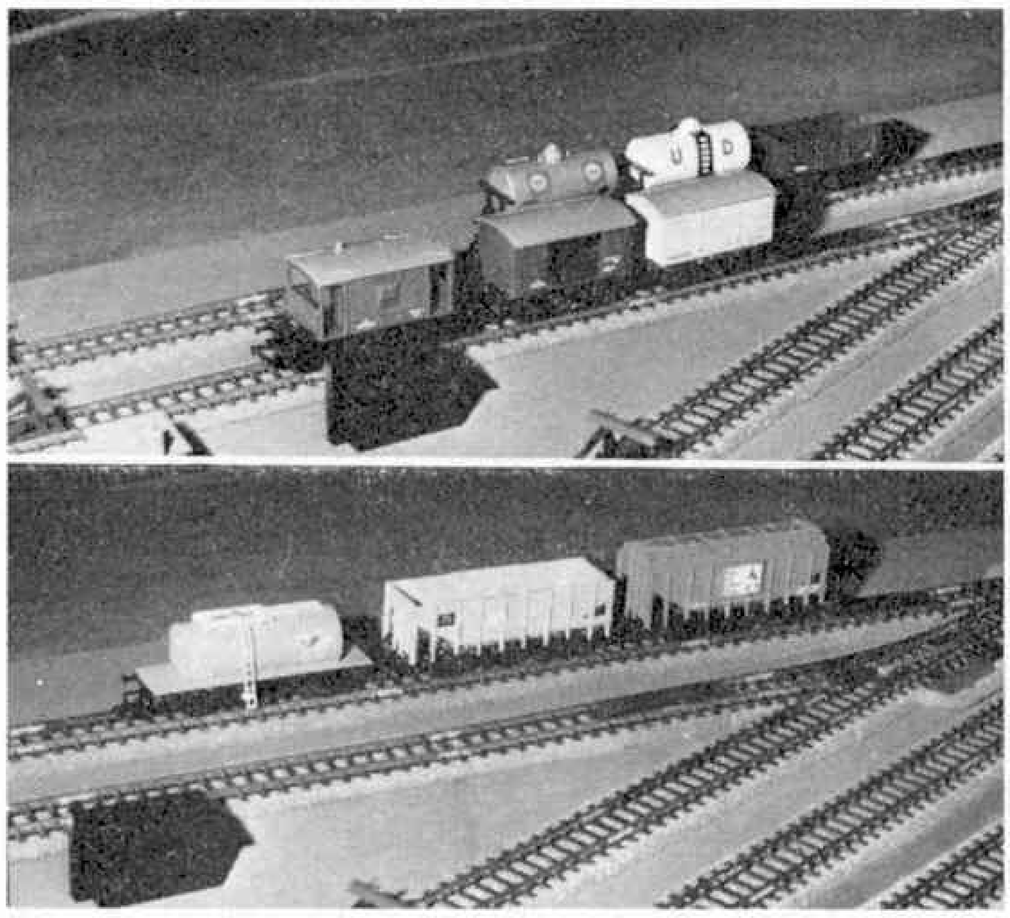
Part III

Rolling stock—operation—more thoughts on end-to-end layouts

Most model railways we have seen are spoilt by the fact that the rolling stock operating on them is usually a completely haphazard collection. Of course, if one has the money, it is very tempting to buy all new items as they appear on manufacturers' lists, but this policy never makes for a realistic model railway. The burning question is; how should one go about planning a collection of locomotives and rolling stock ?

The first thing to decide is the sort of railway the layout represents, and in which " locality " it is situated. Perhaps your layout is to be based on your local railway, or the seaside area in which you have spent holidays. Are the services predominantly freight or passenger ? Main line or branch ? A " commutor " type line will obviously require a lot of passenger rolling stock for its services—perhaps diesel or electric multiple-unit sets. A layout set in an industrial area will need a predominance of goods rolling stock—perhaps even a Freight-liner or Bulk Oil storage depot. Then there are main line express passenger trains—the most spectacular trains of all—but these can look out of place on very small layouts, as a two-coach " Flying Scotsman " never looks realistic, however vivid your imagination.

Apart from deciding what sort of railway the layout is intended to portray, the next most important decision is " what period ? " The Tri-ang/Hornby range alone includes a tremendous variety of livery styles, appro-



The old and the new. Top photograph shows five of the older type B.R. rolling stock in a siding on the unfinished goods yard of our layout. Lower picture shows three more modern wagons in the same siding.

priate to the various periods of railway history. Before 1948, the major lines in Great Britain comprised four large companies—the Great Western, which served South and West Wales, the Midlands and the West Country; the London Midland and Scottish, which served those areas mentioned in its title, plus parts of North Wales; the London & North Eastern, which ran the East Coast route to Scotland, and the Southern Railway, serving the Southern London suburbs and the South Coast resorts. Tri-ang/Hornby locomotives available in the liveries of the "Big Four" include the L.N.E.R. Pacific No. 4472 "Flying Scotsman" (R855); L.N.E.R. B12 Class (R8665); Great Western "Hall" Class 4-6-0 "Albert Hall" (R759G); L.M.S. Pacific "Princess Royal" (R25BG); Southern Railway "Battle of Britain" 4-6-2 "Winston Churchill" (R869S) and Southern M7 class 0-4-4T (R868).

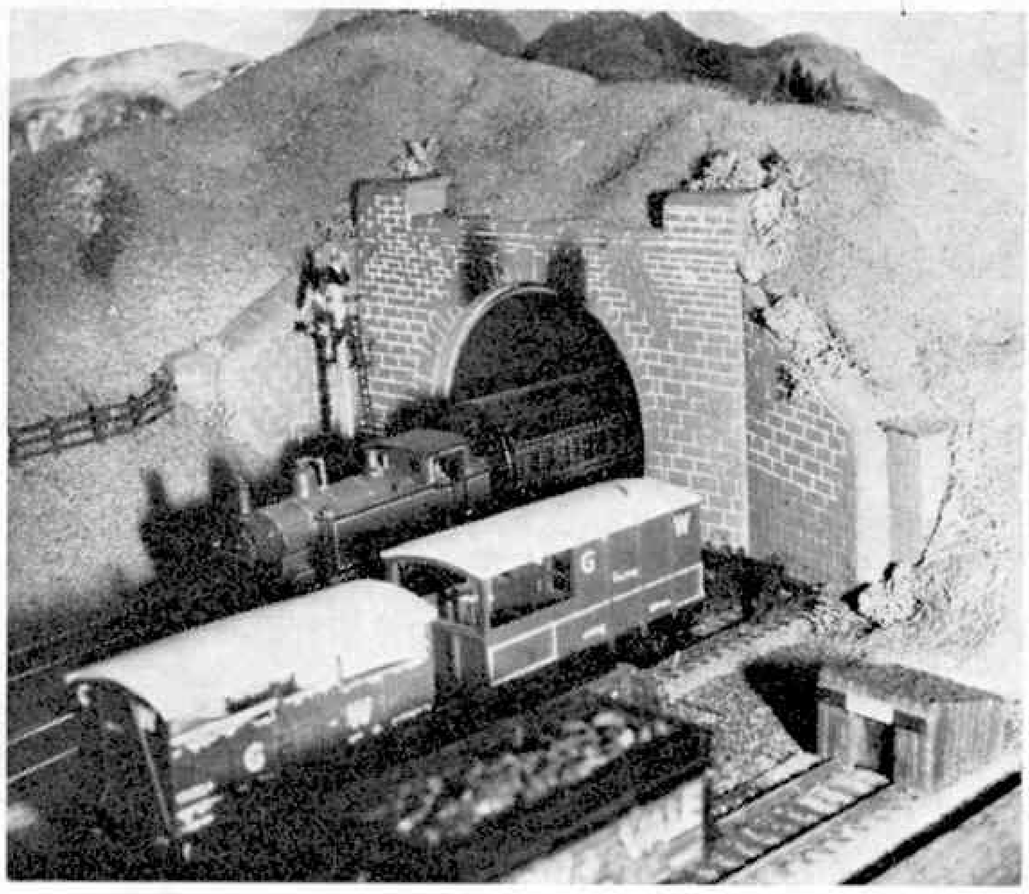
Coaches are available in pre-1948 liveries to match the engines mentioned above. Great Western (chocolate and cream livery) R743, R744, L.N.E.R. (teak livery) R745, R746; L.M.S. (maroon) R422A, R423A; Southern (green) R622A, R623A.

All the locomotives mentioned are also available in post-1948 British Railways colour schemes. Many readers of Meccano Magazine will not be interested in the old liveries, simply because they cannot remember them (it is a sobering thought that one must be in one's forties to have many real memories of pre-Nationalisation railways !).

Even the bang up-to-date "Inter City" trains are represented in the Tri-ang/Hornby range, including the new B.R. Mk 11 coaches (R723, R722) and electric locomotive type AL1 (R753). These vehicles are finished in the now familiar British Rail livery—blue and yellow for locomotives, and blue and grey for coaches.

The photographs of our layout include both "pre-war" and "modern" rolling stock, but it is not a very realistic proposition to mix periods in this way.

Tri-ang/Hornby freight rolling stock also covers a wide period of time, from the standard 4-wheeled wagons and vans (thousands of which are still running on B.R.) to the up-to-date and colourful Freightliner containers and "bogie flats". The car transporter which can be seen in the pictures is a typical example of a modern "special purpose" vehicle. Many motor cars are transported by rail these days—not only



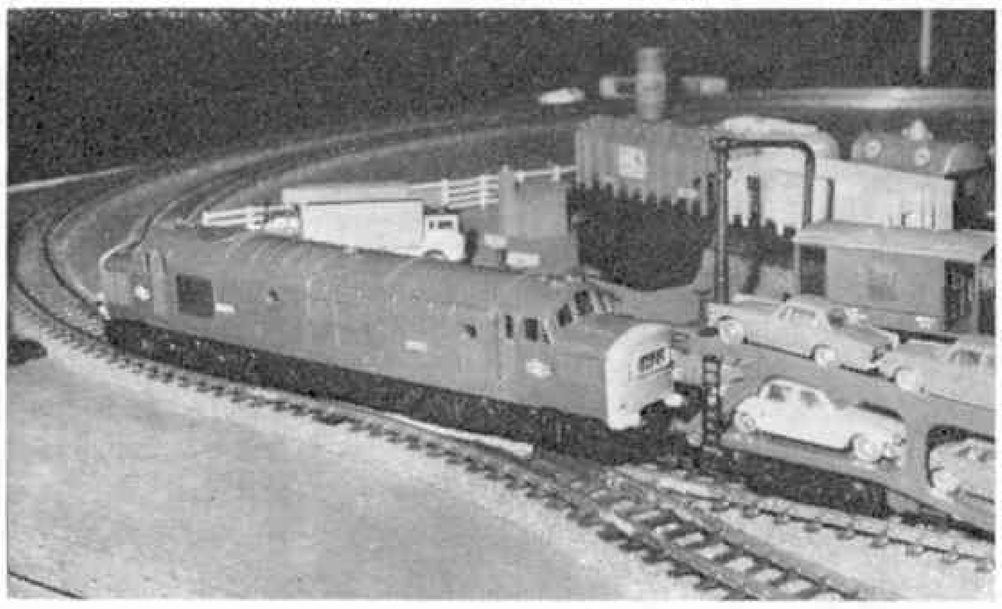
Close up of a typical tunnel mouth, acting as a divider between terminus and "fiddle" sidings.

holidaymakers' cars on "Motorail" trains, but also new cars en route from factories to consumer markets. The Ford Motor Company has its "own" trains for this purpose, which connect Dagenham and Halewood (Liverpool).

Choice of rolling stock for a model railway is the first requirement for realistic operations. "Steam" engines obviously should not run with Mk 11 coaches any more than an AL1 electric locomotive should pair with pre-Nationalisation coaches—it looks wrong, and it is wrong, and it is these small details of choice which make all the difference between a toy train set and a model railway.

In the first article in this series, we described how our small continuous layout could be operated in a reasonable realistic way, and we also hinted at the possibilities of "end-to-end" layouts as opposed to "continuous" ones.

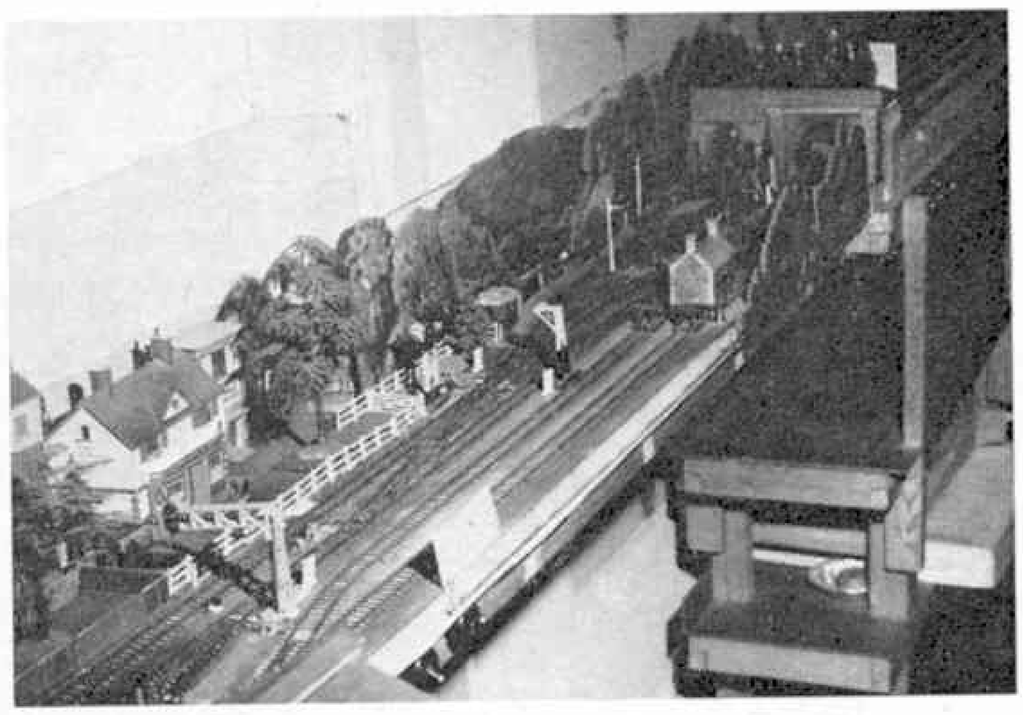
The continuous type of layout has one big advantage and an equally big disadvantage. The point in its favour is that trains can be set in motion, at speed and will circle the layout without any attention from



English Electric type 3 Co-Co Diesel Electric Loco hauling a freight train consisting of 4 of the new Freightliners.

the operator—you can just sit back and watch the action. The drawback is that the " action " can soon become very boring and, particularly if your layout is a small one, the constant gyrations of tarins is unrealistic, to say the least !

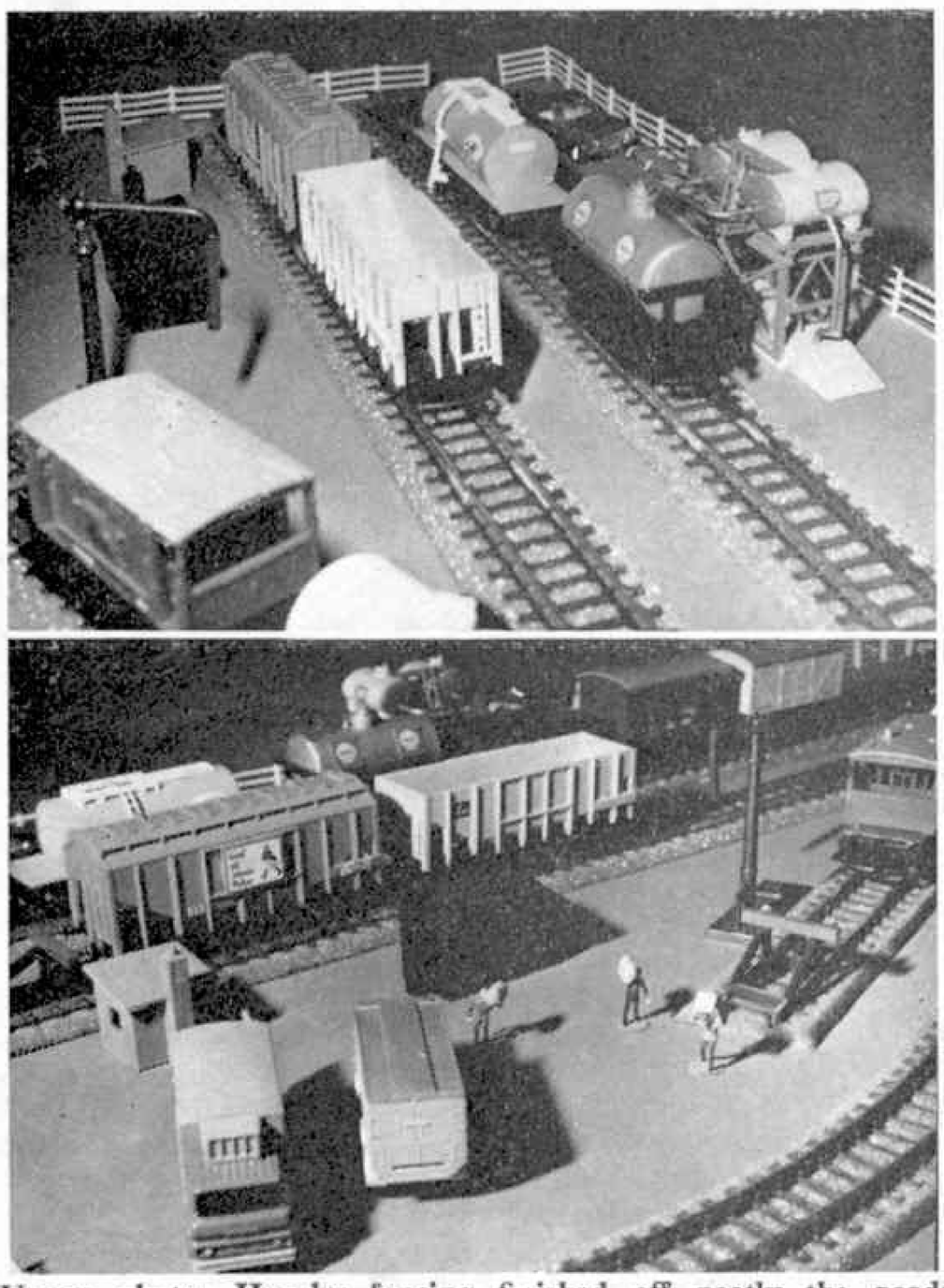
With an end-to-end layout, there is no " circle " or " oval " of track; as the name suggests, the track is simply laid from " end-to-end " of a long, thin baseboard. Admittedly, one has to have a space long enough for the layout (9 ft.-10 ft. minimum in OO gauge) but the width of the baseboard can easily be as narrow as 18 inches. The end-to-end design is very suitable for installing along one wall of a room,



View of an " end-to-end " layout built by G. F. W. Malham. The " fiddle " sidings can be seen beyond the tunnel mouths.

and the thin baseboards can be " sectionalised " into very handy modules (say 2 ft. × 1 ft. 6 in.) for easy transportation: The long and thin appearance of this sort of layout adds greatly to the realism of the model almost before you start—real railways, after all, are always that shape.

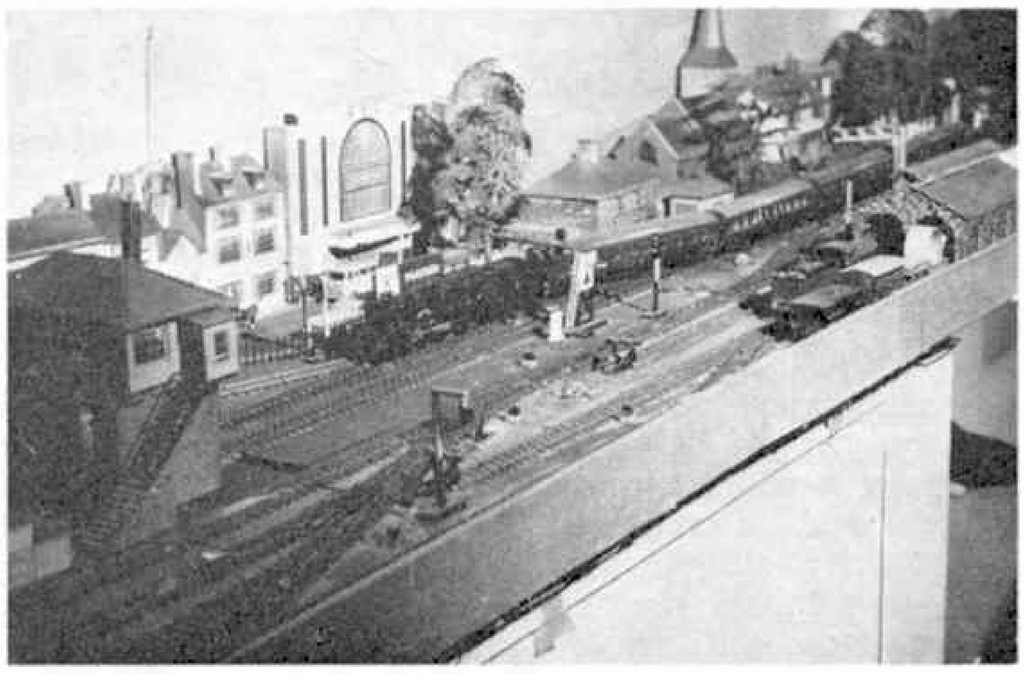
What about operating an end-to-end railway ? Well, at first one is bound to miss the advantages of continuous running, but soon all sorts of other, much more interesting, possibilities will come to light.

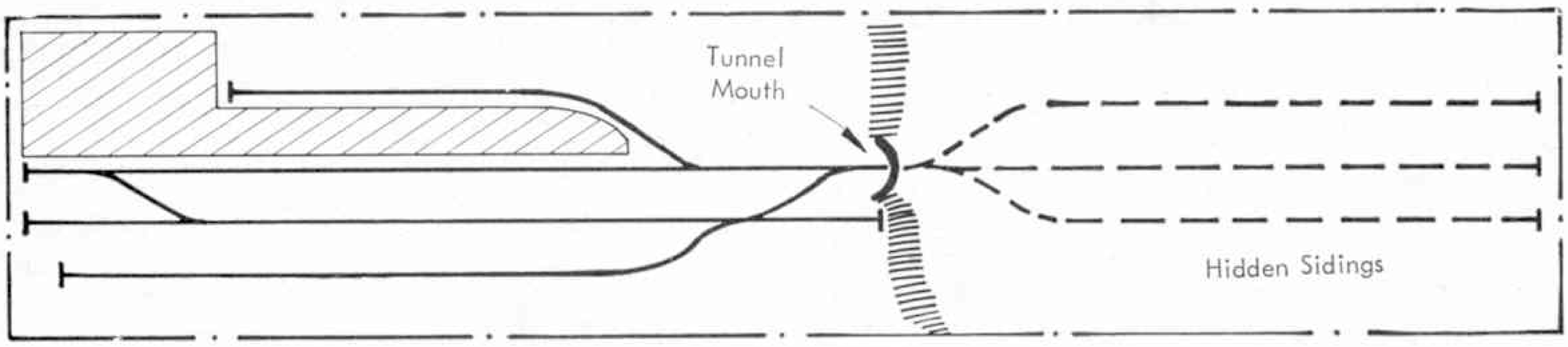


Upper photo: Hornby fencing finished off neatly the goods yard. MATCHBOX car, Hornby lineside huts, water crane and Faller Diesel Depot add to interest.

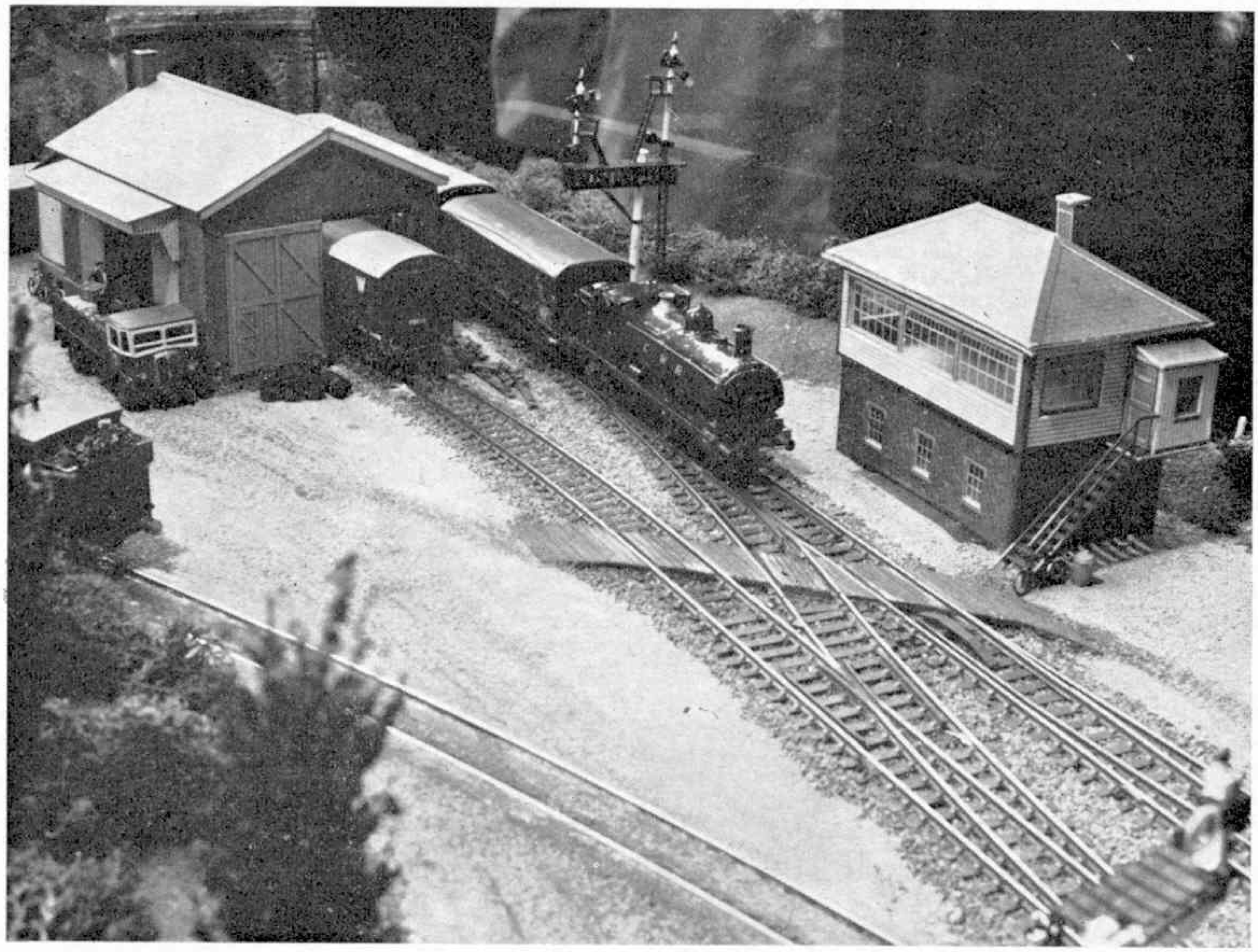
Lower photo: Hornby figures and more MATCHBOX vehicles create further realism.

View near the terminus station on the same layout. Note the narrowness of the baseboard and the " low relief " buildings which act as a backscene.





A simple end-to-end terminus station layout for a space 9' x 2'



The Station approach on a very nicely modelled Great Western branch line layout. Note the realistic " uncluttered " look, yet the baseboard is less than two feet wide.

Perhaps you saw the sketch of a simple layout of this type in the July issue? If you missed it, we print it again here. It incorporates a trick which is used a great deal on end-to-end layouts—that of the hidden or " fiddle " sidings. As you can see from the sketch, only about half the baseboard is " modelled "—only the station itself, in fact. The sidings on the right-hand end of the baseboard are hidden under scenery, and represent destinations " off stage " so to speak. The layout, ideally is worked by two operators. One runs the station itself, and dispatches trains through the tunnel portal on to the " fiddle sidings ", where the second operator receives it and sends a second train out to the station. If a screen separates the two operators, and communication is by " bell code ", then operation can be very railwaylike.

Our sketch shows a very simple branch terminus station suitable for end-to-end operation. It can easily be built up from Tri-ang/Hornby Super 4 trackwork. Only six points are needed (excluding the hidden sidings) and facilities include a main and " Bay " platform, runround loop, locomotive spur, and general siding. The run-round loop is the most important ingredient of any terminus, as it allows the engine of an incoming train to run round its train and take it out again.

Two controllers are required for a layout like this—one for the station and one for the hidden sidings. The electrical break should occur at the tunnel mouth. When both operators are experienced, and know where to set their controllers very smooth transitions can be made where the locomotive passes over the break between one controller and the other.

If any readers have their own ideas on layout design, whether " continuous " or " end-to-end ", we would be very interested to hear of them.

In this article we have shown a small selection of track layouts which can be built up from Tri-ang Hornby Super 4 sectional track. Readers who are interested in more plans (both simple and complicated) are recommended to read the Tri-ang Hornby book of Track Plans, which contains a large selection of very interesting schemes.

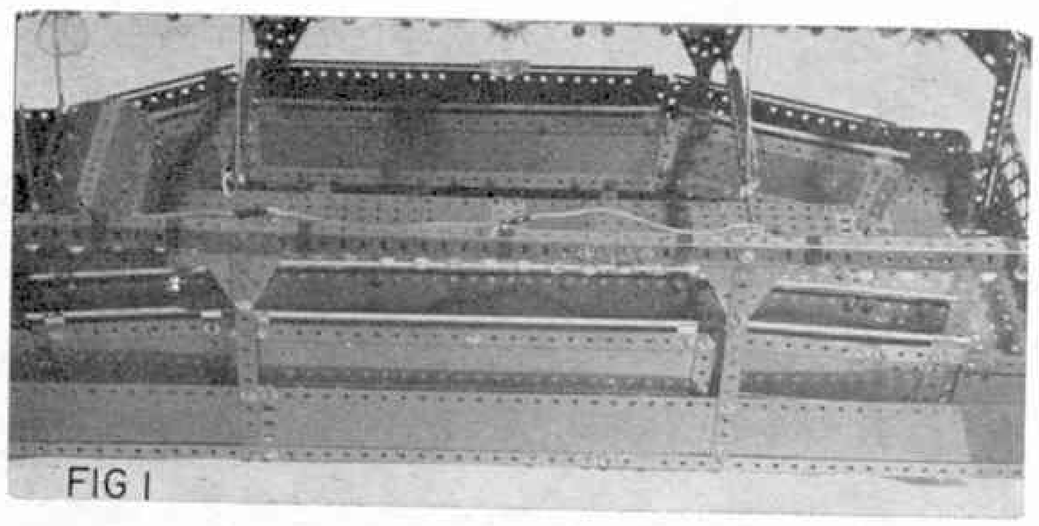


Fig. 1. A simple two-stage " Cake-walk ". Each platform is in three sections with slide bearings at each end and two hinged " breaks " on the walks.

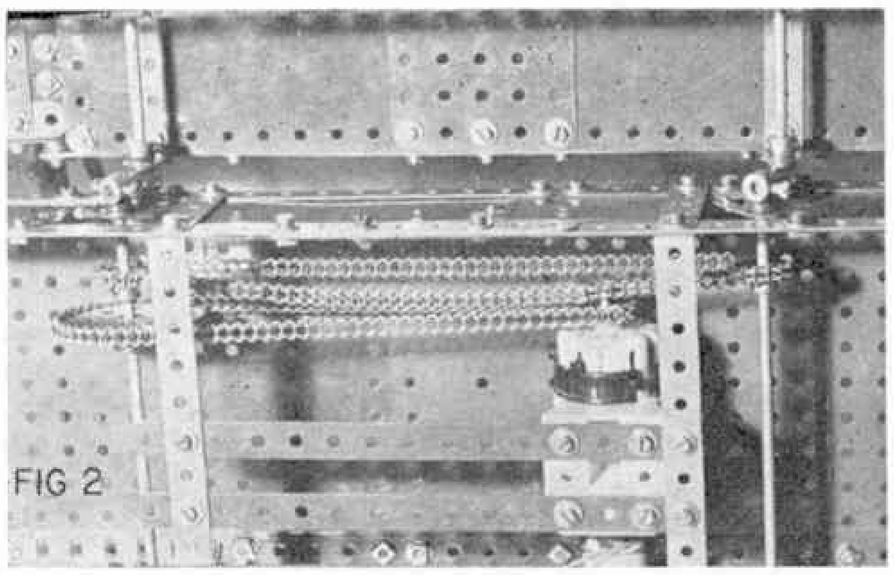


Fig. 2. The simple chain drive to the cranks under each oscillating platform in the " Cake-walk ". The crank rods extend to both platforms, but the Couplings forming the crank webs are off-set at either end.

MECCANO CONSTRUCTORS GUIDE by B. N. Love

Part 9: Fairground Machinery

HAMPSTEAD HEATH ON A BANK HOLIDAY, or any similar location, draws tremendous crowds to the traditional Fair which travels all over the countryside. The Public, as a whole, are fascinated if not spellbound by the huge fairground machines in motion and are always ready to place themselves at the mercy of these mechanical monsters to have their insides shaken unmercifully. Some excellent fairground models have been published in Meccano Magazine from time to time, with comprehensive descriptions of the special mechanisms required to produce the compound motions of such exciting machines as the " Octopus " or the " Satellite " and the fairground is a rich source for other Meccano modelling ideas. Mechanisms abound from the simplest oscillating or rotary motions to the complex compound motions, so that the enthusiast can work his way through the available fairground " rides " according to the parts at his disposal.

A great favourite of our forebears, young and old alike, was the " Cake-walk "—a pair of reciprocating platforms which were negotiated by the " walkers " with many a hysterical shriek from Victorian sporting ladies who ventured upon it. Its popularity survives to this day and is a simple subject to model in Meccano. Fig. 1 shows the general arrangement of the " walks " which are raised platforms, side by side, driven from below by a reciprocating mechanism that rocks the two sides of the Cake-walk in opposite directions—just to make the " walkers " ever more giddy as both walks

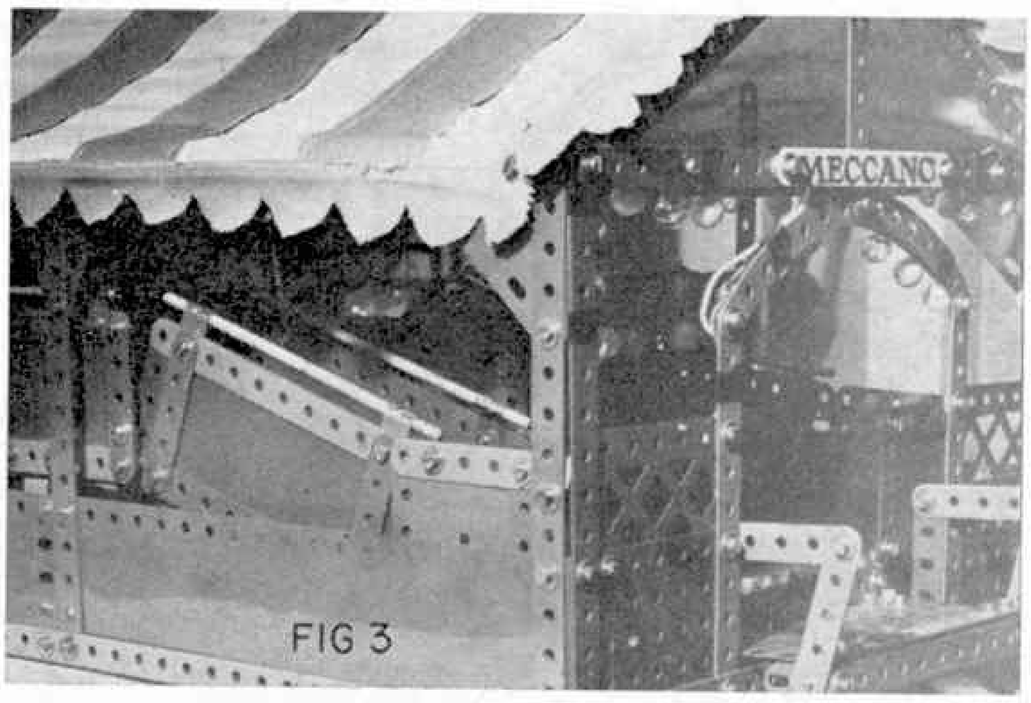


Fig. 3. A gay striped canopy and attractive entrance give added realism to fairground models. Note the " break " in the first cake-walk platform which occurs just before the attachment of the cranks from below.

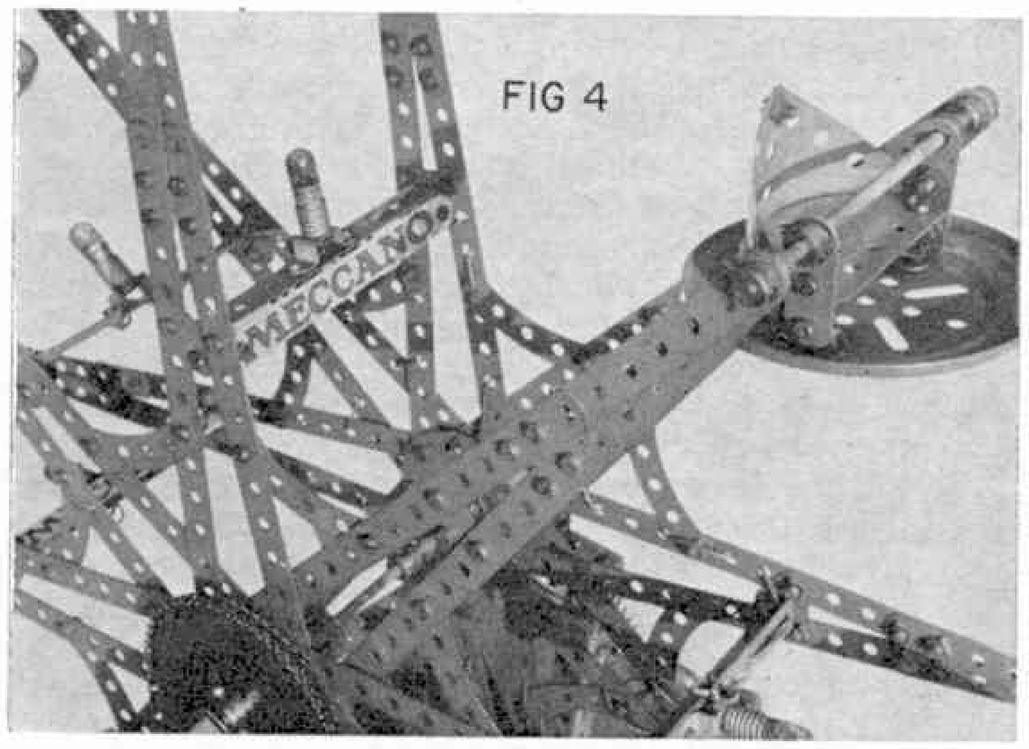


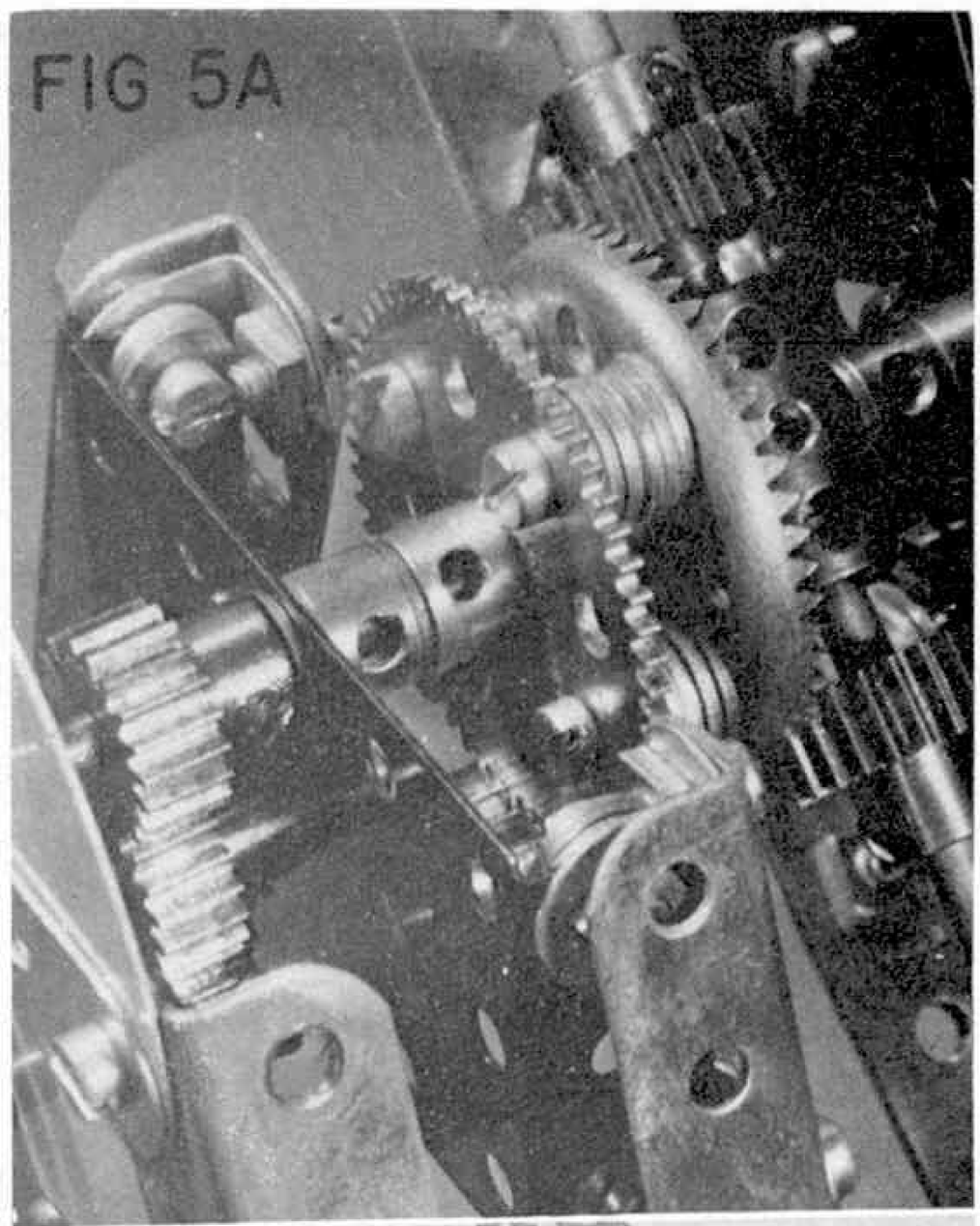
Fig. 4. A simple arrangement for the arms and passenger cars of an open Ferris Wheel.

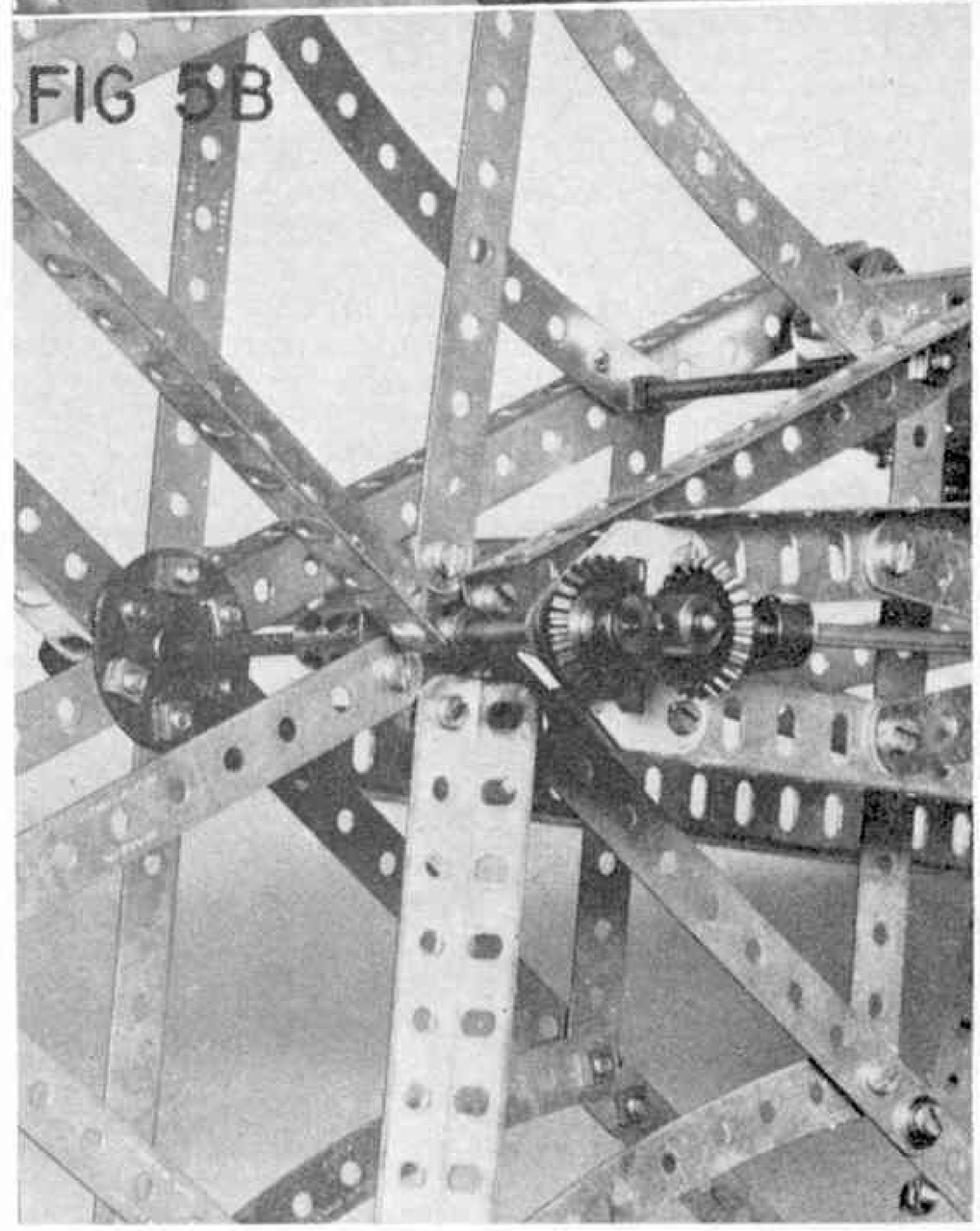
need to be negotiated before the exit platform is reached. Fig. 2 shows the simple arrangement of the mechanism which is driven through chain-drive and cranks by a 3-12 volt D.C. Motor with 6-ratio Gear Box. Although simple in principle, the Cake-walk is an attractive model and, when fitted with lights, a gay canopy of striped material, entrance steps and a pay-box, it has all the realistic flair of the genuine article.

The Showman's aim is to thrill and delight his customers or to exploit their human weaknesses for financial gain—according to one's point of view, but his machinery has remained basically simple for more than a hundred years. The simple Ferris Wheel is always well patronised, being an ideal 'stomach displacer' as the passengers ride through a great arc on its periphery, and this is another simple machine to model in Meccano. Various lengths of Perforated Strips, from 7½ in. upwards, are the most usual components for the wheel spokes, Face Plates forming central hubs to which the radial spokes are attached. A separation by 4½ in. Double Angle Strips would give satisfactory porportions to a wheel of about 20 in. diameter and this will accommodate eight passenger cars, or "cupolas", quite nicely. Fig. 4 shows one of the many variations of passenger cars suitable for Ferris Wheels, but these can be made in a variety of ways with some thought given to exploiting the more interesting shapes which present themselves in the range of Meccano parts.

An interesting development of the Ferris Wheel is the replacement of the main wheel with a rotating boom which carries a separate and smaller Ferris Wheel at each end. By arranging drives both to the boom and the wheels and selecting appropriate gear relationships, some very interesting geometrical paths are traced out by the unfortunate fairground devotee as he is hurled through equilateral triangles and other uncomfortable loci in a vertical plane, much akin to to those provided by the "Whip" at ground level. Fig. 5 shows a simple epicyclic gear mounted at the boom centre of such a contra-rotating "Double Ferris Wheel" which passes on the drive to the outer wheels in one of the geometrical paths outlined above. The 1½ in. Contrate Wheel is bolted to the 57-teeth Gear Wheel, both of which are free to revolve on the main central shaft, this shaft not only turning the main boom, but also passing motion to the Contrate Wheel via the ½ in. Pinion train shown. The 25-teeth Pinions meshing with the Contrate Wheel pass on the motion to the two separate wheels in the correct phase to give the desired locus of travel for each passenger car.

Very strong Ferris Wheels of large diameters can be built from standard Meccano parts if the enthusiast is in a position to command a large collection of parts. Axle Rods joined by Couplings provide spokes which can build up a 6 ft. diameter wheel of elegant proportions. By using hub cheeks made of 3 in. Sprocket Wheels, to which 3½ in. Gear Rings are bolted in spaced pairs, a 32-spoke hub is quite easily constructed. The Axle Rods forming wheel spokes are fitted with Strip Couplings which are, in turn, fastened by Meccano Hinges to the peripheral holes of the Gear Ring. This hinge arrangement allows all of the spokes to be doubled up by using two hinges at one hub anchoring point and allowing for one spoke to go straight out to the rim of the Ferris wheel, or to be slightly angled to give a 'dished' construction, while the inside spoke from the same hinge root goes across at a greater angle to meet the wheel rim on the far side. This gives very strong bracing to the wheel and is the method employed on demonstration models





Upper: Fig. 5a. A simple, but effective epicyclic drive for contra-rotating Double Ferris Wheels.

Lower: Fig. 5b. The Bevel drive to the individual wheels on the rotating boom of a Double Ferris Wheel. This drive is taken from the ¾ in. Pinions shown in Fig. 5a.

Fig. 6. Giant Ferris Wheels of 6 ft. diameter and more can be built by liberal use of Rods and Couplings. Heavy hub sections are constructed from 3 in. Sprocket Wheels and 3½ in. Gear Rings. Note the built-up central shaft reinforced with long Screwed Rods which runs in " square " bearings as described in the text.

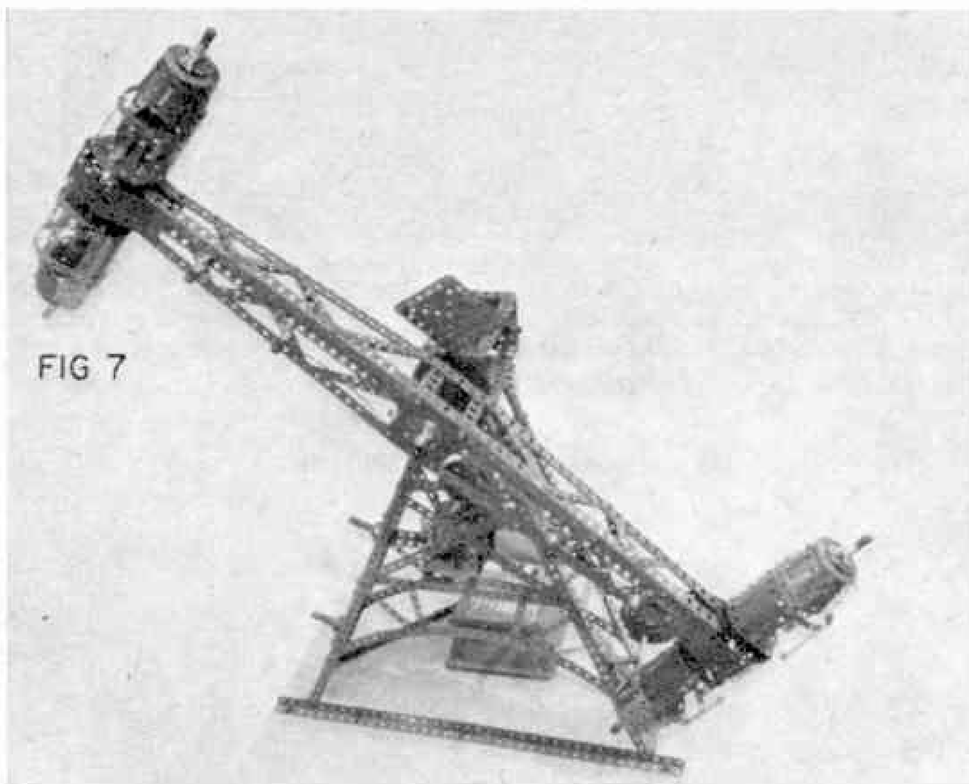


Fig. 7. Whirling " Torpedoes " make a fascinating display model with revolving aerocars driven through simple gearing.

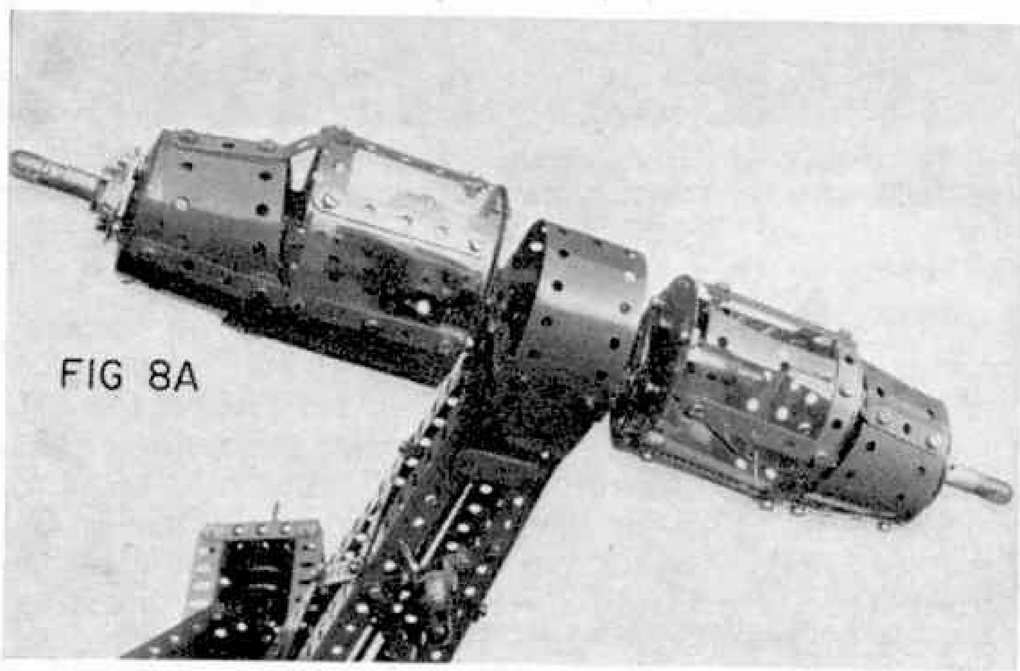


Fig. 8a. A pair of cars from the " Torpedoes " fitted back to back on the same shaft. Passenger seats and " navigation " lights add to the realism.

which have to run for long periods in exhibitions. Fig. 6 shows a portion of such a wheel.

As a diversion from the contra-rotating Double Ferris Wheel, the rotating boom has been put to good use in an even more fiendish piece of machinery in the shape of the " Torpedoes ". This makes a fascinating Meccano model and requires quite simple gearing. The general arrangement of the passenger cars is shown at the boom end in Fig. 8a. Apart from rotation of the main boom, each passenger car revolves on its own axis, thus imparting a helix, or screw-form locus in a circular orbit to the passenger. This type of machinery can have the boom supported between large ' A ' frames but the overhang, or cantilever form shown is quite common and is often designed in this manner so that the vertical plane in which the boom rotates can also be given a tilting motion just to add to the thrills.

While the section of the model illustrated in Fig. 9 is confined to vertical plane rotation, the cantilever or over-hung central shaft must be of substantial proportions. It is, in fact, made from long Screwed Rods and Wheel Discs, the Rods themselves passing right through a large bearing at the front of the model. This means that the shaft on which the boom is carried is almost the diameter of a Wheel Disc—some 1½ in. diameter, although its construction is in cage form. The important part is the front end bearing which really carries all the weight of the rotating structure. This is simply a square box made from 1 × 1 in. Angle Brackets mounted in a framework of short Angle Girders with Nuts and Bolts selectively placed in the corners of the assembly, where they will not foul the large-diameter compound axle. By placing several thicknesses of Wheel Discs together on the Screwed Rods at this point, a large rolling surface is rotating inside of a ' square ' bearing—unorthodox, but quite strong and efficient at low speed, so long as the bearing is packed with grease. Motor car grease is quite suitable, but oil must be avoided. Long Screwed Rods pass right through the eight holes available in the 3 in. Sprockets and into a thick sandwich of 8-hole Wheel Discs at each end of the main axle assembly. A ' square ' bearing is mounted at the top of each massive ' A ' frame and the support given is quite adequate for the heavy wheel revolving at the low speed of a fairground model.

In the case of the cage shaft used for the overhanging boom of the " Torpedoes ", only one of these ' square ' bearings is used, i.e. at the front, where the main weight is carried. Running through the centre of the cage shaft is a fixed Axle Rod secured in a Bush Wheel bolted to a 2½ in. square Plate at the rear of the model. This allows a pair of 8-hole Wheel Discs at the rear end of the cage shaft to rotate on a " dead " centre and at the same time to be held in place literally by a pair of Collars, thus positioning the other Wheel Discs at the other end of the cage in the correct lateral position inside the front ' square ' bearing. The fixed centre Axle Rod runs right through into the centre structure of the rotating boom where it holds a fixed 1½ in. Contrate Wheel. A pair of ½ in. Pinions run round the fixed Contrate Wheel in epicyclic motion to pass on rotation to the aerocars or torpedoes through the long Axle Rods in the arms of the boom. Final drive to the cars is by Pinion and small Contrate Wheel, as shown in Fig. 8b.

Traditionally, the central feature of all fairgrounds for more than a hundred years is the Roundabout, Carousel or Gallopers and these machines offer an excellent subject for Meccano Modelling. Fig. 10

shows just one of the hundreds of examples of which the Meccano system is capable and the model illustrated is built as far as possible on the lines of basic prototypes. Meccano models have appeared from time to time employing a heavy base turntable and this is basically wrong as the showman could never transport such a heavy turntable across country. Instead, for the early types of travelling fairs, a pivot truck formed the centre of a set of gallopers. The truck carried the steam engine, to drive the " ride ", as well as the smoke stack and the central " mast ", or pivot, on which a heavy crown wheel and bevel gearing was mounted. The truck wheels and frame were heavily shored and wedged with timber to give a stable centre pivot and the sections of the roundabout were suspended from ' spider ' arms rigged to a stout centre mast through which the exhaust gases from the steam engine were vented.

Although modern gallopers are fitted with electric motors and electrically-driven " steam " organs, traditionally they still follow the centre truck design. Fig. 11 illustrates the heart of a Meccano roundabout capable of driving 24 gallopers. The centre support is an octagonal pillar made from Ange Girders and Flexible Plates on which a Circular Girder is mounted. A simple ring roller race made from Curved Strips carries eight ½ in. Pulleys, over which a second Circular Girder runs on a self-centring path. This second Circular Girder is reinforced with short Strips and Flexible Plates to form an octagonal ' skirt ' which revolves outside the central octagonal pillar. Bolted to the top Circular Girder are eight 1 × 1 in. Angle Brackets carrying free-running ½ in. Pinions on Short Threaded Pins fixed in their horizontal lugs, the vertical lugs providing a thrust bearing for ¾ in. Contrate Wheels in direct mesh with the Pinions. As the roller race carrying the ½ in. Pulleys is " hollow ", a 3½ in. Gear Ring may be secured rigidly at the top of the central pillar by a series of Reversed Angle Brackets.

The object now is to get the whole superstructure revolving about the fixed gear ring so that the eight ½ in. Pinions will run round the ring and pass on their motion to the Contrate Wheels. Both in the large-scale machine and the Meccano model, the superstructure has very considerable inertia, i.e. resistance to motion when in the stopped position, and, as the drive must be transmitted from the centre of the roundabout, considerable torque must be supplied. This asks a great deal from a Meccano-size Axle Rod, but the hollow centre bearing lends itself to the ' cage ' axle design already described. If a single Axle Rod is used for the central drive, adequate means must be provided for securing driving gears etc. to the Rod. It must also be suitably geared by providing a large Gear Wheel of 2½ in. or 3½ in. diameter at its lower end and this should be reinforced with a Sprocket Wheel with a large boss to give a total of four Set Screws gripping the Axle, the Sprocket Wheel being bolted directly to the large Gear Wheel. At the upper end of the central Axle Rod, two Face Plates are provided, careful fitting of which is very important. The lower Face Plate carries eight ½ in. Angle Brackets to form inner bearings for the 3 in. Axle Rods carrying the Contrate Wheels, and the height of this Face Plate is adjusted to give a slight tilt to the 3 in. Rods for easing the meshing between Contrates, Pinions and Gear Ring. It is then locked into place with two Set Screws. The upper Face Plate carries eight 7½ in. Perforated Strips (only four shown in Fig. 11 for clarity) which are slightly " sprung " by long Bolts

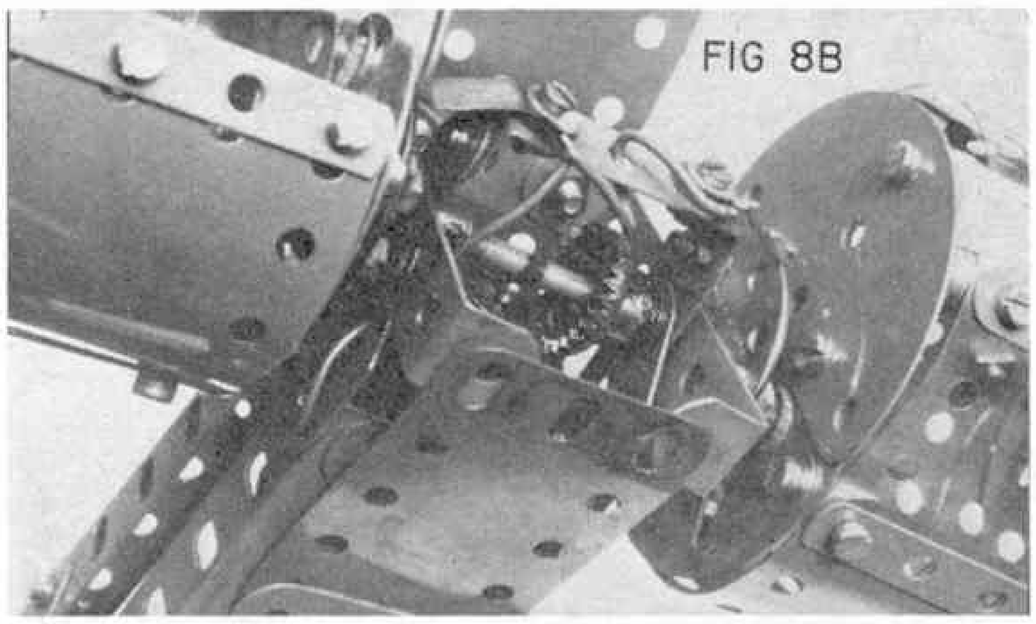


Fig. 8b. Close up view of the Contrate Wheel between the Torpedo's passenger cars with flexible cover plate removed. This gear receives a drive from a ½ in. Pinion fitted to a long Axle Rod running to a 1½ in. Contrate locked to a stationary Rod at the centre of the rotating boom.

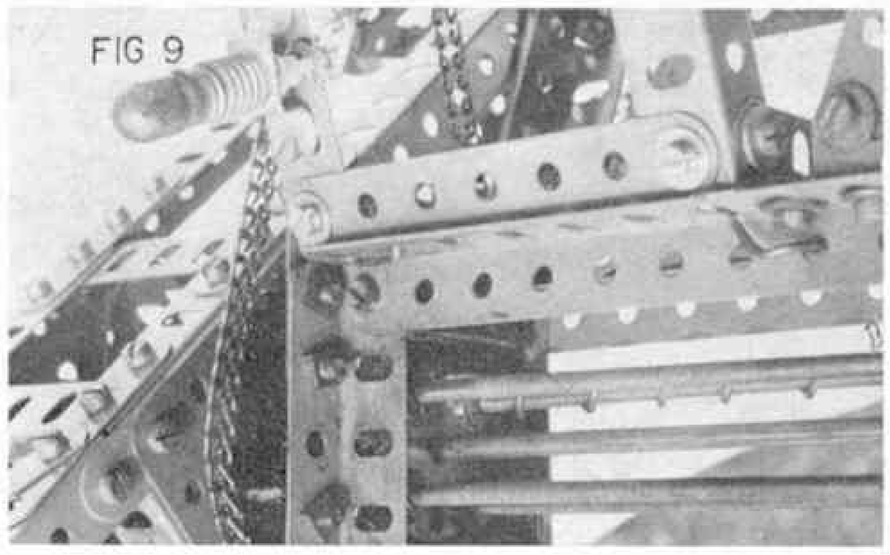


Fig. 9. The ' cage ' shaft built from Screwed Rods and stacked Wheel Discs which supports the overhanging rotating boom for the " Torpedoes " in the ' square ' bearing mentioned in the text.

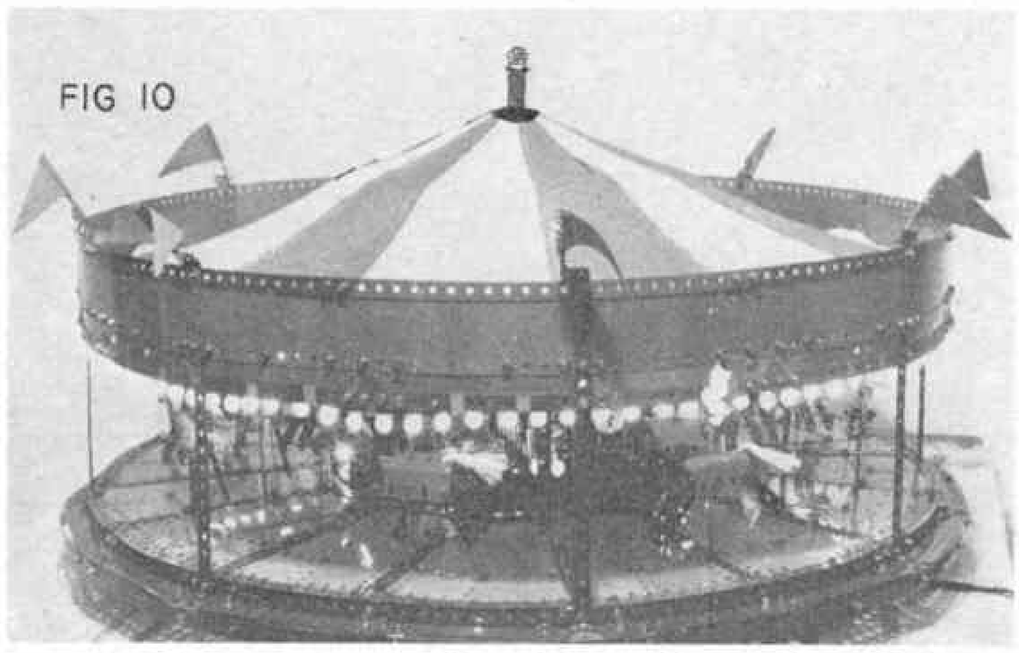


Fig. 10. The ever popular Roundabout, Carousel, or Gallopers —a challenging Meccano subject. Canopy, flags and chimney details again add to the realism.

at their extremities to support the rotating superstructure. However, as these suspension arms pass out through gaps *between* the Contrate Gears, the top Face Plate must be staggered between the holes of the lower Face Plate and must also be locked to it to form a solid hub. This is done by means of four ½ in. Reversed Angle Brackets. We now have four Set Screws (or long Grub Screws) available for securing the hub to the Axle Rod. By this method, standard parts provide all the grip required without the necessity of filing flats on Axle Rods.

Continued on page 517

SWEDEN'S ARCTIC STAMPS .... by James A. Mackay

THE ARCTIC CIRCLE cuts right across Sweden from Vuoggatjalme in the west, through Jokkmokk to Juoksengi, 50 miles north of the town of Haparanda, in the east. North of that line lies an eighth of Sweden, supporting barely one per cent of the country's population. Most of the land is barren, consisting of sparse forest, bog and bare mountain. Where the soil is tilled it seldom yields more than enough food for the farmer's household. One source of livelihood in the far north is reindeer. A herd of reindeer, guarded by a semi-nomadic Lapp, is the subject of one of a series of stamps issued by Sweden on June 5th. The series consists of five 45 ore stamps publicising Sweden's Arctic territory.

The vast herds of reindeer, many numbering up to ten thousand, still follow the ancient pattern of migration: mountain pasture in summer and foraging for mosses and lichens in the forests in wintertime.

Six of Sweden's sixteen national parks, including the three largest in Europe, lie north of the Arctic Circle. They offer research material to the naturalist and outdoor recreation to the sportsman and tourist. Two of the stamps feature the recreational aspects of Sweden's far north, one showing a group of skiers and the other depicting a lakeside scene, representing the winter and summer aspects of the Arctic.

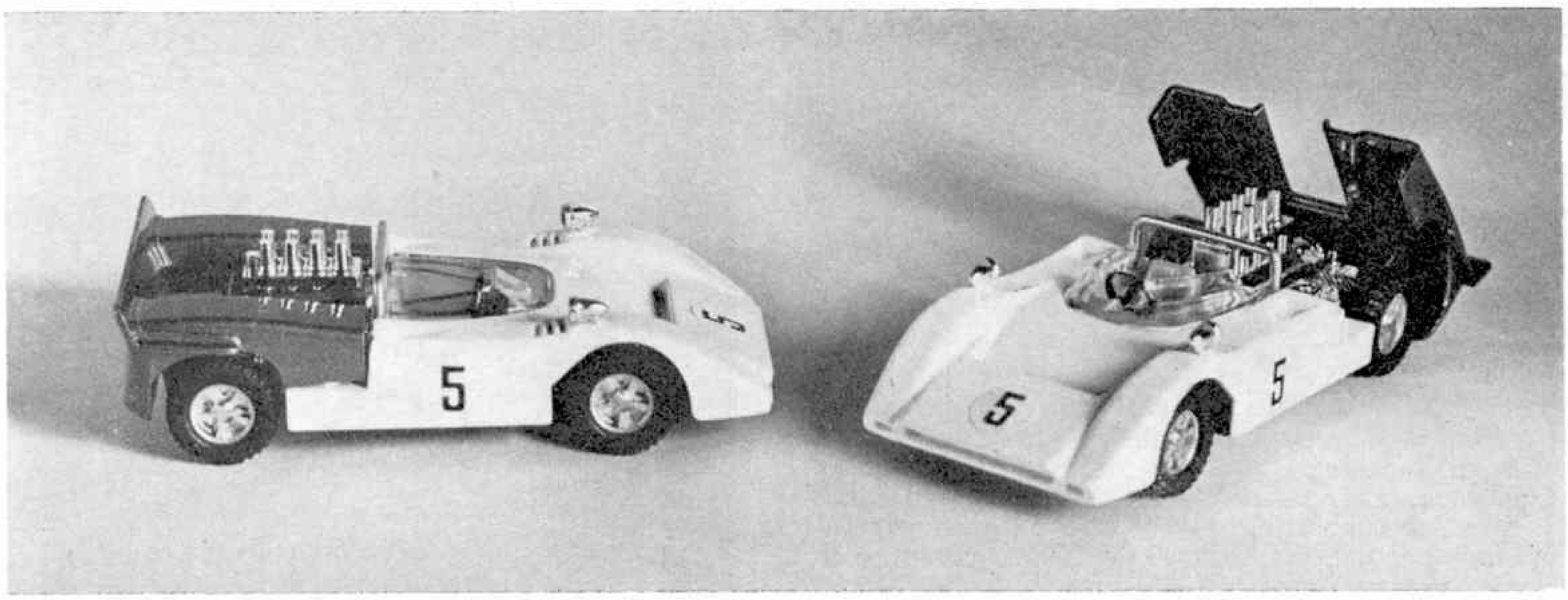
The remaining two stamps are concerned with the development of the Polar regions, and particularly the region around the town of Kiruna. A view of this bustling city of 30,000 inhabitants is shown on one of the stamps. Kiruna, some 90 miles north of the Arctic Circle, has an urban area of 5,000 square miles and is, in fact, the biggest city in the world. Within its civic boundaries both London and New York could be amply accommodated, although most of its citizens reside in a fairly small built-up area on a slope between the iron-ore mountains of Kiirunavaara and Luosavaara.

Mining is the basis of the existence and prosperity of Kiruna. The iron ore lodes are the biggest of their kind in the world, and of an extremely high quality. Since a "Klondyke" period at the end of the nineteenth century Kiruna has developed into a busy modern town boasting many fine buildings and amenities. The winter season is characterised by a seven-week period of almost complete darkness, relieved only by the fantastic auroral displays which brighten the whole sky with flaming curtains of light. The summer season, on the other hand, has a period of uninterrupted daylight, lasting from the beginning of June to mid-July.

The nearby North Magnetic Pole attracts showers of charged particles, emanating from solar flares, which collide with the earth's atmosphere. To this district come scientists from Sweden and other European countries as well as aerospace research teams to launch their rocket probes into the flaming auroral skies. Located about 27 miles east of Kiruna is the ESRO (European Space Research Organisation) Sounding Rocket Launching Range, known as Esrange. ESRO, with its headquarters in Paris, is an intergovernmental organisation formed by ten European countries including Britain. The purpose of the organisation is to provide and promote collaboration among European states in space research and technology exclusively for peaceful purposes. One of the stamps in the present series shows the launching of a Skylark rocket, with the Aurora Borealis in the background.

A special First Day postmark was used in connection with this series at Kiruna. The device showed a pickaxe as a symbol of iron-mining and a rocket symbolising the activities of Esrange. These emblems were set against a globe, drawing attention to the world-wide distribution of Kiruna's iron and to the fact that true science knows no national boundaries.

If you travel by train from Boden to Kiruna you will suddenly notice the train slowing down and the engine emitting a whistle, to mark the crossing of the Arctic Circle. At that point there is a line of white stones and a special signpost. Nearby is the little village of Polcirkeln (Pole Circle). In view of its rather special geographical location this village has a pictorial postmark the only one in Sweden with the inscription in English as well as Swedish. The handstamp shows the Arctic Circle and is thus inscribed in English. Incidentally another Arctic postmark worth looking out for is that used at the North Cape in Arctic Norway. Inscribed NORDKAP it also has pictorial motif and is a favourite souvenir with tourists making the Midnight Sun cruise along the Northern coast of Norway to Spitzbergen.



DINKY TOY NEWS

by Chris Jelley

'THE WORLD BEATERS'

OFTEN HAS IT BEEN SAID that the British Aircraft Industry is fast dying out; that the plane-makers who so often led the world with aircraft like the Spitfire, the Meteor, the Canberra, the Hunter and the Lightening—not to mention the world's first commercial jet airliner, the Comet—are past their inventive peak; that Britain, which was so often first, and frequently provided the best in the air, is steadily dropping lower and lower in the list of air-minded nations. Often has it been said—and often has it been proved wrong! Admittedly, the British Aircraft Industry is not as active now as it has been in the past, (having been reduced by unfair overseas competition, coupled with the political decisions of government, rather than by lack of ideas or ability), but it is far from dead, producing, as it does, some of the finest aircraft in operational use today. As to British plane-makers, they can, and still do lead the world—a fact which is proved beyond all doubt by the fantastic new aircraft just going into service with the Royal Air Force, the Hawker Siddeley Harrier V/STOL "Jump Jet".

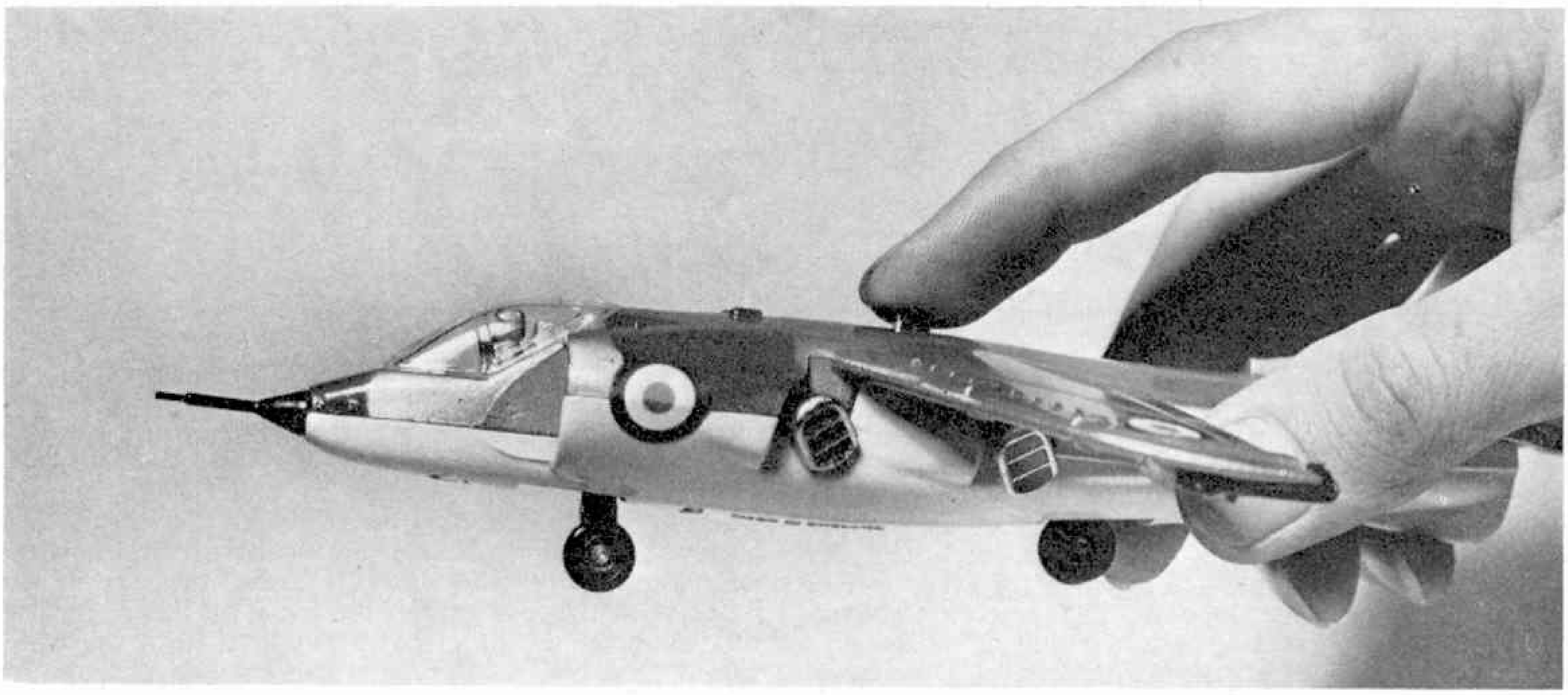
The Harrier is quite the most amazing aircraft in the world. It completely revolutionises the whole concept of air warfare by being a true jet aeroplane—not a helicopter—which can *land and take-off vertically*! Never in the history of aviation has there been a fixed-wing aeroplane capable of vertical take-off and landing (VTOL)—until now, when Britain has broken through an almost insurmountable barrier to achieve the unbelievable. With the Harrier, Britain, which has led the world with so many things, has been first again, and Dinky Toys, who have so often led the die-cast world, now net another die-cast "first" with a superb model Hawker Siddeley Harrier, just released under Sales No. 722.

In real life, the VTOL characteristics of the Harrier are achieved by the four jet thrust nozzles of the aircraft's mighty Rolls-Royce Bristol Pegasus engine being movable. By using a hand lever in the cockpit the pilot can swivel the nozzles through an angle of no less than 98.5 degrees, thus changing the direction of thrust from a straight-back attitude right through the vertically-down attitude, to an attitude pointing several degrees forward. This means that, not only can the 'plane be manoeuvred vertically, as well as being flown forward as a conventional aircraft, but it will also move backwards!

Obviously, the advantages such manoeuvrability gives the Harrier over "normal" aircraft are tremendous, but perhaps the most important aspect of all is the fact that the Harrier need not operate from an airfield. Because it can take off and land vertically, all it requires is a small patch of solid, level ground, and, as something of this sort can usually be found everywhere, it means, in effect, that the Harrier can operate right in the front line of action. The only time it cannot take off vertically is when it is carrying a full payload of fuel and bombs or rockets and, even then, it requires only a very short take-off run of from 600 ft. to 900 ft., compared with a runway of some 7,500 ft. required for comparable "conventional" aircraft. This short take-off characteristic under load combines with the vertical take-off and landing characteristics off-load to give the Harrier its official V/STOL. (Vertical/short take-off and landing) designation.

Once in the air, the Harrier is guided to its target with the help of a highly-accurate, self-contained navigational system. Upon arrival, its "punch" is delivered with pin-point accuracy by a computer-controlled automatic weapon aiming and release system. The "punch", itself, is formidable, the Harrier being armed with two 30 mm. Aden Machine Guns and capable of carrying in addition either rockets or bombs to a total armament weight approaching 8,000 lb.—for a single-seater combat aircraft, that's some attack power!

In miniature form, the Dinky Toy Harrier is not,



Heading photograph shows a pair of the super new McLarens and above, Dinky's new Hawker Siddeley Harrier.

of course, armed, nor will it actually fly, but it certainly qualifies as a first-rate scale model, closely following the distinctive lines of the full-size original with its swept-back anhedral (downward angled) wings and long fuselage made quite " tubby " by the large engine air-intakes. Produced to 1/72nd scale, it is a good, solid model with a wing-span of $4\frac{5}{16}$ inches against a length of no less than $7\frac{3}{4}$ inches—remarkably short wings for such a long fuselage. The standard and accuracy of reproduction alone, is enough to make the Dinky a best-seller, but the new model has much more to offer than just appearance. The big thing about the original is its swivelling jet nozzles, so, sure enough, the Dinky is fitted with swivelling jet nozzles which swing together, controlled by a small button sliding in the top of the fuselage. And that's only half the story ! The model is also fitted with an automatic, full-retractable tandem undercarriage which works in unison with the jet nozzles, controlled by the same operating button ! With the undercarriage lowered, the jet nozzles point downwards in the landing attitude; as the undercarriage is raised by sliding the control button forwards, the jet nozzles swing backwards to the level-flight attitude. When the button is pushed rearward, the nozzles swing downwards, the undercarriage lowering at the same time. In real life, of course, the undercarriage and jet nozzles are controlled quite independently of each other, but in most flying circumstances, the Harrier pilot would usually raise and lower his undercarriage at the same time as he altered the jet nozzle direction, making the linked arrangement in the Dinky Toy perfectly acceptable.

An interesting feature of the Harrier is its tandem undercarriage, consisting of a single nose-wheel and a single, twin-wheel main wheel assembly, both situated in line with each other under the fuselage. Obviously with such an arrangement, the aircraft could easily topple over, and so the Harrier is also equipped with two small stabiliser wheels, one at each wing tip, on long legs which can be lowered for landing and raised to trail behind the wings during flight. Not to be outdone, the Dinky is also equipped with these stabiliser wheels which can be raised and lowered independently by hand. The final touch is given to the model by a beautifully-finished pale blue and green camouflage colour scheme on the top and side surfaces and by a pale grey on the under surfaces. R.A.F. roundels and markings in full colour appear on the wings, fuselage and fin. All this combines to make the new Dinky a world-beating model, just as the real " Jump Jet " is a world-beating aircraft.

New Racing Car

Having chatted at great length about the Hawker Siddeley Harrier I haven't left myself much room to report the introduction of another new Dinky Toy which has been released with the Harrier—the McLaren M8A Can Am, Dinky Toy No. 223. Much room or not, however, the Can Am is still an excellent model and it comes as a sort of Dinky tribute to the late Bruce McLaren, the New Zealand born racing driver who was killed so tragically in June while testing a new car on the Goodwood fast track in Chichester. The real Can Am was built and developed by Bruce McLaren's own company, Bruce McLaren Motor Racing Ltd., and is quite distinctive for its rather squarish shape and huge rear-mounted Chevrolet engine projecting through the top of the engine cover. The Dinky Toy captures all the distinctive lines of the real thing and comes complete with a detailed bright-plated engine moulding, this also projecting through the engine cover. The cover, itself—indeed, the whole rear section of the body—hinges backwards to allow access to the engine.

Just forward of the engine is the driver's cockpit, fitted with a full moulded interior and black steering wheel, the whole enclosed by a complete wrap-around glazed windscreen. The windscreen, itself, is an unusual shape to leave room for the off-centre driver's position. Immediately behind the cockpit is a roll bar to protect the driver in the event of the car turning over, while, forward of the cockpit, one on each front wing, are two racing-type wing mirrors. Speedwheels —the obvious choice for a Dinky racer—are fitted as standard, the wheels themselves being equipped with wide racing tyres. Finish is in a gleaming white gloss, with red cockpit interior, black base and metallic blue engine cover, three grilles built into the rear of the engine cover being painted in a gold colour. The racing number " 5 " appears on each side and on the nose of the model to round it off nicely. In short—a fitting model for any miniature racing stable.

BATTLE

by Charles Grant

Part XXIX

The effect of terrain on the rules

WHEN WE DISCUSS just how terrain can influence our wargame rules, I have to repeat yet again that the effect we consider will generally have to be a standard one. By this I mean that, when we place one of our 'hills' on the battlefield, i.e. the wargame table, we must perforce consider it as being of an average sort of steepness, if such a thing exists. It is not easy —although it is possible—to legislate for every sort of hill from the gentle slope to the precipitous cliff, and such an undertaking would result in a body of rules approaching in bulk the Oxford English Dictionary. Hills, obviously, come in every conceivable shape and size, but the more extreme can be readily ignored. The very slight slope which has little retarding effect on a man moving upwards on it and the totally inaccessible cliff are not necessary for our purpose. The latter can, of course, be catered for if required for some commando operation and such like, but this is not for us at the moment. What we want is a hill which, although it can be mounted by infantrymen without their having to drop on all fours, will nevertheless cause them to climb it at a rate notably slower than their normal progress along the flat.

Incidentally, it is only fair to announce that, as far as infantry is concerned, I have personally done all sorts of checking rates of ascent and descent—to see the writer rushing up and down various hills with a stop watch clutched in has hand was quite something.

Anyway, since we determined in Part XXVIII—a euphemism for my forcing my preference upon the reader—to proceed in the belief that the 'contour boards' described therein were the best means of reproducing hills on the table, we shall carry on in accordingly. If we consider our contour board in terms of a map, we shall find that on most British maps—the Ordnance Survey type—the contours represent an increase in height of 50 feet, i.e. the difference between two contours represents an increase in altitude of 50 feet. Let us say that our contour board has the same effect—one will then indicate a hill 50 feet in height, and two blocks, one on the other, will be a hill of 100 feet. To get the whole picture, this has to be considered together with the gradient of the hill and the effect it will have on movement. Perhaps the diagram —No. 1—will show what is meant. In our case the summit can be seen to be higher than 50 feet (it is not a plateau) but the edge of the contour can be taken as a very suitable spot where we can operate the delay resulting from the reduction in speed through climbing. The experiments (?) with a stopwatch I have mentioned show that a gradient of about 1 in 10 is a most suitable one for our purposes as it takes approximately twice as long to climb such a slope as it does to get over the same distance on level ground. This, I say again, comes from my own personal and fatiguing observations, but they are substantially accurate.

During a war game, then, if infantrymen are climbing such a slope—the one we have decided to take as a 'standard'—their speed will be halved, so that, instead of the normal infantry move of 3 in., it will, in fact be 1½ in. We have to express this in terms of our particular type of terrain, and the most suitable way of doing this is to say that, on the move during which a contour is crossed—in an upward direction, needless to say—the move is reduced by half. For example, when a body of infantry on foot arrive at the end of a move at a point 1 inch from a contour, then, on the next move, when they actually cross the edge of the block, their move is only 1½ inches. This means that, in this example, the infantrymen—1 inch from the edge, would be placed on the move half an inch in from the edge, making the whole move the required 1½ inches. Once over the edge, then progress on the contour is as normal. This curtailment of the move applies to all vehicles as well as the chap on foot. Take the case of a tank with a cross-country move of 8 inches. When crossing the contour—on the way up—the move would be reduced to 4 in. Naturally, if a road crosses the hill, then it would be the 'road move' which would be cut by fifty-per-cent. Downward movement is not affected by our gradient.

The second tactical consideration applicable to hills is its effect on visibility, it being obvious that 'what is on the other side of the hill' cannot be seen by troops at ground level. Again may I refer to Diagram One, which shows the assumed shape of our hill, which, although it is in fact a species of plateau, is for our purposes a rounded eminence with the peak roughly in the centre. If we put one of our 20 mm. figures close up to the contour on ground level, it is plain that anything *on* the contour and as close as a couple of inches would not be seen by the chap on the lower level. We ignore this, however, as our board is taken to have the shape as shown, with a clear field of view from the bottom to the top—up the slope, of course. It is when what is being observed goes *over* the summit that it disappears from view of someone at ground level, and being on 'the reverse slope' or in 'dead ground' it is quite out of sight.

We must decide what constitutes this 'reverse slope' in terms of our contours. As in Diagram Two a second and smaller contour may be placed on the first, but even without this, there is no problem. The actual peak of the hill or its summit can be marked simply, with a spot of paint, or maybe with some additional feature, such as a tree, a bush or what have you. Anything on the hill further from an observer at ground level—beyond the 'summit', that is,—is invisible, and militarily, the chap at ground level will be the worse for it.

It will frequently be the case, of course, that hills will not be round, but will be irregular or elongated into ridges. If this be the case, the ridge can be shown by drawing a line on the contour, and behind this, troops in numbers may be concealed.

A note concerning reverse slopes. They afford complete cover for any troops or vehicles, and these cannot be fired at by troops advancing up the 'forward' slope. The same applies to artillery—unless of course an observer is in such a position that he has the reverse

slope of the hill in sight and can direct his guns accordingly. Shells could be fired onto the reverse slope without direction, of course, in the hope that something might be hit, but this is pretty much a waste, and I feel that it is best if we lay it down that such firing cannot take place, and that, unless they show themselves at the summit, troops on the reverse slope cannot be fired at by rifle or gun. If, of course, the defender moves forward to the crest of the hill then he becomes visible and will have to take what's coming to him.

So much for hills, then, and we get on to the next terrain factor, to wit, woods. These we shall treat in the same way as we did the hill, by adopting a standard, and specifying that our wood is an area of trees spaced fairly densely. This is no copse we are thinking of but something which, taking trees, brushwood and undergrowth together, forms a pretty tangible obstacle to progress, particularly by any sort of vehicle.

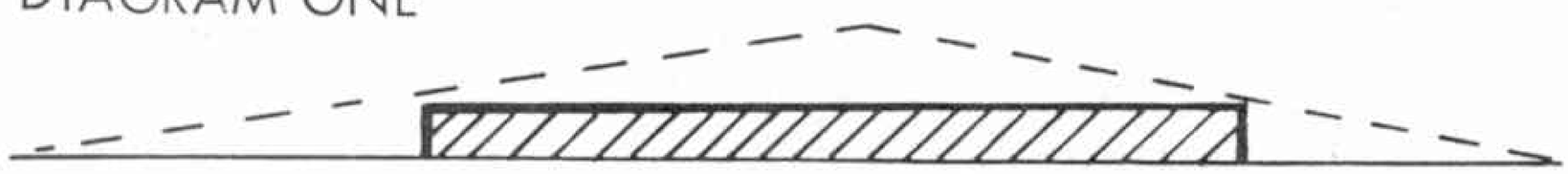
First, we rule in fact that any wheeled or tracked vehicle cannot operate in woods unless by way of some specific trail or road which may be indicated. Infantry may do so, but only under certain conditions. Due to the difficulty of making their way through the trees, etc, their rate of advance must be cut, and from 3 in., their move becomes 2 in. Further, to allow for their having to be very well spread out to negotiate this difficult terrain, they must be the same distance apart —2 inches. So much for the move, what about their fire? Again, this must be limited by the trees and so on—visibility is naturally less and so is the field of fire. The rule then is that rifle range is halved, from 9 in. to 4½ in. and at any point within that range a ' 6 ' must be thrown for a hit to be made. Sub-machine guns—ideal for close fighting—are not affected, but heavy machine guns also have their range reduced by half—to 9 in. Within this range—one can take half the orthodox ' machine gun cone of fire ' as described under ' Infantry Weapons ' in Part XII and use this in woods—a 5 or 6 dice throw will produce a casualty within this curtailed cone.

Should it happen, and it is possible, that opposing troops clash in hand-to-hand combat in a wood, ordinary rules apply—players throw dice, higher is the winner.

A final practical point on woods can be resolved by the way they are made. This is the question of just what area is " wooded ", and the answer is best provided by the trees—the commercial type—shown in the photograph in Part XVIII. The card base can be taken as the exact area of woodland—anything on the base is considered as being subject to the penalties for moving or firing in woods. Simple?

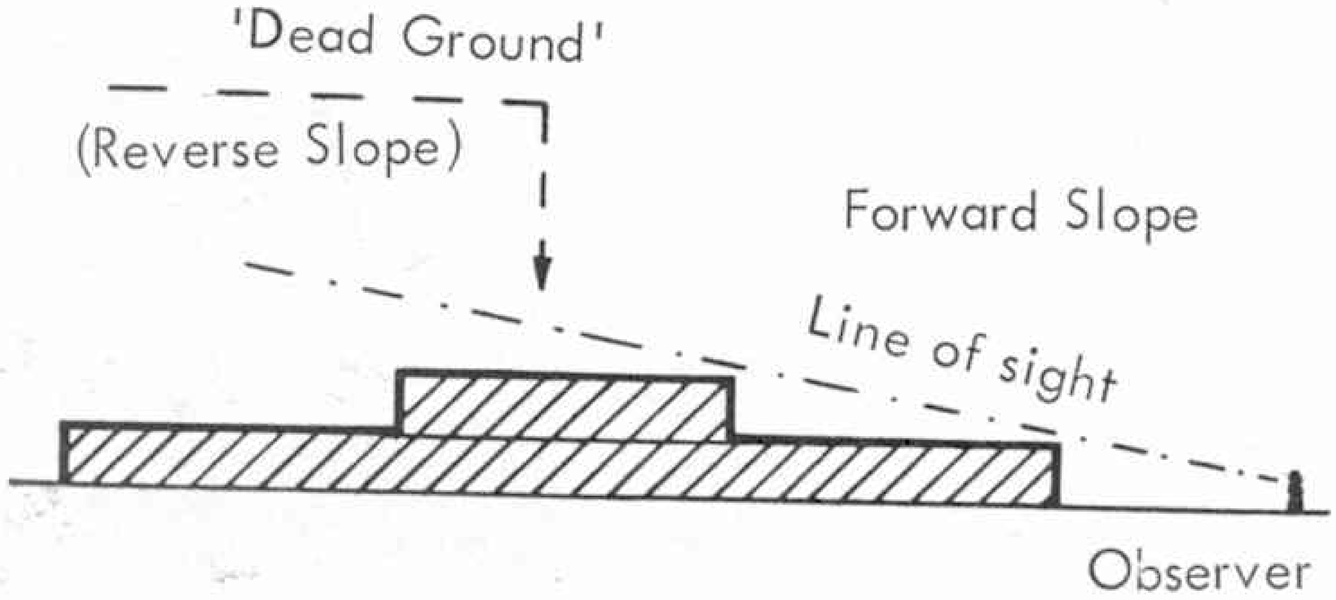
Rivers can be dealt with briefly. We are not at the present interested in pontoons or bridge-building engineers—all this will come later—but with the troops plunging into a river and getting across where no bridge exists. This requires some planning if the game is a spontaneous one with no campaign background, the simplest thing being to have two classes—one being the ' river ', which can be crossed only at fords—they must be identifiable—or by bridges, and the second being the ' stream ', fordable at all points by all troops, infantry or vehicles. If the encounter is part of a campaign than there is no problem, one reproduces on the table the details of river or stream, and the fords if any. Otherwise, the crossing can be effected where the players decide, and the time element is the important one as it will take up quite a bit of time. Experience shows that it is laid down that infantry—on foot—take two complete moves to cross a stream, this is about right. Artillery, and all sorts of vehicles must take longer, and four complete moves has been found to be appropriate. Of course, different types would take slightly different times, but this again is an average. The wargamer seeking refinements can readily allocate a different number of crossing moves to different vehicles.

DIAGRAM ONE



Shaded area - the contour block
Broken line - assumed shape of the hill

DIAGRAM TWO



HAVE YOU SEEN ?

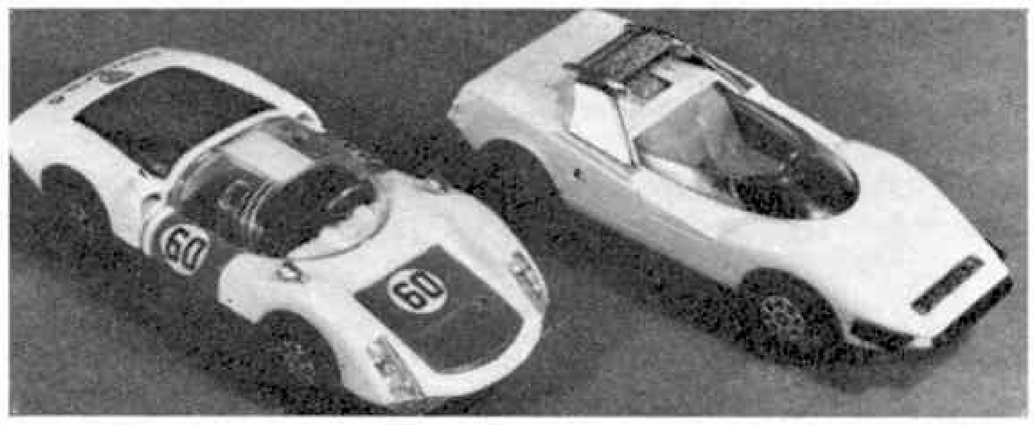
New Corgi's

No less than five new Corgi models have been introduced during the last month, and with one exception, all are colourful die-casts of a selection of the worlds top-line sports cars.

The exception to the rule, and the model we open this month's review with, is a rather unusual one. Corgi have chosen to produce a Citroen DS Tour de France Team Manager's car complete with driver, manager and four " spare " cycle wheels mounted in a special frame in the rear of this much-modified French luxury car.

Finished in a brilliant red with contrasting bright yellow interior, it is indeed a very striking and attractive vehicle. The bonnet is almost covered with a transfer showing the French " Tricolour " and lettered underneath with the words " Tour de France ". Neat transfers running down both sides of the car proclaim that sponsorship is supplied by Paramount. Chromed bumpers at the front, clear headlight covers and the new wide " Whizzwheels " finish off well an excellent little model priced at 9/6d.

The four new sports cars in the Corgi range are a Porche Carrera 6, Alfa-Romeo Pininfarina P33, Chevrolet Corvette Stingray Coupe and finally a Toyota 2000 GT.



Two of the new sports cars from Corgi; on the left the colourful Porche Carrera 6 and on the right the futuristic Alfa-Romeo.

Dealing firstly with the Porche, this is finished in brilliant white with bright red doors, red airfoil " beards " in front of the wings and a bright red bonnet. Window areas and headlight covers are in clear plastic and the transparent engine cover at the rear is moulded in blue.

Racing numbers are supplied on both doors and the " Porche " insignia and wording " Carrera 6 " appear at the rear of the model. Another colourful model fitted of course with " Whizzwheels " and priced at 8/6d.

The Alfa-Romeo is a superb car in its own right and certainly makes a most appealing model. Corgi have captured a lot of the excitement the full-size car produces and turned out yet another eye-catcher.

Finished in gleaming white with black interior trim and bright orange seats, the Corgi model looks every inch a winner. An anti-roll bar-cum-airfoil is fitted and finished in metallic gold.

Once again this car is fitted with Whizz-wheels and is priced at 6/11d.

The last two models released are certainly an eye-catching pair, for both are finished in brilliant coloured " chromium " plating. The Toyota we feel probably has the greatest appeal with its bright blue finish, white interior and jewelled head and rear lights. The steering wheel is moulded in gold, the gear lever and radio arial in red and to round things off nicely it is shod with fat tyres on " Whizzwheels." This model should prove to be very popular with collectors at a price of 7/11d.

The last car under review is the Chevrolet Corvette Sting-Ray and like the Toyota is finished in coloured chromium, only this time it's bottle green ! Pop-up twin jewelled headlamp units operated by a small lever under the model are a special feature of this one, as is the fully detailed engine compartment under the opening matt-black bonnet. The yellow tinted roof section can be removed to reveal a chromium dash-board and steering wheel and bright yellow trim.

" Whizzwheels " are not fitted to this one, but instead the model features " golden jacks ". The price of this beauty is 10/6d.

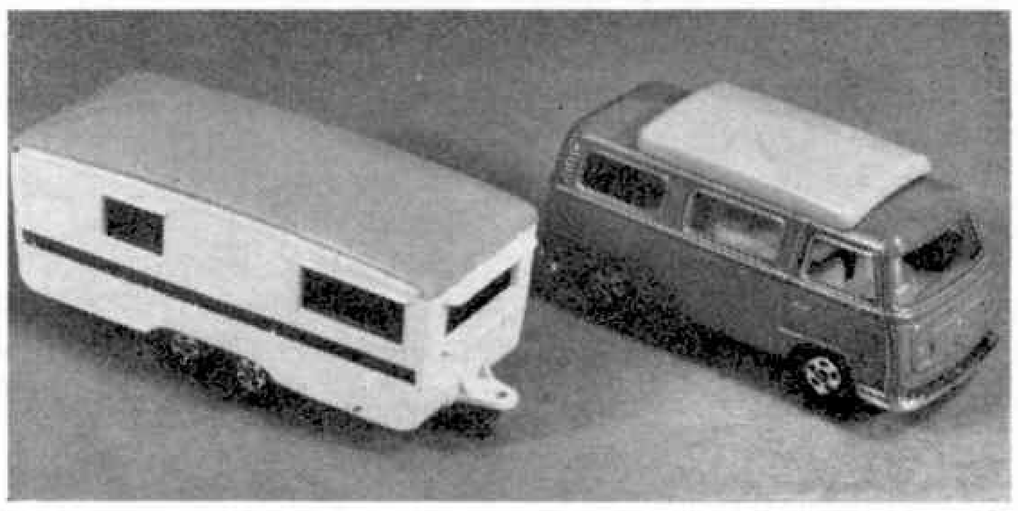
Matchbox Models

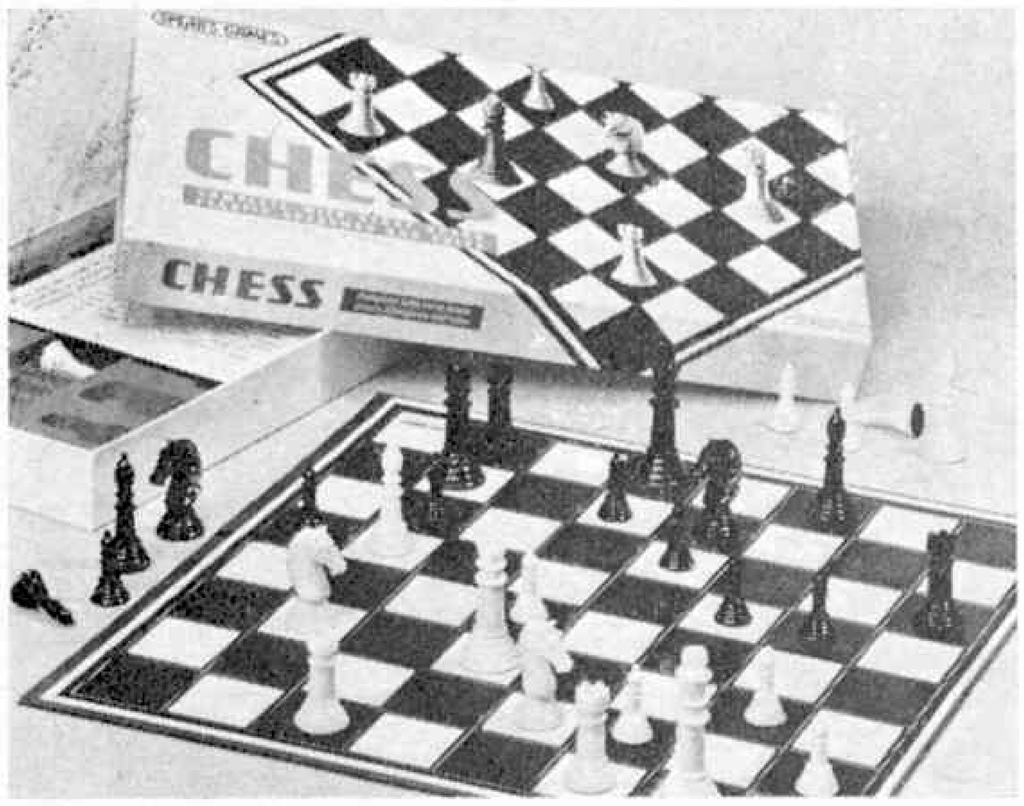
Hot on the heels of Corgi come two new models to add to the already impressive list at present available under the MATCHBOX banner. Both models are of caravans one the Volkswagon motorised Camper, and the other a Trailer Caravan.

The V.W., finished in a very glossy turquoise enamel and fitted with the racy looking " Superfast " wheels sports glazed windows and an opening orange roof section in plastic which when operated reveals full interior detailing in bright yellow. An attractive little model at 2/8d.

The Trailer Caravan, fitted with four " Superfast " wheels also sports full interior detailing in green plastic, and a bright orange removable plastic roof gives access to this. The main bodywork is finished in cream with a chocolate brown trim stripe running down either side. Price of this one is also 2/8d.

The two new ' Outdoor ' models from MATCHBOX.





Chess Set

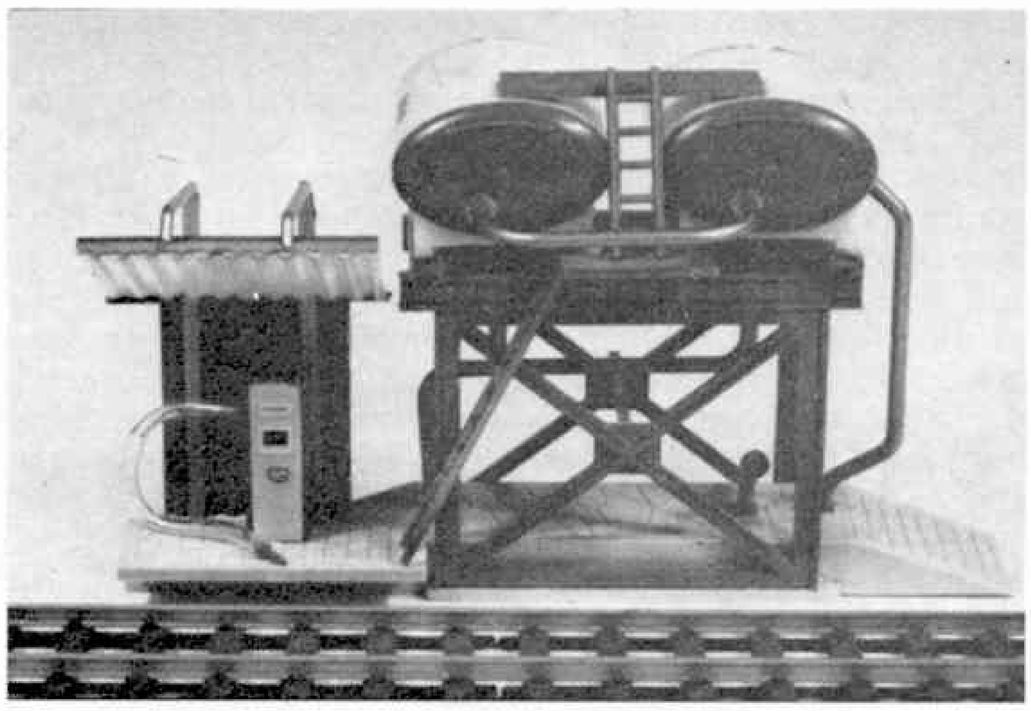
It may seem odd to announce a new chess set when the earliest reference to the game is recorded as being over 1,300 years ago. Nevertheless chess is still a popular game which is played all over the world by people of all ages. The new Spears chess set, the first complete set in their range, includes plastic chessmen which are attractively moulded, a stout board, rules, and a vacuum formed platform with individual places for each of the men. At a retail price of 19/- this appears to be excellent value.

Trackside Accessories

Imported by R. Kohnstam Ltd. are an enormous selection of the Faller range of HO/OO accessories ranging from lineside stations and buildings to small cottages and factories. All are beautifully moulded in a variety of colours, removing completely any need for painting. Detailing is very good and the mouldings on our samples were all completely " flash-free ". Most models are typically German in appearance which makes them look a little odd if used in conjunction with for instance, a Tri-ang/Hornby layout which of course consists of British looking loco's and rolling stock.

However the little diesel-fuel storage tanks and supply pump shown on this page looks completely at home on any layout, indeed we used it on our " Building a Model Railway " layout as some of the keener eyed may have noticed ! Finished in B.P. colours of green and yellow it took only a few minutes to construct and upon completion looks very realistic indeed. The price at 11/- is pretty reasonable and the possibility of the other kits in the range is well worth looking into.

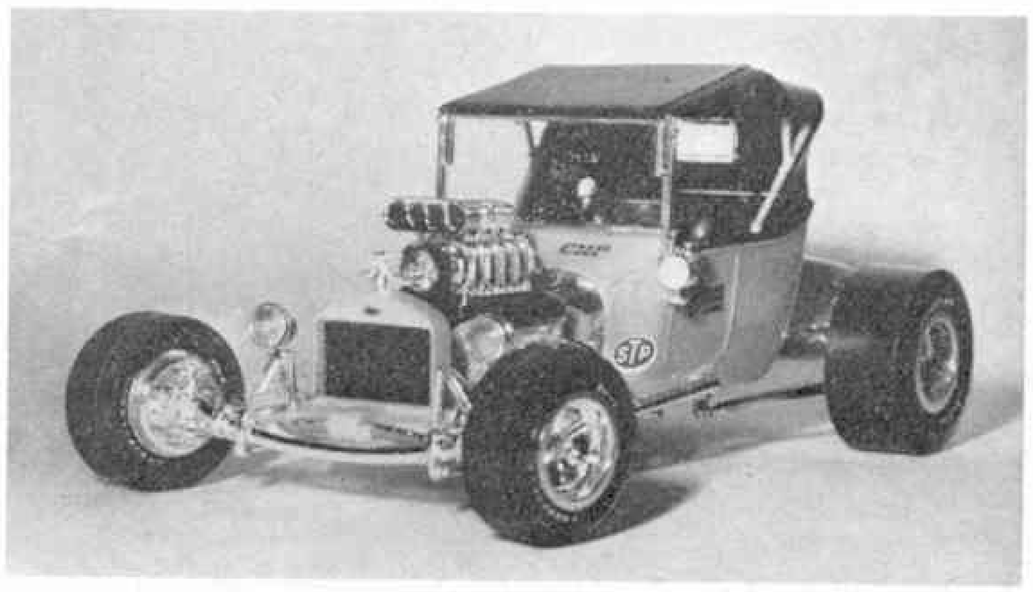
The diesel fuel storage tanks and fuel pump kit from the Faller range is a very well detailed construction kit; simple to build up and with a pleasing appearance when completed.



New Monogram Kits

Monogram have recently released a total of four new models in the well known " Funny Car " range. All are well up to Monogram's usual high standard of finish and easily identifiable with the now familiar chrome plated parts and excellent all round finish. The four 1/24 scale kits are as follows:—" Street Fighter ", a Custom 1960 Chevrolet Panel Truck; " Boss A Bone ", a 1929 Ford Model " A " Pick-up truck; " Sweetee ", a street and show rod, and finally " L'il Coffin ".

Prices to be announced.



' Sweetee ', one of the Monogram ' Funny Cars '.

Monogram Lunar Module

The latest kit from Monogram arrived at our office recently, this being a 1/48 scale model of APOLLO 11's LUNAR MODULE.

The LEM is a really first-class kit, containing over 50 intricately detailed parts moulded in white. When completed the model stands on a simulated lunar surface complete with black shadows ! Also included are the two Astronauts and the Lunar experiments.

A sheet of gold foil is provided together with instructions showing how to apply it to the LEM, thus giving a realistic impression of the thermal blankets on the real machine.

A booklet is included giving a complete story of the Apollo 11 mission, together with many colour photographs which is a handy reference when making the model. Rather pricey at £4 19s. 11d., but quality of the kit is worthy of the cost.

Roco Helicopters

No doubt you've all heard of the ROCO Minitanks, distributed by R. Kohnstam Ltd., but their latest releases are not army vehicles, but a brace of helicopters to 1/87 scale. These are the BELL HUEYCOBRA and the BELL VH-ID IROQUOIS containing 26 and 38 parts respectively. Both models are incredibly well detailed with some parts being very fragile.

The rotors revolve of course and pilots plus decals are also included.

The HUEY COBRA features complete cockpit detail and has full weaponry. The IROQUOIS offers a choice of three different types of armament. Both models are very worthy additions to Army collections. They retail at 5/11d. each.

Sahara Safari

The City University Africa Expedition photographed in the Spanish Sahara. Left to right, Chris Wilson, Pat Reynolds, Mohammed Watfa and Nick Turnbull.

PART 1: LOST IN THE DESERT!

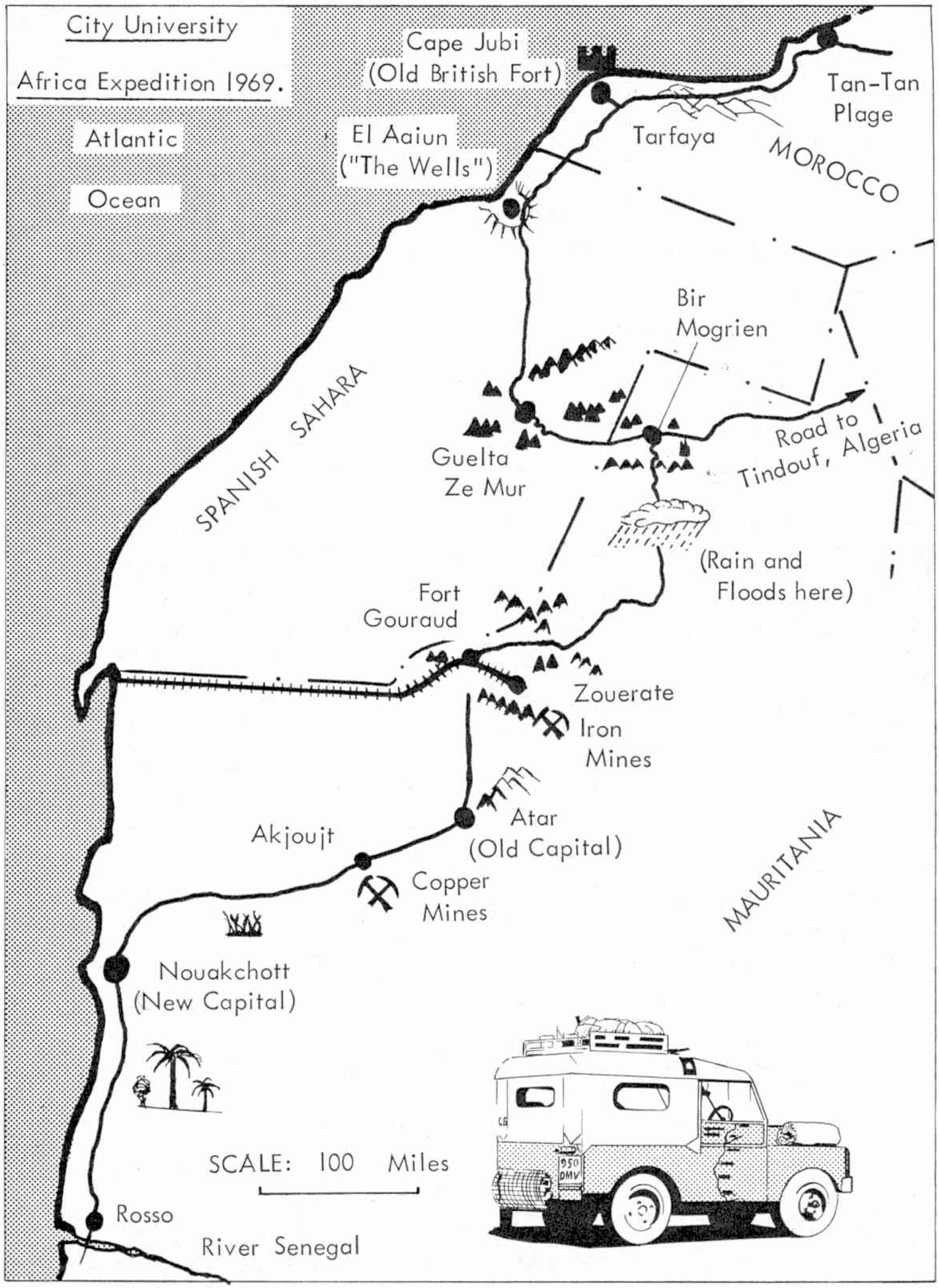
ONE EVENING DURING THE EARLY PART of last Autumn the attention of many "natives" of Kent was arrested by an overcrowded, overloaded fifteen year old Landrover hurtling along the London to Newhaven Road.

Anyone following the progress of the Landrover would have noticed the rather puzzled expressions on the faces of those on the left hand side of the road compared to the more knowing looks on the right hand side. You see, the notice on the right hand side of the Landrover, "The City University Africa Expedition" was written in English, but on the left hand side in Arabic. Therefore if any reader happens to hear of the legend that people living on the right hand side of the London to Newhaven road can understand Arabic, the City University Africa Expedition could well be the source of it!

We had left the University at midday, and through the excellent driving and navigational ability of the four members of the expedition, managed to reach Newhaven by nightfall. "We" were Nick Turnball, Mohammed Watfa (Mo), Patrick Reynolds (Pat), Benjamin the Faithful the Landrover (Benji) and yours truly, Chris Wilson.

Having planned the expedition for nearly a year it was indeed hard to believe that we were finally off. However, we arrived at Dieppe early on the morning of August 26th, and the reality of the situation was driven home when we attempted to explain (in "O" level French) who we were, and where we were going. Then, leaping into Benji, we set off for Paris, trying to remember to keep to the right hand side of the road, which was rather difficult at the beginning of the journey. In Paris, while Mo and I went off to get a Visa for Mauritania, Pat and Nick took Benji's steering mechanism apart to find out what was knocking. Although several theories were put forward, Benji's steering knock was never located, and he knocked all the way to Senagal and back.

The journey down through France and Spain was punctuated with various incidents which generally revealed our severely limited camping ability, and also revealed certain supernatural powers possessed by Pat. For example, when we crossed into Spain we were faced with the difficulty of buying petrol when no one could speak Spanish. This didn't seem to worry Pat very much however, who simply got out of the Landrover and said, "Fill Her up." The rest of us were sitting in Benji wondering when Pat would realise he was talking to a Spaniard. But to our utter astonishment, the Spaniard meekly did what he was told without hesitation. Pat then paid him, bade him goodnight and thanked him and climbed into Benji and drove us away. After some five minutes of silent admiration, someone ventured to ask Pat how he'd done it. It was only then that Pat realised he had been speaking to a foreigner, and the whole thing began to puzzle him as well. The miracle had convinced the rest of us,


City University
Africa Expedition 1969.
Atlantic
Ocean
Cape Jubi
(Old British Fort)
El Aaiun
("The Wells")
Tarfaya
Tan-Tan
Plage
MOROCCO
Bir
Mogrien
SPANISH SAHARA
Guelta
Ze Mur
Road to
Tindouf, Algeria
(Rain and
Floods here)
Fort
Gouraud
Zouerate
Iron
Mines
Atar
(Old Capital)
Akjoujt
Copper
Mines
MAURITANIA
Nouakchott
(New Capital)
SCALE: 100 Miles
Rosso
River Senegal

however, and from then on Pat spoke all the Spanish, ancient Hebrew, and forgotten Berber dialects that we ever needed, and occasionally performed other miracles just to show there was no ill feeling.

A week after leaving England we crossed from Spain to Morocco, thereby fulfilling one of the main objects of the City University Africa Expedition—to reach Africa. The next thing was to get to the right part of it. Our plans involved making a number of preliminary studies of hydro-electric and irrigation schemes in Morocco before tackling the desert, and the first ten days in Morocco was spent doing this. For me, Morocco was both intriguing and disappointing. Intriguing because here was a different continent on which had evolved a different kind of civilisation under the influence of the Moslem religion. But disappointing because all the ancient splendour of Imperial Morocco was hidden behind the superficial mask of the tourist industry. Because Mo could speak Arabic, we were able to get to know several Moroccans, and when it came to buying anything, Mo could drive as hard a bargain as anyone in Fez, Marrakech or Casablanca.

Lost in a sea of sand—thousands of miles from home !

Having visited Dams near Tetoaon and Marrakech and visited the old cities of Fez and Marrakech, we went to Agadir to prepare for the desert crossing. Old Agadir was destroyed by an earthquake in 1961, which killed most of its inhabitants. Now it is a brave new city and a thriving winter holiday resort. But there is no " atmosphere ", and behind the concrete shells that were built as shops or houses, there is an eerie silence. Still after nine years many of the inhabitants who fled the city have not come back again, and the concrete shops and houses that were built for them are empty. We spent three days getting together supplies and giving much love and attention to Benji. On the fourth day we relaxed, and the following morning we set out for the Sahara desert, leaving civilisation behind us for the next 2,000 miles.

It was a bright but not entirely cloudless day, and there was a cool breeze coming in off the sea. Benji was now heavily laden, carrying all our gear, food for fifteen days, thirty gallons of water and forty five gallons of petrol. It was nearly three weeks since we had left England, and now suddenly the Sahara was becoming real to us after months of planning. We passed through Goullimine in the early afternoon, which has two large notices on the side of the road proclaiming " Gateway to the Sahara " in Arabic and French. Then Tan-tan eighty miles further on, and Tan-tan plage, a collection of Bedouin tents and a small airstrip which is used by personnel going out to an Esso oil rig, some sixty miles off shore.

At Tan-tan Plage, the already narrow road ended abruptly. We had a short farewell service for tarmac roads with Benji's back wheels on the tarmac and his front wheels already three feet into the Sahara Desert, and then set off into the sunset. Had we been the heroes of some great feature film one might well have expected " The End " to appear magically above Benji at this point followed by some curtains and " God Save The Queen " as he disappeared into a cloud of dust. But although it was picturesque, it was really only the beginning.

The map illustrates the desert crossing. Tan-tan Plage at the top of the map is nearly 200 miles south of Agadir.

At first the track we followed was reasonable, we could move at about 15 miles per hour. After the first few miles it began to get tricky however, and our speed was reduced to walking pace many times. We stopped when the sun finally dipped into the Atlantic on our right. There was quite a wind coming in off the sea, and as the hot day changed to the cold night, the air started to deposit salt on everything. By ten o'clock we all felt sticky and uncomfortable, and the severe water rationing we were on meant virtually no washing. Furthermore we were apprehensive; having covered seven miles in three quarters of an hour, we averaged just under ten m.p.h. If the desert was to be like this all the way, it would take three weeks to cross on a 100 mile a day basis, which would be pushing it!

The next morning we made an early start, being determined to cover a good distance, but the going was slow. There were several large creeks we had to cross, which meant detours of up to one mile. In places there was soft sand and we often needed Benji's low ratio four-wheel-drive ability to keep going. All this meant our petrol consumption was way above what we had anticipated, and this brought the point of no return nearer and nearer. To add to it all, we saw two or three old cars that had become hopelessly stuck. Their drivers having abandoned them, they lay helpless baking in the sun. We were driving along a coastal strip, the sea on our right and the steep side of an escapement on our left. Very little vegetation grew here, the most common thing being an apparently lifeless grey cactus plant. In the early afternoon the hills on our left gave way to a gently rolling plane, and by about three p.m. we reached our first sand dune. Here we stopped to celebrate, because the track had got just a little easier, and Pat had created a new land speed record of 22 m.p.h! From the top of a large sand dune, the desert really looked like a desert, as in " Lawrence of Arabia ". Somewhere beyond the sand was Tarfaya the last town in Morocco.

We set off again in a jubilant mood, navigating by compass in and out of the dunes. We followed any track which led in the right direction. But soft sand is mysterious stuff, and is always on the move. There was just one set of tyre marks that we were following and these looked pretty old. Suddenly as we rounded one sand dune, the last pair of tracks disappeared under a very large dune. Then it struck us all like a thunderbolt.—we were lost! ***(To be continued)***

" TANKS " *continued from page 496*

Has Russia no light tank ? Yes, one, the " Plava juschtschiz Tank "—which means amphibious tank. It is large, with a boat-like hull, and carries a 76.2 mm gun. Its armour is very thin, and it is propelled in water by water jets. It has been used in Vietnam, in swamp conditions, but proved very vulnerable. They have not developed a parachute tank, although the Red Army was the first one to seriously study this type, back in 1933.

What of the use of tanks in action, 1945-70 ? They were used in the Korean war, at first by the North Koreans in mobile operations, and when these were checkmated, they were used by both sides as a sort of

mobile artillery. The Centurion won a great reputation for the quality of its protection, the hitting power of its stabilised gun, and its general reliability. The Russians used tanks in large numbers to crush the Hungarians and Czechoslovakians; they showed that their MBT was as useful for 'police' work as it was expected to be useful for battle. In 1965, the Indians fought the Pakistanis, both sides using tank formations. In furious duelling the rival tank fleets, made up mostly of Pattons and Centurions, with Shermans and I think some Russian tanks, cancelled each other out. The sandy country was littered with smoking wrecks—but once again the Centurion proved to be a life preserver as well as a hard hitter. This was verified again and again in 1967, when the Israelis taught the Egyptians a thing or two about mobile armoured warfare. By this time the Centurion was 24 years old as a design —but it did all that was asked of it, while carrying out night journeys and long-range endurance marches that its British operators had never dreamed of demanding from it! The Israelis hoped to re-equip their armoured forces with newer British Equipment, and there could be no higher tribute than that.

U.S. Tanks before the concept of "local nuclear war" demanded more sophisticated armour. The two tanks on the left and centre rear are equivalent to the Centurion. The tank in the foreground is equivalent to the Conqueror, and the tank at the right rear is so-called "light", but is roughly equivalent to the Soviet T34 of 1939.

So we might say that of all the MBTs descended from the old T34 type, the Centurion was the best—and if the Chieftain carries the same basic quality plus its new features, it too is a winner in its class.

But what of the future? Will the T34 type last forever? That indeed is unlikely. Already the Swedes are developing the "S Tank"—which features an armament as powerful as the modern MBTs, in a mount much easier to conceal. The tank has no turret, but an improved steering, and a suspension that can be raised or lowered instantly, so that it is almost as quick to aim with the whole 'S' tank, as with the turret of an ordinary MBT. Another idea, suggested by Colonel Peter Hordern of the R.A.C. Tank Museum, is to mount a self-loading gun in a miniature remote-controlled turret, which would give valuable improvement over the basic 'S' type.

As with the Seven Types of the inter-war years, the shape of a tank comes, basically, from the work expected of it. The duty of the MBT is no longer just to "facilitate the advance of infantry", or to "pursue a cavalry role". It is, "to be able to engage and destroy all battlefield targets",—and this may soon include the capacity to throw 'local' nuclear shells. Today's

The very successful Bristol Centurion 9, designed in 1944/45. Modelled originally on the Russian "T34 concept" of a fairly fast general purpose tank having sloped armour and a big gun.

M.B.T.s, awarded this fantastic range of duties, still bear the shape of a bygone class of vehicle, and some authorities think that this shape is due for a change.

Above: The M60, the U.S. equivalent to the "nuclear age" Chieftain. Note the night navigation and range-finding equipment.

Below: This tank has aluminium armour and can be dropped by parachute. One of the early production models of the Sheridan Weapon System, M551, note the short barrelled main armament, the old-fashioned under-cut shape of the turret and the night driving equipment.

car outline
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The first 50 correct entries received will be sent a model of the vehicle illustrated.

The vehicle illustrated is.....
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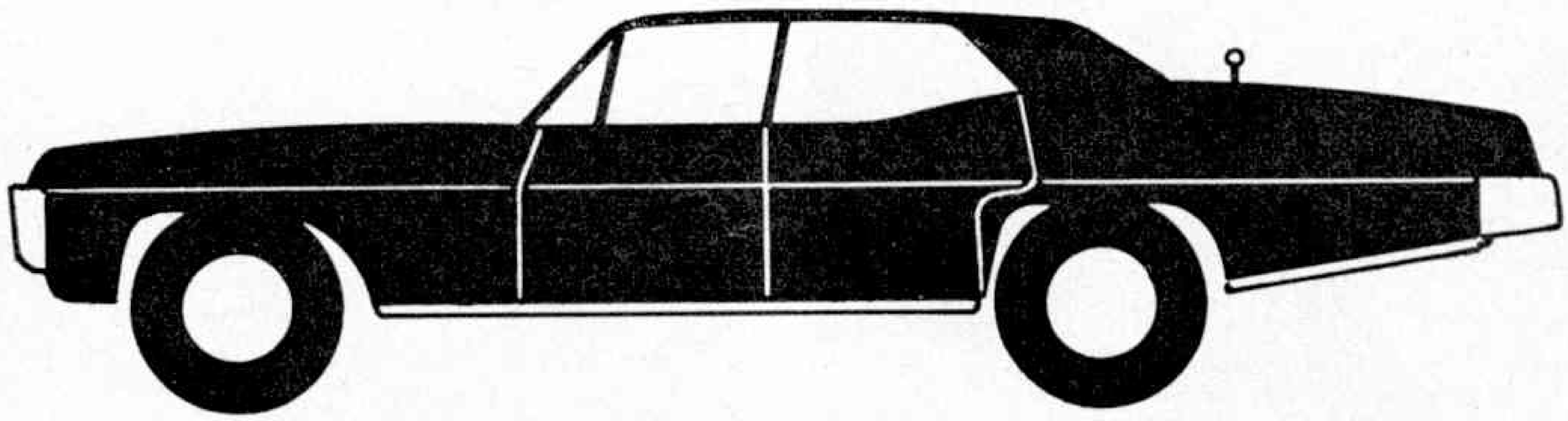


MECCANO CONSTRUCTORS GUIDE

Continued from page 504

Rise and fall motion for three gallopers in line are provided by linking two Crank Shafts, part No. 134, by a central crank made from a pair of Couplings secured to a 1 in. Axle Rod. This arrangement allows all three motions to be adjusted for rise and fall at 120° intervals giving very realistic galloping in correct phase. Universal joints connect the Contrate drives to the galloper crank shafts, while twin Fishplates and Rod and Strip Connectors form the swivel ends for the horse poles, these being located on the pins of the cranks with Washers and Spring Clips. The lower end of the horse poles pass through slots in Flat Girders which form radial elements of the decking below.

The roundabout illustrated was adequately driven from 6 volts by a D.C. Motor with 6-ratio Gear Box, which also provided power for a horizontal replica "steam" engine built on to the side of the central pillar. This, together with an illuminated "steam" organ with working musicians, made the model a most attractive and realistic roundabout.

Coloured lights add tremendously to the realism of fairground models and all the models mentioned in this chapter are fitted with lights on both stationary and revolving parts. This requires the use of commutators or slip rings to feed current to the rotating parts—no less than five separate rings being required for the "Torpedoes". A later chapter in the Guide will deal with the circuits and components required for multiple illuminations, but elementary systems can be assembled using existing Meccano electrical parts.

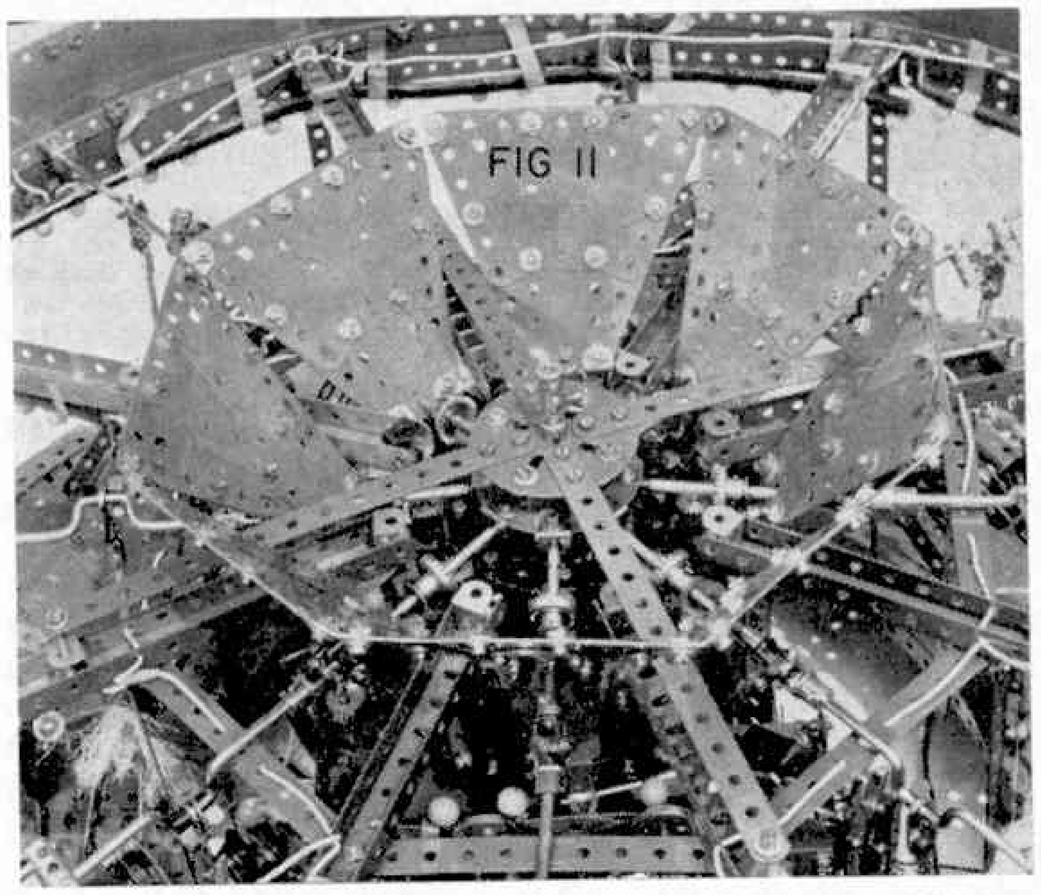
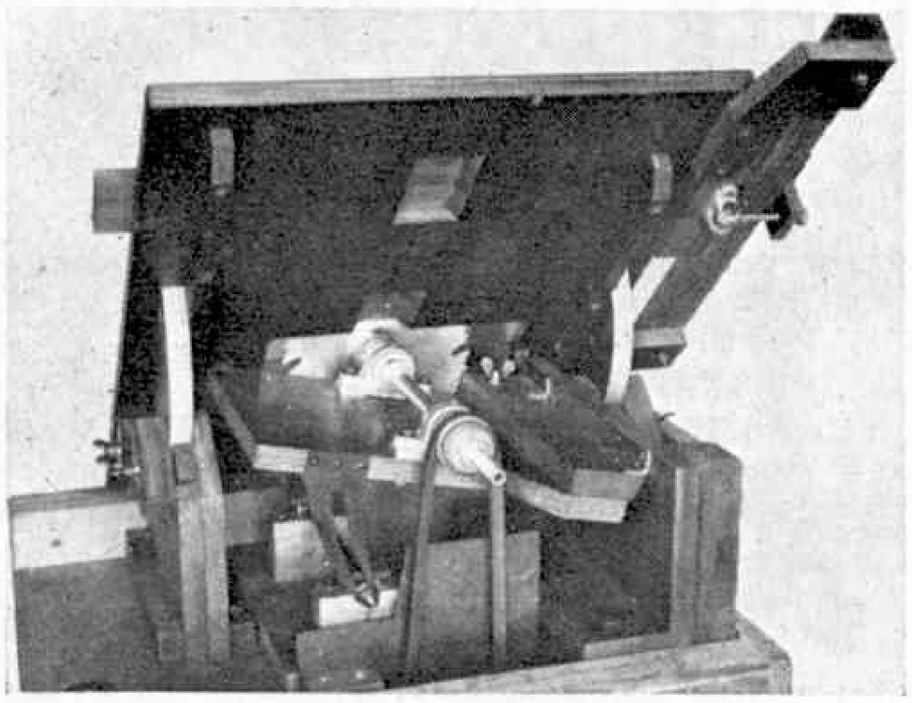


Fig. 11. The "crownhead" gearing for a Meccano 24-horse galloper. Note universal joints to the galloping cranks.

Those constructors who are adept with a sewing machine, or can recruit a member of the family in this direction, can make their fairground models very attractive with bunting and canopies in bright colours. The canopy for the roundabout shown in Fig. 10 is made from triangles of red and white material, trimmed with pinking shears and sewn at the centre to a 1 in. Rubber Ring. This nestles snugly over a small Flanged Wheel which supports the chimney extension.



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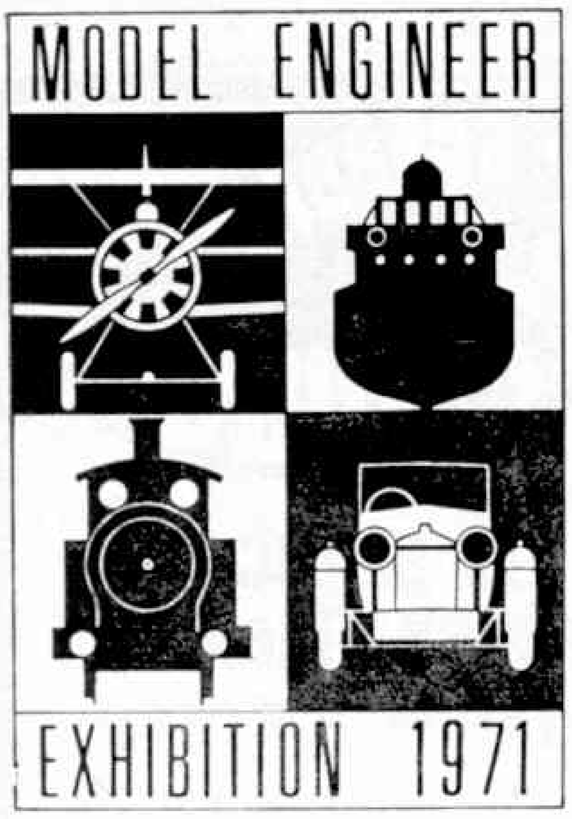

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- **WHAT CAN BE ENTERED?** If it is a model of something that was or could be or could have been, we are interested. A lifetime's work or the brilliant result of a long week-end, there is a place for all kinds and degrees of model. We like real " engineering " models most, of course—but then a beautiful sketch is sometimes as attractive as an elaborate painting!
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- **MILITARIA.** Dioramas, guns, soldiers of all periods, in fact anything of model militaria will be especially welcome. New separate classes.
- **COME AND HAVE A RUN . . .** Yes, you can now with your locomotive. If it is an LBSC prototype then enter the LBSC MEMORIAL BOWL CONTEST which requires a track run.
- **OTHER ATTRACTIONS** include steam ploughing demonstrations with models, a small pond for little ships only (about 2 ft. l.o.a. is the limit), E.C.R.A. Championship Car Track for 1/32 and 1/24 scale, the pick of the model trade with selling stands . . . more of the show anon . . .

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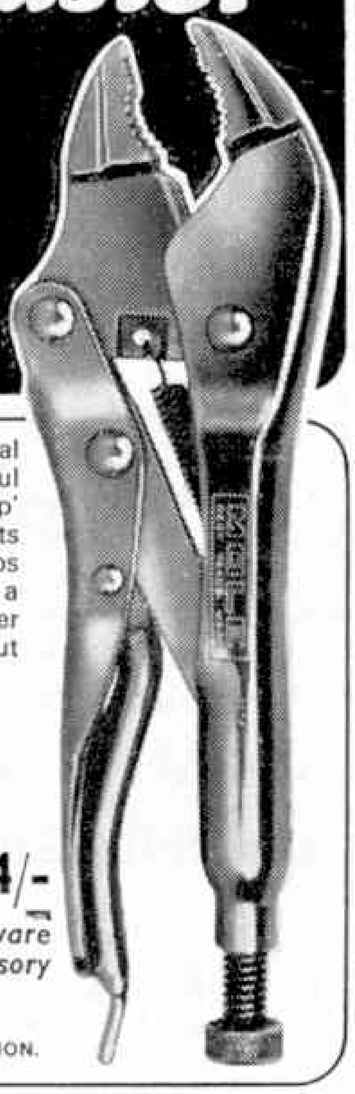

Incorporating unique features made famous in the original MOLE Wrench, this pocket size edition is particularly useful for model making and intricate D.I.Y. tasks. The 'self-grip' jaws can be locked-on to easily control obstinate small parts and materials involved in model making and so many jobs around the home and in the garage. The MINI MOLE is a multi-purpose tool in every respect — a hand vice, super pliers or adjustable clamp — no tool kit is complete without one. Ask for it by name.

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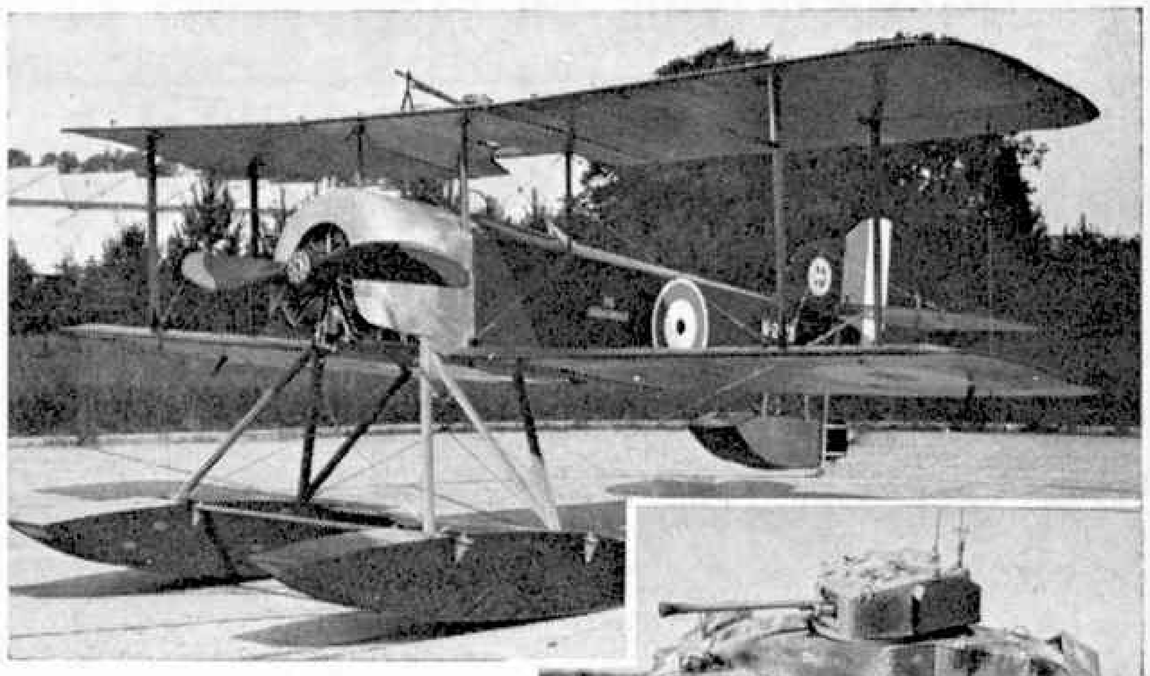

The Fleet Air Arm Museum's latest acquisition described and featured in colour on the cover —The Sopwith Baby Bi-plane Seaplane—always a popular model subject, in a photo feature complete with plans. Plastic card modelling an A.E.C. Mark III Armoured Car with colour information to 1/76th scale; plus Military Insignia; and another miniature figure conversion feature will satisfy the militarists. World Championship for Flying Models preview, New Kit Review, Latest Books and a survey of Space Craft Models; plus the first part of Bristol Aircraft Survivors, and all our regular features in a great 12th Issue, to complete our first year of publication.

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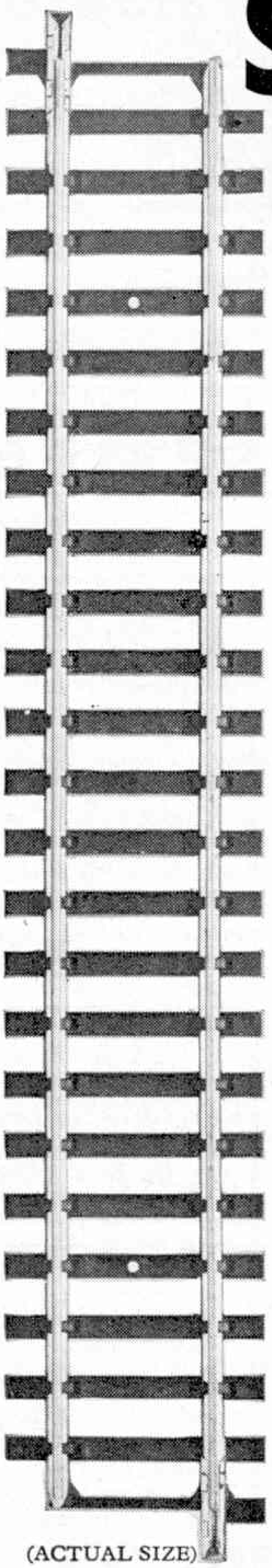

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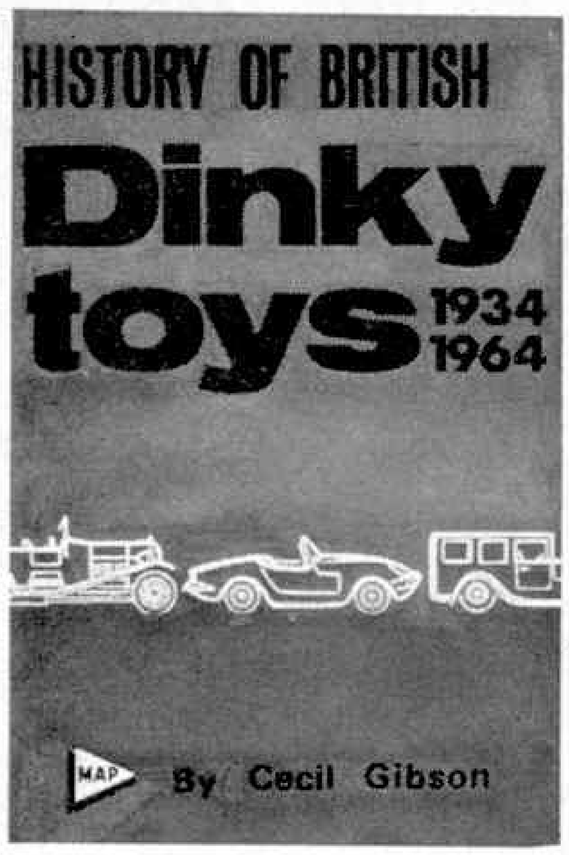

No. 20 HISTORY OF BRITISH DINKY TOYS 1934-64

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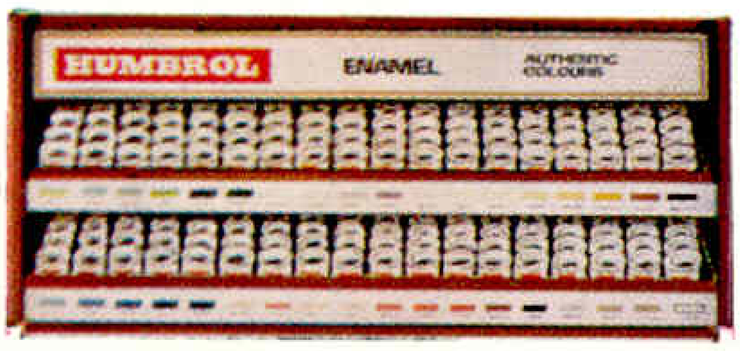

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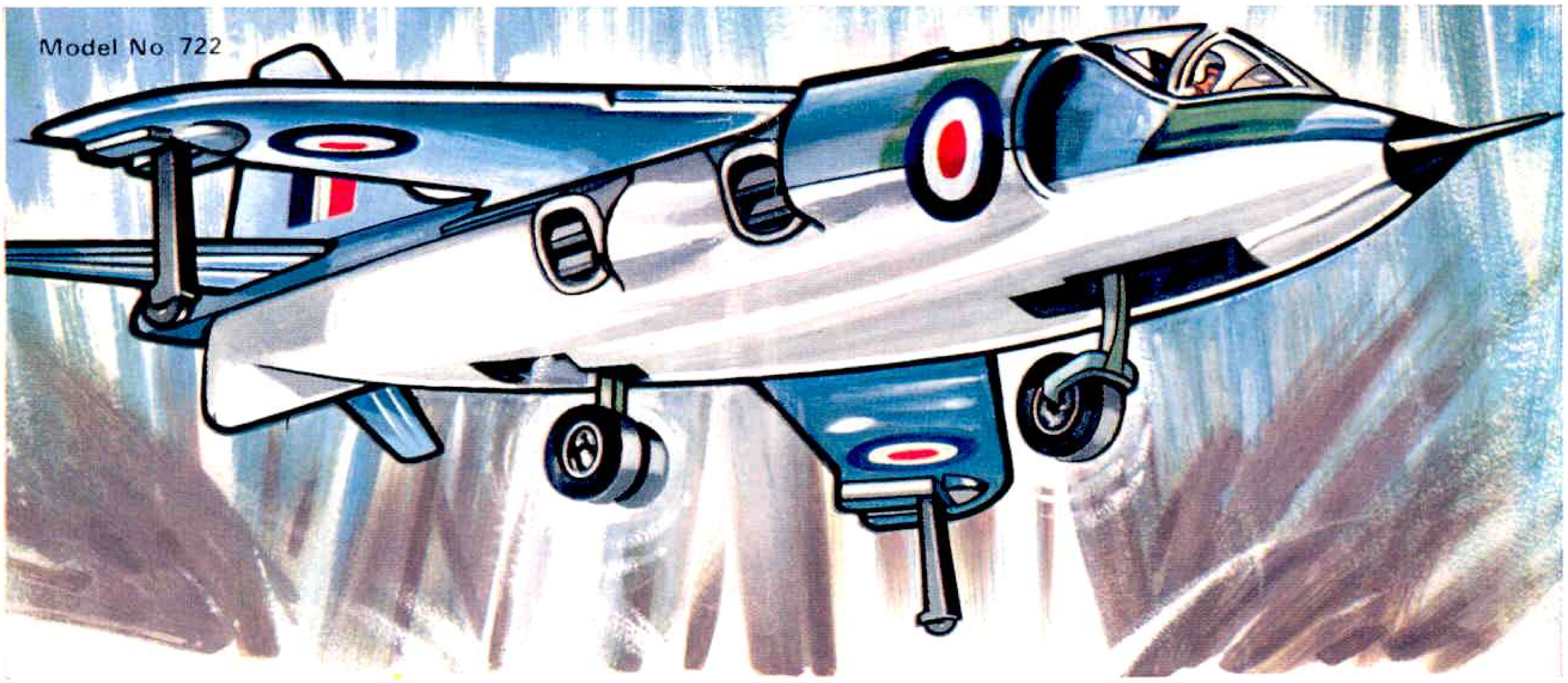

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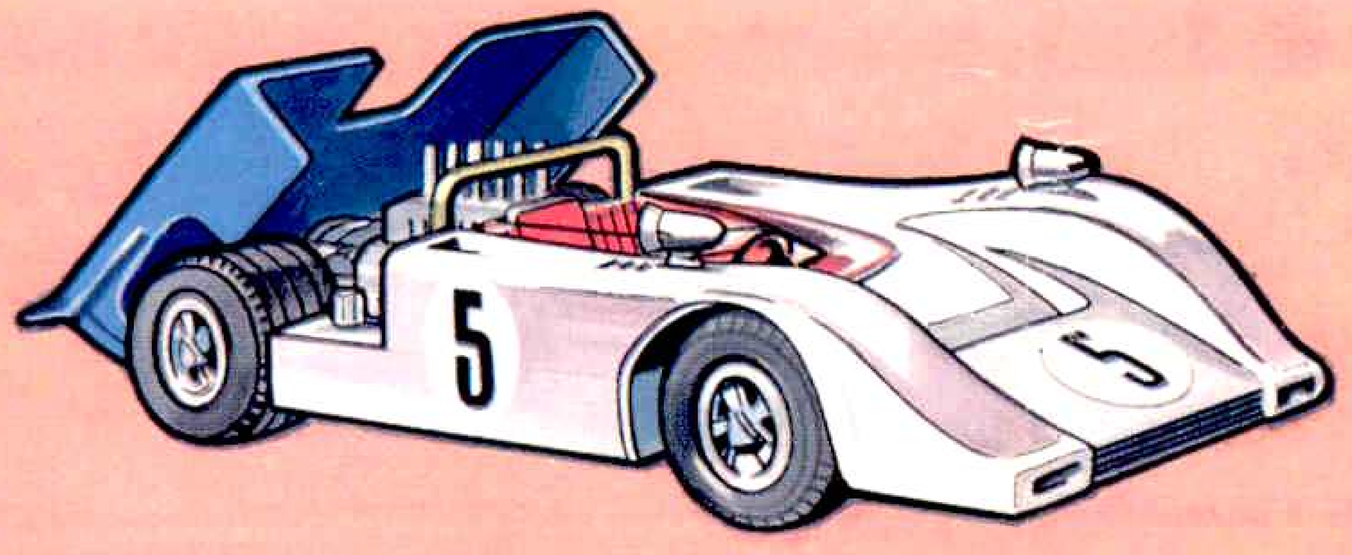

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