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JULY 1970

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MECCANO® Magazine

JULY 1970 VOLUME 55 NUMBER 7
Meccano Magazine, founded 1916.

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MAP HOBBY MAGAZINE

ABC

FRONT COVER

Dinkys Galore ! We doubt if we've ever had so many subjects on a single cover before.

Well over 70 models were used in this display to form our cover which was photographed by Meccano Ltd., of Liverpool.

We know how many models were used and part, if not all of each model can be seen. A free year's subscription to Meccano Magazine awaits the first reader to send us a card with the correct number.

NEXT MONTH

The July issue of Meccano Magazine sees the welcome return of Mike Rickett's Transport Topics feature which has unfortunately been missing for the last three issues.

Mike has recently changed his job and pressure of work prevented him from getting material to us. As a bonus we also include another of Mike's features on Space Projects and this month's subject describes the Mariner Mars 1971 Spacecraft.

Once again the centre four pages of the issue will be devoted to the 2nd instalment of our Tri-ang/Hornby feature and will outline the rules for wiring up your layout.

Chris Jelley's feature, " Models by the Million " is concluded and this month he describes how the models are painted and assembled.

Meccano enthusiasts are naturally well looked after. An unusual self-driving rolling drum being perhaps the most unusual item.

As always the regular favourites such as " Battle," " Air News," " Stamps " and " Dinky Toy News " are included to round off a well balanced issue.

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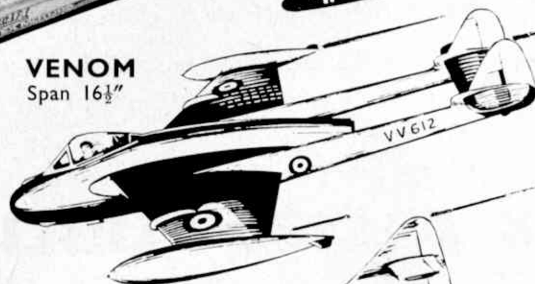

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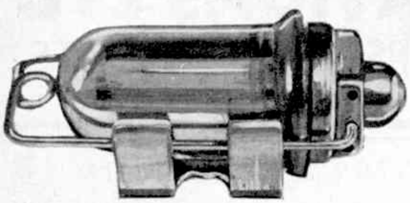

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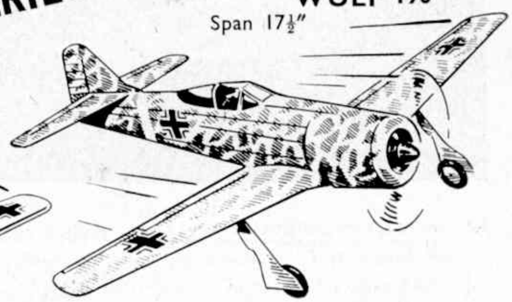

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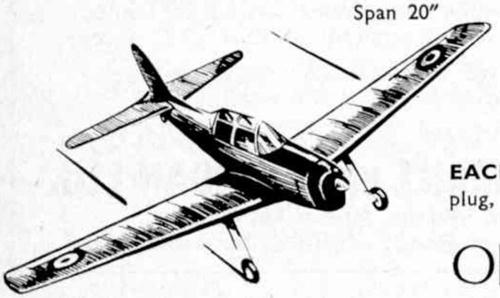

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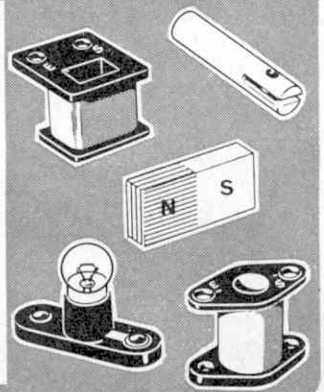

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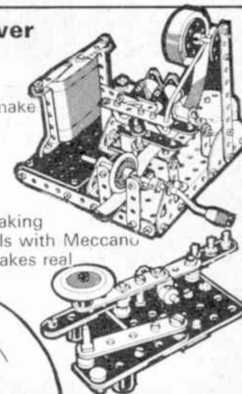

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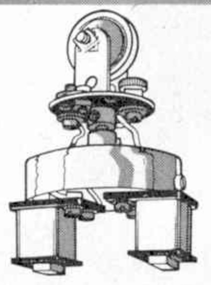

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ON THE EDITOR'S DESK

Veteran Marathon

British Leyland is to mark the seventieth anniversary of the RAC's great 1,000 Mile Car Trial of 1900 by following the original route on the same days (April 23rd to May 12th)—with a Wolseley Voiturette car which won a gold medal in the original trial.

The Wolseley Voiturette of 1899 (the first four-wheeled Wolseley car) is still in its original form and is the only known unmodified survivor of 1900. It will be driven by one of the two persons living who took part in the 1900 trial—85 year old St. John Cousins Nixon, the veteran motorist and motoring historian who, as a boy of 15, rode in S. F. Edge's Napier. Mr. Nixon was then an apprentice mechanic with that great racing motorist.

Mr. Nixon, accompanied by Fred (Topper) Brown as "riding mechanic" will leave from Halkin Street, London S.W.1 (the starting point of the original trial) at 8.30 a.m. on Thursday 23rd April. Averaging the original Trial speed (12 miles per hour), they will cover the whole route, returning to the RAC in Pall Mall on 12th May.

In 1950 to celebrate the Golden Jubilee of the Trial, Mr. Nixon drove the Wolseley from John O'Groats to Lands End and back to Oxford, and in 1960 he celebrated its Diamond Jubilee by driving over the original route, as he is doing this year.

Information sought

Jack Wheldon, whose feature on the Development of Tanks appears in this issue, is making a study of mechanical toys of the past 100 years and would appreciate any help that Meccano Magazine readers can give him. He would particularly like to get in touch with readers who possess examples of pre-1939 mechanically propelled ships and boats, commercially produced traction engines and agricultural models.

All methods of propulsion are however of interest to Mr. Wheldon, be it paddle, screw, oars, steam, clockwork, electricity or even sodium and hot air!

If readers would care to help perhaps they would care to drop a line to Mr. Wheldon, c/o the Editor—Mr. Wheldon promises to reply to all who are kind enough to reply.

Double trouble

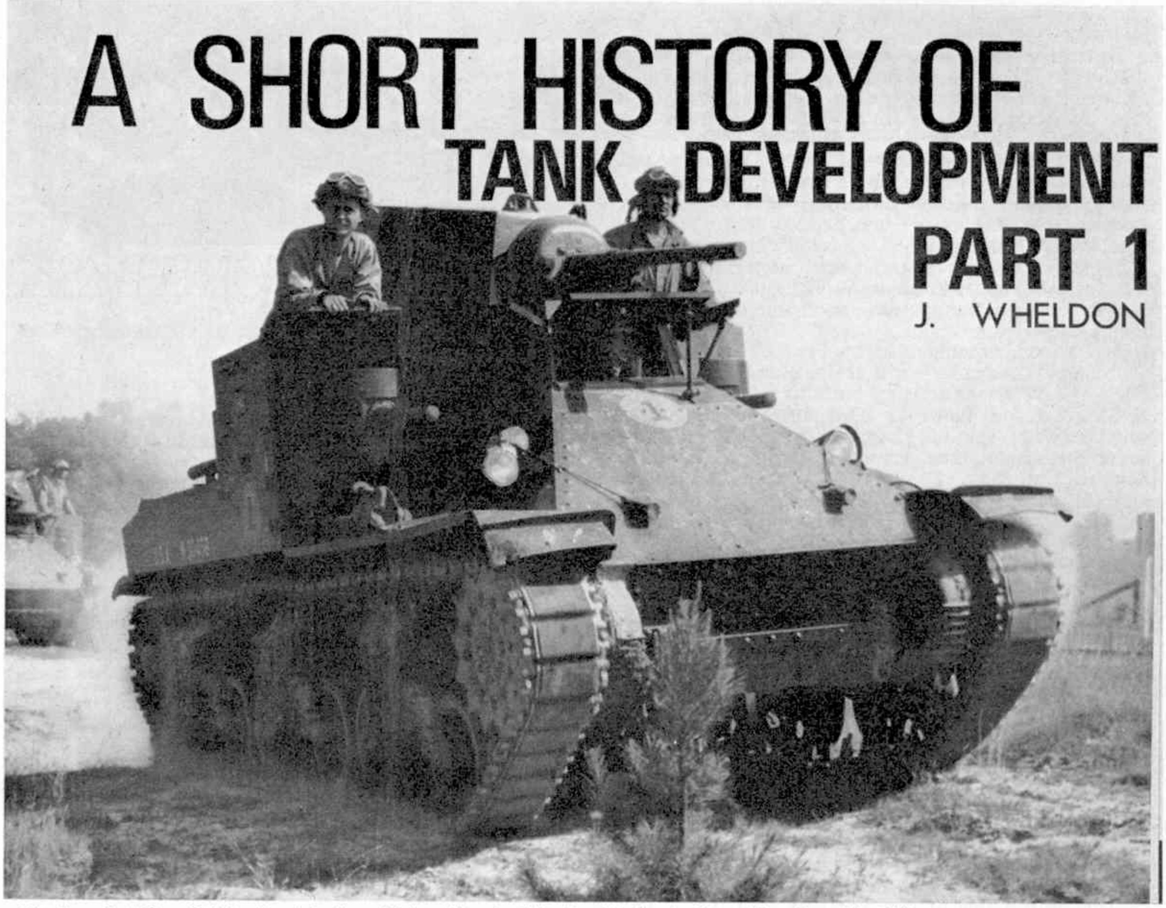
Two "howlers" were brought to my attention by several readers of last month's issue and concern the following: "On Two Wheels" was clearly headed "Test No. 10" although the opening paragraph to the feature described it as "No. 9!" It was of course the latter and we present our sincere apologies for the glaring mistake.

Point (or error!) number two concerned the Waddington elliptical jigsaw, reviewed on page 315. We described it as having "6,000 pieces", when it has in fact only 600! If the thought of a jigsaw with thousands of bits put you off, you will be pleased to learn that it was a printing error, for which we once again apologise.

The 1899 Wolseley Voiture which set off on Thursday, 23rd of April, to repeat the journey it made 70 years ago. Behind the wheel is 85-year-old St. John Cousins Nixon who took part in the original trial and in the passenger seat Fred Brown. More information is given in the text above. *Photo courtesy of British Leyland.*

A SHORT HISTORY OF TANK DEVELOPMENT PART 1

J. WHELDON



The French " Char B " designed in the mid-twenties, built in the thirties by Renault and used in 1940.

Seven tanks for armoured warfare

TANKS HAVE BEEN AROUND for more than half a century now. Familiar things, we take them for granted: they are just part of the scene, for soldiers as for war-gamers. How many of us ask what exactly they are supposed to do? Is what they are supposed to do now, what has always been expected of them?

Well, the work a tank has to do has some effect on its shape, and when we learn that during the period between the World Wars there were tanks as light as 2 tons and as heavy as 75; some with crews of one man and others crews of 13; that some large tanks were scarcely bullet-proof while some little ones could keep out most anti-tank shot; that some tanks would do 65 m.p.h. across country while others could do only 5 m.p.h.; and that weapons varied enormously, some having only machine guns, others howitzers, others general-purpose guns, and some cannon which fired only solid shot . . . when we see this great variety of machinery all classified under the word 'tanks', we see at once that they must have been designed for different kinds of action, by people who had differing notions of what tanks are supposed to do.

These differences date from the very dawn of tank history. The battles of 1914-18 cost so many lives because troops still advanced in close lines, which were accounted for by machine guns. Hence, tanks were invented to knock out the machine guns, and were in fact called Machine Gun Destroyers until Colonel E. D. Swinton gave them the name 'tank', to fool enemy spies.

Although this work seems straightforward, the French and British had very different ideas about it. The former thought that two types were needed—a self-propelled armoured gun carriage to " come into action when the attack had advanced to the point when wheeled artillery would have to limber-up and move forward "; and a small two-man vehicle armed with a machine gun, to accompany each infantry company.

The British thought this was putting the cart before the horse, and that if tanks were to save infantry lives, they must lead, not follow them. Hence, the great lozenge-shaped British tanks of World War One which could cross any obstacle, making paths for the infantry to follow, and fighting on their own if need be.

But none of these tanks was proof against any kind of artillery fire. They moved at walking speed, and while they protected their infantry from machine guns, the infantry were expected to protect them against field guns when they broke into the enemy's artillery zone, where the gunners could see them and take direct aim. If the infantry riflemen didn't take on the gunners, the latter could score hits on a slow tank before it could fire back effectively—the early tank weapons were inaccurate at long range, especially when the tank was lurching and sliding over rough ground. It was a hair-raising moment for a tank crew if they burst through a screen of trees to find themselves confronting a cool, well-served battery! But even so, there were occasions when a tank got right in amongst the guns and silenced the lot.

By 1918 anti-tank guns, small and easily hidden were all over the front and tanks were having a very difficult time. New designs were urgently needed and an Inter Allied Tank Committee was formed to provide them. But once again, ideas were divided. The French argued that tanks should carry shot-proof armour and be built in two sizes—small ones to accompany infantry as before, and large ones, "chars de rupture" as they were called, to take on the old British idea of leading the way through trenches and strong-points.

But in 1918 the British Tank Corps was looking ahead to an altogether new role for tanks! They thought it would be better if tanks were developed as vehicles to go much faster and farther—for this would enable them to by-pass the front of an enemy who still relied heavily on horse and railway transport, and hunt down his Generals and supply organisation—which would quickly collapse him. The Tank Corps called this 'Strategical Paralysis', and knew they were well ahead of the rest of the world with it; they even designed and began to build their own fast long-range tank, as I described in my last article, "The World's First Fast Tank".

Yet another line of development was put forward by the great American car manufacturer Henry Ford. In 1917 he had speeded-up the mechanisation of farming by producing the world's first cheap, mass-produced 'modern' farm tractor; the same year, he turned his mind to fighting and suggested that if every two soldiers could be given a "tankette"—what we should call a mini-tank—the mass-production of these would prove a lot cheaper in the long-run than the cost of continuing with the ordinary type of fighting, since they could be guaranteed to end the war quickly. A few years after the war this idea was taken up enthusiastically by some Englishmen named Martel, Carden and Loyd, and some very good British tankettes were produced.

However, Germany was weaker than the Allies imagined, and the war ended suddenly in 1918 before any of these ideas could be tested.

And then another American, an engineer named J. Walter Christie, designed tanks that could swim, tanks that could motor across country much faster even than the British fast tanks, and finally, tanks that could be carried by aircraft deep into enemy territory.

So when Governments had to decide how they would spend the taxpayers' money to equip their peace-time armies, they had a bewildering variety of tanks to choose from, especially as some old-fashioned soldiers of high rank scoffed at all tanks, and ridiculed the enthusiasts of modernisation as "tank maniacs". These old stagers were very sure of themselves, and told the politicians that the next war would be dominated by men on horses once again!

Well, there was one development simply inevitable as a result of this—a spate of theory and argument. Big industrialists, with an eye to the armament trade, notably Vickers in Britain and Skoda in Czechoslovakia, produced 'commercial' tanks which looked modern and featured at least some of the attractions of each school of thought—and above all, were reliable vehicles and reasonably priced, in the popular 'light' and 'light-medium' sizes.

No doubt quite a few military advisors looked on these 'commercials' with a sigh of relief; they saved the cost and risk of designing and building from scratch, and if they proved to be not much good for real fighting they could be re-classified as 'training machines', and there would be no wasted production lines in the war factories.

So, in the twenty-five year period between the World Wars it was no real use to talk vaguely about tanks, for there were too many different kinds, all designed for different kinds of armoured warfare! It might be a good idea to draw up a list of them, and show who favoured which, and what happened to them. We'll start with the slowest and oldest, and end with the newest off-beat!

1. The large, slow, heavy assault tank

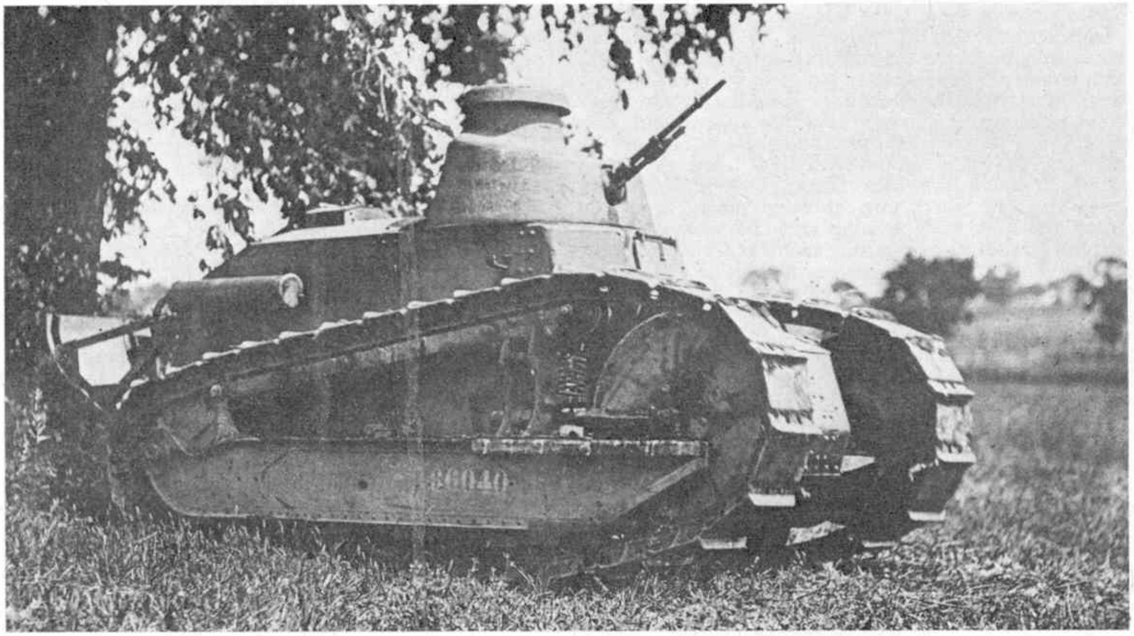
This was meant to plough through enemy positions just ahead of the main infantry attack. It is also known as a 'leading' tank, 'char lourd de rupture', and 'Durchbruchwagen'. It was a British idea of 1916, but as we have seen, by 1918 the British Tank Corps was thinking of much faster vehicles rupturing not the enemy's front, but his command system. The French stuck to the heavy assault tank until 1940, the British re-adopted it in the late 'thirties, with the 'Churchill' and 'TOG'. The Americans took it up in 1919, dropped it a few years later, took it up again in 1939, and dropped it again when the Germans showed what fast, light tanks could do. The Germans experimented secretly with a durchbruchwagen in the 'twenties, then dropped it in favour of the British long-range 'paralysis' idea. However, the German infantry chiefs and some industrialists thought this too chancy by far, and several designs for heavy tanks were pushed ahead; they lay unused until 1942 when the fighting became less mobile, and then served as groundwork for the Tiger and other super-heavy tanks.

2. The small infantry escort

A slow, two-man tank to accompany infantry at walking pace, originating with the French, who stuck to it until 1940. The British adopted it in 1936, but believed that a tank should be crewed by more than two men, so created the three-man Matilda, which for a short time proved to be absolutely invincible. At the same time, the German infantry wanted to take up this type of tank, but were over-ruled by the Panzer forces, who wanted fast, long-range machines. The Americans adopted slow infantry-escorts in 1918, but dropped them in the 'thirties, as did the Russians and Italians.

3. The fast, long-range medium

Here was Britain's most notable contribution to modern armour, the beginnings of which I described in my last article. Its original aim was to by-pass slow, costly frontal fighting, and collapse an enemy swiftly and cheaply by paralysing his command system. But only a few soldiers were able to grasp this idea, because it was so different from the soldiering they were used to. It was rejected in Britain, and the men



Although built in America, this small infantry escort tank was a close copy of the French Renault F.T. *Photo by courtesy of the National Archives.*

who strongly supported it, General Fuller and Captain Liddell Hart were forced out of the Service. The British Army chiefs would allow only that fast tanks could be used for skirmishing, guarding flanks, and pursuing an enemy who had been defeated in a pitched battle. They renamed fast medium tanks, calling them ' cruiser ' tanks. But some far-sighted soldiers in Russia and Germany took up the idea. In the Red Army, Marshal Tukhachevski and Colonel Kalinowski built up a large, fast Mechanised Corps in the early 'thirties. Unluckily for them, they fell out of favour with the great Russian Dictator Stalin, who had them both shot. The Mechanised Corps was then broken up, as Stalin had decided that all tanks should be usable in pitched battles. In Germany, Generals Lutz and Guderian created a similar mechanised force, but gained the favour of the German dictator, Hitler, and so were able to build up a number of Panzer (Armoured) Divisions—which gave Germany her lightning successes in Europe, Russia and Africa between 1939 and 1941.

In America, a civilian engineer named J. Walter Christie saw that this type of tank—speedy and long-ranged—would be vital to the U.S.A.'s transcontinental defence organisation. He built several very fast medium tanks, but the U.S. Army would have none of them. The Red Army, however, copied them in large numbers for its short-lived Mechanised Force—and these subsequently became the basis of the T 34 general purpose tank. The British Army also took them up as ' cruiser ' tanks in preference to Vickers designs.

The first, fast, thinly-armoured, long-range mediums were of course British designs, but they were not developed, and as hinted in the last paragraph, were soon overtaken by Christie's designs in the U.S.A. The Germans then built their own entirely original machines, the Panzers 3 and 4. The U.S. Ordnance Department also produced an interesting one called the M2, which however was developed like the Russian Christies into a general-purpose tank.

4. The tankette

We would call this a mini-tank nowadays! It was originally Henry Ford's idea, to overwhelm the German positions on the Western Front with infantry all protected inside little 15 m.p.h. vehicles. Later the British re-introduced the idea as a means of enabling infantry to keep up with fast tanks. But most army chiefs and governments saw the tankette as a means of saving money rather than time or lives—they bought them for issue not to the infantry, but to the tank forces, as cut-price tanks! Vickers did a brisk trade with them, selling them to money-saving War Departments all over the world. All the infantry got was a modified version to carry their heavy weapons for them—it became known as the Bren Carrier. The Artillery also asked for some, to use as field-gun tractors.

The actual tankettes were of course soon found to be pretty useless as tank-substitutes, so Vickers marketed a new alternative to it. . . .

5. The fast light tank

. . . which was very cheap, costing no more than a luxury motor-car (a good, full-scale medium tank in the late 'twenties cost £16,000), but had full protection, could carry a cannon and/or machine guns, had a speed of at least 20 m.p.h., and could travel a hundred miles or more. Vickers' great breakthrough in marketing fast light tanks was the invention of lightweight forged steel tracks, of open skeleton type, which would run great distances before wearing out. Basically, the same kind of track is still in use on tanks all over the world today. Vickers' commercial fast light tank weighed about 6 tons and could (with a little imagination) be classed suitable for a variety of roles. Some nations wanted them as infantry escorts. The Americans took up the Vickers layout, but went on to build their own machinery around it. The Japanese used them for any purpose because they were cheap. The Italians copied them for the same reason, but by adding a few inches here and there, turned the original into a sort of Medium tank. The Germans bought Vickers chassis and built their own fighting bodies on to them, to serve as training tanks until their own Medium Tank building programme was under way. In fact, these little training tanks had a great part to play in the lightning conquests of Poland in 1939, and France in 1940! Britain used Vickers light tanks in considerable numbers, again, to save money, and there was talk of using them as 'cavalry' tanks, especially when it was known that the new German armoured divisions used them a lot. It was not realised that the Germans kept them on because of a dire shortage of full-scale mediums! As soon as these became available, the Panzer forces promptly passed their light tanks to the Artillery, to be converted into gun-carriages.

6. The general purpose medium tank

Here, Soviet Russia stepped into the lead. When the armies of the West were bickering among themselves about the respective merits of Infantry and Cavalry tanks, and the uses of Light tanks, Stalin solved the problem by shooting the men who spoke in favour of fast, long-range, lightly armoured tanks, then ordering a new type of General Purpose Tank which would have a speed of around 30 m.p.h., wear enough armour to keep out most kinds of anti-tank shot, and carry a big gun useful in all kinds of action. Simple! Why had no one thought of it before? Fortunately, for the Russians, they had two tanks, the T35 and the Christie, which were the right sort to build on, and by 1939 these had been worked and re-worked through a whole series of experimental models into the Klimenti Voroshilov Mark 1 and the T34. They were simple, in some ways they were crude, but they had huge diesel engines, 17 pounder cannons, bigger than any other tanks of their day, and wonderfully stout armour. They could be used in mobile war as well as in pitched battles, and they were very reliable. In spite of having such thick armour, the KV weighed only 45 tons, and the T34 28 tons—only 2 tons more than the British Matilda, which had only a 2-pounder solid-shot cannon, thinner armour, could do only 15 m.p.h., and was more costly to produce.

The Americans and Japanese were next with this sort of development. The U.S. Ordnance Dept. toughened up a light tank until it became the light-medium M3—known to the British as the "Stuart", or "Honey". It was a very reliable machine, but not as generally useful as the Russian machines. They then toughened up their M2 Medium, which became first the M3 "Grant", and then the M4 "Sherman".

A Russian T34/85 of 1943. This tank was ahead of its contemporaries in having a larger cannon; a diesel engine; very simple construction layout and a very low ground pressure.

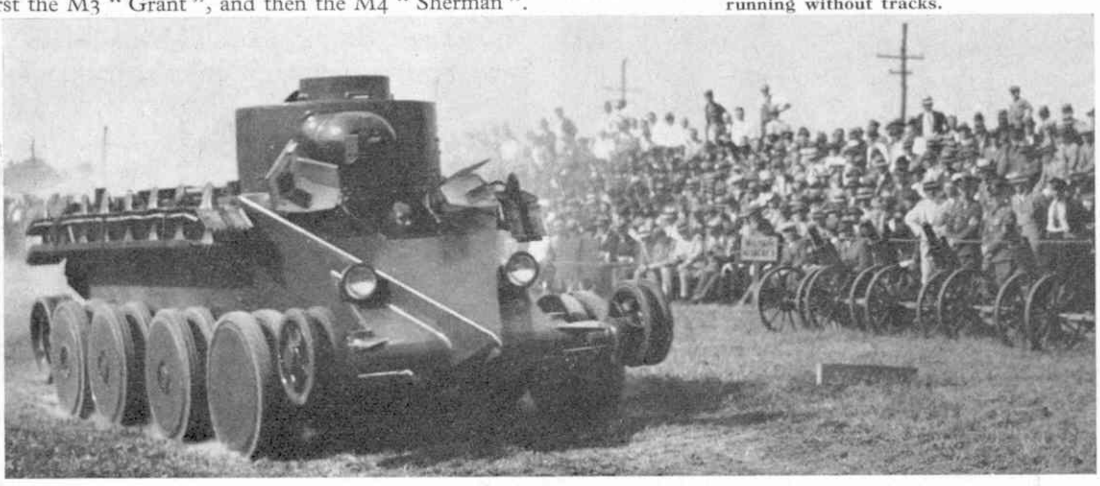
Although these are thought of as wartime tanks, their development started shortly before World War Two broke out. The Japanese did not give tank design so high a priority as, say Germany or Russia, and so their general-purpose medium tanks remained somewhat inferior. They had no influence on the course of international tank development.

7. Amphibians and airbornes

At first it seems unlikely that tanks could swim or fly, but when one thinks of the importance of water obstacles to an advancing army, one sees that tanks must be made to cross them somehow. The British were first in the field with the 'D' fast tank; its designer, Colonel Johnson, made it very long so that it could cross trenches, then decided that the resulting empty spaces could be used to make the tank float.

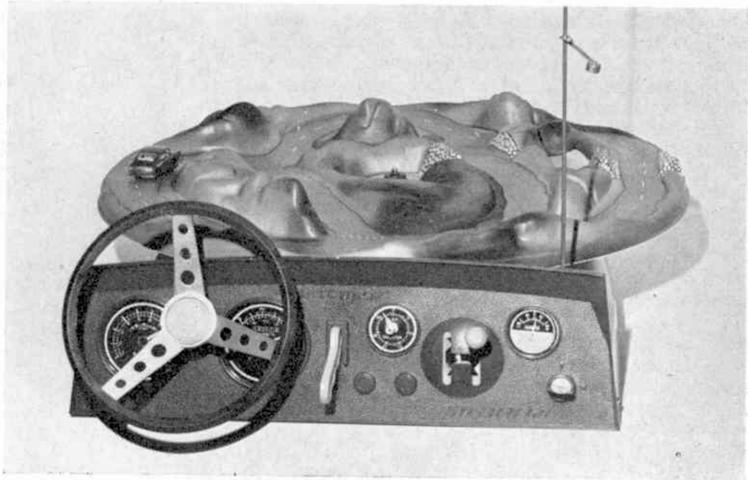
But the 'D' was not a true amphibian. The American designer Christie was the first to build one of these in the early 'twenties—it could swim in rough seas, without sinking, and it had screw propulsion. However, its boat-like body was unsuited to tank warfare, and so its combat roles were limited. The Japanese took it up in preparation for their invasion of South-East Asia.

The T3 fast medium was the last Christie designed for Warfare. This one was built in 1931, and is seen below running without tracks.



The complete layout is shown on the right. The 'rod' on the extreme right is the automatic timer. The small weight gradually works its way down and takes approximately 25 seconds from top to bottom.

STEER —N— GO!

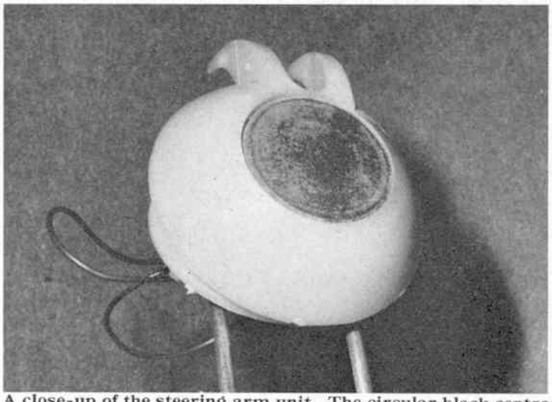


A preview of a brand new driving game from Lesney Products & Co. Ltd.

DUE FOR RELEASE during the latter part of May is a new game from MATCHBOX called "Steer-N-Go".

We first saw the prototype way back in January of this year at the Brighton Toy Fair, but a large queue of interested visitors had formed and it was impossible for us to obtain a good look—let alone a go! Subsequently we contacted the manufacturers who kindly supplied us with one of the first production models, thus enabling us to give Meccano Magazine readers all the gen before "Steer-N-Go" hits the Toy and Model Shops.

"Steer-N-Go" is a test of driving skill, requiring calm nerves and concentration. It utilizes any standard MATCHBOX car or commercial vehicle which is "modified" for the "Steer-N-Go" course by simply attaching to its underside a small magnet (the magnet is of course provided with the sets). The main moving feature of the amazing device is a circular roadway, complete with hills, bridges and in fact, all scenic details.



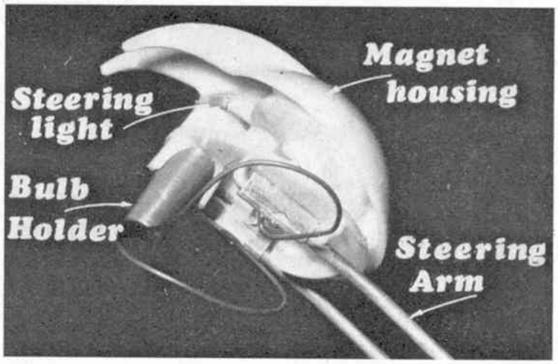
A close-up of the steering arm unit. The circular black centre section is a strong magnet; the two wires provide power for the bulb which shines through the track to show the position of the arm in relation to the car.

This "roadway" is approximately 20 in. in diameter and revolves in an anti-clockwise direction during normal driving. From the driver's seat of course the track appears to remain stationary and the car to move around the circuit, whereas in actual fact the car only moves from side to side!

The steering wheel mounted on a realistic looking dashboard turns an arm with a magnet at its end, which in turn moves the car sideways to enable it to follow the twisting roads.

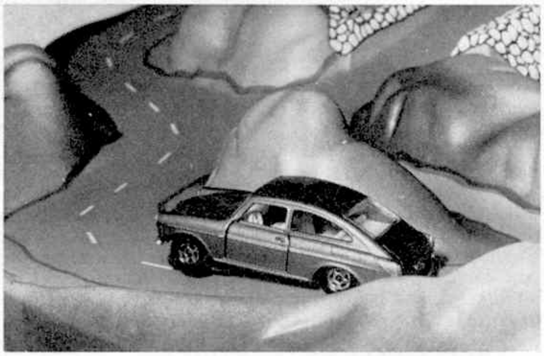
We stated earlier that "under normal driving the roadway revolves in an anti-clockwise direction". Should the driver manage to steer the car off the road, or lose magnetic contact altogether, a gear lever on the dashboard can be flicked into reverse, allowing the car to be picked up and repositioned for normal forward driving. This gear lever can be positioned to give a selection of no less than *three* progressively quicker forward speeds (with of course reverse) creating a situation nearer to driving an actual car than we've ever seen before.

Third gear requires tremendous concentration and

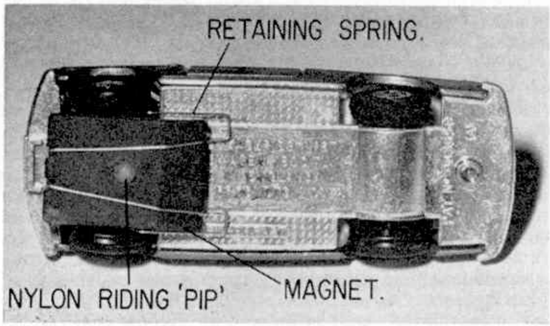


This underside shot shows clearly the lighting fitting. The tip of the "pea" bulb can just be seen.

skill on behalf of the driver to negotiate the rapidly approaching bends (you can see how twisty the circuit is from the photographs). Some corners just cannot be taken in top gear (just as in driving a full size car), so the driver can either change down *or* apply the braking lever situated just to the right of the steering wheel! Pressing the lever further down increases the amount of braking—once again just like the real thing! Also included is an automatic lap recorder which faithfully records up to 35 laps *and* an automatic timing device so as "against-the-clock racing" can be tried.



The car supplied is a Volkswagen "Beatle," but we swopped it for a Volkswagen 1500 saloon as it was slightly narrower and therefore easier for a beginner to use when negotiating the narrower section of the course. Giving the roadway a good polish with furniture wax gave the car a smoother run and allowed it to 'swing out' on the corners.

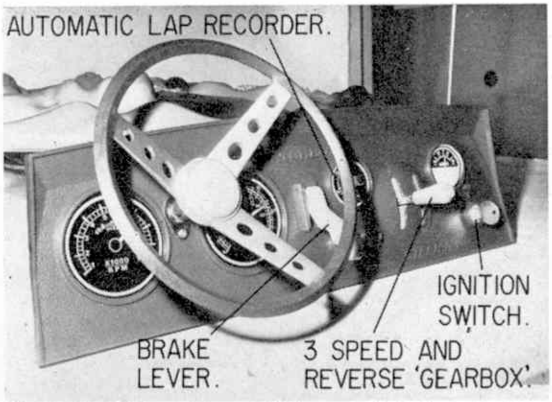


The second magnet is attached to the underside of *any* Matchbox car by a small spring wire. The front wheels are lifted clear of the track and the car rides on a small nylon pip in the centre of the magnet.

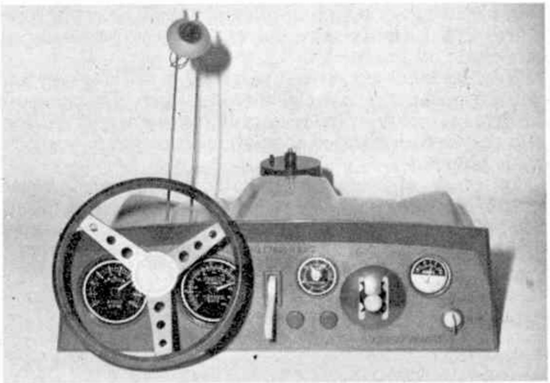
When driving is finished, the gearbox is returned to neutral, the ignition switched off and the key withdrawn. (But of *course* there is an ignition switch!)

Four alternative roadway courses will be available to add even more interest to this exciting game/toy. A "sand-dune" *course* ideal for MATCHBOX Beach Buggies: A "Town" course complete with garages for any of the MATCHBOX range: A Grand-Prix roadway for cars such as the MATCHBOX Ford G.T.'s and Ferraris, and finally a tricky "hill-climb" course known as "Pikes Peak Roadway" for the MATCHBOX Rally cars. These extra courses will cost, we are told, just under £1 each.

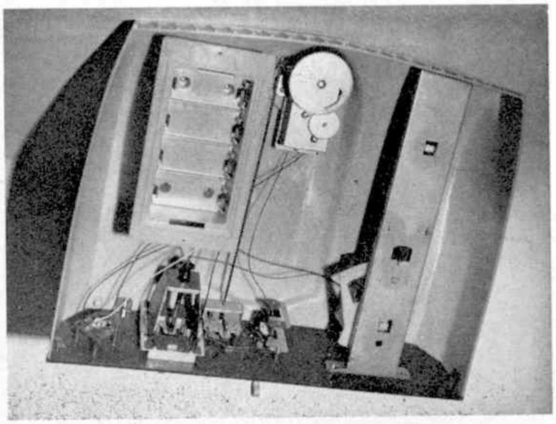
Our impression of "Steer-N-Go" is that it promises to be one of the biggest attractions of 1970. It's packed with excitement for everyone, and at approximately £7 is remarkable value for money. Keep an eye open for it during the next few weeks.



The dashboard layout is a realistic copy of what most saloons have. Perhaps the brake and gearlevers are slightly out of place but the overall effect is excellent.



A driver's eye view of the unit. The track has deliberately been removed to show the spring steering arm and centre drive unit for rotating the track.



We don't advise you to take your Steer-n-go apart like this! We just did it to show the inquisitive the 'works.'

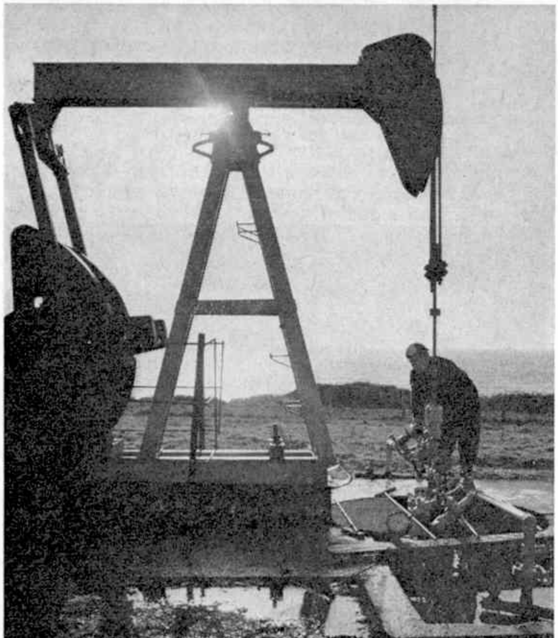
ARTHUR GAUNT asks......

ARE YOU WALKING ON OIL?

ALTHOUGH BIG-SCALE PRODUCTION of crude oil is confined largely to overseas areas, such as Texas and the Middle East, Britain has a stake in this important industry. In fact, you'll probably be astonished to learn that more than 270 wells in various parts of the United Kingdom are in regular operation. One of them alone, on a Dorset cliff top, has yielded more than 100,000 tons of oil, and sites in Nottinghamshire and Leicestershire have added substantially to our crude oil production figures.

Yet the landscape is not marred by drilling rigs and wildcat gushers like those abroad. Such rigs *are* built in Britain, but they are used only for the actual drilling, and they are dismantled soon after oil is struck—or if no oil is tapped.

In place of the soaring towers, engineers install "nodding donkeys"—seesaw structures which pump the oil to the surface by means of a small engine alongside. The installation makes no more noise than similar equipment used to pump water from a well. Thanks to this arrangement, the countryside is not disfigured and farming can continue without disturbance.



This well near Lulworth Cove, Dorset, has yielded more than 100,000 tons of crude oil since 1961.

The story of Britain's home-produced oil industry really goes back to the time of World War I. When enemy submarines menaced the importation of petroleum, a Government-sponsored search for this vital fluid was launched in Derbyshire, where underground reservoirs of oil were thought to exist. One oil well was discovered at Hardstoft, near the ducal Hardwick Hall, but the overall results of the quest were disappointing. Nevertheless, desultory drilling continued after the War, and by 1922 fourteen wells had been bored, though they yielded little oil. Though the big oil firms hardly found these results encouraging, the search continued in the belief that bigger reserves waited to be tapped in some areas. In 1934 Government interest resulted in an Act which made all undiscovered deposits State property, with companies being granted licences to explore specified regions.

British Petroleum took up the challenge, and the first B.P. well was drilled at Portdown, Hants., in 1936-37. The hoped for oil, however, failed to materialise there, only a dry hole being reached. The first really significant discovery of oil in Britain was made in 1939, only a few months before the outbreak of World War II, when promising amounts were found at Formby, Lancashire. A few weeks later a team of drilling engineers struck a significant field at Eakring, fifteen miles north-east of Nottingham. During the War quantities of good quality oil were found at Caunton and Kelham Hills, in Nottinghamshire. The oil, brought to the surface from more than 2,000 ft. underground, was invaluable, and a total of 400,000 tons was extracted before the state of hostilities ended in 1945.

The search for other oilfields did not end when the War finished, and in 1953 "strikes" were made at Plungar, Leicestershire. This success encouraged further prospecting in Nottinghamshire, and oil was located at Egmanton, Bothamsall, and South Leverton. Lincolnshire has proved fruitful, oilfields having been found at Corringham, Gainsborough, and Glentworth. One of the most important discoveries occurred in 1959 at Kimmeridge, Dorset. It was significant because it was a long way from the other fields. In point of fact, oil prospectors had drilled on the same site twenty years earlier, but had abandoned their quest after drilling there.

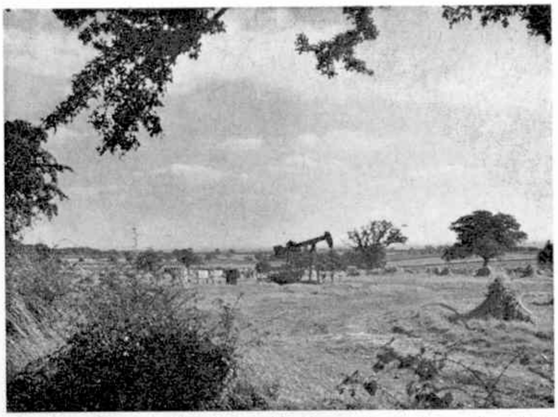
Today many of the sites explored in the past and regarded then as failures are being examined again. In a number of cases it has been shown that improved exploration techniques and better equipment can disclose the presence of oil where earlier searches failed.

The Kimmeridge discovery ranks as a big milestone in the quest for oil in Britain. It has prompted a re-examination of other sites hitherto regarded as unproductive. Seismographic tests are carried out as a preliminary step, the results determining whether drilling is likely to strike oil. Geophones are planted in the ground to record "earthquakes" produced by shot-hole explosions. The reconnaissance operations enable experts to determine whether there are signs of underground geological structures worth investigation as likely sources for oil.

At present there are six areas in the United Kingdom yielding sufficient oil for commercial exploitation—five in the East Midlands and the one in Dorset. The location of further exploratory drillings will depend largely on the interpretation of information obtained by seismic surveys. In some instances slim holes may be bored to a depth of 2,000-3,000 ft. in order to obtain more geological data. But prospecting oil experts sometimes get surprises. When their early quests in Southern England failed to reveal areas worth fuller exploration there, the teams moved to Scotland and Eskdale in North Yorkshire. They did make discoveries in those areas, but drilling released natural gas, not crude oil! Gas from these borings has since been fed into Gas Board undertakings. Yet circumstances sometimes conspire in the reverse way, to the benefit of the oil seekers. The important oil wells at Eakring first became known as a result of information provided by scientists exploring for coal. A borehole which they used at Kelham, a few miles from Eakring, showed that oil as well as coal waited to be brought to the surface. This discovery led to an expansion of the Nottinghamshire oil industry.

Whilst the quantities of oil obtained in Britain is infinitesimal compared with the output from overseas sources, even the great Texas oil corporations have taken an active interest in the United Kingdom explorations. One subsidiary obtained permission to drill in the moorland area which separates Yorkshire and Lancashire. Another district earmarked for seismographic testing—in this instance on behalf of British Petroleum—is near Shapwick, a few miles from Wimborne, Dorset. A survey began in that region in Spring, 1968. Oil explorers in Lincolnshire were so convinced about the existence of substantial quantities underneath Gainsborough that they adopted a special drilling technique to probe beneath the town. Plainly, they could not set up derricks in the town itself, so they bored from a more convenient point and slanted the drilling to reach the oil.

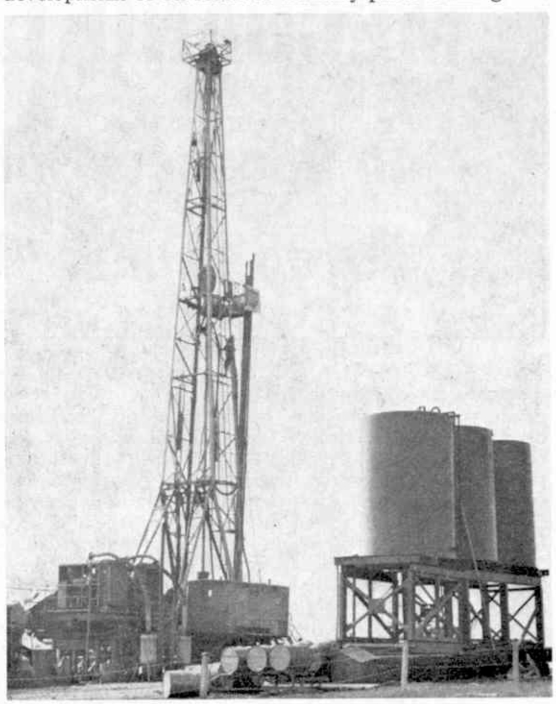
A new type of drilling rig has been developed, too, and has undergone tests at Eakring, Notts. Invented to speed up and cheapen the drilling of oil wells, and named after its inventor, Hew Fanshawe, it is a double hydraulic lift. In effect it allows the drill-pipe to be handled in and out of the borehole in a continuous motion—like using a hand-over-hand action to draw a bucket of water from a well. The Fanshawe drilling rig overcomes the disadvantage of having to pull out the drill pipe in 90 ft. lengths and having to pause while each section is being unscrewed, pending the lowering of the block to pick up another length. With the new type of rig, the unscrewing takes place while the upper hydraulic hoist is pulling and the lower one is descending to take a grip further down the pipe. The unscrewed lengths are stacked automatically as the operations continue. Another benefit of this system is that the pipe is undone in 30 ft. lengths instead of 90 ft. sections. This means that the rig can be much lower than the hitherto conventional derrick.



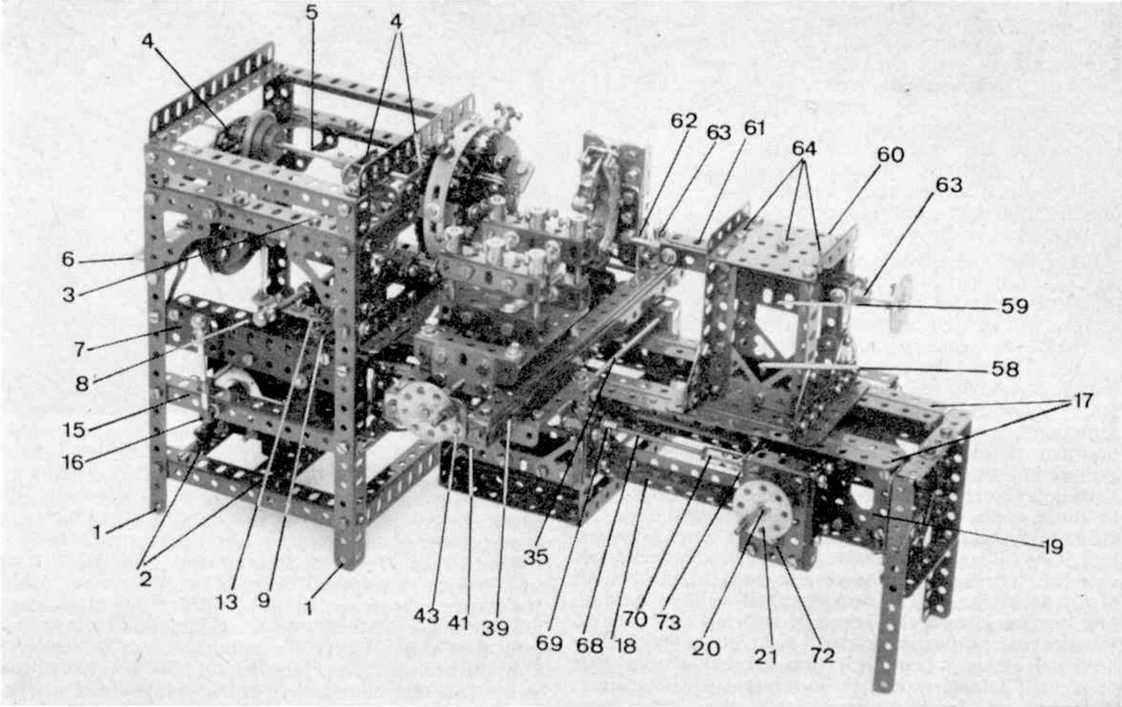
Another shot of the Lulworth Cove site. The only visible sign of pumping being a small "nodding donkey" which pumps the fuel to the surface.

Tapping the oil under our feet in Britain is a still-growing activity, and it is so promising that in some localities the operations continue through the night.

More than a million feet of test drilling has been undertaken, at a cost of from £5 to £10 per foot. Yet the expense is regarded as a worthwhile investment, and although the search has been long and tedious, it is now providing results rewarding enough to justify a continuation of the operations. Of special interest, too, is the fact that oilmen here are able to gain experience in their job, before going to oilfields overseas. So, although the output of "home produced" oil is relatively small, it has a bearing on the commercial development of oil reserves in many parts of the globe.



An oil drilling rig at Kimmeridge, Dorset, during boring operations in 1959. The discvovery of oil in this locality was of unusual interest to oilmen.



MECCANO LATHE Part II

An advanced model described by Dutch reader Dr. J. DE ZEEUW

IN THE FIRST part of this article last month we covered construction of the Lathe bed and motor/gearbox casing, but were just unable to finish the description of the chuck. To continue where we left off, therefore, each Screwed Rod 33 is then fitted with two Nuts, a Washer, two Formed Slotted Strips 32, one or two Washers and a Handrail Coupling in which two Grub Screws are fastened. Note that the Screwed Rods 33 are screwed as far into the bores of Collar 31 as possible without fouling the 2½ in. Rod. Formed Slotted Strips 32 are bolted to brackets 30, while the two Nuts on each of the Screwed Rods are in turn tightly locked against the Formed Slotted Strips. The second slotted Sprocket Wheel is now fixed to the rear of the chuck, its boss pointing outward, then the Flat Girders forming each jaw are bolted together with a spacing Washer between them. If necessary the Nuts joining the rear parts of each jaw should be filed off a little bit, and Grub Screws could be used in place of normal Bolts.

It is worth mentioning, here, that if materials of small diameters are to be turned on the model the jaws can be made longer by replacing the spacing Washers between each pair of Flat Girders 28 with a small Strip such as the largest piece previously sawn off the Flat Girders. The width between the jaws should not exceed ¾ in.

The main shaft 5, supplied by an 8 in. Axle Rod, is provided with a 60° point, which is done with a grinding machine. While grinding, the Rod should be turned regularly at not too low a speed, and note it is essential that the point be *exactly* in the centre. Finally, this shaft which carries also a Cone Pulley, is journalled in the upper three bearings of the motor casing 4, then the chuck is fixed on this shaft by two Grub Screws in the boss of the rear Sprocket Wheel.

Saddle and Cross Slide

Coming to the part known as the "saddle" which slides along the length of the lathe bed, this is built up from two square frames 34, assembled from 3½ in. Angle Girders, the two frames being connected by four 4½ in. Screwed Rods 35 and two 5½ in. Angle Girders, as is shown in Fig. 5. The connections between the frames and the 5½ in. Girders are reinforced by Corner Gussets 36, while the corners of the frames themselves are made rigid by four 1 in. and four 1½ in. Corner Brackets, two to each frame.

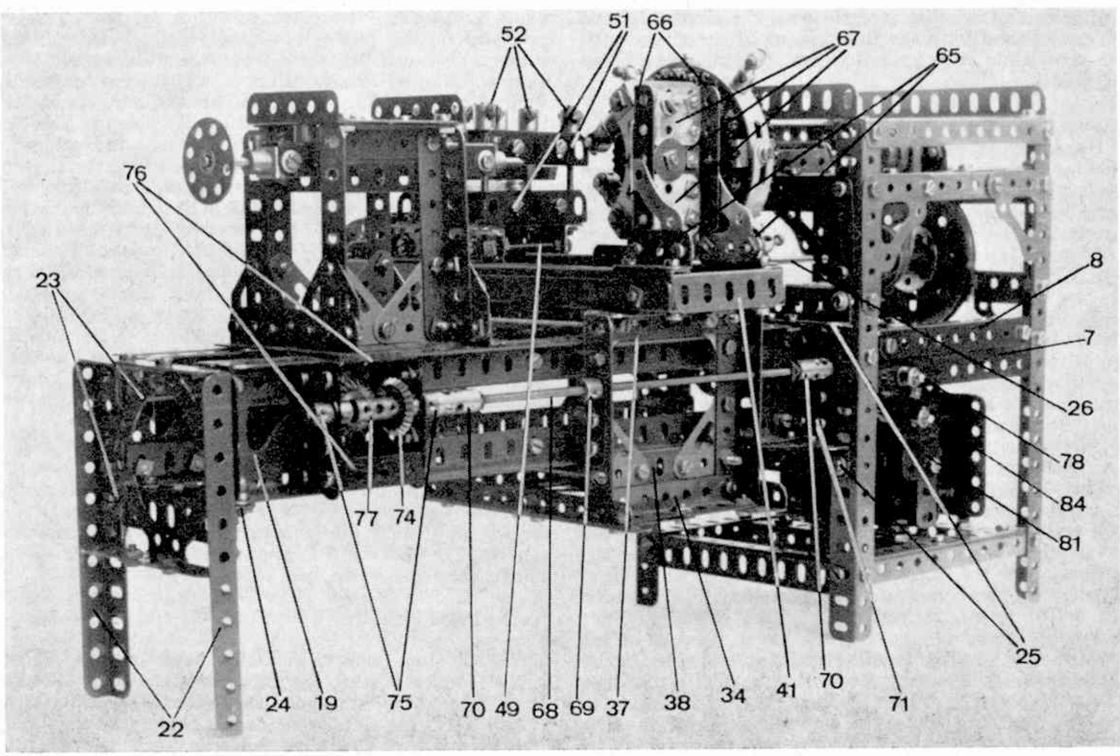
Fixed to the inside of each frame, one to Girder 37 and the other between the side Girders of the frame, are two special runners, each built up from a 2½ in. Angle Girder and 3½ in. Angle Girder bolted together to form an "F" profile, between the arms of which the outer edges of the bed are held. The upper slide is secured in place by appropriate Screwed Rods 35 and two separate Bolts and Nuts by which the space between the Girders of the "F" construction can be adjusted, as also is the lower slide, numbered 38 in Fig. 2. By using Screwed Rods 35, the width of the saddle can be precisely adjusted to the width of the bed. At the same time, the space between the sliding Girders can be adjusted with the fixing Bolts, so that the saddle runs smoothly and with the least amount of play along the bed.

This adjusting and spacing is critical for good functioning of the lathe, but, before making any final adjustments the cross-slide should be mounted on the top of the saddle. The cross-slide moves on two 9½ in. "U"-section Girders 39, each built up from two 9½ in. Angle Girders. From the illustrations it will be apparent where slotted and where circular holes are used. The "U"-section girders are connected at each end by a 3 in. Screwed Rod 40 and a 2½ in. Angle Girder 41, the Girder at one end being attached by Angle Brackets, while the other Girder is bolted directly in place. The former Girder also carries a set of two 1½ in. Flat Girders 43, one bolted to the other, then construction is reinforced by a 3½ in. Angle Girder 44, which rests on two Flanged Brackets 45, and by four 1½ in. Corner Brackets 46.

As in the case of the saddle, both slides for the cross-slide are again built up from a 2½ in. Angle Girder 47 and a 3½ in. Angle Girder arranged to give an "F" profile. Each slide is bolted to a 3½ in. Angle Girder 48, then the two are connected by two 2 in. Screwed Rods 49 (Fig. 2) which also serve for spacing purposes. On to this assembly is fixed a 2½ × 2½ in. Flat Plate 50 and the tool holders, the latter being built up from eight 2½ in. Angle Girders 51, bolted together in pairs (using ¾ in. Bolts in the second and fourth holes) to give four rectangular 'tubes'. The bolting is done with three Nuts, two inside each 'tube' and one outside. The tubes are mounted in pairs, as shown, on six 3½ in. Screwed Rods and it is between the tubes that the cutting tool is clamped by six Threaded Bosses 52, in which Set Screws are locked by Nuts.

At the front end of the cross-slide, a 2½ in. Angle Girder 53 is fixed, the height of which is adjusted by spacing Washers. To this Angle Girder a pair of 1½ in. Flat Girders is bolted, a Nut being sandwiched between them. Through this Nut an 8 in. Screwed Rod 54 is screwed and, at the front end of this Rod,

Fig. 2, showing construction of the saddle and cross slide, with one of the controlling leadscrews.



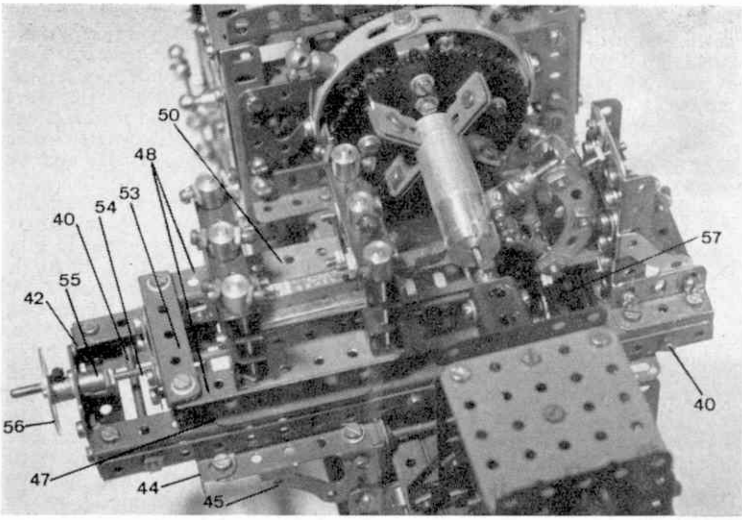


Fig. 4. A close-up view of the cross slide with the Lathe set up for operation.

an Adaptor for Screwed Rod 55 is mounted and locked in place by a Nut. This Adaptor carries a Bushwheel 56, by means of which the cross-slide can be moved forward and backward. If there is too much play, here, a second Nut can be inserted between the two Flat Girders. The rear end of Screwed Rod 55 is journalled in the central hole of 1½ in. Flat Girder 57, being held in its position by a Nut locked against the Girder. This Girder is fixed to a 2½ in. Angle Girder that, in its turn, is fixed in the fifth hole of the two lower "U"-Section Girders 39. Here, again, adjusting and spacing is done with the Screwed Rods 40 and 49 and with the fixing Bolts of the slides until the cross-slide runs smoothly and without play along its guides.

Loose Headstock and Steady

Construction of the loose Headstock will be apparent, for the greater part, from the illustrations. Moved by hand, it slides along the inner edges of the bed, the actual slides each being provided by a pair of 2½ in. Angle Girders which enclose the flange on the relevant bed Angle Girder. Bolted to each slide is a 2½ in. Flat Girder 58 and two 1½ in. Corner Brackets, then the two slides are connected by two 2 in. Screwed Rods, fixed, together with the Corner Brackets, in the slotted end holes of Flat Girders 58. These Rods, again, serve for spacing purposes. The superstructure is built up from four vertical 3½ in. Angle Girders, the two Girders at each side being joined by two 2½ in. Flat Girders 59 and two 2½ in. horizontal Angle Girders, the latter at the top of the Girders. Bolted to the latter Girders at each side are another two 2½ in. Angle Girders and a 2½ × 2½ in. Flat Plate 60. The sides of the headstock are joined at the base by two transverse 3½ in. Angle Girders, the joins being strengthened by four Flat Trunnions.

Serving as the centre point shaft 62 is a 6½ in. Rod mounted in the bosses of two Large Fork Pieces which are bolted to an inverted 4½ in. "U"-Section girder 61, built up from two 4½ in. Angle Girders. This assembly is secured to the top of the headstock by three ½ in. Bolts 64, spaced by three Collars and as many Washers or Thin Washers as are necessary to get this shaft in a direct line with the main shaft. The alignment is very critical for the good functioning of the lathe.

In operation, the headstock would of course be bolted to the bed and, when thus secured in place—particularly at the limits of its travel—the distance between the centre point shaft and the main shaft can be varied up to one inch by altering the position of "U"-Section girder 61 in its mounting. The centre point shaft itself may also be used for fine adjustment of the distance between the two shafts, so that a pretty good range of distances is available.

To compensate the pressure exerted on the material while turning and to reduce vibration, a steady rest is mounted on the guides of the cross-slide. Its general construction can be seen from the illustrations. A Formed Slotted Strip (Fig. 3, right-hand part) is flanked by two 2½ in. Stepped Curved Strips, to which it is attached by means of three ½ × ½ in. Double Brackets, fixed by one standard Bolt through the centre hole and a ¾ in. Bolt through each of the slotted holes. The complete rest is then secured to a support, consisting of two 1½ in. Angle Girders 65 and two 2½ in. Angle Girders 66 connected by three 1½ in. Flat Girders 67, and reinforced by two Flanged Brackets. Rollers are supplied by Collars, fitted with 7/64 in. Grub Screws, on a short length of Rod, mounted in Small Fork Pieces. These rollers can be adapted to the diameter of the material to be turned, since they are secured to Threaded Pins or, if necessary, to Long Threaded Pins. To remove all danger of damage to the turning material a piece of plastic tube can be glued round the Collars.

Motor and Gearing

Both the saddle and cross-slide are moved along the bed by means of two 8 in. Screwed Rods, the lead-screws 68, which are screwed through two Threaded Cranks 69, one fixed to the saddle by a 1½ in. Flat Girder, and the other fixed directly to a vertical 3½ in. Angle Girder, as shown. A Threaded Coupling 70 is screwed and locked by a Nut on each end of each lead-screw, a 1½ in. Rod being fastened in each of the two Threaded Couplings nearest the motor casing. These latter Rods pass through the second hole of a 2 in. Flat Plate 71 and through the boss of a Crank which is bolted to this Girder inside the motor casing. This Flat Girder and Crank assembly is fixed to the 2 in.

vertical Angle Girders on each side of the bed.

The small gear casing on the right front or operators side of the lathe, the so-called (fixed) apron, consists of a $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flanged Plate to the front of which a Crank 72 is bolted and to each side of which, a $2\frac{1}{2}$ in. Angle Girder extended by a 2 in. Flat Girder is fixed. The casing is then fastened to the bed by two 2 in. Angle Girders. In order to allow adjustment of the leadscrew, full use should be made of the slotted and circular holes in both the Angle and Flat Girders of this casing. The gearing, itself, consists of two $\frac{7}{8}$ in. Bevel Gears, one of which is fixed on a $1\frac{1}{2}$ in. Axle Rod fixed in Threaded Coupling 70 and journalled in the boss of a Double Arm Crank 73, bolted to the casing. The other Bevel Gear is mounted on a $5\frac{1}{2}$ in. Axle Rod 20 which is journalled in the holes of the 2 in. Strips already secured to the bed, as described above. Inside the casing Rod 20 carries a Coupling, the centre transverse bore of which serves as a bearing for the $1\frac{1}{2}$ in. Rod.

On the " rear " side of the lathe a similar casing is mounted, as is shown in Fig. 2. Bevel Gear 74 is fixed on a $2\frac{1}{2}$ in. Axle Rod which is journalled in the bosses of two Cranks 75, then the two sides of the casing, each consisting of a 2 in. Angle and a 2 in. Flat Girder, are connected by two $1\frac{1}{2}$ in. Double Angle Strips 76. The central transverse bore of Coupling 77 serves as the end-bearing of Rod 20.

Before the gearing of the motor casing is assembled, two $2\frac{1}{2}$ in. Angle Girders are bolted to one motor side-plate, a $2\frac{1}{2}$ in. Flat Girder, in turn, being bolted to one flange of each of these Girders. Bolted between the Angle Girders, through their upper holes, is a $3\frac{1}{2}$ in. Flat Girder.

On each of the Rods fastened to the two leadscrews inside the motor casing, a $1\frac{1}{2}$ in. Bevel Gear is fixed. These Gears are in constant mesh with two $\frac{1}{2}$ in. Bevel Gears 79 on Axle Rod 78, this Rod also carrying a $1\frac{1}{2}$ in. Gear Wheel 80. A Worm 82 on the output shaft of the Motor is in mesh with a $1\frac{1}{2}$ in. Gear Wheel 83 on a Rod 84 which also carries a $\frac{1}{2}$ in. Pinion 85 and a 1 in. Gear Wheel. An " idler " $\frac{1}{2}$ in. Pinion 86 turns freely on a $\frac{3}{4}$ in. Bolt held by Nuts in one Flat Girder 81, then a slideable $4\frac{1}{2}$ in. Axle Rod 87 is mounted in the upper holes of Flat Girders 81. Fixed on this Rod, from right to left, are $\frac{1}{2}$ in. Pinion, a free-moving Collar, in the threaded bore of which a Long Threaded Pin 88 is lock-nutted, a fixed Collar, a 1 in. Gear Wheel and a $\frac{1}{2}$ in. Pinion with a $\frac{3}{4}$ in. face 89. Stops for the sliding movement of the Rod are supplied by Collars at both its ends, while the movement, itself, is controlled by lever 8, the Bell Crank of which moves Threaded Pin 88. The arm of this Bell Crank is held between two Collars fixed on Threaded Pin 88.

At this point the Motor, with gearbox, is mounted on the two transverse Girders of the framework, using four $\frac{1}{2}$ in. Bolts with three Nuts on each of them, so that the Motor can be adjusted in order to ensure that Pinion 89 meshes with Gear Wheel 80. On the other side of the Motor, a $\frac{1}{2}$ in. Pulley with Boss is fixed on the output shaft, then a 3 in. Pulley 90, screwed to a Bush Wheel, is mounted, together with a Cone Pulley, on $5\frac{1}{2}$ in. Rod 26. On the model illustrated, final transmission was by commercially-produced plastic belting, but suitable small Vee-Belts could be used, or standard Meccano Driving Bands. Alternatively, instead of a pulley and belt transmission system, Sprockets and Chain could be used, although somewhat more noisy.

In adjusting the model for operation, it is important

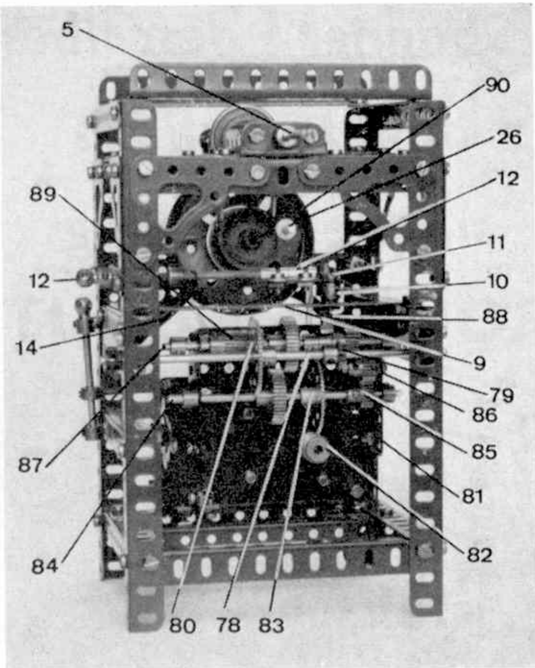


Fig. 6. The Motor and gearing, in their framework, removed from the remainder of the Lathe.

to remember that the $1\frac{1}{2}$ in. Bevel Gears on the shafts of the leadscrews and also the $\frac{7}{8}$ in. Bevel Gears on Rod 20 must be synchronised with each other to avoid uneven driving of the saddle.

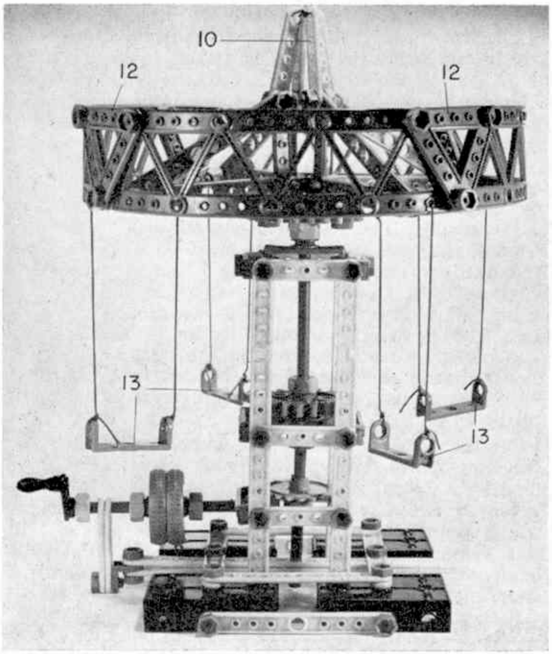
Using the Lathe

After all moving parts have been carefully adjusted and lubricated, the lathe can be given its first trial. A suitable, cylindrical piece of wood or brass is provided with centre holes in both its ends by a centre drill. This must be done very precisely; exactly in the centre of the material. The piece of wood or brass is then fixed between the centre points, as is shown in Fig. 4, and then carefully clamped between the jaws. Before the actual turning is done, however, the working of the lathe, and especially the centring of the material, should be double-checked.

The tool used in the model shown is a $3\frac{1}{2}$ in. Eclipse chisel, the upper point of which *must* be at exactly the same height as the centre points—something which can be achieved by packing an appropriate number of $2\frac{1}{2}$ in. Strips under the tool. On the other hand, the tool need not necessarily be fixed at right-angles to the material being turned, but could just as well be clamped at an obtuse angle to the material. Turning lengthwise is done either by hand or by motor and transverse turning, or feeding, is done by moving the cross-slide into the direction of the material. This feeding should be done very carefully to avoid heavy vibration.

It is very probable that readjustment of several parts must be done, before the lathe turns satisfactorily. Modellers not sufficiently acquainted with lathes and turning are advised to read MAP-publications No. 52: " The Beginners Guide to the Lathe " and No. 32: " Using the Small Lathe ".

'Spanner' describes how to build a simple, working ROUND-A-BOUT from PLASTIC MECCANO



This delightful Round-a-bout is built with Plastic Meccano Set 'C' plus a few extra parts which can be obtained from the northern office of Meccano Ltd.

ALWAYS POPULAR with Meccano model-builders have been reproductions of fairground "rides", particularly those terrifying machines calculated to tie your stomach in knots! Why this is, I feel, is not because Meccano modellers have an unnatural interest in queasy insides, but simply because fairground models look really good in Meccano. I know I like them, while I can assure you that sight of the full-size versions makes my courage rapidly disappear!

Traditional metal Meccano, with a history of more than 60 years behind it, has had plenty of time to gain a place in the hearts of fairground modellers, but its baby brother, Plastic Meccano, is so young by comparison that there has just not been enough time for any one type of model to rise in popularity over another. There is, however, no earthly reason why the fairground scene should not eventually blossom forth and perhaps we might start the trend, now, with the delightful Roundabout, featured here. This operates extremely well and is a fine example of what can be achieved with the system. In fact, a young lady typist from another office popped in on us only a few moments ago, spotted the model, tried it out and was moved to comment, in the vernacular, "That's great! It's amazing what can be done with this stuff!" Hardly the best way to put it, but it sums up the situation!

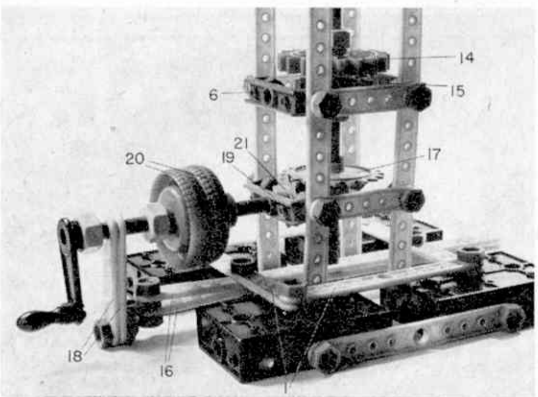
As far as construction is concerned, a good, wide base support is built up from four Bases, spaced apart, as shown, but rigidly connected by four 3-hole Strips 1 bolted between the tops of the Bases, two further 3-hole Strips being bolted between the longer sides of the Bases to provide extra strength. Four vertical 5-hole Strips 2 are then bolted, one to the inside corner of each Base, these Strips being connected at each side by three 2-hole Strips 3, 4 and 5. The Bolts securing Strips 4 and 5 also fix four Double Angle Strips 6 between the sides. Bolted to the upper two Double Angle Strips is another Double Angle Strip 7, spaced from the former by a grey Collet Nut on the shank of each securing 1 in. Bolt.

Revolving Structure

The actual revolving superstructure carrying the "cars" is built up from a 24-teeth Gear Wheel 8, to the face of which four Angle Brackets are bolted.

Fixed, in turn, to these Angle Brackets are four 3-hole Triangular Girders 9, to the upper corner of each of which a 2-hole Strip 10 is bolted. Strips 10 are brought together at the top and tightly tied to each other by a short length of Cord passed through the upper holes of the Strips. Four Bridge Girders 11, suitably curved, are then attached by Angle Brackets to the outside corners of the Triangular Girders, the joins being overlaid by four 2-hole Triangular Girders 12. Four Double Angle Strips 13 are suspended on cords from Triangular Girders 9 and Bridge Girders 11 to represent the " cars ".

When completed, the finished structure is fixed on the upper end of a 12 in. compound rod, obtained from two 6 in. Axles joined together by an 18-teeth Gear Wheel 14 and a 12-teeth Gear Wheel 15 locked together to form a coupling, as shown in the accompanying sketch. The compound rod is journalled in Double Angle Strip 7 and in two 5-hole Strips 16, mounted one on top of the other and bolted to the underside of two Strips 1. A Pulley Wheel spaces the Collet Nut of Gear Wheel 8 from Double Angle Strip 7, while the rod is prevented from lifting out of its bearings by an Axle Clip on the Rod beneath Strips 16. Mounted on the lower section of the compound rod is a 20-teeth Sprocket Wheel 17.

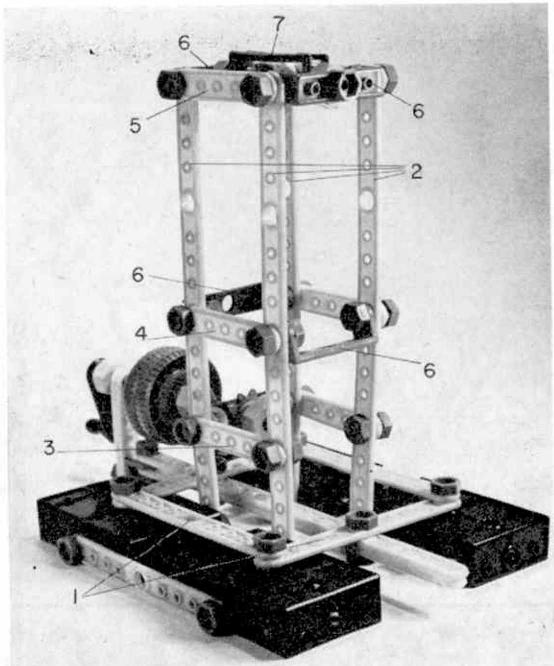


A close-up view of the base of the model showing the drive system.

Bolted between Strips 16, at one end, is an Angle Bracket, to the vertical lug of which two 2-hole Strips 18, one on top of the other, are fixed. Journalled in the upper holes of these Strips and in a Double Angle Strip 19, bolted between two Strips 2, is a 6 in. Axle on which two Road Wheels 20 and a 10-teeth Sprocket Wheel 21 are mounted. The teeth of this Sprocket Wheel engage at right-angles with the teeth of Sprocket Wheel 17 to give a bevel gear action. A Handle 22 is mounted on the outside end of the Rod to provide a drive point for the model.

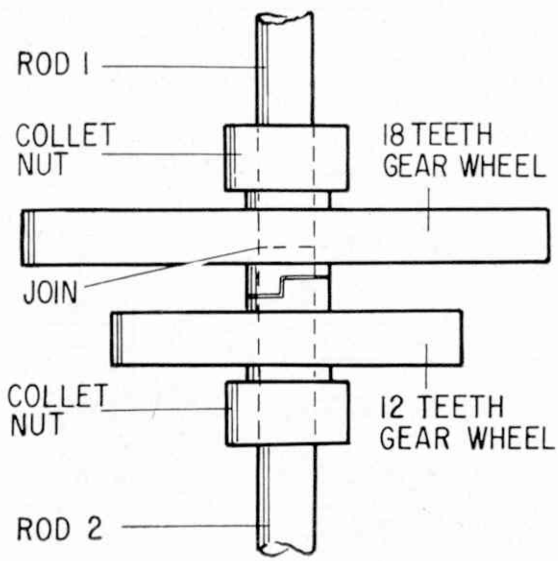
It should be mentioned that the two Road Wheels 20, mounted face to face on the initial drive Axle, are included to serve as a drive pulley in the event of the model being fitted with a motor. We found that a standard Meccano Reversible 4½ volt D.C. Motor bolted to one of the nearby Bases drove the model very effectively. A standard ½ in. Pulley on the Motor output shaft was connected by a 10 in. Driving Band to the built-up pulley provided by the Road Wheels.

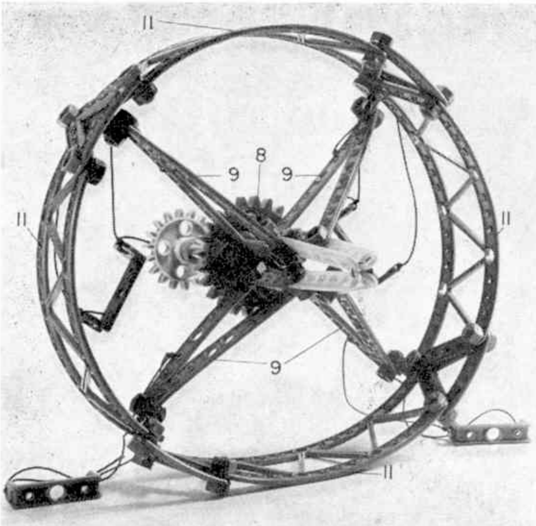
Finally, I would like to point out that the Roundabout is built from a Plastic Meccano Set C with the addition of a few extra parts : 6 Bolts, 3 Angle Brackets and 1 Double Angle Strip. All these additional parts are obtainable separately and, in fact, we will supply any interested reader with them direct from this office. Just send a 2/9d. Postal Order to Meccano Magazine, Northern Office, Binns Road, Liverpool 13. Please note, however, that we can *only* supply the extra parts in question and in the quantities listed.



The main tower of the Roundabout with the revolving section removed to show the simple Strip formation used.

A diagram (not to scale) showing the method of joining the two 6 in. Axles to form a 12 in. compound rod for the main vertical drive shaft.





The revolving top section of the model as it appears removed from the tower structure.

PARTS REQUIRED

12—2-hole Strips	1—Axle Clip
6—3-hole Strips	3—6" Axles
6—5-hole Strips	4—2-hole Triangular Girders
4—Bases	1—Handle
56—Bolts	1—24-teeth Gear Wheel
2—1" Bolts	1—18-teeth Gear Wheel
51—Nuts	1—12-teeth Gear Wheel
9—Angle Brackets	1—20-teeth Sprocket Wheel
11—Double Angle Strips	1—10-teeth Sprocket Wheel
2—Road Wheels	4—Bridge Girders
1—Pulley Wheel	4—3-hole Triangular Girders

MECCANO CONSTRUCTORS GUIDE by B. N. Love

PART 7: CRAWLER TRACKS

MACHINERY WHICH TRAVELS on self-laying tracks fall into three basic categories and it is important to understand the different requirements of each. They may be listed as follows :

FIG I

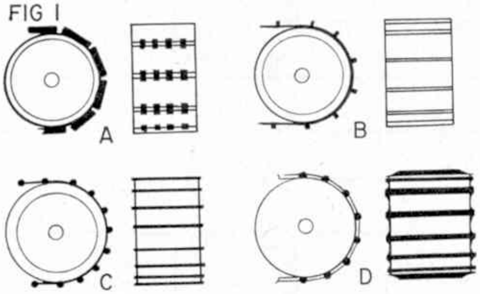


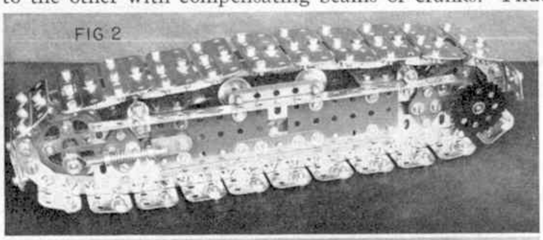
Fig. 1a. The heavy-plate slow-moving track used on Excavators, and, Fig. 1b, the lighter, but powerful-grip track form of the Bulldozer or Crawler Tractor. Fig. 1c. Highly-flexible track for high-speed Tanks and some small Tractors or "Calfdozers" and, Fig. 1d, tracks for medium and heavy Tanks. Note convex shoe form to reduce "scrubbing" when steering.

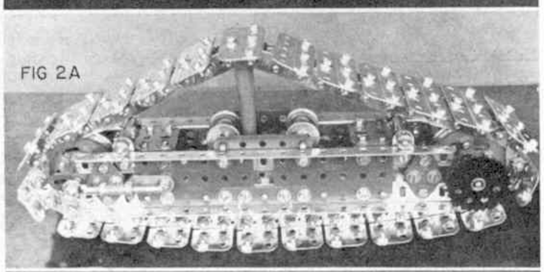
1. **Excavators and Mobile Cranes with heavy-duty turntables.**
2. **Bulldozers and Crawler Tractors.**
3. **Military Track-laying Vehicles.**

In the case of Category 1, the requirements are for simple, but rugged tracks which will provide a firm support for a heavy superstructure and allow it to run steadily but slowly across the site where it is working. Fig. 1a gives the basic pattern for such heavy-duty tracks which are made of thick steel plates hinged at their edges with two or more lugs built into the track shoes themselves. The contact surfaces are quite flat with a small recess moulded into them which assists the tracks in bedding down where the excavator is used in a stationary position. This type of track is mounted on a frame of rollers which is rigidly attached to either side of the superstructure or turntable, giving a stable platform, and the driver will often use his machine to skim a flat surface on the site if a bulldozer is not available to do this.

Tracks required for Category 2 are generally much lighter in design but are nevertheless strongly made to withstand the stresses of the workload on bulldozers and crawler tractors. Essentially, these machines must be capable of pulling, pushing and winching very heavy loads and their tracks must be designed accordingly. This means that the track must be flexible enough to conform to the contours of rough ground over which the crawler may be working, yet light enough not to absorb excessive power. At the same time they must be capable of a positive grip on the site surface and are therefore fitted with "spuds" or ridges, as shown in Fig. 1b, which bite into the ground. Generally speaking, crawler tracks are capable of working at higher speeds than those in Category 1.

Moving on to Category 3, i.e. Military Vehicles, track requirements are different again. In some cases, high speed over rough terrain is the required performance for infantry carriers and light tanks. It is therefore necessary to fit highly flexible track with short length "shoes", or track elements, and suspension is vital to cope with sudden changes in ground contours. Bulldozers negotiate rough ground by having their track frames independently mounted, but linked one to the other with compensating beams or cranks. Thus





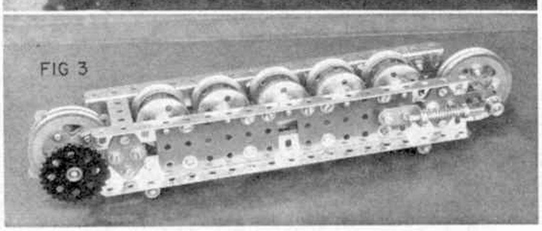


Fig. 2. View of a complete track assembly for a small-scale Excavator. Note the spring slide compensator for track tension. Fig. 2a. This illustration gives a good idea of the excellent scope available from the track-tensioning device described in the text. Fig. 3. A track frame construction for a small-scale Excavator showing under view of load-carrying rollers.

a rise of one track frame causes a fall of the other so that the tractor keeps on a reasonably even "keel" to prevent dangerous tilting. Tanks on the other hand have track drives mounted solidly on the hull and the travelling gear is mounted on multiple sprung units. While such vehicles can double up as towing tractors they are, essentially, high or medium-speed gun platforms. Fig. 1c shows the general form for high-speed tank tracks while that of Fig. 1d is typical of medium or heavy tank tracks. The track "shoes" of some tanks, including the British Chieftain, are shod with rubber blocks to reduce road and track wear.

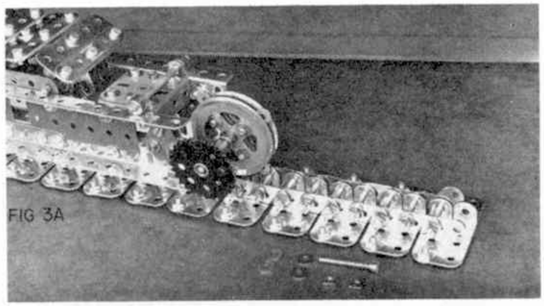


Fig. 3a. Driving sprocket arrangements and general view of a track construction using Fishplates and Double Brackets as track plate hinge components.

Meccano modellers obtain great pleasure from making track-laying vehicles and some ingenious efforts have appeared in the Meccano Magazine from time to time where Sprocket Chain, Rubber Driving Bands, paper clips and Meccano Cord have all been pressed into service for elementary models. The system does, however, lend itself to the construction of authentic tracks falling into some of the above categories. Fig. 2 shows what can be done in the way of making a small-scale excavator track assembly of realistic appearance and performance. It is strongly constructed with a compound girder frame carrying both lower and upper rollers and the journals for the track sprocket and idler wheel, with its tensioning device. This last is provided by spring-loaded Rod and Strip Connectors applying tension via the slots in 2 in. Slotted Strips, as shown, and Fig. 2a shows the remarkable degree of adjustment available with this arrangement.

Fig. 3 shows an inverted view of the track frames displaying the bottom rollers on which the entire weight of the model is carried—an important aspect of the prototype as superstructure weight should always be relieved from the driving or idler wheels which are raised clear of the ground. This can be seen quite clearly in Fig. 2. Fig. 3a, showing a portion of the track laid out, clearly shows the constructional system used. Each track plate is made from a $2\frac{1}{2}$ in. Flat Girder, overlaid with a $2\frac{1}{2}$ in. Perforated Strip for appearance sake to hide the slotted holes, while a centre Bolt fitted with a Washer maintains the level of the plate in the second row of holes. Hinge elements are made from pairs of Double Brackets, bolted directly to the track shoes and reinforced with Fishplates, a further pair of Fishplates linking the shoes together, with long Bolts fitted with a pair of lock-nuts being used as hinge pins. One-inch Axle Rods may also be used as track pins, secured with Spring Clips, Collars or Cord Anchoring Springs.

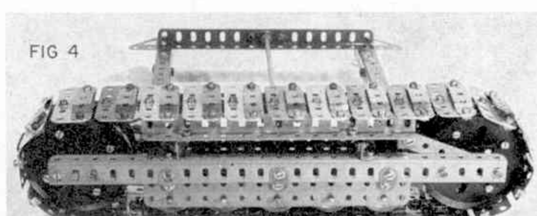


Fig. 4. General view of a track assembly for heavy-duty Excavators.

The dogs on the driving sprocket are 2½ in. Narrow Strips bolted between a pair of 2 in. Pulleys and suitably spaced with Washers. The 1½ in. Sprocket Wheel mounted on the same rod receives a chain drive from the side of the excavator.

Passing to a more sophisticated track form, Fig. 4 shows a track assembly suitable for a larger model. Experienced constructors will raise an eyebrow at the peculiar shape of the 2½ in. Perforated Strips which appear in the photograph as they are bent deliberately to the form shown. The close-up of Fig. 4a shows the shape more clearly and at this stage the reader is warned that there is no intention of pursuing a policy of mutilation in the course of the Meccano Constructors' Guide. However, probably the most common part in the system is the 2½ in. Perforated Strip which has been turned out by the million at Liverpool over the last half-century. Literally thousands of them linger at the bottom of store boxes where they have been relegated as " tatty " or slightly bent parts devoid of most of their paintwork. Now is the chance for all ambitious constructors to put their old stock to good use ! Crawler tracks, etc. never have painted surfaces for obvious reasons and they are soon scrubbed to bright steel by a run across the site where they are employed. Readers can give their surplus or redundant 2½ in. Strips similar treatment by dunking them in paint stripper (reading the instructions thereon very carefully!) and finishing off the stripped parts with an emery cloth rub. The fact that the finished Strips will be bare, scratched and well worn will simply add to their appearance in the right place.

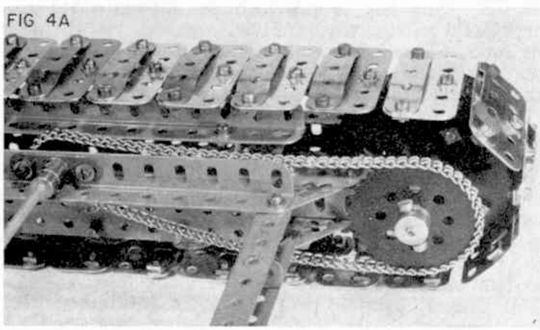
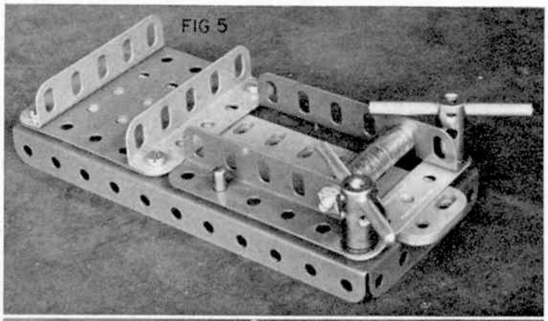


Fig. 4a. The sprocket chain drive and general track arrangement of the assembly shown in Fig. 4.

The problem of getting the correct shape to these Strips is solved by making a tool from parts inside the system. Fig. 5 shows a little hand-screw Press which does the job quickly, neatly and with constant regularity, the " exploded " view in Fig. 5a showing the component parts of the Press. The bed is a 5½ × 2½ in. Flanged Plate on which from four to six 5½ in. Flat Girders are trapped by a locking plate, as shown. The screwing and guide posts are mounted on a 2½ × 2½ in. Flat Plate which is inserted from below so that the Pins and Bolt shanks protrude up through the Flanged Plate. These pins form a register for the strip-forming jaw which is made from two 3 in. Angle Girders rigidly spaced by a 2 in. Screwed Rod packed with Washers. The guide post plate remains in position under the Flanged Plate because the serrations of the Bolt threads bind slightly against the edges of the holes in the Flanged Plate.

Fig. 5 shows a 2½ in. Strip inserted in the Press ready for forming. The butterfly screws are made from Threaded Couplings fitted with 2 in. Axle Rods



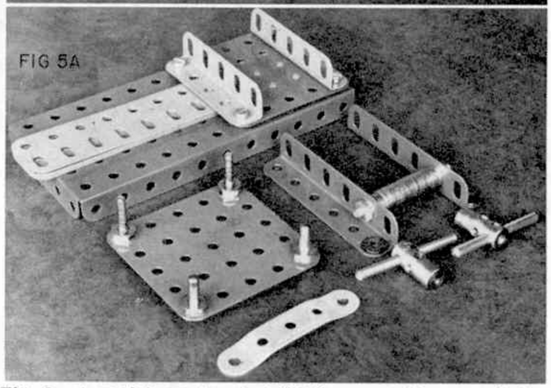
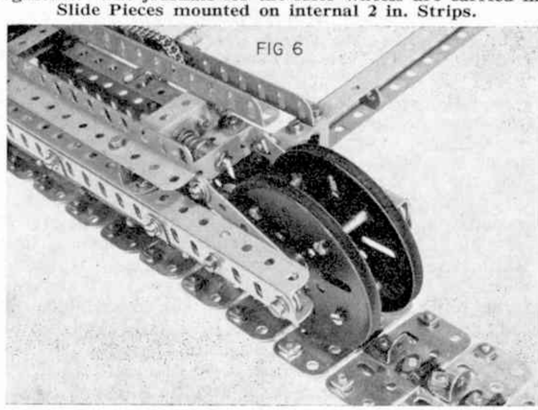


Fig. 5. A useful pre-forming Jig for scrap Meccano Strips used for smooth-faced track segments. Note the 2½ in. Strip in the jaws ready for bending. Fig. 5a. The pre-forming Jig with the locating plate and pressure jaw removed. Note the formed Strip in the foreground.

for leverage. Pressure should be applied equally at the same time until the butterfly screws are tightened right down. The object is to produce a bridge shape in the 2½ in. Strip with sufficient clearance below its arch for a bolthead. It may be necessary to adjust the number of Flat Girders laid on the bedplate to get the clearance required. The forming process does, of course, shorten the overall length of the 2½ in. Strip, but not so much as to prevent it being located at standard spacing with Meccano Nuts and Bolts.

Referring back to the track plates shown in Fig. 4a, it will be seen that the bridge-formed 2½ in. Strip gives a smooth contact surface to each " shoe " so that

Fig. 6. Top view of Excavator track frame showing idler wheels, tension ram and centre-hinged formation of track segments. The journals for the idler wheels are carried in Slide Pieces mounted on internal 2 in. Strips.



no scuffing of boltheads occur and thus the tracks steer with great smoothness. The same illustration shows the chain drive to the excavator tracks taken from the turntable framework. Flat Plate tracks can be made from other lengths of Flat Girders of Flat Plates, hinged at their extremities with Meccano Hinges, Part No. 114. However, the track assembly shown in Fig. 4 has 27 track plates on one track frame. This means a total of 54 track segments for both sides of the model and, if double hinges were used, some 108 Hinges would be required—a prohibitive cost for most modellers. As an alternative, therefore, the centre-hinge track section shown in Fig. 6 is perfectly satisfactory and construction is very straightforward, as can be seen. The idler wheels shown are pairs of 3 in. Pulleys spaced by long Bolts and fitted with a tension yoke made from a pair of 3 in. Strips bolted to a $1\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip fitted with a Rod Connector and Compression Spring. The Axle Rod carrying the idler wheels runs in bearings made from Slide Pieces running inside the channel girders on 2 in. Perforated Strips attached to the channel girders with Bolts and Washers. Fig. 6a shows the under view of the track frame with bottom rollers displayed. One-inch Pulleys with Rubber Rings are used for a cushioned and quiet motion and, again, these are set to keep the driving and idler sprockets clear of the ground. $2\frac{1}{2}$ in. Perforated Strips are set at 90° between the 3 in. Pulleys on the driving sprocket to engage with the elongated slot of the $\frac{1}{2}$ in. Angle Brackets attached to each track plate hinge.

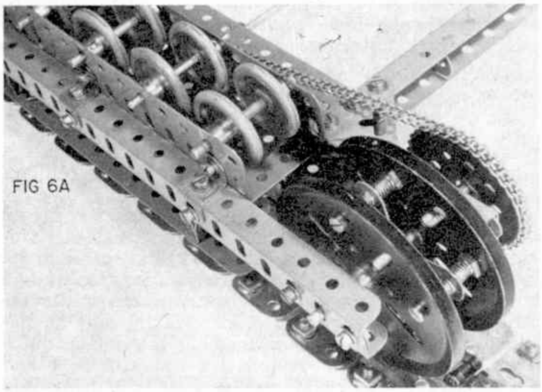


Fig. 6a. An underside view of the heavy-duty track frame showing support rollers and drive sprocket containing $2\frac{1}{2}$ in. Strips used as driving "dogs."

With the exception of half-tracked vehicles, track-laying motions are always steered by locking one of the tracks and maintaining drive to the other. This means that one track is skidding or "scrubbing" as the vehicle turns. Tanks and crawler tractors need to be far more manoeuverable than excavators and their axle boxes must be designed to transmit the necessary power both for traction and steering. Fig 7 illustrates an excellent design of axle reduction box suitable for transmitting a very powerful drive to a Meccano Crawler Tractor. The final Axle Rod is a "dead" axle, i.e. it does not revolve, and is supported externally by the outrigger bearing shown alongside. The drive to the large track sprocket shown is directly via Pinions and Gear wheels in a reduction arrangement.

Finally, an "economy" track is featured in Fig. 8 for the benefit of readers who have a limited supply of components. The track shoes have already been described but they are attached on this occasion to $2\frac{1}{2} \times 2\frac{1}{2}$ in. Plastic Plates. This produces a highly flexible track with the following advantages. It is very quick and simple to construct, is light in weight, flexible enough for "high-speed" models, is realistic in appearance and not bulky. By using $2\frac{1}{2} \times 2\frac{1}{2}$ in. Plastic Plates (recent production types with a hole punched in the centre), a smooth path is provided for the travelling gear rollers, as shown, and centre dogs can be bolted to the tracks at $1\frac{1}{2}$ in. spacing. These boltheads will be *under* the formed $2\frac{1}{2}$ in. Strips so that the finished model tank has perfectly smooth-faced tracks capable of running on domestic surfaces, without creating damage or havoc !

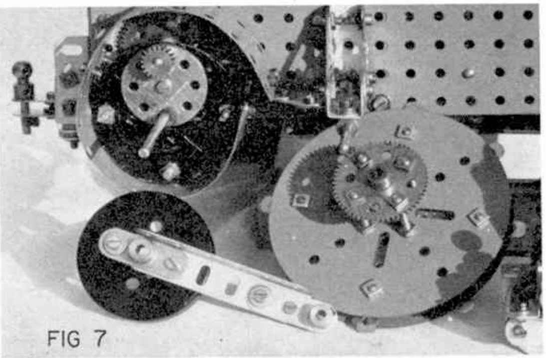
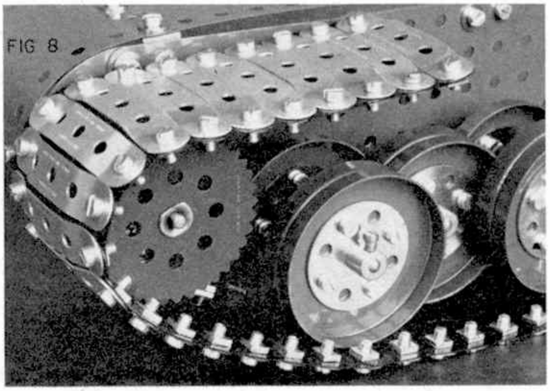


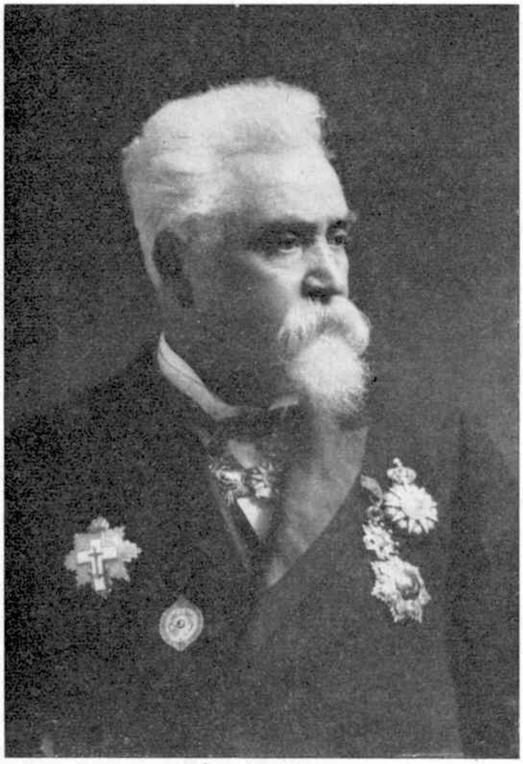
Fig. 7. Heavy-duty reduction gear in a rear axle assembly for a Crawler Tractor. Note the outrigger arm with journal for supporting the fixed sprocket shaft.

Fig. 8 shows only a section of "economy" track and the 2 in. Sprocket Wheels shown are included for scale appearance sake. The actual drive to the centre dogs bolted to the Plastic Plates would be via a pair of Bush Wheels mounted between the 2 in. Sprockets. These Bush Wheels would be fitted with Strips, Brackets or Bolt shanks suitably mounted to engage the Angle Bracket centre dogs. To give these Brackets additional support, each formed Strip may be reinforced by a normal $2\frac{1}{2}$ in. Strip, bolted on with it at the same time (on the outside of the Plastic Plates).

Hull details for tanks are readily modelled in Meccano parts and with the "Economy" track described quite a realistic model of the Royal Tiger or the British Chieftain is well within the scope of the Meccano system.

Fig. 8. A specimen length of "economy" tank track made from pre-formed $2\frac{1}{2}$ in. Strips mounted on Plastic Plates.





GREAT ENGINEERS NO. 30
SIR HIRAM MAXIM (1840-1916)
by A. W. NEAL

AN AMERICAN who became a naturalised British subject, Sir Hiram Maxim was a man who, although receiving little conventional schooling, became one of the world's most gifted inventors.

He began inventing as a young man and remained dedicated to the tasks he set himself right up to the time of his death. More than 270 patents were taken out in his name, some British, others American, between 1886 and 1916, the year of his death.

Hiram Weston Maxim was the son of Isaac Weston Maxim, a farmer who later became a wood turner, of Sangerville, Maine, U.S.A. The family moved to Milo where Hiram Maxim went to the local school. It seems to have been the only conventional schooling he ever had.

When he was 14 years old his father apprenticed him to a carriage builder at East Corinth, and upon finishing his training there he obtained employment as a fully-fledged tradesman with another carriage builder at Abbott Lower Village. It was at this time that he produced his first invention, an improved form of mousetrap and a tricycle.

In 1860 he went to Dexter, Maine, where he was engaged as a wood turner and painter. He then spent some time in his uncle Levi Stevens engineering works and worked upon the manufacture of gas making machines. From there he moved to an instrument makers workshop in Boston, for whom the gas machines were being made. His next engagement, an important one for him, was with the Novelty Iron Works and Shipbuilding Company, New York. Here he was really able to bring his inventive skill to light. He improved, it is thought in his own time, the gas equipment and brought out various new devices. For these ideas he secured patents, which in due time were made over to a new concern, the Maxim Gas Machine Company. Subsequently another company known as Maxim-Weston, was formed in this country to manage electrical appliance patents here.

About 1880 Maxim became chief engineer and general manager to the United States Electric Lighting Company, and during the time he held this post he devised a host of electrical equipment, including an arc lamp and a voltage regulator. Some of these inventions were on show at the Electrical Exposition of 1881 in Paris.

1880 was also the year that he developed an M-shaped carbon filament electric lamp, but it was not his first. The earlier lamp had a carbon rod operating in a rarefied hydrocarbon vapour.

One would have thought that the potentialities of electricity would have been sufficient to satisfy his restless nature, but he veered away from the subject in favour of less peaceful pastures. He came to London in connection with his business activities and started designing a machine gun. After securing a patent in 1883 he set up the Maxim Gun Company to make it. In this he employed the "kick" or recoil, to shoot out a continuous stream of projectiles. It was a brilliant weapon and one with which his name will always be associated. Many notable people, including the Prince of Wales (later King Edward VII), the Duke of Cambridge and high officials of the War Office, came to see the successful trials of it. It fired at the rate of 666 shots per minute. It was not, however, his only automatic gun. Weaponry enthralled Maxim and he delighted in working in this field. He made a quick firing gun with a hopper feed for use with 3, 6 and 14 pounder guns, recoil mechanisms, air guns and many others.

One of his ideas to combat Zeppelin raiders in World War 1 was a bomb attached to a cord, led down and dragged across a raider by aeroplane.

The Maxim Gun Company was amalgamated with the Nordenfelt Gun & Ammunition Company, and out of this move came Vickers, Son & Maxim Ltd.

The late 1880's found Maxim investigating slow burning and smokeless gun powders, explosives, erosion of the internal parts of guns, and devising improved forms of fuse for shell-heads.

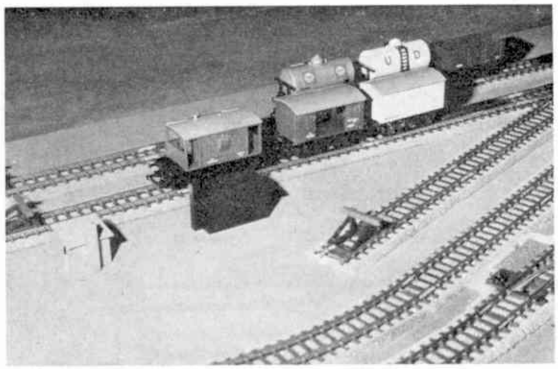
Maxim's mind then turned to flight and his next big project, a gigantic steam-driven aeroplane. It embodied, as one would expect, many new contrivances of his own design. A somewhat grotesque looking machine, it was arranged on a circular railway as a testing track. It was wrecked when it took off from the rails, and Maxim, who was seated in the machine just escaped with his life, and was lucky to be unhurt.

The achievements mentioned were but a few of his activities, and right up to the time of his death he was still experimenting.

In 1900 this American became a naturalised British subject and was knighted the following year, following which numerous distinctions were conferred upon him by many countries.

He died in 1916 and was buried in the cemetery at West Norwood.

BUILDING A MODEL RAILWAY



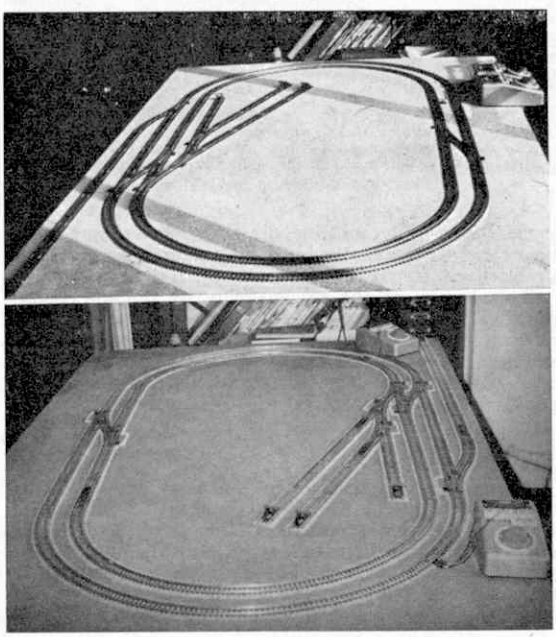
Part I

Planning the layout, the baseboard, and laying the track

A PROPER MODEL RAILWAY cannot exist without a baseboard, unless you call the traditional circle of track on the hearthrug a model railway—we don't!

As we were determined to make the layout described in this series as *simple* as possible, we started with the very simplest of baseboards. It is, in fact, nothing more than a 6 ft. × 4 ft. sheet of blockboard, ¾ inch thick, which can be bought " off the shelf " and without cutting, from any good D.I.Y. store. One great advantage of this material is that, in the smaller sizes at least, it is extremely rigid and needs no additional framing to keep it stiff and flat. If you are keen on carpentry, a perimeter frame of 1 in. × ½ in. battening could be fixed to the underside of the board, which would give clearance underneath for electrical wiring. In the interests of simplicity and time saving, we did without any framing at all, and our baseboard has withstood a fair amount of moving about without showing any signs of bending.

Below: Two views of the layout. In the top picture, the track has just been laid out roughly, without fixing down, to check that everything fits together properly. In the lower picture, track has been pinned down, with the underlay in position, and the baseboard has been painted green.

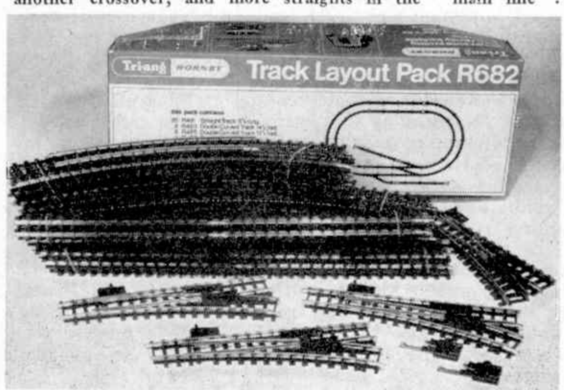


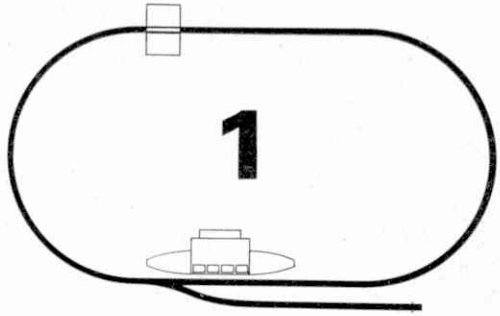
Before any track is laid, we would recommend that the board's top surface be painted with a coat of flat green paint (Household brand from Woolworth's is ideal). We forgot about this until the track had been fixed down, which made the painting more difficult, as keen-eyed readers will detect from the photographs!

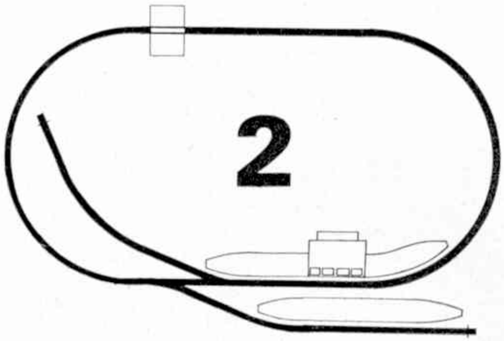
The Track Layout

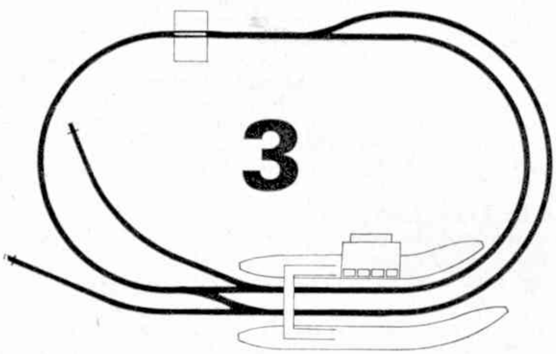
We kept the track plan simple, but tried to " build in " a certain amount of operational interest. Basically, the double-track oval provides a " main line " upon

The contents of the Tri-ang Hornby Track Pack R682, upon which our layout was based. The drawing on the box lid shows the R682 layout—we simply added two extra sidings, another crossover, and more straights in the " main line ".



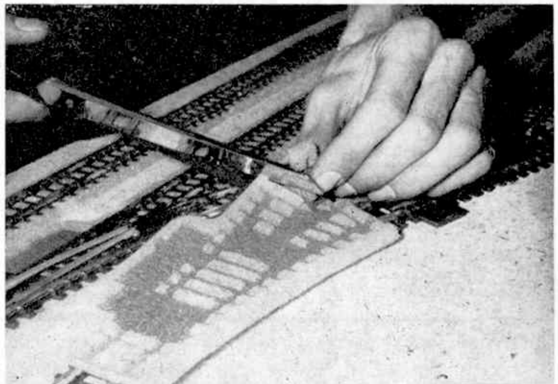


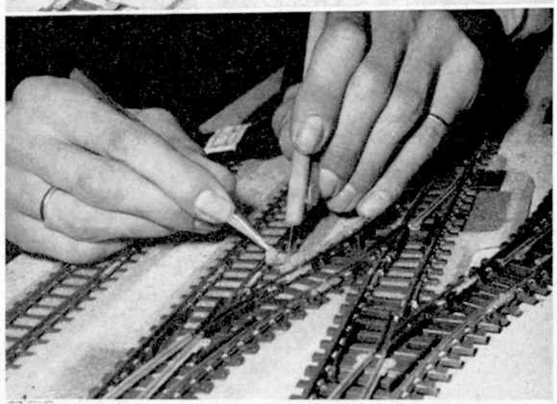




If you compare the picture of our track layout with that of the Tri-ang Hornby Track Layout Pack R682, you will see that our plan is really only a development of that provided in the pack. We have added more straight sections to lengthen the " main line ", and an additional four points have provided the extra cross-over and two additional sidings.

Of course, you do not have to follow our track plan. If money is short you could easily start by purchasing Pack R682 as it stands, or even one of the smaller





The line drawings on these two pages show how a simple layout can be developed gradually, using Tri-ang Hornby Track Packs. A 6 ft. by 4 ft. baseboard is the right size for all these layouts.

which two trains can run continuously if you are in a mood to just sit and watch 'em roll by. Two crossovers provide trains with the ability to cross from one line to another, and also enable locomotives to " run around " their trains without cheating, i.e. simply making a circuit of the track and arriving at the other end of the train by that means. As you can see from the photographs, a small goods yard is provided in the centre of the oval, comprising three short sidings, and a further siding branches off on the *outside* of the " main line ". Remember that, in this country, trains always run on the left-hand track (like road traffic). This means that trains travelling on the *outside* of our two tracks travel *clockwise,* and can easily back wagons into the outside siding, and those on the inside track go *anti-clockwise* and can use the sidings on the inside of the main line. We will go into this in more depth when we come to discuss " operation " in a later instalment.

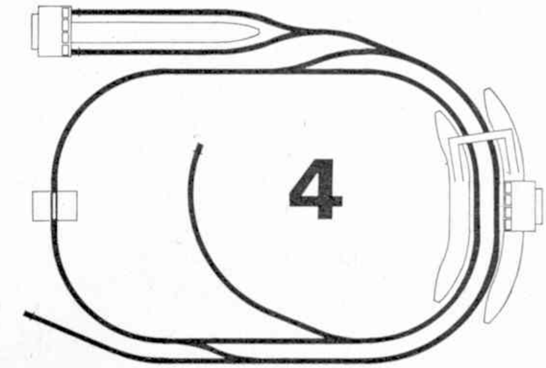
Packs. The series of line drawings shows how these packs can be gradually built up to form a very comprehensive 6 ft. × 4 ft. model railway.

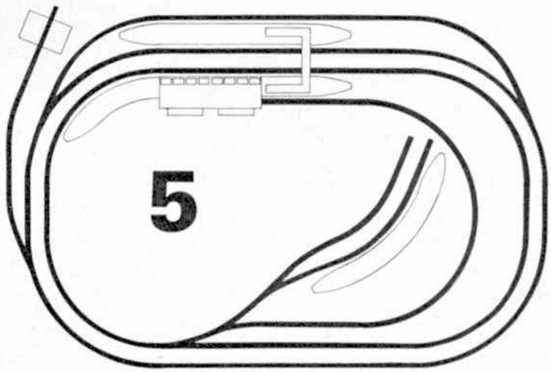
This is one of the reasons why we do not recommend flexible track to beginners—you cannot keep altering your layouts as you can with the sectional, snap-together, Super 4 track, although Tri-ang Hornby now market flexible track in yard lengths which is very good, and makes more realistic " transitional " curves.

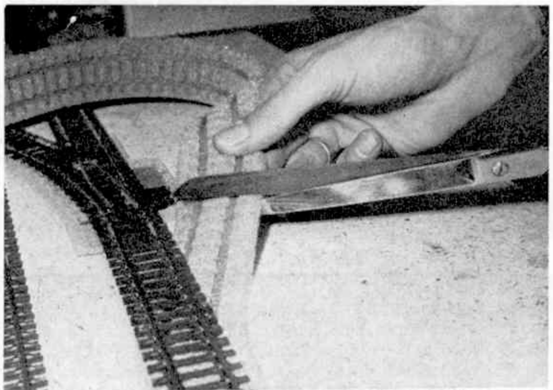
Track Underlay

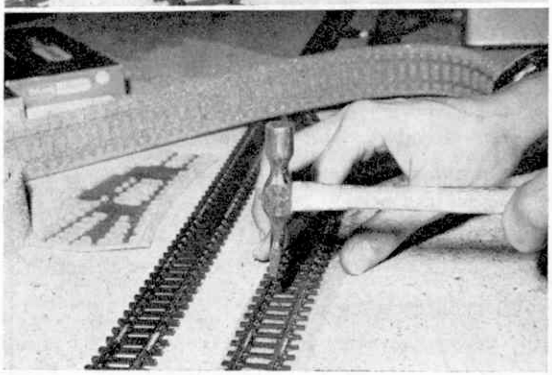
A good start to track laying is to lay out the whole track system on the board exactly as you want it, and snap every section together. At this stage, you can try out a few modifications to sidings, etc. We think that it is well worth while to fit Tri-ang Hornby foam plastic track underlay (R410), and this must be done at this stage. Not only does the grey-coloured underlay look exactly like proper track ballast (even down to the "chamfered" edge) but it also makes the trains run much more quietly, stopping "drumming" noises from the baseboard.

Study of the photographs will show that the underlay has indentations moulded in it, into which each sleeper of the track sections fits neatly. Thus the "ballast" lies flush with the sleeper tops, and looks very realistic. Separate underlays are used for points (available correctly in both left and right-hand versions).





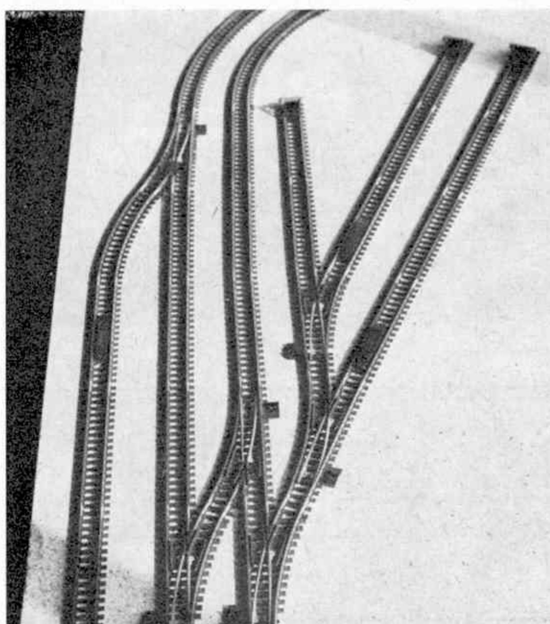




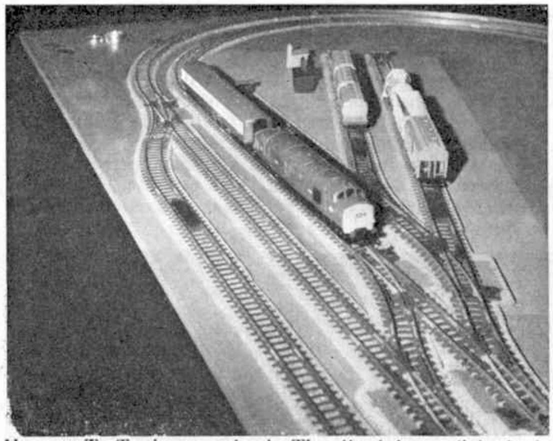
Above and left: Cutting and fitting foam plastic track underlay. Note the moulded-in recesses for the sleepers—this makes "ballast" flush with sleeper tops. Photo top left shows special point underlay. Picture above shows final pinning down with Tri-ang Hornby Track Pins.

"Feeding" the underlay underneath the track needs a little patience and prodding, and sometimes trimming with scissors. Some of these operations are shown in the photographs. At the same time as the underlay is fitted, the track should be fixed to the baseboard. Tri-ang Hornby Track Pins (R207) are ideal for the job, although you may well have some equally suitable pins to hand already. Holes are provided in certain sleepers to accommodate the pins—the whole thing could hardly be easier.

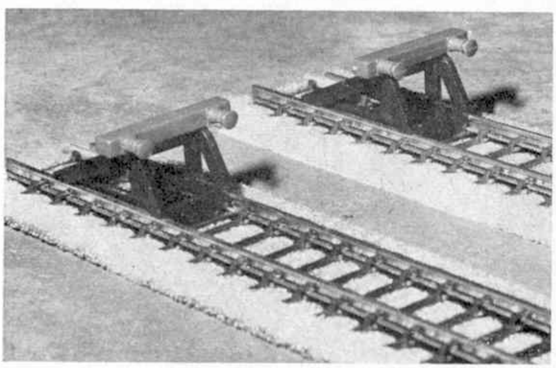
Next month we will show how the layout was wired up for two controllers, and how electric point motors were installed. We will also discuss methods of operating the railway in a realistic way.



Right: Close-up of the "goods yard," showing how we enlarged and developed the original R682 plan. Note the positioning of the uncoupling ramps at the entrances to the sidings.

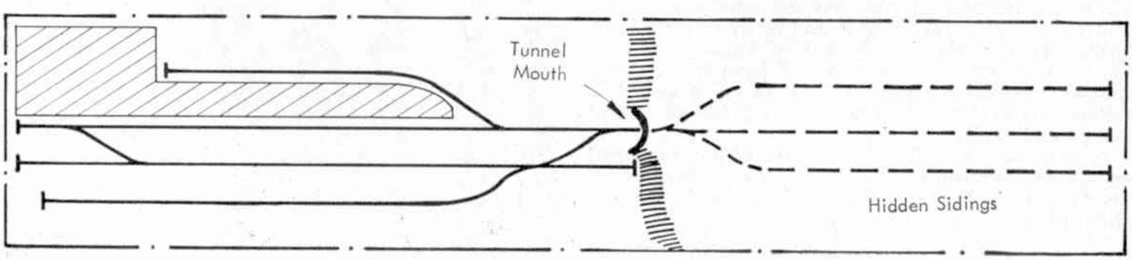


Above : Traffic in operation ! The diesel has a light load. Left : Tri-ang Hornby Track Pins. Left lower : Buffer Stops simply clip on to siding ends.



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.

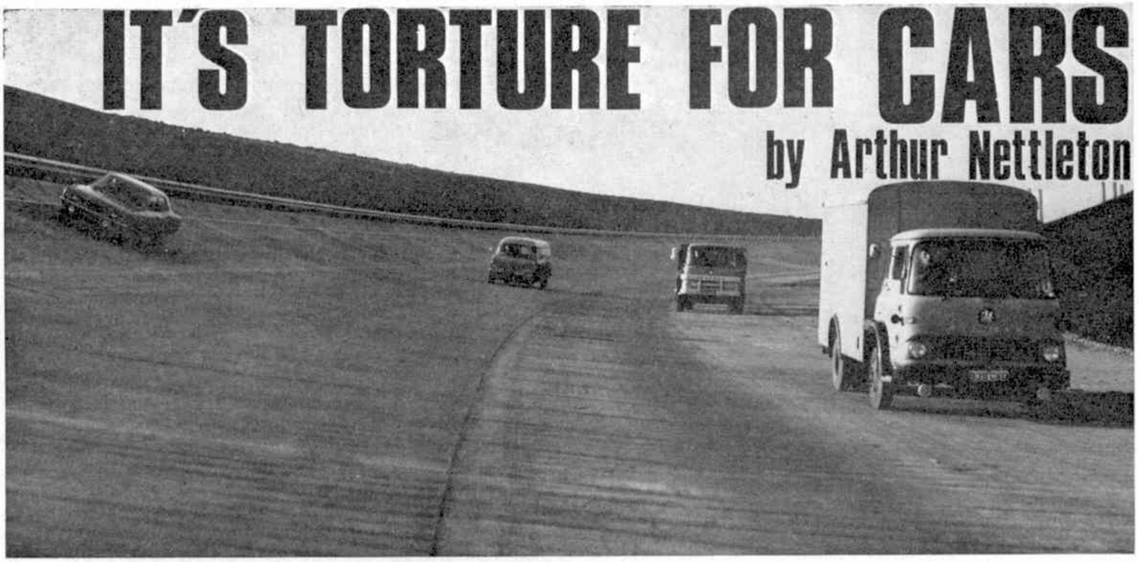
Below : A simple "end-to-end" layout, which makes a change from continuous types. Sidings shown dotted are hidden under scenery, and form an invisible place for the trains to "go". More on end-to-ends later.



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

IT'S TORTURE FOR CARS

by Arthur Nettleton



HOW WILL A MODERN CAR withstand "punishment" on our present-day roads, which range from specially built motorways and bypasses to winding country lanes and roughly paved streets? Road vehicles have to be designed and built with such questions in mind, and to find the answers a proving ground or test track with various facilities is being brought into operation at Lidlington, eight miles from Luton, Bedfordshire.

Part of the project, by Vauxhall Motors Ltd., has already been completed, and when the whole proving ground comes into use it will be the most comprehensive one of its kind in Europe. More than one-and-a-half million pounds is being spent on the enterprise, and it will be used to improve the quality of Vauxhall cars and Bedford commercial vehicles coming from the firm's plants. The first turf on the 700-acre site was cut in 1968, and in early stages of construction more than 50 earth-moving machines were needed to shift 2,000,000 cubic yards of soil.

Preparing the site entailed the diversion of water mains and other underground services, together with the construction of a new 20-foot-wide public road around the area. A public highway that crossed the site had also to be diverted, and major drainage operations had to be carried out. The biggest feature of this testing ground is a circular high-speed track two miles in circumference and with five running lanes, plus inner and outer safety lanes. This circular track is safe for sustained speeds up to 125 m.p.h. Another notable feature is a hill circuit nearly 3½ miles long. It consists chiefly of asphalt roads that climb and twist over a wide variety of gradients. Here various driving activities, such as stop-and-restart, and acceleration tests through the gears, can be undertaken. A number of curves of different radii are also included. Available too is a 200-ft. "pad" on the 11.6 per cent gradient for reversing manoeuvres, and when the whole scheme is finished there will be a total of 13½ miles of test roads, including a four-lane straight track one mile long. Half the length of this straight, level asphalt track can be flooded for tyre tests, and at one end is an elevated downhill approach road enabling vehicles to enter at speeds up to 100 m.p.h. Along-

Above: Part of the two-mile high-speed circuit built for testing cars, coaches, and other motor vehicles at Lidlington, Beds. *Vauxhall Motors Ltd.*

Below: One of the punishing test tracks at Vauxhall's new 700 acre proving ground at Lidlington is the 0.9 mile Belgian pavé circuit. *Vauxhall Motors Ltd.*

The banked two-mile circular test track is spanned by an access bridge strong enough to carry 40-ton loads. *Vauxhall Motors Ltd.*

side the straight-way, and separated from it by a guard-rail, various test services have been provided. A "general handling course," as it is called, has been incorporated by the designers of this modern proving ground.

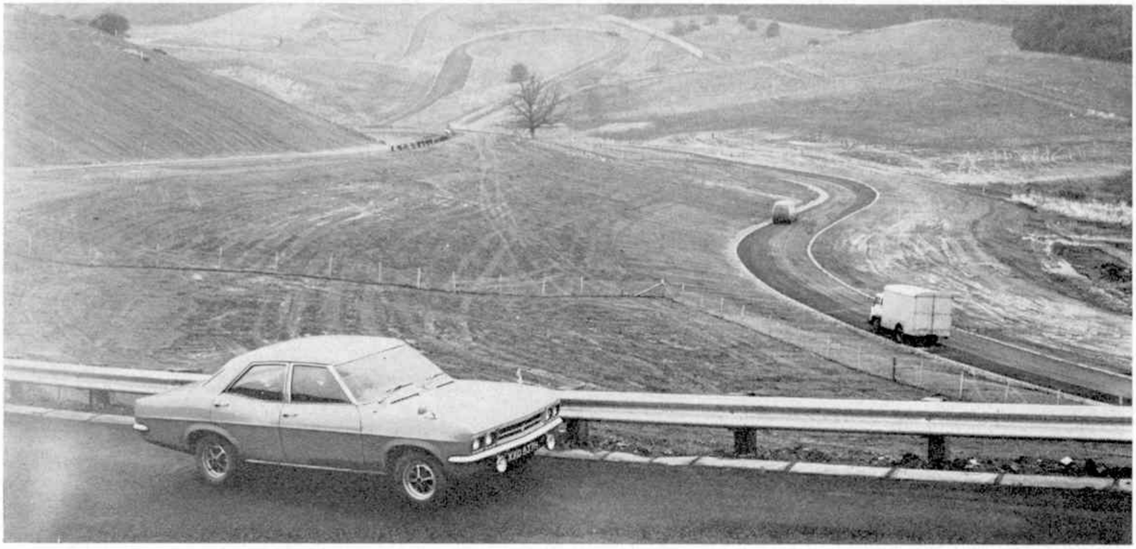
They have introduced an asphalt surfaced roadway 1½ miles long, with different cambers representing typical road conditions, and including curves up to 180°. Features such as railway crossings, spoon drains, and other road hazards are included as well. For really tough testing there is a circuit nearly a mile long, with five severe bends and a dreadful surface of unevenly laid granite blocks. Traversing these objects puts the utmost strain on almost every component in a vehicle. Motoring once round this track is estimated to be the equivalent of all the rough-riding likely to be undertaken by an average car in its entire life! Another rough ride, intended for testing trucks and military vehicles, is a 1½-mile stretch including unmade road surfaces, rocky sections, muddy areas, and potholes.

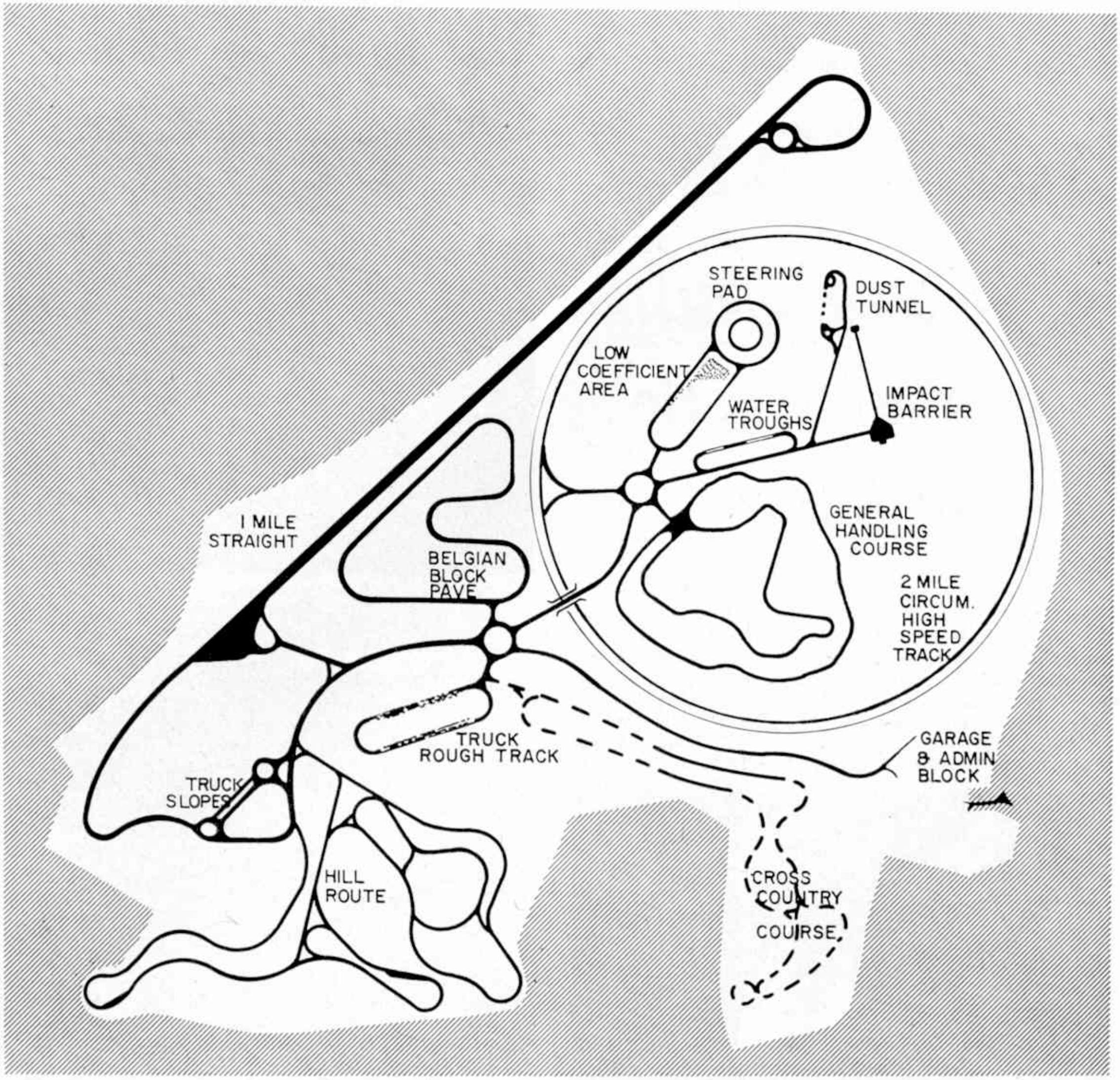
"Torture treatment" for cars is so thorough that they are made to undergo saltwater and dust treatment. A trough 300 ft. long is filled with saltwater to a depth of about half an inch, and vehicles are driven through this brine repeatedly, to simulate roads which receive salt treatment to rid them of snow and ice in winter. The effects of saltwater on cars and trucks can then be studied scientifically. Saltwater is also sprayed on their sides by automatically operated spray nozzles. Road dust can seriously affect the life and performance of a car, so the designer of the Lidlington proving ground have included a dust tunnel—a shed 200 ft. long with open ends and a return loop road. Fine dust on the road inside the tunnel is stirred up by the vehicles passing through. After a number of journeys through these dusty conditions the vehicle is carefully examined for points where sealing against dust is needed.

There is also a rough track on which concrete blocks up to 2 in. high are scattered at random. They give test vehicles an extreme hammering and supplement the other harsh treatment they receive at Lidlington. The two-mile high-speed test track is the first banked circular one of this size in the United Kingdom, and the profile was developed as a result of experiences by American automobile firms in designing similar tracks, particularly the one built by General Motors at Milford, in Michigan.

A radar-type electronic surveying instrument was used to set out the track, and after the removal of the soil a 12 in. layer of compacted and cement-stabilised sand was laid. The curvature of the banking was obtained by using a template mounted on a structure built of tubular scaffolding. Next, the surface was sprayed with bitumen, and a layer of polythene sheeting was laid over this. Finally a layer of concrete 9 in. deep was added. The total surface area of the banked track is just over 20 acres. A self-propelled paving train was used for the job, and it was carried out at the rate of 200 sq. yds. an hour, equivalent to 1¼ sq. ft. a minute. One section of the proving ground, however, was laid by hand, paviors being recruited to construct the vehicle-shaking Belgian pavé stretch.

There are 3-3 miles of inter-connected hill loop routes, with gradients varying from 7 per cent to 26 per cent, at Vauxhall's 700-acre proving ground at Lidlington. *Vauxhall Motors Ltd.*



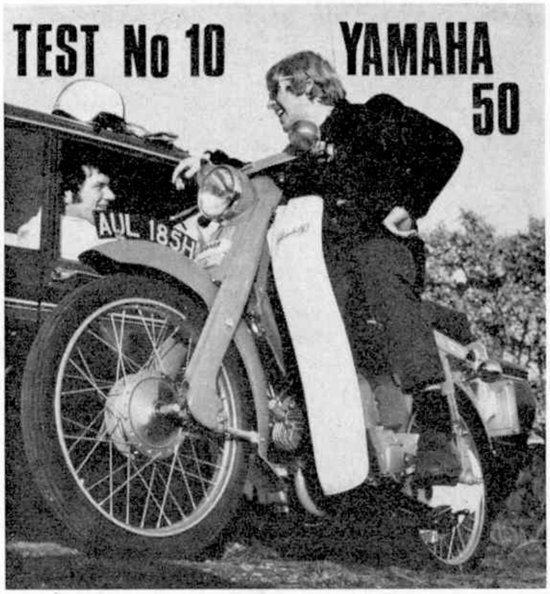


Laboratory facilities for engineering research and other scientific investigations connected with vehicle testing have been provided. Research operations relating to engine fumes and vehicle safety are undertaken here. A machine which produces crash conditions has been provided as well. It is the first of its kind to operate in Europe. Unlike other crash simulators, it does not impel actual cars against obstacles, but accelerates a test unit or sled backwards, with such thrust that the effects produced on it are the same as those arising from stopping suddenly when travelling forward at a chosen speed. The unit provides the thrust pneumatically through a ram, and is able to exert more power than the take-off thrust delivered by the Concorde aircraft's four Olympus engines! A speed of 40 m.p.h. can be attained within a distance of 5 ft. The simulator enables the effects of crashes to be produced under controlled and repeatable conditions. It allows the behaviour of seats and their attachments to be studied, and enables instrument panels, steering wheels, and other components to be assessed in safety terms. Outside tests are carried out too, by running cars into a 75-ton block of concrete at 30 m.p.h. Both the impact operations and the outdoor crash tests are photographed with high-speed cameras so that the results can be examined visually.

The Lidlington test and research enterprise ranks as a major contribution in the quest for safer and better motor vehicles. Although the facilities are concerned only with Vauxhall cars and Bedford commercial vehicles, the proving ground will be used by the engineering department to assess new components for incorporation in future cars, buses, coaches, tippers, vans, and so on built by Vauxhall Motors. The final touch on this big enterprise will be to seed the banks with grass and to plant 24,000 trees, mature ones as well as saplings. Careful landscaping will give the whole area a park-like look.

ON TWO WHEELS

A sparkling little semi-automatic from Japan . . .



The lively Yamaha is an ideal means of getting around during the summer months.

REMINISCENT OF A RECENT TEST subject in engine capacity only, this month's "two-wheeler" represents everything we admire in modern Japanese powered cycle developments; unlike the previous test subject referred to, which was really no more than an easy to use and extremely safe powered bicycle, the Yamaha 50 retains the lines and "feel" of a scaled down motor cycle and, in all honesty, bears little resemblance to the more normal 50 c.c. "motorised bike" theme.

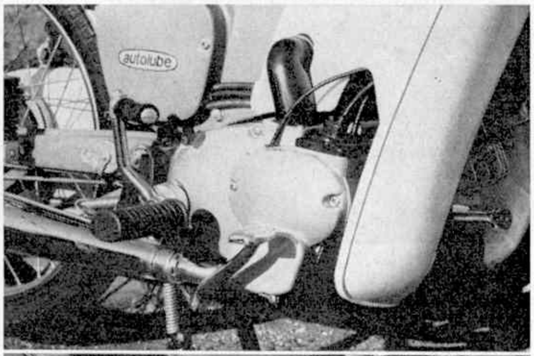
Top: A riders eye view of the Yamaha. The mirror is a standard fitting.
Above: Large direction indicators are a very sensible "extra".

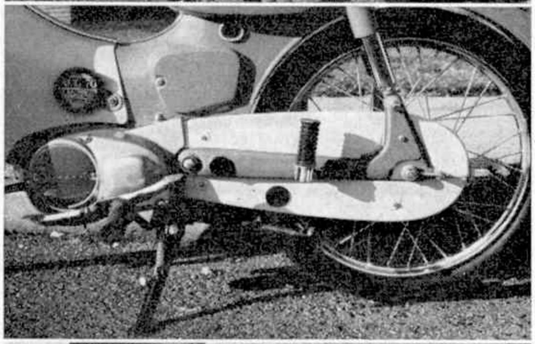
Smallest in a range of super efficient motor cycles from a firm renowned in competition racing circles, the Yamaha 50 is surprisingly smooth and powerful for its small size and incorporates many big bike features unusual on machines of this capacity. For instance there's an absence of pedals—the engine is started in the conventional manner by a kick start situated on the right hand side and the three speed gear box is actuated via a foot gear change lever of the rocking type (toe down to change up, heel down to change down). The rider's legs are protected by leg shields which are a standard fitting and the long, dual saddle has ample room for a pillion passenger who is also provided with fold down foot rests. The bike is also fitted with electric direction indicators, a slide switch for these being located on the right hand handlebar. The twist grip throttle is also situated on this side while over on the left are a choke lever for cold starting and the headlamp main and dip switch and horn button.

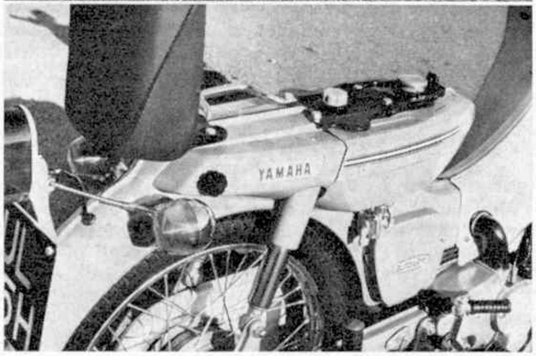
Riding this wonderful little machine takes a degree of getting used to; an automatic clutch is featured and, therefore, no left hand lever work is required, one merely presses down the toe to select the gears. These come in with something of a "bang" and smooth changes were difficult to obtain until we had been riding the bike some hours and knew it fairly well. The technique, therefore, is, with the engine ticking over, to snick down on the gear lever with the toe of the left foot when a reassuring "clunk" signifies that first gear is engaged. All that happens now is that you can pull away by opening the throttle and at the appropriate moment, shut the throttle and toe down again. This is where you really do know you have changed gear because nine times out of ten there's quite a jerk as the gears drop in. Then open up on the throttle and the same process for the third. Changing down is also jerky and, if going too fast, the jerk can be rather violent—as we said care at first and careful practice is important for riding this one.

THE BODYWORK

Bodywork of the Yamaha 50 is extremely attractive and the bikes are available in red and white or blue and white. The long leg shields are a welcome " extra ", especially when the weather is either wet or cold. The







Top : The plastic legshields extend downwards to keep the worst of the weather off the rider's feet.
Centre : The final-drive chain is totally enclosed.
Lower : Access to the fuel and oil tanks is by lifting the dual-seat rearwards.

Smooth lines and attractive finishing make this bike a good looker.

ignition key is conveniently placed and doubles as a steering lock, and the seat, unlike earlier models, now tilts backwards for greater safety when standing, and reveals a useful handle for pulling the machine onto its stand. The saddle is comfortable and adequate for two, and electrical equipment is neatly covered beneath the saddle on the right with a tool compartment (containing a tool kit) on the left. Our test model had conventional stand and also side stand, and on the road the suspension is comfortably soft but reassuring.

THE ENGINE

The engine is of 50 c.c.'s and is a two stroke, rotary valve single cylinder unit. Lubricated by the Yamaha Autolube system it burns a petrol/oil mixture which is pre-mixed by the system before being fed to the carb. We found it necessary to use the choke on all cold starts but the engine warmed up quickly and the choke could be dispensed with after a minute or two. The power is excellent; road speeds of 40 to 45 m.p.h. were quite usual and the little bike accelerated nippily just as fast as you could pump the gears.

SUMMARY

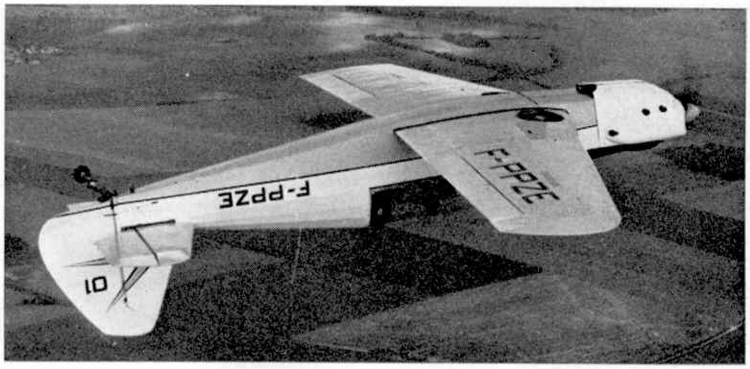
A superb machine in every respect and by far the most sophisticated 50 c.c. bike we have handled; it's an ideal youngsters bike—there's even room for the girl friend on the back ! It retails in this country for £99.19.0.

FOR THE TECHNICALLY MINDED

Cubic capacity	50 c.c.'s
Maximum power	4.5 b.h.p.
Consumption (per gallon)	118 miles
Weight	161 lbs.
Transmission	3 speed, Automatic clutch.
Lubrication	Separate petrol/oil system
Common dimensions	Length 71 in.
	Width 24 in.
	Height 39 in.
	Wheelbase 45 in.

AIR NEWS

by John W. R. Taylor



Aerobatic Aircraft : New Trident : V.T.O.L. Harrier

New French Aerobatic Aircraft

Few modern two-seat lightplanes are neater or more agile than the French Dalotel DM-165, shown above in inverted flight. Yet it is not the product of a big, experienced manufacturer. Its designer is a gifted and enthusiastic amateur and the prototype (F-PPZE) was built by Poulet Père et Fils, a small general engineering company of Colombes, near Paris.

When M. Dalotel began designing the DM-165, he set himself the task of producing the kind of aircraft that small flying clubs could afford to buy and operate. At the same time, its aerobatic capabilities had to be good enough to rival the Czech Zlins and Russian Yak-18s that have dominated international contests in recent years. It is too early to say whether the DM-165 will become widely accepted, even in France; but more than a year of flight tests and demonstrations since its first flight, in April 1969, have shown how well it lives up to its designer's hopes.

The DM-165 spans 27 ft. 6¾ in., is 22 ft. 10 in. long and has a maximum take-off weight of 1,850 lb. Its close-cowled 165 hp Continental 10-346-A fuel-injection engine has been modified by M. Dalotel to permit long periods of inverted flight, and top speed is a very respectable 186 m.p.h. Stalling speed is under 60 m.p.h. and the DM-165 has the precise handling characteristics that are so essential in competitive aerobatics.

Construction of the prototype is mixed, with a steel-tube fuselage and all-wooden wings and tail surfaces, the fuselage being fabric-covered; but production versions could be all-metal if customers preferred this. The undercarriage main wheels retract electrically into the wing roots, helping to give the whole aircraft a clean, businesslike look that is rarely achieved outside the design offices of the big companies.

The Jumbo proves itself

Back in the early weeks of 1970, the Boeing 747 "Jumbo-jet" had more than its share of problems. Because its engine mountings were not stiff enough, the big JT9D turbofans tended to bend, distorting the turbine casing and causing loss of power. Flights were delayed by engine failures and there were plenty of people ready to criticise the manufacturers and pioneer operators of the massive new jet-liners.

It will take time to solve all the problems, but this is quite normal for a new aeroplane, especially one as revolutionary and complex as the 747. Already there are hints of its money-making capabilty. Pan American found within a matter of weeks that its single daily 747 evening flight from New York to London was carrying more passengers than the two Boeing 707 flights it replaced.

By April 23, this airline was able to report a 106 per cent increase in traffic on this route, mostly through passengers' wanting to fly on the 747. In three months, 47,397 passengers travelled by "Jumbo" between New York and London, an average of 264 per flight. The Pan Am version is equipped as a 362-seater, but the hundred or so empty seats are not serious, as it will make money if only half its seats are filled. This is because it can then carry up to 27 tons of freight in its huge lower-deck holds, which is almost as much as the capacity payload of a 707 freigher.

Four engined Trident

The name Trident was chosen ten years ago for Hawker Siddeley's latest jet-liner to symbolise its "three-pronged" power plant—the cluster of three Rolls-Royce Spey turbofan engines at its tail. Even the prototype of BEA's new Trident Three flew for the first time on December 11, 1969, powered by three of the same Spey 25 MK.512-5W engines that are fitted to the Trident Twos already in service.

There is, however, a large pod beneath the rudder of the Trident Three, designed to house a Rolls-Royce RB.162-86 booster engine. This has now been installed, and since March the prototype Trident Three has been flying as a unique four-engined jet-liner.

The use of booster engines is not new. Back in the war years military aircraft used JATO rockets to help get them into the air with a heavy load, and several current military types, like the Neptune and Shackleton, have small auxiliary turbojets for the same purpose. The idea of building a booster into the tail of a civil airliner is more unusual; but it makes sense, as it permits big increases in range and payload with a minimum of cost and redesign.

Each of the Trident's three Speys gives 11,930 lb. of thrust for take-off; the RB.162 is rated at 5,400 lb. As a result, if one of the main engines should fail during take-off, the booster would be able to increase the available thrust by more than 20 per cent. Where runways are short, or in hot climates or at high altitudes, the availability of a booster adds so greatly to the aircraft's safety margin that its payload can be increased enormously. It will, for example, be possible to carry an extra 70 passengers in each flight on BEA's Naples-London route when the Trident Three enters service next year.

Close-up of the tail of a Trident Three in B.E.A. insignia, showing booster turbojet at base of rudder.

Bird-dog with a difference

Although the little SM.1019 illustrated . . . is the only aircraft of its kind in the world, it has a strangely familiar look about it. This is not surprising, as it began life as one of 3,431 L-19/0-1 Bird Dog observation and liaison monoplanes built by Cessna for use by air forces and armies all over the world.

Powered usually by a 213 h.p. Continental 0-470 piston-engine, the Bird Dog has proved one of the most useful light military aircraft produced since the war. In Vietnam it has even been employed for forward air control duties, seeking out targets for more aggressive aircraft to attack and "marking" them with smoke flares or light rockets. However, it is getting a bit old and some operators, such as the Italian armed forces, have been looking for a replacement.

Aerfer and Aermacchi designed and built a new aeroplane on the same lines, known as the AM.3C. Siai-Marchetti, on the other hand, suggested that the Italian government could save a lot of money by simply modernising the Bird Dog design, and built the prototype SM.1019 to show what they had in mind. It uses the basic airframe of a Bird Dog, but has a 317 h.p. Allison 250-B15G turboprop in a lengthened nose and a larger, more angular fin and rudder. The rest of the structure is strengthened and modernised, but looks little different; and the aircraft would be so economical to produce that the Italian government is expected to order between 100 and 200, with deliveries beginning next year.

The turboprop gives the aircraft such improved performance that the SM.1019 rates as a STOL (short take-off and landing) type. With a crew of two and full equipment, including up to 500 lb. of rockets, flares or gun pods, it will cruise at 173 m.p.h. and has a range of up to 320 miles. Maximum range, with no weapons and cruising at 135 m.p.h., is 765 miles.

Flying over Siberia

One of the greatest "breakthroughs" in commercial aviation in recent years is Russia's agreement to let western airlines fly scheduled services over Siberia. First to do so, on April 10, was Air France, joining Aeroflot and Japan Air Lines which had inaugurated similar services on March 28. Each company is now making two flights per week over the 8,200-mile route between Paris and Tokyo, via Moscow, which is 1,200 miles shorter than any route that does not pass over Soviet territory.

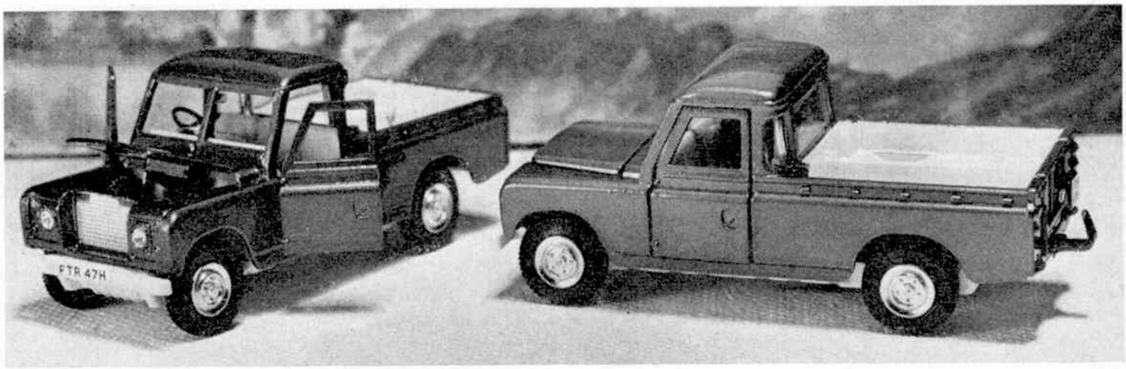
BOAC were expected to begin flying a similar service from London to Tokyo, across Siberia, in June of this year. In exchange, Aeroflot has been given rights to operate across the Atlantic via London.

Exit, the Hunter—Enter, the Harrier

The Hunter jet fighter, which for many years thrilled crowds at air displays all over Britain and abroad with its superb manoeuvrability, and which served the RAF so well in action at Aden, during the Brunei rebellion and in the confrontation in Malaysia, has at last disappeared from fully operational service in the United Kingdom.

The RAF station at West Raynham, Norfolk, which housed Air Support Command's Hunter Support force in recent years, was handed over to Strike Command on April 1. The last Air Support Command Hunters, of No. 4 Squadron, flew from West Raynham to their new home at RAF Wittering. There the squadron is continuing to fly the Hunter in a training rôle until it starts to convert to the Harrier "jump-jet", the lead-in training for which it has already begun. When conversion is complete, it will transfer to RAF Germany, to become No. 4 Squadron and that Command's first Harrier unit.

Heading photograph: Dalotel DM-165 aerobatic and training aircraft in inverted flight.
Right: Sia-Marcheti SM-1019, a turbo-prop conversion of the Cessna L-19/01.



DINKY TOY NEWS

by Chris Jelley

'ANOTHER DINKY BREAKTHROUGH'

IT'S AMAZING how things can plod along, unaltered, year in year out, decade after decade, with nothing outstanding to make the headlines—and then, suddenly: revolution—and the whole situation changes beyond recognition !

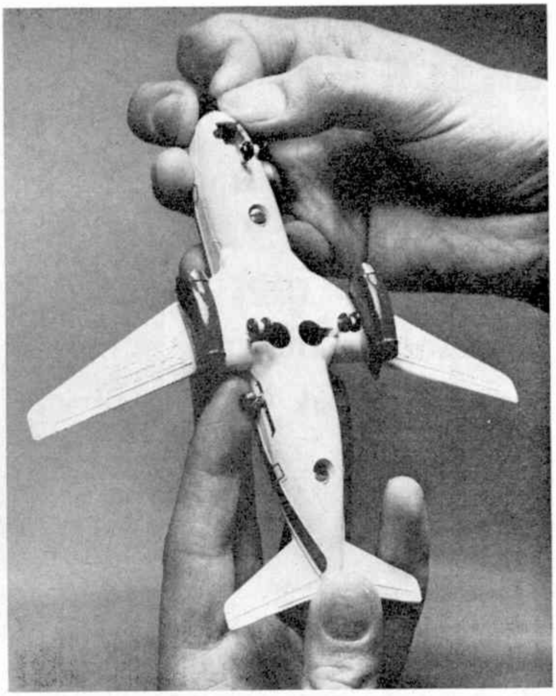
This is precisely what has happened in the die-cast modelling world. Die-cast models have been mass-produced, now, for more than 35 years, yet for something like the first thirty of them, the crude and simple standard of modelling used altered hardly at all. Then, about five years ago, "gimmicks" arrived and, since that time, models have changed from rough reproductions that did nothing but push-along to highly sophisticated pieces of miniature engineering that do just about everything ! In fact, so many features have been invented in the last five years that it hardly seems possible that there could be anything new in the way of special features to introduce. It may *seem* that way, but the facts prove otherwise. Dinky Toys have just come up with yet another brand new "feature first"—a Boeing 737 aircraft complete with an automatic retractable undercarriage !

Our heading shot this month shows the new Dinky Toy Landrover, No. 344, which is modelled on the long wheelbase version of Britain's most famous cross-country vehicle.
Above : Dinky Toy No. 717 Boeing 737—the first die-cast model aircraft to be fitted with a remotely-controlled working undercarriage.

Dinky Toys were pioneers of small-scale die-cast model aircraft way back before the last World War and are still the undisputed leaders in the field. As leaders they have produced models fitted with retractable undercarriages in the past, but the wheels in these have always been raised and lowered one at a time, by hand. Now, for the first time, an entire undercarriage system—main and nose wheels—can be raised and lowered automatically, in one movement, in this case controlled by a small lever built into the rear right-hand side of the 737's fuselage: pushing the lever forward drops the wheels; sliding it back folds them neatly up into recesses in the fuselage. The control mechanism included is smooth in operation, without being loose or in any way flimsy, and gives a good, positive action to the undercarriage movement.

Its design is such as to prevent all liklihood of the undercarriage "collapsing" by folding up on its own under the weight of the aircraft.

To avoid a possible misunderstanding, I must stress that the Boeing 737 on which the new Dinky Toy is based must not be confused with the enormous Boeing 747 "Jumbo Jet". Unlike the Jumbo Jet, the 737 is a comparatively small, twin-jet "short haul" aircraft, intended for short inter-city flights as opposed to long inter-continental flights. The German State Airline, Lufthansa, in fact, refer to the 737 as the "City Jet" and this is particularly relevant, here, as the Dinky 737 carries Lufthansa identification—the "Lufthansa" name in blue lettering on each side of the fuselage and the airline's emblem of a symbolic blue bird on a yellow disc on each side of the fin. The fin, itself, is blue as also are the underwing engine nacelles and a wide window band running down each side of the fuselage. Wings, fuselage and tailplane are finished in gleaming white which contrasts well with a nose in matt black. Produced to 200th scale, with a wingspan of a fraction under 6 inches, the new Dinky Boeing, Sales No. 717, is an inspiring model which brings the Dinky range of aircraft bang up to date.



An underside view of the new Dinky Boeing 737 showing the control lever for the undercarriage.

Cross-country Transport

Aircraft collecting is a hobby which appeals to many people, if Dinky Toy sales are anything to go by, but there are still thousands more who specialise in land vehicles. Never fear, Dinky have not forgotten you this month, either. Released with the Boeing is a model of that most famous of British cross-country vehicles, the world-renowned Land Rover—and you can't get a much better example of a land vehicle than that!

There has actually been a Land Rover in the Dinky Toy range for many years, now, but the new release is quite different in that it is based on the long wheelbase (109 inch) pick-up version, with enclosed 3-seater cab and open load body, whereas the existing model represents the common short wheelbase "open" type of vehicle. As is only to be expected, the new model, numbered 344, is a very much more sophisticated reproduction than the old, being fitted with all sorts of modern Dinky features such as low-friction Speedwheels for long distance travel, an opening bonnet, covering a detailed engine casting, and opening cab doors giving access to a fully fitted-out moulded interior complete with windows, three seats, a facia panel, a black steering wheel and even a tiny gear-shift lever. Featured externally are jewelled headlamps, number plates and, at the rear, a small towing hook, this last item being particularly useful as it means that the existing Dinky Trailer, No. 341, produced for use with the old Land Rover, can be towed by the new version.

Another point which should be mentioned for the special interest of Dinky Toy connoisseurs—those really searching types who study every minute detail of a model—is to do with the wheels. These are a brand new design intended to represent the sort of wheels likely to be found on trucks, etc. and, although not produced exclusively for the Land Rover, this is the very first model to be fitted with them. As a glance at the photographs will show, they are in no way exotic or "showy", being nothing more than good reproductions of basic wheels, without hub caps, clearly showing the wheel fixing nuts, but they are certainly highly realistic and just the right sort of thing for this type of model.

Finally we have the colour scheme—which is where the Dinky goes one up on the real-life vehicle! Unlike full-size Land Rovers, the new model before me is finished in a beautiful metallic blue gloss with yellow interior moulding and white chassis and load platform. The wheels are bright plated, while the famous radiator-grille and engine casting are sprayed silver. The effect is splendid.

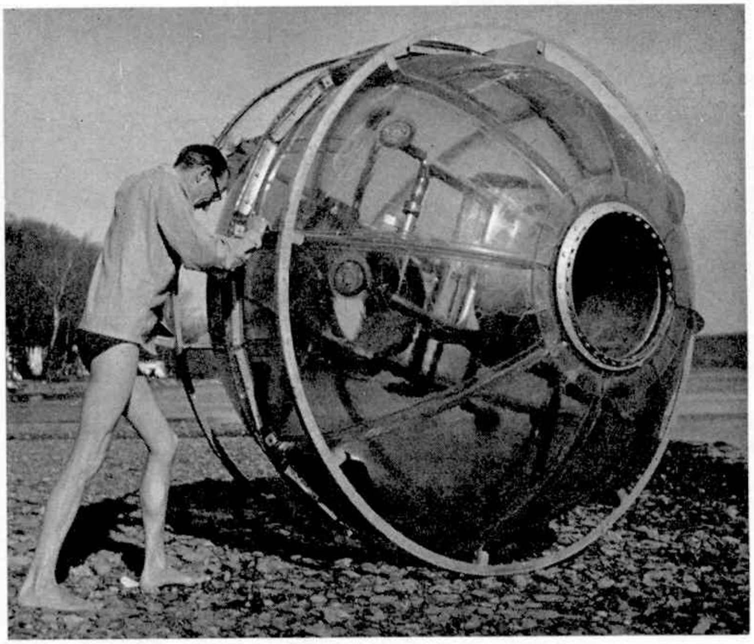
As a parting shot: I particularly like this Dinky Toy just as I particularly like real Land Rovers. In short, therefore—a good model of a great vehicle!

A close-up view of the Landrover which clearly shows the finely detailed radiator-grille. Note also the wide-opening doors.

WATER TROTTER

One of the most unusual means of transport in the World

MICHAEL LORANT



WAYNE E. WILSON, a Pennsylvanian electrical engineer, has invented, constructed and patented a vehicle, as strange as one can ever wish for. He calls it a "Water Trotter," and it looks a cross between the gun turret of a superbomber and an ingenious space device. Nevertheless, according to the inventor, it is the world's safest vehicle for use on water. Its configuration provides over 800 pounds of excess buoyancy when positioned with an entrance port in the water and over 2000 pounds in the normal operating position—the weight of the average user being relatively so small as to have no significant effect on these margins. Thus, it is practically "proof" against swamping and the user cannot fall out. Even under the extremes of possible (but unlikely) puncture and ensuing panic by the user, the structure still would not sink because its configuration automatically traps over twice as much air as is needed for floatation. Sinking can be caused only by two or more punctures, and, even then, special care might be needed to lose all buoyancy.

The plastic material, called "Tenite Butyrate" is $\frac{3}{16}$ in. thick and is so tough that it is comparable to sole leather in many respects and the structure is capable of taking as much abuse as a ping-pong ball. Being transparent, the part above the water line affords observation for orientation, while the surface in contact with the water provides for observation of things beneath without optical interference. Thus, the wonders of submarine life and landscape can be observed at the user's comfort and leisure (unless the water happens to be too muddy) without danger from attack, exhaustion or drowning.

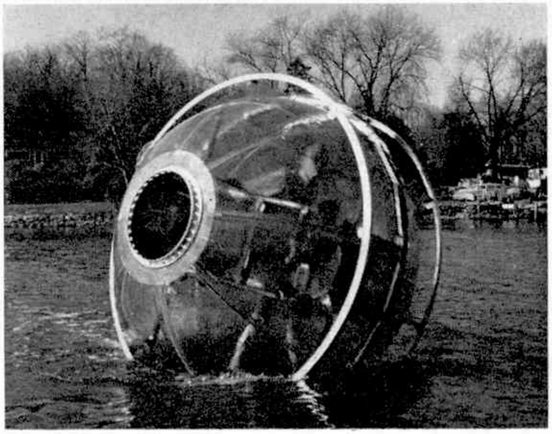
Operation is so simple and easy that no experience is needed to use and enjoy the "Water Trotter;" a 12-year-old can handle it as well as a 32- or 52- or 72-year-old. Two lockers are provided to carry sandwiches, beverages and clothes. Rest and relaxation can be enjoyed by simply reclining on the bottom. Fishing can be enjoyed through an entrance (or exit) port by tipping the vehicle to the entrance (or exit) position. With co-ordination, it can be used successfully by two people at the same time but it is primarily a single-operator device.

This picture shows the inventor out for a stroll when it was cold enough that ice had formed on small ponds of still water. Yet, the inventor-rider was perfectly comfortable in the "Water-Trotter." Here one can see the tubular aluminium struts which stabilise the inboard ends of the entrance tubes. The struts are bolted to plastic pads, also chemically welded to the inside of the sphere.

If there be a "secret" to the successful performance of this vehicle, it lies in the fact and it is *perfectly symmetrical,* both for buoyancy and weight distribution. Therefore, it has no preferred position of stability and will respond completely to where one places his weight in it.

This picture illustrates how the two aluminium rims stabilize the structure for rolling on terra firma. They also tie the outer corners of the paddles together for protection and strength.

Quarter-inch foam rubber was used as gasket for the bolted joint on the major circumference between the two hemispheres as well as for the joint where the entrance tubes are fastened. The sphere is 6 ft. 8 in. in diameter.



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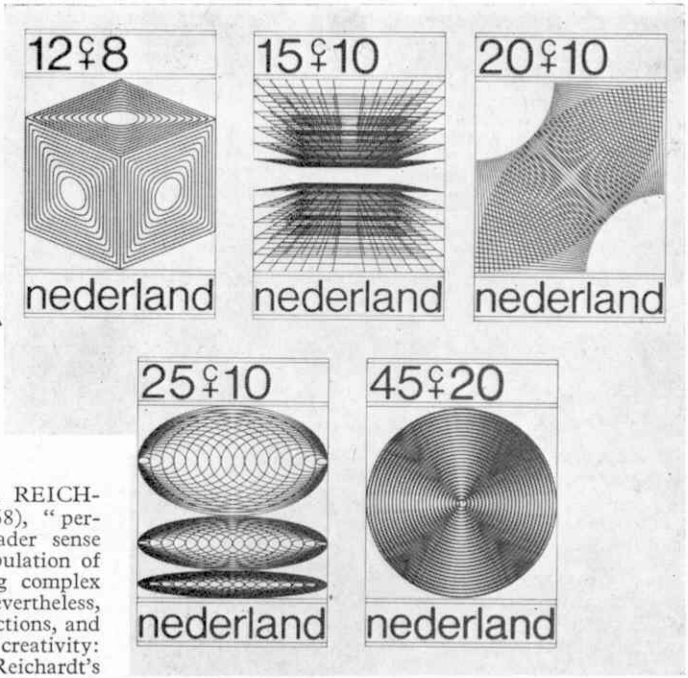
STAMPS DESIGNED BY COMPUTER

by James A. Mackay



"THE COMPUTER", WROTE JASIA REICHARDT, in *Studio International* (1968), "performs various functions which in the broader sense seem to be the act of intelligence, i.e. manipulation of symbols, processing of information, obeying complex rules and even learning by experience. Nevertheless, the computer is not capable of making abstractions, and is devoid of the three prime forces behind creativity: imagination, intuition and emotion." Mr. Reichardt's comments would seem to have been confounded by a recent set of Dutch stamps which were actually designed by computer.

To be more precise the stamps were designed with the aid of a man-machine system, the mechanical part of which consisted of a programmed computer coupled to a drawing-table equipped with a steering unit and receiving instructions from the computer in the form of X and Y co-ordinates. It is important to bear in mind that, in the creation of these stamps, the computer only played a part as a quickly and perfectly operating tool. The job of selecting the programme was left to Mr. R. D. E. Oxenaar, one of Holland's most experienced and enterprising stamp designers. Nevertheless, bearing in mind the infinite number of variable playing possibilities it is obvious that designs of such geometric precision would hardly be practicable without the aid of the computer.

The idea for this series arose out of a problem facing the Netherlands Bank. The Bank was concerned with finding a geometric pattern which could be printed on banknotes and other forms of security paper, of such intricacy and complexity as to defeat the forger. The task of finding a pattern to meet such exacting requirements was given to Mr. Oxenaar who worked in conjunction with banking specialists, laboratory technicians and security printers. One of the concrete results of this investigation with regard to the "graphic face" of security paper in general was that linear structures were experienced as an element of security. Linear structures in the sense of very thin, very regular lines, arranged according to certain patterns, intersecting at continually differing angles, a linear microcosm with as much refinement in print as possible.

To turn these findings to practical advantage the security printing firm of Johann Enschede evolved a numerically-controlled drawing machine for creating such linear structures. This was made possible as a result of the co-operation of the business science department at the Technical University of Eindhoven. Mr. Oxenaar collaborated with the group numerical control of this department headed by T. W. M. van Lammeren and J. van de Vorst and as a result of their co-operation produced a series of intricate patterns which were later submitted to the Ministry of Posts and Telecommunications for consideration as stamp designs.

The designer sketched a series of basic structures which were put before the computer experts. Certain parts proved to be available on punched tapes. These tapes were fed into the computer and when the drawing arm visualised them they turned out to be surprisingly complex structures, especially when the strictly technical details were slightly modified by multiplication or other mathematical operations.

The resulting stamps are totally abstract in concept and, in the sense that they do not actually represent anything, are completely novel not only in Dutch philately but in world stamps as well. Nothing quite like this has ever appeared since the classic Penny Black and Twopence Blue of 1840. And yet, these Dutch computer-designed stamps have something in common with the world's first adhesive stamps 130 years ago, for they also were produced with an eye to defeating the would-be forger. The early British stamps, and, indeed, many of the classic issues produced by Perkins Bacon, had an intricate background of fine lines which it was hoped would be impossible to forge. These complex patterns were produced by fine engraving on the original die with the "improved" Rose engine which Perkins Bacon had previously patented in the production of banknotes.

The current Dutch series, on sale during April and May, bear a premium in aid of various national charities. These *zomerzegels* (summer stamps) have been issued annually since 1935 and further details about them, and the work they finance, may be obtained from the Foundation Summer Stamp Committee, Bankastraat 128, P.O. Box 1857, the Hague.

Showing how 'contour boards' can be used to indicate hill levels.

BATTLE by Charles Grant

Part XXVII

The effect of Terrain

UP TO THIS POINT we have not considered the effect that different types of terrain have on movement—and consequently on tactics—other than to note the primary rule which laid down the different moves for vehicles on roads and across country. It was obvious, naturally, that movement on metalled roads was much easier than it was through scrubland, across ploughed field, through marshy ground or what have you. Now we shall have to extend our horizon somewhat by considering other sets of circumstances in which varying types of ground or terrain features will have an effect on the movement of troops and their vehicles, for it is apparent that both the people fortunate enough to be carried about in half-trucks, trucks and so on will be just as involved as those who have to be content with getting about on 'shanks's pony'.

What we shall do, then, is to take certain prominent terrain features—the principal ones which influence tactics—and consider them from two points of view, first, the most convenient way to reproduce them on the wargame table, and second, just how rules will have to be created to cope with their presence thereon. These features are not terribly numerous and in fact we can reduce their number to but three, although I realise that they can be added to in many ways by the player who would like more subtle differences in his terrain. Those dealt with, however, should be sufficient to cope with most occasions when we have to reproduce some specific area of map on the table. The three are as follows: (1) hills, or any sort of rising ground; (2) woods, and (3) rivers. Here it should be stressed that what is being looked at is something pretty definite and substantial and which will have an appreciable effect on troop movement. For example, when we think of a 'hill', we don't mean a gentle sort of rise from ground level, but something of sufficient gradient to cause some slowing down of the speed of the troops or vehicles climbing it. With this in mind we can continue with the first part of our discussion, to wit, just how it is proposed that we create the necessary pieces of equipment for our wargame, and how far we are going to go to achieve a pictorial or dioramic setup, if you like.

Let us then have a look at the question of hills, then, and before anything else is said, I have to point out that my own approach—and that is what I'm writing about—is a purely functional one. There comes a point, in relation to the realism of one's scenery, where the wargamer has to make a decision, an important one, but one which can be decided only by personal taste and inclination. This is whether to adhere to a 'functional' type of approach—mine, in actual fact—or to 'have a go' at a more decorative and pictorial sort of thing, something I can liken to the model railway background idea, where great efforts are made to build up a completely realistic stretch of scenery, with every detail of landscape minutely simulated. Now, I have no option but to agree that it is extremely satisfactory to wargame over terrain which has been made with this 'dioramic' idea in mind, with tree-clad hills, waterfalls and rivers, tiny houses, all created with painstaking thoroughness so that the finished article would suffice for any film 'backdrop'. Very nice so far as it goes, BUT there are several disadvantages, of which the first is that the more realistic the ground, usually the more unwieldy it becomes, depending upon how it was constructed. What I mean is this. Once upon a time (to coin a phrase), when I was a bit of a devotee of this sort of technique, I constructed some really elaborate pieces of battlefield scenery, using the time-honoured method of having squares of hardboard of varying sizes as bases. The method of construction is well-known, and is briefly that blocks of wood of different heights are glued to the hardboard base, covered with strips of glued paper until the whole forms an irregular surface, with the paper—hardening as the glue dries—forming an uneven sort of hill. The thing is then covered with a thin layer of plaster of paris, which, when set, is painted in the appropriate colours, green, brown and so on. When a number of such pieces are placed on the wargame table, there is no question but that the result—if care has been taken—is highly spectacular and looks good from any point of view. The disadvantage—the unwieldiness I referred to—is that one tends to over-emphasise the features being created—hills are made too high and steep, and human nature what it is, there is a tendency to over-employ certain favoured pieces of terrain. I recall, during this phase, that, with much labour, I built a high mountainous affair, two peaks with a pass between them, the top rising to something like eighteen inches from ground—or table-level. When in use, this had a seemingly fatal fascination for wargamers, and possibly because it looked too good not to fight over, the most unlikely scraps took place upon it and up and down the gorge. Anyway, what with all this fighting, it rapidly began to acquire a rather "tatty" appearance, fragments of plaster flaking off and holes being punched in the surface by over-eager fingers. There are always strong domestic reactions at the sight of powdered plaster being trodden into carpets and so on all over the house.

One other minor point might be noted is the one of storage. These plaster covered terrain pieces have to be put away with some care and take up a fair bit of room, this not always being a practicable proposition.

Furthermore, if you have, for example, a square of 18 in. sides covered by some particular type of hilly ground, this can be used for no other purpose than the one applicable to its specific construction.

It is for these reasons given above, and probably others, that for some time I have used another method of making up battlefield terrain from the point of view of hills, this being one which oodles of practice suggest is by far the best proposition. As a matter of fact, it will be found, too, that a little attention can ensure that it is not without scenic merit itself. Fundamentally, what we do is this. We take an ordnance survey map, or any other type whereon heights are shown by contour lines, and with this as a kind of inspiration, we bring the contours to life, as it were, by reproducing them on our wargame table by showing them as corresponding shapes cut from some suitable material. This can be inch-thick insulation board (half-inch will suffice, although this thickness can be doubled for use quite easily). This material can be readily cut to any desired shape—round, oval or indeed any irregular form (hills are not always perfect circles in area) and these can be used over and over again in many different ways. The photograph shows how these shapes appear—note that a little "chamfering" of the edges does enhance their appearance somewhat, and one 'shape' can be placed upon another to represent increases in height in exactly the same manner as do the contours of a map (each contour usually represents an increase in height of 50 metres over its outer neighbour).

The 'contour shape', it is apparent, gets full marks for convenience—both from the actual wargaming point of view and for its ease of storage between games. Certainly, as I hope to show, they are functionally highly suitable for any sort of wargame. Anyway, there you are—the choice is with the reader. You can either have the very dioramic and pictorially very attractive pieces of terrain I have referred to above (they can now, of course, be made by the simpler process of using commercially produced plaster-impregnated material to cover the blocks of wood on the hardboard), or to use the more convenient, and not necessarily ill-looking-contour shapes, which are more than adequate in use, are convenient for storage and for adapting the table terrain to the requirements of any particular engagement which might be on hand. Naturally, the more 'shapes' one has, and the greater variety that might be available, the easier it is to set up an interesting game or to reproduce on one's table a section of an actual map over which to fight. There are all sorts of ways by which one can add to or alter one's contour shapes. Should they have been cut from one piece of insulation board, two or more can be fitted together to provide a large area of rising ground, and, as can be seen from the photograph, the judicious addition of pieces of lichen—representing low bushes—as well as trees, can result in a very realistic sort of appearance. It is with the subject of trees—and then with rivers—that we shall presently deal.

NEW BOOKS REVIEWED
PART II

"THE WONDERFUL WORLD OF COMMUNICATION", published by Macdonald & Co., Price 21/-.

From cave paintings made 25,000 years ago when our ancestors took the first steps towards communicating beyond reach of the voice and beyond the grave, this remarkable book carries the reader step-by-step through all the stages of communication finishing with the latest scientific inventions that link this modern world.

Books, photographs, films, sound recordings and television bring the farthest corners of the globe into our homes every day and are taken for granted, until we stop to think that only 500 years ago there were no printed books and less than a century ago no telephones, radios, television or films. Lancelot Hogben tells this exciting story in a fascinating way and every conceivable way of communication used through the ages is revealed vividly.

Each chapter unfolds the discovery of yet another link in the chain binding the cave dweller to modern man. Carrier pigeons, posters, Morse Code, Chemical formulas, cameras, all are paraded before us in this excellent and lavishly illustrated book. It is one of a series of "Wonderful World" books, other subjects being Mathematics, Energy, Prehistoric Animals, Archaeology, Music, The Theatre, Medicine, Evolution, Transport, Dancing, Engineering, The Sea, and The Air. Each written by a world famous authority and providing a stimulating combination of education and entertainment.

E. Knowles.

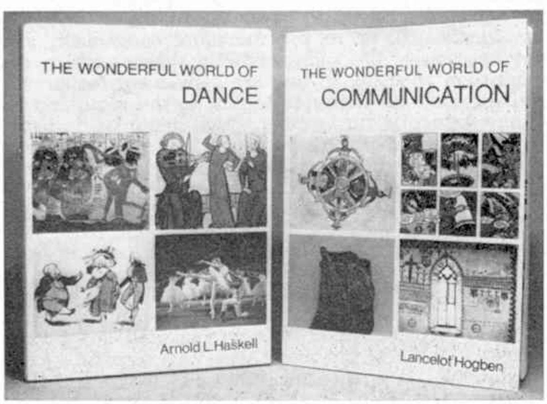
THE OBSERVERS BOOK OF SHIPS. Edited by Frank E. Dodman, Published by Frederick Warne and Co. Ltd. Price 7/-.

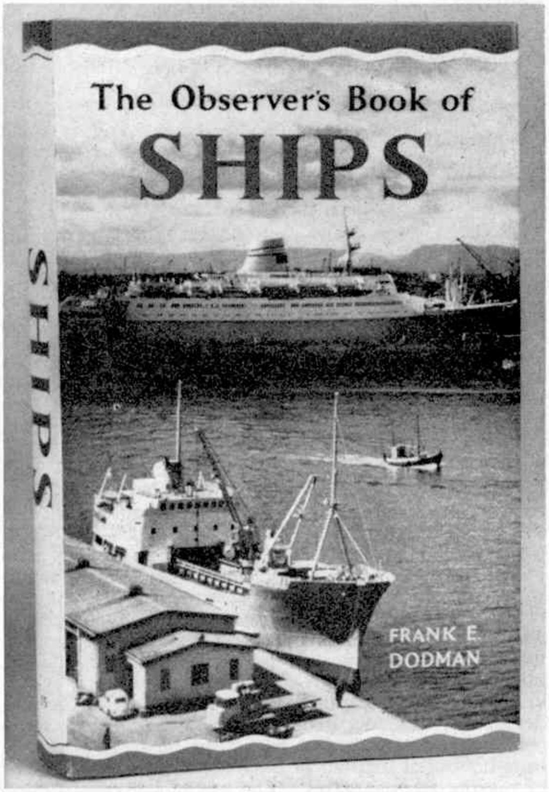
There must be very few people who have not heard of the "Observer Series" of pocket guide books, a series having now been available for many years, with constant revisions ensuring that they are always up to date.

Latest of the 42 books in the series to come through the process of updating is the Observer's Book of Ships. Containing almost 200 pages of text, drawings and numerous photographs this splendid little book contains information on a wide variety of vessels including warships, merchantmen, sailing yachts, fishing and harbour craft as well as miscellaneous craft both ancient and modern. Also in the contents are descriptions of ensigns, flags and signals, lists of shipping companies, the list is almost endless!

At the reasonable price of 7/- this book is a must for all people interested in the sea and its ships.

J. Johns.





FORTY YEARS of CONFLICT: 1914-1945:—The Marshall Cavendish Learning System (History). Price 9/-.

The first half of the 20th century is almost certain to be known in history as the era of world wars. The chapters in this book set out the reasons for the two major wars of 1914-18 and 1939-45 in all their concentrated destructiveness. Well illustrated in colour, this book describes clearly and concisely the uneasy years between them. How, in less than 50 years, Japan changed from a peaceful feudal society into an aggressive military power, her territorial ambitions acquiring for her an empire, and how the atomic bomb brought it to an end. Between the two wars was the hour of the Great Dictators. Almost all the European countries involved in the first World War emerged from it with changed frontiers. Many people felt cheated because their countries failed to achieve the territorial ambitions for which they had fought. Under this emotional stress the masses in dissatisfied countries were easily and dangerously stirred by nationalist demagogues.

The book describes the Spanish tragedy, the expansion of Nazi power in a Germany humiliated in defeat and suffering from a major economic crisis, and how Mussolini dreamed of restoring the grandeur of classical Rome to his battered country.

E. Knowles.

WHERE LIFE BEGINS:—The Marshall Cavendish Learning System (Biology). Price 9/-.

The study of Biology is a search for an answer to the question "What is life?" In recent years many discoveries have been made to shed new light on what is the essential nature of the living process. In this book the reader is given a picture of how far biologists feel that they are able to answer this age-old question. The difference between the living world and the rest of existence is studied. The mystery of the "living spark" is dealt with. Most of the book is concerned with new information about the cell and its special structures which allow it to carry out the life functions. It shows how, armed with the electron microscope and sophisticated biochemical techniques, scientists are now able to describe how molecules themselves are built-up to make a cell. This is the very essence of reproduction but even when all the workings of the cell are unravelled the question remains—is there some other ingredient of Life still to be found which is now unsuspected?

E. Knowles.

"INSIDE INFORMATION SERIES" by Lashwell Wood, Published by Benwig Books.

Recently released are four books, the first of a new series aimed at youngsters who are interested in learning "how things work".

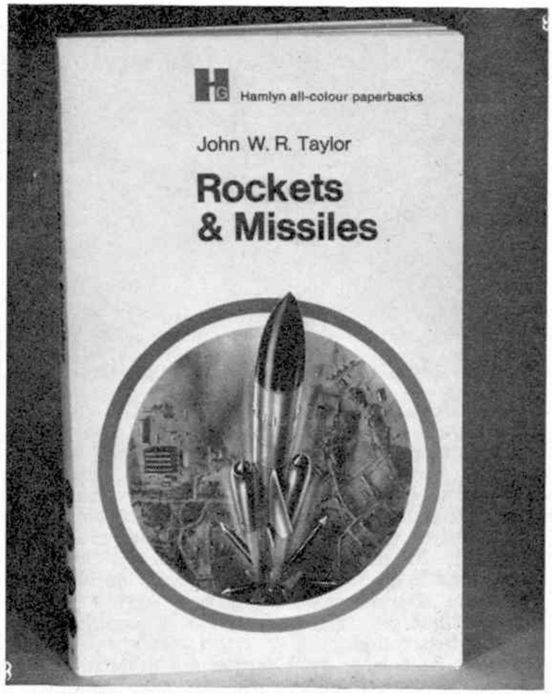
Entitled "Civil Aircraft", "Military Aircraft", "Trains Today" and "Modern Ships", they are first-class publications being both well written and well illustrated. Each booklet contains information on ten subjects, a full colour sectioned drawing on every left-hand page and a brief description and key to numbered parts on the right. Other titles at present in the pipeline are: Space Travel, Naval Ships, Racing Cars and Hovercraft.

Priced at 3/- each they represent excellent value and are to be recommended.

J. Johns.

ROCKETS AND MISSILES, edited by John W. R. Taylor, published by Hamlyn.

From the author of "Air News" comes a fascinating



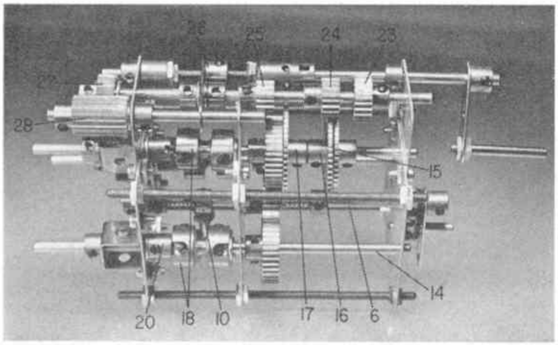
new book dealing with the history, development and the future of rockets and missiles.

Lavishly illustrated with coloured drawings and diagrams, this book is written in an easy-to-follow manner by John W. R. Taylor and runs to well over 150 pages.

Most of us think of rockets as being purely weapons of war, but this book shows how they are used to save lives, i.e. distress rockets and lifeline carriers. Rocket powered aircraft vehicles and the spacecraft of today's world are just a few other uses rocket power can be used for and naturally all are covered in detail in this excellent little paperback.

Priced at a very reasonable 6/- it is to be thoroughly recommended.

J. Johns.



In this view of the Gearbox designed by Mr. Stutter, the layout of the gears on the 3-speed shaft is clearly shown.

AMONG THE MODEL BUILDERS

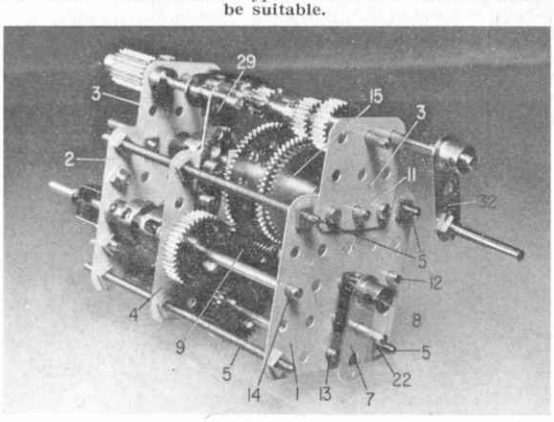
with Spanner

4-MOVEMENT, 3-SPEED GEARBOX

No general chat by way of introduction, this month, but straight down to business, instead. For our first offering, here, I have chosen a very interesting 4-movement gearbox which is unique in that it not only gives four independent output drives from one input, but also gives a choice of three speeds for each drive. Full credit for the unit goes to Mr. R. E. Stutter of Hampton Wick, Kingston, Surrey, who supplied me with plans of his original design and, having built up the unit illustrated from these plans, I can confirm its successful operation.

The end plates of the Gearbox are supplied by two $2\frac{1}{2} \times 2\frac{1}{2}$ in. Flat Plate 1 and 2, to each of which a $1\frac{1}{2} \times 1\frac{1}{2}$ in. Flat Plate 3 is bolted, an intermediate support between the end plates being provided by another $2\frac{1}{2} \times 2\frac{1}{2}$ in. Flat Plate 4. Plates 1, 2 and 4 are held by Nuts on four $4\frac{1}{2}$ in. Screwed Rods 5, these Rods passing through the corner holes in the Plates. The spacing between the Plates is important—$2\frac{1}{4}$ in. between Plates 1 and 4 and $1\frac{7}{16}$ in. between Plates 2 and 4.

Now journalled in the centre holes of the three Plates is a sliding 5 in. Rod 6 carrying, in order, a Crank 7, and a Coupling 8, these outside Plate 1, a fixed Collar, a Compression Spring, a loose 1 in. Gear 9 and a Washer, all these between Plates 1 and 4, another fixed Collar 10, a second Compression Spring and a loose Collar, all these between Plates 4 and 2, and, finally, another Collar fixed on the end of the Rod outside Plate 2. Gear Wheel 9 and the loose Collar are held against Plates 4 and 2 respectively by their appropriate Compression Springs, the Springs themselves being held by the nearby fixed Collars. In constant mesh with Gear Wheel 9 are four further 1 in. Gear Wheels, each fixed on a $3\frac{1}{2}$ in. Rod, 11, 12, 13 or 14, these Rods being journalled in the centre edge holes of Plates 1 and 4. Rod 11, alone, in addition to the 1 in. Gear, also carries one 50-teeth Gear 15, one 57-teeth Gear 16 and one 60-teeth Gear 17 between the Plates, while all the four $3\frac{1}{2}$ in. Rods carry, outside Plate 4, a Washer, a Collar, a Socket Coupling 18 and the male section of a Dog Clutch. In each case, the Collar and Dog Clutch section are fixed on the Rod inside the ends of the Socket Coupling which is, in turn, fixed to the Collar and Dog Clutch. The Rods should be free to slide approximately $\frac{1}{8}$ in. in their bearings.



An interesting 4-movement 3-speed Gearbox designed by Mr. R. E. Stutter of Hampton Wick, Kingston, Surrey. Cranes and fork lift trucks are two types of models for which it would be suitable.

Screwed into one transverse bore of Collar 10 on Rod 6 is a Threaded Pin 19, the tip of which engages with the waist of one or other Socket Coupling 18 as Rod 6 is turned by means of Crank 7. With the Threaded Pin in engagement, pushing Rod 6 inwards will move the Socket Coupling forward. In line with the male section of the Dog Clutch in each Socket Coupling is the female section of a Dog Clutch 20 on the end of a 2 in. Rod journalled in Plate 2 and in a Double Bent Strip 21 bolted to the Plate. A Washer spaces the Clutch section from the Plate, while the Rod is held in place by a Collar. Movement of the Socket Coupling should therefore cause the two sections of the Dog Clutch to mesh. To ensure that the Threaded Pin remains in location in the Socket Coupling during operation, a 1 in. Rod 22 is fixed in the free end transverse bore of Coupling 7. When Rod 6 is pushed inwards this Rod engages with one of the holes in the nearby Flat Plate.

Now journalled in the upper centre holes of Flat Plates 3 is a sliding 5 in. Rod on which are mounted a $\frac{3}{4}$ in. Pinion 23, a $\frac{1}{2}$ in. Pinion 24, a $\frac{7}{16}$ in. Pinion 25, the arm of a Threaded Crank 26, held between two Washers and Collars and another $\frac{1}{2}$ in. Pinion 27, the last fixed on the end of the Rod outside the Plates. This last Pinion is in constant mesh with a $\frac{1}{2}$ x $\frac{3}{4}$ in. Pinion 28 fixed on the end of a 3 in. Rod, the input shaft, passed through the end hole in the arm of Threaded Crank 26 and mounted in one Plate 3 and in a 2 in. Strip 29 bolted to Plate 4. A Collar holds the Rod in place.

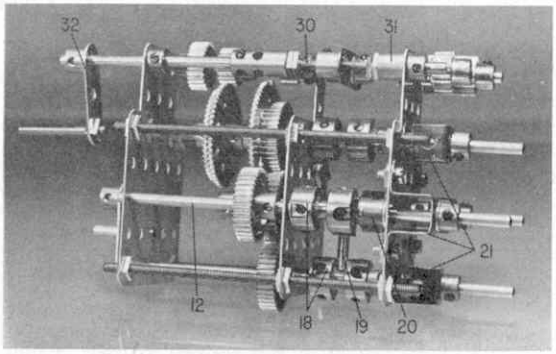
Movement of the Rod is controlled by a 2 in. Screwed Rod 30 locked in an Adaptor for Screwed Rod 31 and screwed through the Boss of the Threaded Crank. The other end of the Screwed Rod is extended, via a Threaded Coupling, by a 3 in. Rod held by a Collar in remaining Flat Plate 3. A Crank 32, fitted with a Long Threaded Pin, is fixed on the end of this Rod to serve as a winding handle.

Pinions 23, 24 and 25 meshing with Gears 15, 16 and 17 provide the 3-speed characteristics for the Gearbox. Great care should therefore be taken with the positioning of the gears on their Rods, and a good idea of the positions can be had from the accompanying illustrations. When Pinion 25 is in mesh with Gear 17, the other Pinions and Gears must be out of mesh.

Moving the shaft in the direction of the input shaft, as Pinion 25 disengages with Gear 17, Pinion 24 should move into mesh with Gear 16 and, as these two gears disengage, Pinion 23 should move into mesh with Gear 15.

PARTS REQUIRED

1—6			
2—15	1—27	17—59	1—81
4—17	1—27a	2—62	1—115
4—16	1—27d	1—62a	1—115a
2—16b	5—31	1—63	2—120b
1—25	38—37a	1—63c	4—144(complete)
2—26	12—37b	3—72	4—171
1—26b	43—38	2—74	1—173a
1—26c	4—45	4—80b	



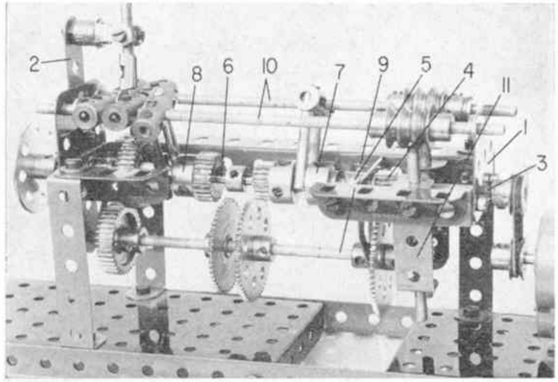
Drive to the relevant shaft in the 4-movement Gearbox is transmitted through a Dog Clutch. Three of the four clutch assemblies can be seen in this view.

CAR-TYPE GEARBOX

Still on gearboxes—but a totally different sort of gearbox—we have a realistically-acting 4-speed car-type unit designed and built by Mr. Ron Fail of Bedford. Mr. Fail points out, however, that the unit, as illustrated, is a demonstration model, but it closely follows the layout of a typical car gearbox, although it is of the "crash" type. While not being particularly compact, it is quite suitable for inclusion in any fairly large model.

"A framework," writes Mr. Fail, "Is built up from a pair of 5½ in. Angle Girders connected by three 1½ × 1½ in. Double Angle Strips, one at each end and one in the fourth hole from the front. (In the illustration, the right hand girder has been replaced by two shorter ones to show the gear arrangement more clearly.) The front Double Angle Strip carries a 1½ × 1½ in. Flat Plate 1, projecting upwards. The intermediate Double Angle Strip carries a Flat Trunnion projecting downwards and the rear Double Angle Strip carries both a 1½ × 1½ in. Flat Plate and a Flat Trunnion. A 2 in. Strip 2 is bolted to the rear Flat Plate.

"The input, or first motion shaft 3 is a 3 in. Rod journalled in the front two Double Angle Strips. It carries a $\frac{7}{16}$ in. Pinion 4 and the male part of a Dog Clutch 5, the Rod projecting about ½ in. backwards beyond the Dog Clutch. The output or main shaft 6 is a 4 in. Rod with Keyway which carries two sliding gear clusters. The front (top and third gear) cluster consists of a Socket Coupling 7 holding the female part of the Dog Clutch and a ½ in. Pinion fitted with a Key Bolt. The rear (second and first gear) cluster consists of a Socket Coupling 8 holding a ¾ in. Gear and a 1 in. Gear with Key bolt. The main shaft is journalled in the rear Double Angle Strip, its forward end being supported by the front gear cluster which overlaps the input shaft.



An effective 4-speed car-type Gearbox designed and built by Mr. Ron Fail of Bedford.

"A layshaft 9 is provided by a 5 in. Rod journalled in the bottom holes of the Flat Trunnions. It is driven by a 1⅝ in. Gear on the forward end and also carries a 1½ in. Gear, a 1¼ in. Gear and a 1 in. Gear, all of which are fixed on the layshaft in suitable positions to permit the gears to engage and disengage properly.

"Sliding in the top outer holes of the 1½ in. Flat Plates is a pair of nearly identical 6½ in. selector rods 10 each carrying a selector fork, this latter consisting of a Coupling fitted with two 1½ in. Rods. Note that the left hand Rod engages top and third gears. The three positions of each selector Rod are positively located by means of a ½ in. loose pulley sandwiched tightly between two fixed ½ in. Pulleys. Bearing on these Pulleys are spring-loaded 2½ in. Rods carried in 1½ × ½ in. Double Angle Strips 11 bolted to the side Girders. Near the rear end of each selector rod a pair of Couplings are fixed by their centre holes about $\frac{1}{16}$ in. apart. The gear lever is a 3 in. Rod carried in a Swivel Bearing mounted on a Pivot Bolt. A Rod and Strip Connector, fixed to the bottom of the gear lever, engages with the pairs of Couplings on the selector rods.

As described, the gearbox gives reduction ratios of 4 : 1, 2 : 1, 1.33 : 1 and 1 : 1, all of which are quite realistic. A standard Ford Cortina for example, has ratios of 3.54 : 1, 12.4 : 1, 1.41 : 1. Other sets of ratios can easily be provided by using other pairs of gears and, in particular, a reverse gear with a ratio of 4 : 1 can be supplied, in place of first gear, by using a train of three ½ in. Pinions instead of the pair of 1 in. Gears. Acknowledgement should be made to Mr. T. Holland who described the method of positively locating gearbox shafts in Meccano Magazine for February 1967."

One final point which should be mentioned, here, is that the accompanying illustration shows the Gearbox specially mounted for demonstration, driven by a small motor. The mounting and motor are of course unnecessary when the unit is built into a model.

PARTS REQUIRED

1—6	2—23b	16—37	1—144
2—9	1—25	14—38d	1—147b
2—14	1—26	5—48	1—165
1—15	1—26c	6—59	2—171
2—16a	1—27	6—63	1—212
2—16b	1—27a	2—74	1—230
4—18a	1—27d	2—120b	2—231
4—23a	2—31	2—126a	

First stage in the production of a new Dinky Toy. A skilled draughtsman designs the component parts of the model.

Many readers have written to us recently requesting a descriptive feature on how Dinky Toys are made. To answer many of the questions concerning die-cast models Chris Jelley presents part I of . . .

MODELS BY THE MILLION

AS THE OLD SAYING almost has it, all the world loves a modeller. At least, if the world doesn't actually care for the modeller himself, it certainly loves his model!

Everybody, it seems, is fascinated to some extent by miniature reproductions of real-life equipment. Just about everything mechanical and structural that has ever been made has been modelled at sometime or another, and more often than not, the model has aroused as much, if not more, interest than the real thing. Most of us, however, do not have the equipment, time, skill, or patience needed to take up modelling for ourselves and, because of this, a tremendous demand for professionally-produced models has grown up. Meccano Tri-ang Limited is one company which caters for this demand with their world-famous series of Dinky Toys:—small-scale model motor vehicles and aircraft die-cast predominantly in metal.

Meccano was the first major manufacturer of mass-produced die-cast models in the world. They, in fact started the " car craze " way back in the 1930's when they began to make little models for use with their model railway system to add realism to train layouts. These " scenic effects " became popular in themselves and soon grew to be the enormous success that they still are today.

A Pattern-Maker at work, producing a large-scale wooden " mock-up " of the body component for a new Dinky.

In those early days Dinky Toys were rather crude, rough " toys ", not necessarily based on any particular vehicle in real-life. They rarely consisted of more than a body and baseplate with wheels and axles and sometimes not even a baseplate was included—a far cry from the modern Dinky which in almost every case is a scale reproduction of a real-life vehicle likely to be equipped with all sorts of features such as working lights, steering and suspension plus opening doors, bonnet and boot and so on. Dinky Toys, in fact, are now so highly sophisticated that they sometimes incorporate more than 50 separate parts and require a factory full of specialised machinery for their production.

The work involved in designing, tooling up for and finally making any particular Dinky Toy is quite staggering when it is gone into. It is also extremely interesting.

Now it all starts

At the very beginning nothing more substantial than an idea exists; a suggestion, to be considered initially by Meccano's New Projects Manager, Mr. Terry Boland. The idea may originate with Mr. Boland, himself, or it may come from elsewhere, either outside or inside the company, but whatever its origin, Mr. Boland's job at this early stage is to decide whether or not the idea is a practicable proposition. If not, it is rejected at the start, but if it does have possibilities, it goes forward for further consideration by a special committee made up of experts on all aspects of design, production and marketing, who meet at regular intervals to select suitable models for future manufacture. These are the boys who, between them, really know the ins and outs of the business. They can tell what can be made and what can't be made; what features can be fitted, and what can't; whether something can be done economically or not; even, to a large extent, whether a model will sell or not. In short, they know the possibilities and they decide accordingly.

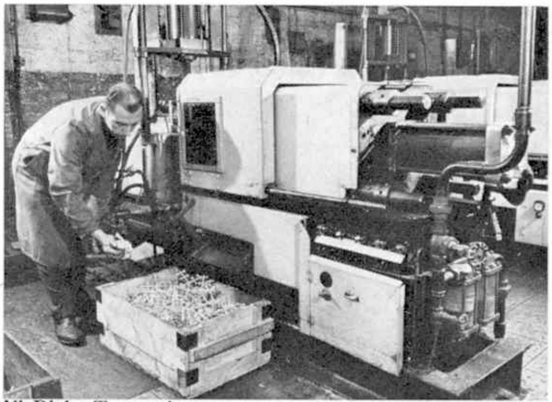
Once a model has been given the go-ahead, the New Projects Manager sets about obtaining details of the full-size vehicle for the design team to work from. This presents no problems as in almost every case the manufacturers are fully co-operative, often to the extent of supplying complete working drawings as well as photographs and full technical data. In fact, some manufacturers supply details of new cars on which they themselves are working while they are still on their own secret list! In such cases, of course, complete security is maintained at Meccano. Only three or four key people are made aware of the car's real identity, the model itself being given a simple code mark, such as "Saloon Car X", for identifying purposes during design and production. In this way, the model will go through all the stages of production without the hundreds of people involved in its manufacture knowing what it is.

With details of the real-life car to hand, the draughtsmen go to work and prepare technical drawings of each individual component to be used in the model. When you consider that any modern Dinky could have, in addition to the body, base and wheels, such things as separate doors, bumpers, bonnet and boot lids, engine, head and tail lamps, radio aerials, seats, windows, springing, possibly roof fixtures and the like, you can imagine how many drawings are involved. And these component drawings make up less than half of all the drawings that are required. All the components are made and assembled on special machines all of which must be equipped with individual dies, tools and jigs, and there are considerably more of these required than there are components for any particular model. When the component drawings are finished, therefore, they are passed to a team of tool draughtsmen who design all the tools, etc., and it is not until these tool drawings are completed that anything further can be done.

First people to do any actual "making" are the pattern-makers, to whom the complete sets of plans go when the draughtsmen have finished them. Working from the plans, these highly-skilled craftsmen prepare exactly-detailed wooden mock-ups or "patterns" of each component to a much bigger scale than will finally be used for the finished toy. A body mock-up, for example, may be as much as 15 in. long while the final toy might only be 3½ in. A hard wood such as beech or sycamore is used for the patterns which, after careful checking, are used in the preparation of special resin casts from which the final dies are copied on a die-sinking machine—a sort of mechanical three-dimensional pantograph which cuts the dies out of solid steel blocks.

Production processes

When all the dies and machine tools are thus prepared and hardened, production proper can at last begin. Naturally enough, the first stage in production is the manufacture of all the individual components used in the model and this involves three or sometimes four processes—die-casting, moulding, turning and sometimes pressing. The major part of the model is *die-cast* in tough metal to enable it to stand up to any rough treatment it is likely to suffer in the hands of an enthusiastic youngster, while the interior fittings and "extras"—usually nestling in the comparative safety of the main casting—are *moulded* in a strong



All Dinky Toy castings are produced on fully automatic, high-speed die-casting machines. Here, an operator is seen checking the output of one of the many machines at the Meccano Tri-ang factory in Liverpool.

polystyrene. In some cases the wheels are also moulded but more often than not, they are either cast in Mazak or *turned* from aluminium rods on fully automatic lathes which shape, drill and cut the wheels entirely unaided, once their "magazines" have been "loaded" with the necessary rods.

Most Dinky Toys today are equipped with die-cast bases, but occasionally a model does appear with a sheet-metal base. Such bases are *pressed* out of thin steel sheet on high-speed presses, the same process being used for the odd accessory like, for example, the bells on the latest Dinky Fire Tender, the Merryweather Marquis. Pressings, though, are becoming far less common than they used to be.

Die-casting

Of all the initial processes, the die-casting is the most important—and the most expensive! All castings are produced from a zinc-based alloy on fully-automatic machines which, again, require no attention except for the filling of the reservoirs with the necessary raw material. "Mazak" is the trade name of the alloy used, this consisting of approximately 96% pure zinc mixed with minute quantities of Aluminium and Magnesium. It comes in solid ingots which are first melted down in a large gas-fired pot before being transferred to the machines in a mobile ladle.

The actual die inside each machine is in two main

After all unwanted metal has been removed from the castings by "barrelling", the castings pass down an inspection conveyor. Any flash still remaining is removed by hand.

The "exit" end of the Phosphating Plant, through which Dinky Toy castings pass to be prepared for painting.

sections, one fixed and the other bolted to a moving platform technically termed a "platen". The two sections are brought together and the Mazak, which is kept in a molten state in the reservoir, is injected into the die under pressure. Almost immediately the metal solidifies, the platen slides back and the resulting casting is automatically ejected. The platen then returns and the cycle is repeated.

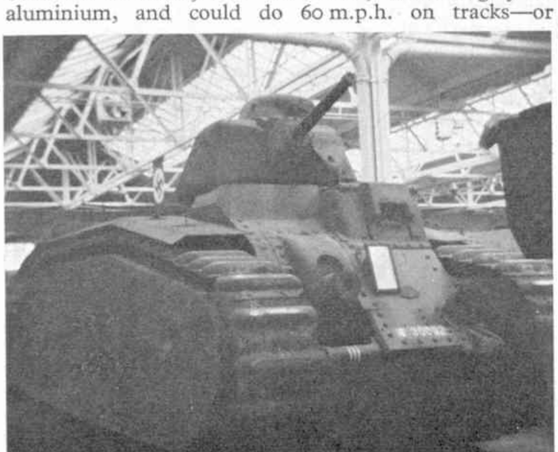
When ejected from the machines, the castings are mounted on "sprigs" of Mazak caused by the metal solidifying in the access channels to the die through which the molten Mazak is injected. These, together with a certain amount of "flash" which invariably clings to the castings, are unwanted and so the castings next go to the Barrelling Section where they are placed, along with specially graded stones and soapy water, in large hexagonal barrels made of steel and lined with rubber. The barrels are rotated and the stones remove the unwanted metal while the soapy water cleans the castings.

After separation, the unwanted metal is returned to the Die-casting Section for re-use, whereas the castings themselves travel down a checking conveyor. As they do so, a team of checkers inspect them for faults and, if necessary, remove by hand any flash that might still remain. Faulty castings are returned to Die-casting for re-melting, but the good majority are transferred to the Phosphating Plant. Here the castings—smooth and bright at this point—are passed through a special chemical solution which not only removes all trace of grease, but also etches the surface of the castings slightly to give a good "key" for the enamel, next to be applied. The castings emerge from phosphating dull, but completely clean and ready to go straight into the Paint Shop.

TANKS—*continued from page 373*

Vickers then made some of their light commercial tanks float, using at first balsa-wood beams along the tops of the track guards. This type was adopted by the Russians. Later, Vickers experimented with collapsible screens to help light tanks to float, but these schemes were not given enough official support.

Christie, meanwhile, argued that there was no point in making tanks swim, if he could make them fly. By 1932 his first airborne tank was under test! It was a beautiful machine, low and sleek, built largely of aluminium, and could do 60 m.p.h. on tracks—or 120 m.p.h. on wheels. Christie's idea of launching it was to drop it from an aircraft flying slowly just above the ground. He gave it a wonderful suspension which should have coped with the shock—indeed, he actually tested it successfully with his son aboard, dropping it from the factory roof! Christie could not interest his Government in this project, although the Russians bought one model in order to examine it. Until the beginning of World War Two he continued to build experimental 'flying tanks', but soldiers found them too unconventional. Both the British and U.S. War Departments ordered specimens of airborne tanks that could be carried in gliders, but these were nondescript machines—they had to be thin-skinned to save weight, but being conventional in design they did not have the superb mobility of the Christie airbornes; Christie believed that if tanks could zip about at nearly 100 m.p.h., they wouldn't need thick armour! We can get an idea of just how far ahead Christie was, when we recall that it is only in the past few years that Britain and the U.S.A. have got to grips with the design of light alloy tanks which can be dropped by parachute. . . .



The M 2 Medium was a speedy machine which did not see action. I.s chassis was used as a basis for the wartime M 3 Grant/Lee and M 4 Sherman.

Well, that is a quick survey of the types of tank evolved during those hectic 20 years between the first and second World Wars. It was a time when a thoughtful soldier could plan entirely novel kinds of warfare with the help of new kinds of modern armour—and when old-fashioned soldiers hated the very sound of the word 'tank', and did all they could to stop their development. In my next article, I shall describe how the seven types clashed in war—and how they got sorted out.

Because, for war machines, the laws of Evolution apply! Only the fittest survive and we shall see which of the seven were the fittest, in the vast struggle for survival that was World War 2.

HAVE YOU SEEN?

Three games from Waddingtons

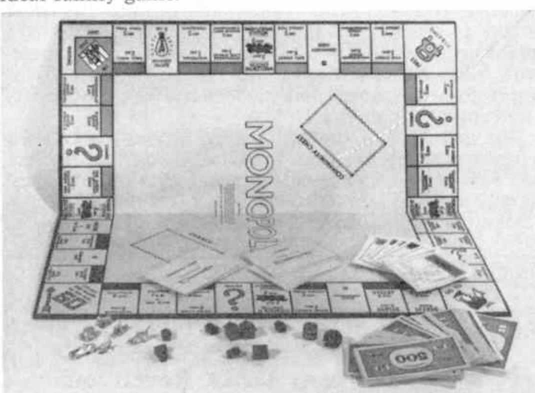
" Something old and something new " could well be the theme for the following reviews of games from John Waddingtons, as two of the games we have recently received are no less than 35 years apart !

The " oldest " game is of course Monopoly, a game which must be the most widely known of all board/card games.

For the benefit of the few who have never played Monopoly, or for the fewer who have never heard of it, here is a brief description of what it is all about : Extracted from the instructions included in the contents. The ideal of the game is to buy and rent or sell properties so profitably that one becomes the wealthiest player and eventual MONOPOLIST. Starting from " Go " tokens are moved around the Board according to throw of dice. When a Player's token lands on a space not already owned, he may buy it from the Bank; otherwise it is Auctioned off to the highest bidder. The object of owning property is to collect rents from Opponents landing there. Rentals are greatly increased by the erection of Houses and Hotels, so it is wise to build them on Building Sites. To raise more money Building Sites may be mortgaged to the Bank.

Monopoly comes in a strong colourful box which when opened reveals the thick card playing board. Underneath are to be found in separate compartments the houses and hotels (red plastic for the hotels, green for the houses), dice, paper money, " deed " cards (for the property owned), " Chance " and " Community Chest " cards, a pair of dice and the players " tokens ". These are die-cast metal objects in the form of a racing car, a top-hat, a battleship, a dog, an iron, and last of all, a boot !

At a cost of 35/- " Monopoly " is excellent value for money and to be thoroughly recommended as the ideal family game.



In production for over 35 years, Monopoly is still one of the world's biggest selling games.

Cube fusion

Coming right up to date this is the latest game from Waddingtons, and is entitled Cube Fusion. Basically it is a game of three dimensional naughts and crosses (explanation follows) and is intended for one or two players.

The game consists of 24 clear perspex cubes, fused into pairs. Each pair of cubes have a coloured bead in their centres, one green and one red. Players select which colour they wish to play and lay a piece alternately onto a small chequerboard included in the contents. The idea is to form a line of beads of your colour, in any direction, rather like in naughts-and-crosses. The differences are however, that in " Cube Fusion " the winning line can be made in one of three directions, up, down or across (including a diagonal line) and of course as your partners cube is fused to yours, everytime you make a move, you make one for him ! Very careful concentration and thought are required as you can see !

At a price of 40/- the game may seem at first expensive, but as there are a further five games possible, one of which is a form of " Solitaire " we feel that it is reasonably priced. Certainly it became a firm lunchtime favourite here in the office in one form or another !

Bang up-to-date is " Cube Fusion," a game of careful strategy based on " naughts-and-crosses."

One Too Many

The wording on the box of this game proclaims it to be for the five to ten age group, but we would disagree. One too many is a game of nerves and entails the building of a pyramid of coloured " Clowns ".

One to four players each take 10 clowns of a certain colour, and in rotation place them one onto the other. The player who topples the pile takes all, and the one who manages to get rid of his is the winner.

Once again an attractively boxed game. The clowns are in brightly coloured non-toxic plastic and are strongly moulded. We feel (contrary to the manufacturers !) that this game is ideal for everyone with a steady hand and good value at 29/6.

New Corgi's

First of the new Corgi cars to arrive at the office this month was a model of the new Ford Capri. Finished in brilliant white and correctly named the Ford Capri 3,000 GT this model represents the car driven by leading Rally driver Roger Clark. It sports a matt black bonnet, racing numbers and eye-catching ventilated wheel discs. To catch some of the speed the full-sized car can achieve (over 110 miles per hour) the model is fitted with Whizzwheels which increase in speed and long-range performance.

Although primarily intended for the under-tens, " One-Too-Many " is an ideal family game, the prime requirement being a steady hand.

In addition the model features jewelled headlights, opening doors and folding front seats. Also in the box is a sheet of nine transfers which include a pair of number plates and various advertisement slogans. The price of this model is 8/11d.

Lamborghini Muira

This model must surely be one of the most attractive British die-cast sports cars to appear. Finished in an eye-catching lime green with contrasting red interior it sports a wealth of detail which includes jewelled headlights, suspension chromed racing wing mirrors, opening bonnet at the front revealing a spare wheel, opening rear boot-lid *plus* opening rear engine cover which gives access to a chromium and gold plated engine. The new ventilated wheel discs are fitted to this model which naturally has Whizzwheels.

The Italian firm of Lamborghini has a Bull as its motif, and a rather ferocious model of one is also supplied with this model all in the price of 11/6d.

Rolls Royce Silver Shadow

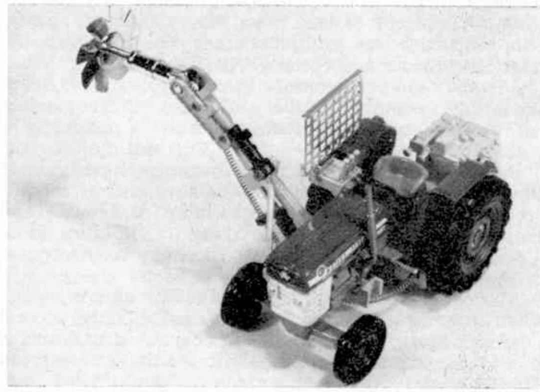
Last of the new Corgi cars for this month is a model of the latest Rolls Royce, the luxurious Silver Shadow.

Finished in two-tone blue and white this model differs from the other two in being fitted with " golden jacks " instead of Whizzwheels. This system allows the wheels to be removed leaving the model standing on small jacks. The interior of the car is well detailed in medium blue with tipping front seats and full dash-board instrumentation, complete with a gold plated steering wheel. Outside the bonnet opens to show the engine, and the boot to reveal a spare wheel. Both doors open and to complete the exterior the large chromium plated front of the car is fitted with two pairs of twin jewelled headlamps. This model is priced at 12/6d.

Massey-Ferguson Tractor

Rounding off this month's Corgi die-cast models is a new tractor fitted with a circular-saw hedge trimmer which actually revolves ! The secret lies in a flexible drive unit from one of the rear wheels operating the realistic looking saw attachment which is fitted to a " boom " on the tractor's side. The boom is completely adjustable for angle and height. The tractor is finished in bright yellow and red, and features a simulated engine noise when pushed along.

This model costs 14/11d.



Corgi's finely detailed Massey-Ferguson tractor with engine noise and working hedge trimmer.

Spacenik 2

In the March issue of Have You Seen ? we published details of the 79/11 version of " Spacenik " and have recently received from the manufacturers the £6.19.6 type.

Called " Spacenik 2 " this one utilizes the same system of track, but for the extra outlay there is a machanically operated " crossing " and a second spacecraft. The additional spacecraft is rather like a flying saucer in appearance, and has the added attraction of a flashing red dome to it.

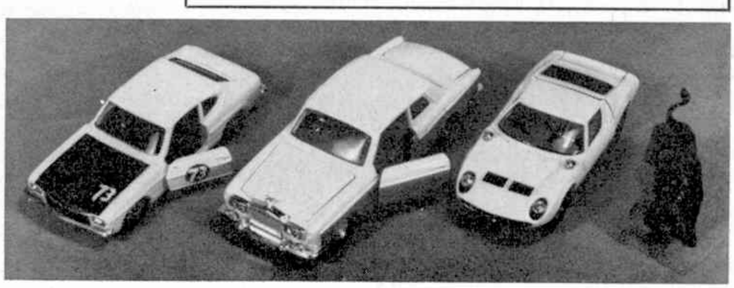
The inclusion of the 2nd spaceship and the crossing makes for better fun than the cheaper version, we feel, but both are most unusual toys and sure to be a great hit with the 5 to 10 year olds.

Manufacturer : Rovex Industries.

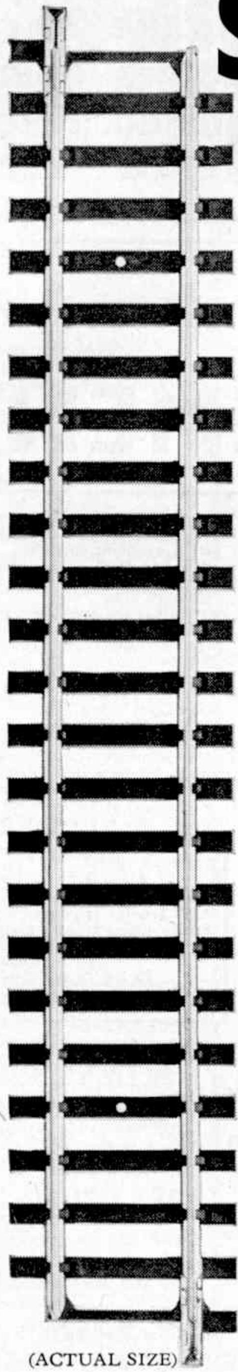
NEXT MONTH . . .

Have You Seen? will be largely devoted to reviews of the latest plastic kits from Airfix, Revell and Monogram.

The three new Corgi cars: Left, the Ford Capri; Centre, the Rolls Royce; Right, the Lamborghini Muira, complete with Bull.



This is New System 6 track by Tri-ang HORNBY



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